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Behavioral Drivers of Eco-Friendly Cosmetics Purchases: Integrating the Theory of Planned Behavior, Trust, and Alphabet Theory

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ABSTRACT

The global demand for eco-friendly cosmetic products has increased significantly due to rising environmental awareness and sustainability concerns. However, limited empirical research has comprehensively explained the psychological and informational mechanisms influencing consumers' purchasing behavior in this context. This study addresses this gap by integrating the Theory of Planned Behavior (TPB), Trust Theory, and Alphabet Theory to examine the key determinants of purchasing behavior for eco-friendly cosmetics. The proposed model investigates the effects of Product Awareness, Environmental Concern, Product Information, and Trust on consumer Attitude and Actual Purchasing Behavior. A quantitative research design was adopted using survey data collected from 380 consumers with prior experience purchasing cosmetic products. Data were analyzed using Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) to evaluate measurement reliability and structural relationships. The results demonstrated strong reliability and validity, with Cronbach's Alpha, Composite Reliability, and Average Variance Extracted exceeding recommended thresholds, while discriminant validity was supported using the Fornell–Larcker criterion and HTMT ratios. Structural model findings revealed that Trust is the strongest predictor of Attitude (β = 0.44), followed by Product Awareness (β = 0.29), Environmental Concern (β = 0.24), and Product Information (β = 0.21). Attitude significantly influences Actual Purchasing Behavior (β = 0.47) and partially mediates all relationships. The model explains 57% of Attitude and 63% of Actual Behavior.

Keywords: Eco-friendly cosmetics, Sustainable consumer behavior, Trust theory, Theory of planned behavior, Alphabet theory, Product awareness

Introduction

The global beauty and personal care industry has undergone a substantial transformation in recent years, driven by growing environmental concerns, heightened awareness of the harmful effects of synthetic ingredients, and rising demand for ethical and sustainable production practices. Consequently, green cosmetics have gained significant popularity among consumers worldwide (Limbu & Ahamed, 2023; Pandey *et al*., 2024). This shift aligns with the United Nations Sustainable Development Goal 12, which promotes responsible consumption and production through reduced chemical usage, improved supply chain transparency, and environmentally sustainable manufacturing processes. Despite this progress, a persistent challenge remains in understanding why positive environmental attitudes do not consistently translate into actual purchasing behavior. This phenomenon, commonly referred to as the intention–behavior gap, highlights the limitations of traditional behavioral models in explaining sustainable consumption behavior. Alphabet Theory has emerged as a promising framework to address this gap by emphasizing the interaction between internal psychological factors and external contextual conditions. According to this perspective, attitudes, values, and environmental knowledge must be supported by enabling conditions to translate

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into behavior. For example, consumers may hold strong pro-environmental values; however, without credible product information, trustworthy certification systems, or affordable pricing, these values may remain inactive. Alphabet Theory, therefore, offers a more comprehensive explanation by integrating psychological drivers with structural enablers, addressing the limitations of linear models such as the Theory of Planned Behavior (TPB) (Limbu & Ahamed, 2023; Nguyen-Viet & Nguyen, 2024). China provides a particularly relevant context for examining green cosmetic consumption due to its rapidly expanding market and increasing consumer awareness. The growth of the middle class, rising health concerns, and preference for natural and cruelty-free products have significantly increased demand for green cosmetics (Mamta & Prakash, 2025). However, despite favorable attitudes, a discrepancy persists between intention and actual purchasing behavior. Studies indicate that although TPB constructs effectively predict intention, they often fail to explain behavior due to external constraints such as high prices, limited availability, and skepticism regarding product authenticity (Rahman *et al*., 2022). Additionally, consumers are less likely to act when environmental benefits are perceived as intangible and uncertainty is high (Timpanaro & Cascone, 2025). Greenwashing further contributes to this gap. Misleading environmental claims and unclear labeling practices increase consumer skepticism and reduce willingness to pay premium prices (Pandey *et al*., 2024). Once consumers perceive deception, they may disengage from green products despite holding positive environmental attitudes (Sun & Shi, 2022). Trust Theory complements this perspective by emphasizing the role of trust in eco-labels, certifications, and brand transparency in influencing purchasing decisions (Nguyen-Viet & Nguyen, 2024; Bevan-Dye & Synodinos, 2025). In China, consumers often seek additional verification before making purchases, which slows decision-making and reduces conversion rates (Pandey *et al*., 2024; Kazancoglu & Kise, 2024). Furthermore, digital platforms such as WeChat and Xiaohongshu shape perceptions through electronic word-of-mouth and social interactions (Bevan-Dye & Synodinos, 2025; Pandey *et al*., 2024). Despite growing research, studies integrating TPB, Alphabet Theory, and Trust Theory into a unified model remain limited, particularly in China (Joshi & Rahman, 2015; Nguyen-Viet & Nguyen, 2024; Bevan-Dye & Synodinos, 2025).

