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KEYWORDS	ABSTRACT
Green Advertising; Brand Trust; Willingness to Pay a Premium; Signaling theory; AI Skepticism	The growing use of artificial intelligence (AI) in digital advertising is transforming how brands communicate environmental value, but it also raises questions about whether consumers trust green claims generated through AI. This study investigates whether AI-generated green advertising can effectively communicate environmental value and translate such communication into favourable consumer responses in the emerging bio-cosmetic market. A stimulus-based online survey of Generation Z consumers in Pakistan (N = 374) was conducted, who evaluated an AI-generated Instagram-style advertisement for a fictional bio-cosmetic brand before completing the questionnaire. The findings show that AI-generated green advertising strengthens green brand trust, which subsequently translates into stronger bio-cosmetic purchase intention and greater willingness to pay a premium. Green brand trust serves as the central pathway through which AI-generated green advertising drives consumer outcomes; however, this process is conditional: higher AI skepticism weakens the positive relationship between AI-generated green advertising and green brand trust. The study extends signaling theory to AI-enabled green advertising by integrating the environmental signal, trust-based mechanism, behavioural and economic outcomes, and a receiver-level boundary condition within a single framework. For managers, the findings suggest that AI-generated green advertising should be built around specific and credible environmental claims that strengthen green brand trust, while transparent evidence supporting those claims can help convert consumer trust into more favourable marketplace responses.
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Introduction

The transition toward sustainable consumption has made environmental considerations increasingly relevant to consumer markets, including the cosmetics industry, where consumers are paying greater attention to product ingredients, production practices, packaging, and broader environmental consequences (Amberg & Fogarassy, 2019). At the same time, digital platforms have become important spaces through which brands communicate their environmental positioning and influence consumers' perceptions of green products (Sameeni et al., 2022). This convergence is particularly relevant for Generation Z, who has attracted considerable attention in sustainable consumption research because of its reported environmental concern and engagement with sustainability-related issues; however, evidence also points to a persistent gap between pro-environmental attitudes and actual consumption behaviour (Borah et al., 2024; Mushtaq & Akhtar, 2024). Consequently, green digital advertising has become more than a promotional device; it represents a mechanism through which brands communicate otherwise difficult-to-observe environmental attributes to consumers. The communication of such attributes, however, is not straightforward. Environmental performance is often difficult for consumers to verify before purchase, creating information asymmetry between firms and consumers (Mushtaq & Akhtar, 2025; Zhang et al., 2026). Green advertising therefore functions partly as a signal of a firm's environmental orientation, but the value of such a signal depends on whether consumers regard it as credible and worthy of reliance. Signaling Theory explains that under conditions of information asymmetry, firms communicate observable signals to convey information about otherwise unobservable qualities (Spence, 1973). In the green consumption context, advertising can consequently reduce uncertainty by communicating environmental characteristics that consumers cannot directly evaluate.

With the advent of generative artificial intelligence (AI), the ways in which these signals can be generated and communicated have also shifted dramatically. Today, AI can produce advertising copy, images, representations of products, and other marketing communications on a massive scale, providing new possibilities for brands to personalize and speed up digital advertising (Kirk & Givi, 2025). While green marketing has already started to use AI-generated content, there is emerging evidence that the motivational implications of this are not necessarily positive. The positive outcomes of AI-generated green content can cause the perception of greenwashing, which can then lower purchase intent, as demonstrated in recent studies (Zhang et al., 2026). This presents a significant paradox – the more sophisticated and scalable the green communication, the more skeptical the consumers might be about what they are receiving. This paradox is even more significant on the case of bio-cosmetic products. It is difficult for consumers to know with a simple digital ad that the product is truly environmentally responsible, and there can be many different factors that make a cosmetic product “Green,” such as ingredient content, sourcing, production, packaging, or ecological effects. Therefore, trust has become a key element in the research of green products, as it has been found to be important to bridge the gap between green communication and purchase related responses by consumers (Chen, 2010). Green marketing also has been linked to green trust and green purchase intention in cosmetics. Therefore, AI-generated green

advertisements might not be enough to provoke consumer purchase intent if they do not first gain trust in the brand's eco-friendly messaging.