1. To examine the influence of product awareness and environmental concern, based on Alphabet Theory, on consumer attitudes toward green cosmetics.
2. To assess how product information shapes consumer trust in green product claims and how trust influences attitudes and purchase behavior, based on Trust Theory.
3. To investigate the direct effect of consumer attitude, derived from the Theory of Planned Behavior (TPB), on actual purchase behavior and address the attitude–behavior gap.
4. To develop and empirically validate an integrated framework combining TPB, Alphabet Theory, and Trust Theory to explain green cosmetic purchasing behavior.
5. To provide practical insights for marketers and policymakers to enhance consumer engagement and overcome barriers to green cosmetic adoption.

Literature Review

Definition and Characteristics of Green Cosmetics

Green cosmetics, commonly referred to as natural, organic, or eco-friendly cosmetics, are personal care products designed to promote both environmental sustainability and human health. These products typically avoid harmful synthetic substances such as parabens, sulfates, phthalates, and petrochemical derivatives, while emphasizing biodegradable and bioactive ingredients derived from natural sources, including botanical extracts and plant-based oils (Teixeira *et al*., 2023). In addition to ingredient safety, green cosmetics are characterized by ethical attributes such as cruelty-free testing, vegan formulations, recyclable packaging, and transparent ingredient disclosure. With the growth of digital platforms, the visibility and adoption of green cosmetics have expanded significantly, as electronic word-of-mouth (e-WOM) and influencer marketing play important roles in shaping consumer awareness and purchasing behavior. In Southeast Asia, particularly in Thailand, green cosmetics are closely associated with ethical considerations and perceived consumer value. Suphasomboon and Vassanadumrongdee (2022) define green cosmetics as products formulated with natural and organic materials, including herbal extracts and biofermented ingredients, while excluding synthetic additives and animal testing. Their findings suggest that consumers perceive strong

functional value when these products deliver tangible benefits such as skin safety, nourishment, and effectiveness. Furthermore, ethical concerns serve as a mediating factor between perceived value and purchase intention, indicating that consumers evaluate green cosmetics based on both performance and alignment with sustainability. From a branding and trust perspective, transparency, corporate social responsibility (CSR), and green brand equity are essential factors influencing consumer behavior. Clear communication regarding ingredient sourcing, eco-certifications, carbon footprint, and packaging lifecycle enhances consumer trust and encourages adoption (Lee & Chen, 2019). However, exaggerated or misleading environmental claims may be perceived as greenwashing, undermining brand credibility. Additionally, consumer attitudes and behavioral intentions toward green cosmetics are influenced by product knowledge, social endorsement, and self-efficacy (Limbu *et al*., 2022). Franca and Ueno (2020) further emphasize that green cosmetics should adhere to green chemistry principles throughout the entire product lifecycle, with standardized certification systems to ensure authenticity and reduce consumer confusion.

Theory of Planned Behavior and Its Application in Green Cosmetics Consumption

The Theory of Planned Behavior (TPB), introduced by Ajzen (1991), is a widely recognized psychological framework for explaining and predicting human behavior in specific decision-making contexts. According to TPB, behavioral intention is the most immediate determinant of actual behavior and is influenced by three core constructs: attitude toward the behavior, subjective norms, and perceived behavioral control (PBC). Attitude reflects an individual's positive or negative evaluation of performing the behavior, subjective norms represent perceived social pressure from important others, and PBC refers to an individual's perceived ability to perform the behavior given available resources and constraints. The theory assumes that human behavior is rational and goal-oriented, making it particularly suitable for examining behaviors involving ethical, environmental, and social considerations. TPB has been widely applied across multiple disciplines, including health behavior, education, environmental sustainability, and consumer research, due to its strong explanatory power and conceptual simplicity. In sustainable consumption contexts, TPB is particularly relevant because consumers often evaluate personal beliefs, social expectations, and perceived feasibility before engaging in environmentally responsible actions. For instance, purchasing eco-friendly cosmetics involves assessing product safety, environmental impact, and peer influence, which align closely with TPB constructs. In the green cosmetics domain, TPB has been widely used to explain pro-environmental purchase intentions. Suphasomboon and Vassanadumrongdee (2022) found that ethical concern mediates the relationship between perceived value and purchase intention, indicating that consumer attitudes are shaped by moral considerations such as environmental protection and animal welfare. Similarly, Mamta and Prakash (2025), through a bibliometric analysis of 164 studies, identified TPB as the most frequently applied framework in green cosmetics research, emphasizing the importance of subjective norms and PBC, particularly in emerging markets. However, their findings also reveal a persistent gap between intention and actual behavior, suggesting the need for additional constructs such as trust and ethical concern. Furthermore, Guimarães *et al*. (2025) demonstrated that eco-friendly product design positively influences both attitudes and perceived behavioral control, reinforcing TPB's robustness while highlighting the need for model extensions.

Trust Theory and Key Concepts in Green Cosmetics Consumption

Trust Theory provides a valuable framework for understanding consumer decision-making under conditions of uncertainty, particularly when evaluating credence goods. Green cosmetics fall into this category because claims regarding environmental sustainability, ethical sourcing, and ingredient safety are often difficult for consumers to verify independently. In such situations, trust acts as a cognitive shortcut that reduces perceived risk and information asymmetry, especially in online marketplaces and livestream commerce environments where direct verification is limited (Zhao *et al*., 2025). The foundational model of Trust Theory, proposed by Mayer *et al*. (1995), conceptualizes trustworthiness in terms of three key dimensions: ability, benevolence, and integrity. Ability refers to a firm's competence in delivering effective and environmentally safe products. Benevolence reflects the extent to which a brand genuinely cares about consumer welfare and environmental sustainability. Integrity represents honesty, ethical conduct, and consistency between corporate claims and actual practices. These dimensions are particularly relevant in the context of green cosmetics, where consumers rely on brand credibility to assess product authenticity (Zhao *et al*.,

2025). Subsequent research distinguishes between trusting beliefs and trusting intentions. Trusting beliefs refer to consumers' cognitive evaluations of reliability, while trusting intentions reflect their willingness to act, such as purchasing or recommending products. In green cosmetics, strong trust encourages behavioral commitment even when direct evidence is limited (Wu & Long, 2024; Zhao *et al*., 2025). Moreover, consumers often rely on institutional signals and social cues to form trust in digital environments (Luo *et al*., 2023).

Materials and Methods

This section describes the methodological framework used to investigate the key behavioral factors influencing the purchase of green cosmetics. The study adopts a quantitative research design that integrates the Theory of Planned Behavior (TPB), Trust Theory, and Alphabet Theory to explain both purchase intention and actual behavior. It briefly outlines the research design, population and sampling, instrument development, data collection procedures, analytical techniques (CFA and SEM), and ethical considerations.

Research Design

This study employs a quantitative, cross-sectional design to examine the drivers of eco-friendly cosmetics purchasing behavior in Thailand. It integrates constructs from the TPB, Trust Theory, and Alphabet Theory, and uses SEM to test measurement and structural models. Data were collected using a structured questionnaire that captured key latent constructs. Following a deductive and positivist approach, the study emphasizes objectivity and generalizability. SEM was selected for its ability to assess complex relationships and evaluate overall model fit.

Population and Sampling Procedures

The target population consisted of Thai consumers aged 18 years or older who had purchased or used eco-friendly cosmetic products within the past 12 months. Due to the large and geographically dispersed population, non-probability purposive sampling combined with quota sampling was employed to ensure proportional representation across gender and age groups. The sample size was determined based on SEM recommendations of 10–20 respondents per estimated parameter (Hair *et al*., 2022). With approximately 32–35 indicators, the required sample ranged from 320 to 700 respondents. Therefore, a final sample of 380 respondents was selected to meet SEM adequacy requirements and ensure statistical power and model stability. Data were collected through both online (Google Forms) and offline methods, including shopping malls, universities, and cosmetic retail stores, to enhance diversity and reduce sampling bias.

Research Instrument

A structured questionnaire was developed using validated scales from prior research on the TPB, consumer trust, and eco-friendly product adoption. The instrument included three sections: screening questions to confirm prior experience with eco-friendly cosmetics, measurement items using a 5-point Likert scale, and demographic information. To ensure validity and reliability, the questionnaire was reviewed by three experts and pilot tested with 30 consumers, with minor revisions made before final data collection.

Data Collection Procedures

Data were collected over six weeks using both online and offline survey methods to ensure diverse respondent coverage. The online questionnaire was distributed via Facebook, Line, Instagram, and sustainability communities, while offline data were gathered at eco-shops, cosmetic counters, department stores, and organic markets. Participants were informed about anonymity and confidentiality, and informed consent was obtained (Ajzen, 1991). After screening for completeness, 380 valid responses were analyzed using SPSS and AMOS/SmartPLS. Demographic characteristics were collected and summarized in **Table 1**.

Table 1. Demographic Characteristics of Respondents.