Green brand trust is therefore positioned as the central psychological mechanism in the present study. Green trust, which was introduced by Chen (2010), is consumers' trust that a brand's environmental claims and commitments are credible. This is especially valuable as a greenwash can cause consumers to lose trust in environmental claims and the level of green trust (Chen & Chang, 2013). Previous studies have tested the effects of green perceptions on purchase intentions, showing that consumers' reactions to environmental marketing are influenced by the trustworthiness of the environmental messages conveyed by the firms. Recently, in the field of social-media green advertising, green trust is also considered as one of the key mechanisms between social media advertising and green purchase intention (Zhang et al., 2026). Yet, buying intentions could be a partial indicator of consumers' reactions to sustainable cosmetics. Green products are often more expensive, and if willing to pay more is a behavioural result of successful green positioning, then it is important (Berger, 2019). This is especially important to consider when looking at Generation Z, because while they may be concerned about the environment, they don't necessarily feel like spending more money on sustainable products. Some recent studies identify that there is a disconnect between the positive attitudes and actions of younger consumers toward sustainability, where positive attitudes may not necessarily translate into increased economic commitment to green products (Gomes et al., 2023). Therefore, in the present study, both intention to purchase a product and willingness to pay a premium are taken into account, and thus, the impact of green advertising messages can be analyzed on both an intention level and a more economical level of consumer response.

Meanwhile, consumers are not going to agree on what they consider "advertising," when it comes to AI content. AI skepticism is a notable individual difference because people can have different levels of trust and skepticism towards the reliability and credibility of the information provided by AI. New research has shown that consumers' attitudes towards AI can impact their reactions to green marketing messages and their belief in AI-driven communication (Suh, 2026). This indicates that the effectiveness of an AI-generated environmental signal could be related not just to the signal itself, but also to the user who receives the signal. AI skepticism could, therefore, affect the level of trust or skepticism that consumers have in the information that is being given via an AI-generated advertisement.

Against this background, the present study develops a signaling-based framework to examine whether AI-generated green digital advertising influences bio-cosmetic purchase intention and willingness to pay a premium through green brand trust, and whether AI skepticism conditions this process. Rather than treating AI merely as a technological feature of digital advertising, the study conceptualises AI-generated green advertising as a contemporary signal whose effectiveness depends on consumers' willingness to trust the environmental information communicated by the brand. This perspective responds to recent calls for greater attention to AI-generated green marketing and the psychological processes through which consumers evaluate such content

(Aldaihani et al., 2024). It also extends existing green advertising research, which has largely examined conventional green advertising, social-media communication, or greenwashing, by bringing AI-generated content into the same explanatory framework.

The study is situated in the Pakistani market and focuses on Generation Z consumers of bio-cosmetic products. Pakistan provides a relevant emerging-market context for examining green digital advertising because consumers encounter environmental claims within a rapidly evolving digital marketplace, while the credibility of such claims may be difficult to evaluate directly. Prior research in Pakistan has examined green purchase behaviour and environmental attitudes, but relatively limited attention has been given to how consumers evaluate AI-generated green advertising and whether trust in the advertised brand translates into purchase-related responses. This context therefore provides an opportunity to examine the contemporary challenge of communicating environmental value in a market where consumers may need to rely substantially on firms' digital signals when evaluating sustainability-related claims.

Literature Review and Hypotheses Development

Signaling Theory

Signaling Theory explains how organizations communicate information about otherwise unobservable attributes to stakeholders under conditions of information asymmetry (Spence, 1973). In consumer markets, firms use signals to communicate product or brand qualities that consumers cannot directly verify before purchase. This perspective is particularly relevant to green products because environmental attributes such as sustainable sourcing, production practices, and ecological impact are often difficult for consumers to independently evaluate (Connelly et al., 2011). Green digital advertising can therefore function as a signal of a brand's environmental orientation. However, the effectiveness of such a signal depends on how consumers interpret its credibility. This issue becomes more complex when advertising is generated using artificial intelligence. AI can facilitate the production and personalisation of marketing communication, but consumers may simultaneously question the authenticity and reliability of AI-generated content (Kirk & Givi, 2025). Thus, AI-generated green advertising represents a contemporary signal whose effectiveness depends on the receiver's interpretation rather than merely on exposure to the advertisement.