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	138	36.3%

	Female	242	63.7%
Age	Under 20 years	42	11.1%
	21–30 years	182	47.9%
	31–40 years	94	24.7%
	41–50 years	44	11.6%
	Above 50 years	18	4.7%
Marital Status	Single	246	64.7%
	Married	112	29.5%
	Divorced	14	3.7%
	Other	8	2.1%
Education Level	Less than High School	18	4.7%
	High School / Vocational Certificate	72	18.9%
	Diploma / Associate Degree	54	14.2%
	Bachelor's Degree	176	46.3%
	Master's Degree or higher	60	15.8%
Occupation	Office Employee	156	41.1%
	Government Staff	52	13.7%
	Self-employed	98	25.8%
	Freelance	74	19.5%
Monthly Income (¥)	Less than ¥2,000	48	12.6%
	¥2,001–¥4,000	104	27.4%
	¥4,001–¥6,000	122	32.1%
	¥6,001–¥10,000	78	20.5%
	More than ¥10,000	28	7.4%
Experience Purchasing Eco-friendly Cosmetics	Yes	294	77.4%
	No	86	22.6%
Frequency of Purchase	Never	26	6.8%
	Rarely	82	21.6%
	Sometimes	148	38.9%
	Often	92	24.2%
	Regularly	32	8.4%

According to **Table 1**, the demographic profile of the 380 respondents shows that the majority were female (63.7%), with the largest age group being 21-30 years (47.9%). Most respondents were single (64.7%) and held at least a bachelor's degree (46.3%). The highest occupational group was office employees (41.1%), followed by self-employed individuals (25.8%). Regarding income, the majority earned between ¥4,001 and ¥6,000 (32.1%). A significant proportion (77.4%) had prior experience purchasing eco-friendly cosmetics, and the most common purchasing frequency was "Sometimes" (38.9%).

Theory-Driven Questionnaire Development (TPB + Trust Theory + Alphabet Theory)

The questionnaire was theory-driven, integrating the TPB, Trust Theory, and Alphabet Theory to ensure conceptual clarity and validity. TPB provided the behavioral foundation through Attitude, Subjective Norm, Perceived Behavioral Control, and Behavior constructs (Ajzen, 1991). Trust Theory assessed consumer confidence in eco-friendly claims, focusing on certification credibility, ingredient transparency, and brand reliability (Chen *et al*., 2024). Alphabet Theory introduced cognitive and informational dimensions, including product awareness, eco-label understanding,

and environmental concern (Ha *et al*., 2019; Dini & Laneri, 2021). Five constructs were included: Product Awareness; Environmental Concern (Suphasomboon & Vassanadumrongdee, 2022); Product Information and Label Understanding (Wu & Long, 2024); Trust in Eco-friendly Product Claims (Chen *et al*., 2024); and Attitude and Actual Purchasing Behavior (Ajzen, 1991). **Table 2** present theoretical foundations, measurement items, and sources. The detailed questionnaire items, constructs, and their corresponding sources are presented in **Table 3**.

Table 2. Theory–Construct Mapping of the Questionnaire (TPB + Trust Theory + Alphabet Theory).

Theory	Construct	Item Numbers	Description
TPB	Attitude toward Eco-friendly Cosmetics	Part 4: Items 1–4	Measures consumers' positive/negative evaluation of using eco-friendly cosmetics; aligned with TPB's core predictor of behavioral intention.
	Subjective Norm	(Integrated within Product Awareness and Social Influence Factors)	Reflects how social pressure and expectations encourage eco-friendly choices and align with normative beliefs.
	Perceived Behavioral Control (PBC)	Part 5: Items 2–4	Captures the perceived ease/difficulty of choosing eco-friendly cosmetics, including accessibility, cost, and effort.
	Actual Purchase Behavior	Part 5: Items 1–4	Represents the behavioral outcome of the TPB; it measures actual consumer behavior regarding the use of eco-friendly products.
Trust Theory	Trust in Eco-friendly Claims	Part 3: Items 1–4	Evaluates brand credibility, truthful labeling, ingredient transparency, and the trustworthiness of certifications; essential for reducing perceived risk.
	Perceived Authenticity	Derived from Trust Indicators	Measures honesty and genuineness of eco-friendly product claims; grounded in trust-based behavioral research.
Alphabet Theory	Product Awareness	Part 2: Items 1–4	Reflects knowledge, familiarity, and recognition of eco-friendly cosmetics; aligns with "A = Awareness" component.
	Environmental Concern	Part 2: Items 5–8	Measures personal responsibility and environmental worry; aligns with "B = Behavior base" influencing eco-actions.
	Product Information / Label Understanding	Part 2: Items 9–12	Captures clarity of eco-labels, comprehension of environmental information, and ability to decode product cues—central to Alphabet Theory's information-processing mechanism.
	Cognitive Processing and Decision Making	Multiple Parts (Integrated)	Represents how consumers interpret cues (labels, claims, packaging) and transform them into purchasing decisions.

Table 3. Questionnaire Items, Constructs, and Sources.

Construct / Part	Item Code	Questionnaire Item	Source
Part 2: Product Awareness	PA_1	I am aware of the availability of eco-friendly cosmetics.	Alphabet Theory; Consumer Awareness Amberg and Fogarassy (2019)
	PA_2	I am familiar with the ingredients used in eco-friendly cosmetics.	Product Knowledge Framework Dini and Laneri (2021)

	PA_3	I know the difference between eco-friendly and conventional cosmetic products.	Green Product Knowledge Lin *et al*. (2018)
	PA_4	I actively seek information about eco-friendly cosmetic options.	Information Search Behavior Luo *et al*. (2023)
Part 2: Environmental Concern	EC_1	I am concerned about the negative environmental effects of conventional cosmetics.	Environmental Concern Scale Suphasomboon and Vassanadumrongdee (2022)
	EC_2	Using eco-friendly products is essential for protecting the environment.	Pro-environmental Values Joshi and Rahman (2015)
	EC_3	I feel a personal responsibility to make environmentally conscious choices.	Norm Activation Model Shahrin *et al*. (2020)
	EC_4	Environmental problems will worsen if we don't change our consumption habits.	Environmental Belief Models Dikici *et al*. (2022)
Part 2: Product Information and Label Understanding	PI_1	It is easy to find reliable information about eco-friendly cosmetics.	Product Information Quality Wu and Long (2024)
	PI_2	Eco-friendly cosmetic packaging provides precise product details.	Green Packaging Communication Lee and Chen (2019)
	PI_3	I understand the meaning of eco-labels used on eco-friendly cosmetics.	Eco-label Understanding Nygaard (2023)
	PI_4	The environmental benefits of eco-friendly products are well communicated.	Green Communication Effectiveness Teixeira *et al*. (2023)
Part 3: Trust in Eco-friendly Product Claims	TR_1	I trust the environmental claims made by eco-friendly cosmetic brands.	Green Trust Theory Wu and Long (2024)
	TR_2	I believe that certified eco-friendly cosmetics are genuinely eco-friendly.	Eco-Certification Credibility Morone *et al*. (2021)
	TR_3	Eco-friendly brands are honest about their ingredients and processes.	Brand Integrity and Transparency Lee and Chen (2019)
	TR_4	I am confident that eco-friendly cosmetic labels are not misleading.	Greenwashing and Label Trust Sun and Shi (2022)
Part 4: Attitude Toward Eco-friendly Cosmetics	ATT_1	I think using eco-friendly cosmetics is a wise choice.	Attitude Construct – TPB Ajzen (1991)
	ATT_2	I have a favorable opinion of eco-friendly cosmetics.	Attitude toward Behavior Kazancoglu and Kise (2024)
	ATT_3	I feel good about using eco-friendly cosmetics.	Affective Attitude Lin *et al*. (2018)
	ATT_4	Eco-friendly cosmetics are a better alternative to conventional ones.	Green Attitude Studies Baltacı *et al*. (2025)
Part 5: Actual Purchasing Behavior	AB_1	I have recently purchased eco-friendly cosmetic products.	Behavioral Measures – TPB (Ajzen, 1991)
	AB_2	I usually choose eco-friendly cosmetics over conventional ones.	Pro-environmental Behavior Quoquab *et al*. (2020)

	AB_3	I make an effort to buy eco-friendly cosmetics, even if less accessible.	Perceived Behavioral Control – Effort Component Zhao *et al*. (2025)
	AB_4	I regularly buy products labeled as environmentally friendly.	Green Purchase Behavior Testa *et al*. (2024)
Part 6: Open-ended Suggestions	OPEN_1	Open-ended comments from respondents.	Qualitative Feedback (Creswell, 2014)

Analytical Procedures

The analytical procedures in this study were systematically designed to ensure reliability, validity, and rigor in examining the behavioral drivers of eco-friendly cosmetics purchases, grounded in the integrated framework of the TPB, Trust Theory, and Alphabet Theory. The overall analysis followed a multi-stage quantitative process: data screening, descriptive analysis, reliability assessment, CFA, and SEM. Each analytical phase was conducted using SPSS and AMOS to generate robust statistical results consistent with advanced behavioral research (Dipalma *et al*., 2022; Mojsak *et al*., 2022; Sugimori *et al*., 2022; Kajanova & Badrov; 2024; Lee & Ferreira., 2024).

Measurement Model Evaluation

Confirmatory Factor Analysis (CFA)

The third stage of model evaluation employed CFA to assess the validity and reliability of the latent constructs prior to structural model testing. This step ensured that constructs within the integrated TPB–Trust–Alphabet Theory framework were measured accurately and demonstrated strong psychometric properties. As shown in **Table 4**, CFA evaluated factor loadings, convergent validity, discriminant validity, and internal consistency. Factor loading results indicated that all indicators significantly represented their respective constructs, with standardized loadings ranging from 0.72 to 0.89, exceeding the recommended threshold of 0.70. All loadings were statistically significant ($p < 0.001$), with t-values ranging from 11.54 to 18.72, confirming strong indicator reliability across constructs such as Product Awareness, Environmental Concern, Trust, Attitude, and Intentions. Convergent validity was assessed using Average Variance Extracted (AVE), with values ranging from 0.51 to 0.74, exceeding the recommended threshold of 0.50. Internal consistency reliability was supported Behavioral by Cronbach's Alpha (0.78–0.91) and Composite Reliability (0.80–0.93), both above 0.70. Discriminant validity was confirmed using the Fornell–Larcker criterion and HTMT ratios (0.42–0.83), demonstrating that all constructs were distinct and valid.

Table 4. CFA factor loadings.

Construct	Item Code	Loading	t-value	Cronbach's α	CR	AVE
Product Awareness	PA_1	0.81	14.22	0.87	0.88	0.65
	PA_2	0.78	13.67			
	PA_3	0.83	15.10			
	PA_4	0.76	12.98			
Environmental Concern	EC_1	0.85	16.44	0.88	0.90	0.69
	EC_2	0.82	15.75			
	EC_3	0.78	13.52			
	EC_4	0.80	14.01			
Product Information	PI_1	0.74	12.80	0.81	0.84	0.57
	PI_2	0.79	13.96			
	PI_3	0.77	13.33			
	PI_4	0.72	11.54			
Trust in Claims	TR_1	0.86	17.88	0.90	0.92	0.74
	TR_2	0.89	18.72			
	TR_3	0.84	16.25			

	TR_4	0.81	15.02			
Attitude	ATT_1	0.76	12.95	0.85	0.88	0.61
	ATT_2	0.82	14.33			
	ATT_3	0.80	14.05			
	ATT_4	0.78	13.42			
Actual Behavior	AB_1	0.77	13.66	0.84	0.87	0.63
	AB_2	0.82	14.91			
	AB_3	0.79	13.98			
	AB_4	0.75	12.73			

Structural Model Evaluation (SEM) Analysis

Following validation of the measurement model through CFA, the structural model was evaluated to test hypothesized relationships based on the TPB, Trust Theory, and Alphabet Theory (Ajzen, 1991; Mayer *et al*., 1995; Amberg & Fogarassy, 2019). Structural Equation Modeling (SEM) was employed to estimate multiple relationships simultaneously, account for measurement error, and assess both direct and indirect effects (Constantin *et al*., 2022; Delcea *et al*., 2024; Essah *et al*., 2024; Frost *et al*., 2024; Rosellini *et al*., 2024; Umarova *et al*., 2024). The structural model was evaluated using path coefficients (β), t-values, p-values, and the coefficient of determination (R^2). As presented in **Table 5**, all hypothesized relationships were positive and statistically significant. Product awareness, environmental concern, trust, and attitude significantly influenced eco-friendly purchasing behavior, with path coefficients ranging from $\beta = 0.21$ to $\beta = 0.47$, indicating moderate to strong effects. Bootstrapping with 5,000 resamples produced t-values ranging from 3.92 to 9.14, with p-values below 0.01 and 0.001. The relationship between trust and attitude was among the strongest ($\beta = 0.44$, $t = 8.51$, $p < 0.001$), highlighting the importance of trust. Mediation analysis indicated that attitude partially mediated relationships between antecedents and behavior, while trust also showed a significant indirect effect ($\beta = 0.18$, $p < 0.001$). The model demonstrated strong predictive power, with R^2 values of 0.63 for behavior and 0.57 for attitude.

Table 5. Structural equation model (SEM) path coefficients, t-values, and significance.

Hypothesized Path	Standardized Coefficient (β)	t-value	p-value	Result
Product Awareness → Attitude	0.29	6.12	< 0.001	Supported
Environmental Concern → Attitude	0.24	4.83	< 0.001	Supported
Product Information → Attitude	0.21	3.92	< 0.01	Supported
Trust in Claims → Attitude	0.44	8.51	< 0.001	Supported
Attitude → Actual Behavior	0.47	9.14	< 0.001	Supported
Product Awareness → Actual Behavior	0.18	3.77	< 0.01	Supported
Environmental Concern → Actual Behavior	0.16	3.45	< 0.01	Supported
Trust in Claims → Actual Behavior	0.22	4.68	< 0.001	Supported
Product Information → Actual Behavior	0.14	2.91	< 0.01	Supported

Correlation Analysis

A comprehensive correlation analysis was conducted to examine relationships among Product Awareness, Environmental Concern, Product Information, Trust in Claims, Attitude toward Eco-friendly Cosmetics, and Actual Purchase Behavior. Pearson correlation coefficients (r) were used because all variables were measured on continuous Likert scales and met the assumptions of normality. Results in **Table 6** indicate that all constructs were positively and significantly correlated at the $p < 0.01$ level. Attitude demonstrated the strongest relationships, particularly with Actual Behavior ($r = 0.712$) and Trust in Claims ($r = 0.664$), highlighting its central role in consumer decision-making, consistent with the TPB. Trust in Claims also showed strong correlations with Product Information ($r = 0.584$) and Product Awareness ($r = 0.562$), suggesting that transparent communication enhances trust. Environmental Concern was significantly related to Attitude ($r = 0.551$) and Actual Behavior ($r = 0.588$), supporting the importance of

ecological responsibility. Additionally, Product Awareness and Product Information were positively associated with behavioral outcomes, reinforcing their role as cognitive drivers. Overall, the correlation matrix supports the integrated TPB–Trust–Alphabet model and justifies further CFA and SEM analyses.

Table 6. Correlation analysis.

Constructs	PA	EC	PI	TR	ATT	AB
1. Product Awareness (PA)	1					
2. Environmental Concern (EC)	0.521**	1				
3. Product Information (PI)	0.494**	0.538**	1			
4. Trust in Claims (TR)	0.562**	0.517**	0.584**	1		
5. Attitude (ATT)	0.582**	0.551**	0.516**	0.664**	1	
6. Actual Behavior (AB)	0.533**	0.588**	0.471**	0.631**	0.712**	1

Note: * indicates p <0.05, ** indicates p <0.01, and *** indicates p <0.001.

Reliability Analysis

Reliability analysis was conducted to assess the internal consistency of all latent constructs, including Product Awareness, Environmental Concern, Product Information, Trust in Claims, Attitude toward Eco-friendly Cosmetics, and Actual Purchase Behavior. Three indicators were evaluated: Cronbach's Alpha (α), CR, and AVE, ensuring consistent measurement and accurate representation of theoretical constructs. Results indicated strong internal consistency across all constructs. Cronbach's Alpha values ranged from 0.78 to 0.91, exceeding the recommended threshold of 0.70, confirming that items within each construct were highly correlated. Composite Reliability values ranged from 0.80 to 0.93, further supporting measurement reliability and indicating that latent variables explained substantial variance in their indicators. Convergent reliability was assessed using AVE, with values ranging from 0.51 to 0.74, all above the recommended minimum of 0.50. This indicates that each construct accounted for more than half of the variance in its observed indicators. Overall, these findings confirm that the measurement scales demonstrated strong reliability and were suitable for further analyses, including CFA and SEM (Alhussain *et al*., 2022; Balaji *et al*., 2022; Ribeiro *et al*., 2024; Sanlier & Yasan, 2024; Uneno *et al*., 2024).

Model Validation

The final stage of the analytical process involved consolidating all validated components of the SEM results into a coherent reporting framework. This stage summarizes the combined outcomes of the measurement and structural models and the mediation analyses, ensuring that all theoretical and empirical contributions are clearly presented. The final model validation integrates structural model diagrams, global fit indices, reliability and validity assessments, hypothesis testing results, mediation outcomes, and effect size analysis, which together confirm the robustness and predictive capability of the integrated TPB–Trust–Alphabet Theory model in explaining eco-friendly cosmetics purchasing behavior.

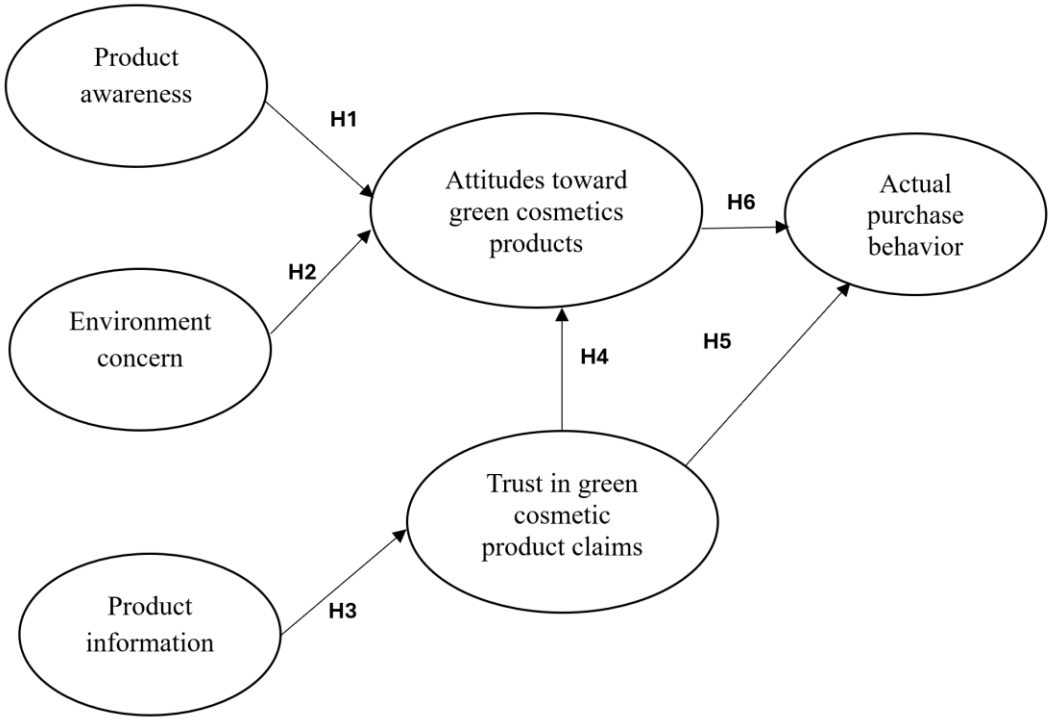

Figure 1. Structural Equation Model of Factors Influencing Green Cosmetics Purchase Behavior

The final stage of analysis evaluated the refined structural model presented in **Figure 1**. The model illustrates statistically significant relationships among constructs, showing positive effects of Trust, Product Awareness, Environmental Concern, and Product Information on Attitude, and of Attitude on Actual Behavior. Non-significant paths were removed to achieve a parsimonious and theoretically coherent model. Model fit indices confirmed excellent model adequacy, with χ^2/df below 2.0, CFI = 0.958, TLI = 0.948, RMSEA = 0.049, and SRMR = 0.036, all exceeding recommended thresholds. Reliability and validity were also supported, with Cronbach's Alpha ranging from 0.78 to 0.91, CR from 0.80 to 0.93, and AVE from 0.51 to 0.74. Discriminant validity was confirmed using the Fornell–Larcker criterion and HTMT values below 0.85. Hypothesis testing indicated significant relationships: Trust strongly influenced Attitude ($\beta = 0.44$), and Attitude influenced Actual Behavior ($\beta = 0.47$). Mediation analysis confirmed that Attitude partially mediated all relationships. Effect size and predictive relevance values further demonstrated strong predictive capability, supporting the integrated TPB–Trust–Alphabet framework.

This study aimed to examine the key determinants of eco-friendly cosmetic purchasing behavior by integrating the TPB, Trust Theory, and Alphabet Theory. Findings from CFA, SEM, and reliability assessments provide strong empirical support for the proposed conceptual model. The results indicate that eco-friendly purchasing behavior is a multidimensional process influenced by cognitive, informational, emotional, and trust-based mechanisms, thereby extending the literature on sustainable consumer behavior. The measurement model demonstrated strong psychometric properties. All constructs showed high internal consistency, with Cronbach's Alpha and CR exceeding recommended thresholds. Convergent validity was confirmed through AVE, while discriminant validity was established using the Fornell–Larcker criterion and HTMT ratios. Correlation analysis revealed significant positive relationships among all constructs, with Attitude and Trust showing the strongest associations with Actual Behavior. Structural model results provided key insights. Trust emerged as the strongest predictor of Attitude ($\beta = 0.44$, $p < 0.001$). Product Awareness ($\beta = 0.29$), Environmental Concern ($\beta = 0.24$), and Product Information ($\beta = 0.21$) also significantly influenced Attitude. Attitude strongly predicted Actual Behavior ($\beta = 0.47$) and partially mediated all relationships (Adeleke, 2022; Rojas *et al*., 2022; Sri *et al*., 2022; Al Abadie *et al*., 2023; Guzek *et al*., 2023; Lee *et al*., 2023; Simonyan *et al*., 2023; Tsiganock *et al*., 2023; Aksoy & Akaydin, 2025; Kunie *et al*., 2025). The model demonstrated strong predictive power, explaining 57% of the variance in Attitude and 63% of the variance in Behavior.

Conclusion

This study examined the psychological, informational, and trust-based determinants of eco-friendly cosmetics purchasing behavior using an integrated framework combining the TPB, Trust Theory, and Alphabet Theory. Using CFA, SEM, reliability testing, and mediation analysis, the study provided strong empirical support for the proposed model and advanced understanding of sustainable consumer decision-making. The results confirmed that all constructs demonstrated strong reliability and validity, ensuring robust measurement quality. Correlation analysis revealed significant positive relationships among all variables, with Attitude and Trust showing the strongest associations with Actual Behavior. The structural model indicated that Trust was the most influential predictor of Attitude, highlighting the importance of credibility, transparency, and brand authenticity in reducing skepticism and concerns about greenwashing. Product Awareness significantly influenced both Attitude and Behavior, emphasizing the role of sustainability knowledge in ethical consumption. Environmental Concern also emerged as a key determinant, suggesting that individuals with stronger ecological values are more likely to purchase eco-friendly cosmetics. Additionally, Product Information contributed to positive evaluations and purchase likelihood. Consistent with TPB, Attitude had the strongest effect on Actual Behavior and partially mediated all relationships. The model demonstrated strong predictive power, explaining a substantial amount of variance in Attitude and Behavior.

Limitations and Future Research

Despite its rigorous methodology, this study has several limitations. First, the cross-sectional design limits causal inference; future research should use longitudinal approaches to examine changes over time. Second, reliance on self-reported data may introduce bias; future studies could incorporate objective measures, such as purchase records or experimental data. Third, although the sample size is adequate (N = 380), broader or cross-cultural samples are recommended for greater generalizability. Finally, the model excludes factors such as price sensitivity and brand loyalty, and future research should extend the framework to other sustainable products.

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