In the present framework, green brand trust represents the consumer's response to the environmental signal. When consumers perceive the signal as credible, they may develop confidence in the brand's environmental commitments, which subsequently facilitates purchase-related responses (Chen, 2010). These responses are captured through both purchase intention and willingness to pay a premium. At the same time, consumers differ in their willingness to accept AI-mediated information. AI skepticism therefore represents a boundary condition that may determine whether an AI-generated green signal is accepted or discounted. Recent research provides direct evidence that AI skepticism can influence responses to AI-mediated green advertising (Suh, 2026). Accordingly, Signaling Theory provides a unified explanation for the proposed mechanism: AI-generated green digital advertising functions as the signal, green brand

trust represents the receiver's evaluation, purchase intention and willingness to pay represent downstream responses, and AI skepticism determines the strength of signal interpretation.

AI-Generated Green Digital Advertising and Green Brand Trust

Green advertising communicates environmental information that consumers may otherwise find difficult to verify. When such information is perceived as credible, it can reduce uncertainty regarding a firm's environmental orientation and strengthen consumers' confidence in the brand (De Sio et al., 2022; Sameeni & Qadeer, 2015). From a signaling perspective, green advertising therefore provides observable information from which consumers infer less observable environmental qualities. AI-generated advertising introduces an additional source characteristic into this process. AI enables brands to produce sophisticated and highly scalable advertising content, but the technological origin of the message may also affect how consumers evaluate its credibility. Recent research suggests that AI involvement in green advertising can influence consumer perceptions of authenticity and trust, indicating that AI authorship itself can become part of the advertising signal (Suh, 2026). When AI-generated green advertising is perceived as credible and informative, consumers may infer that the advertised brand has genuine environmental commitments. Green brand trust captures consumers' confidence in a brand's environmental claims and commitments (Chen, 2010). Evidence from green consumption research indicates that credible environmental communication contributes to trust and subsequent consumer responses (Akhtar et al., 2022). Thus, AI-generated green advertising should strengthen green brand trust when consumers interpret the environmental message as a credible signal.

H1: AI-generated green digital advertising positively influences green brand trust for bio-cosmetic products.

Green Brand Trust and Purchase Intention

Bio-cosmetic products often involve environmental and sustainability-related attributes that consumers cannot completely verify before purchase. Consumers therefore rely partly on information communicated by brands when evaluating the environmental credibility of such products. Green brand trust reduces this uncertainty by increasing consumers' confidence that a brand's environmental claims and commitments are reliable (Chen, 2010). From a signaling perspective, trust represents the successful interpretation of the firm's environmental signal. Once consumers accept the information communicated by the brand as credible, uncertainty surrounding the product's environmental characteristics is reduced, making purchase-related decisions easier. Previous research has established green trust as an important determinant of green purchase intention (De Sio et al., 2022; Malik et al., 2022). Research on green cosmetics similarly demonstrates the relevance of trust-related evaluations in shaping consumers' intentions toward sustainable cosmetic products (Testa et al., 2024). Therefore, consumers who have greater trust in the environmental commitments of a bio-cosmetic brand should be more willing to purchase its products. In signaling terms, trust converts environmental information into a behavioural response by reducing uncertainty surrounding the firm's green claims.

H2: Green brand trust positively influences purchase intention for bio-cosmetic products.

Green Brand Trust and Willingness to Pay a Premium

Purchase intention does not necessarily indicate consumers' willingness to incur additional financial costs. Willingness to pay a premium represents a stronger economic response because consumers must attach sufficient value to the product's attributes to accept a higher price. This distinction is particularly important for green products, where environmental benefits can involve additional costs for consumers (Berger, 2019). Signaling Theory suggests that credible environmental signals can increase the perceived value of green products. When consumers trust a brand's environmental claims, they are more likely to perceive its sustainability attributes as genuine rather than merely promotional. This reduces uncertainty surrounding the value of the green offering and can increase consumers' willingness to make an additional financial commitment. Evidence indicates that signaling can increase consumers' willingness to pay for green products (Berger, 2019). Moreover, research focusing on Generation Z has shown that green-related perceptions can contribute to willingness to pay more for sustainable products (Gomes et al., 2023). Recent research specifically examining green cosmetics also identifies willingness to pay a premium as a meaningful consequence of green consumption evaluations (Uturestantix et al., 2026). Accordingly, greater green brand trust should increase consumers' willingness to pay a premium for bio-cosmetic products.

H3: Green brand trust positively influences willingness to pay a premium for bio-cosmetic products.

Mediating Role of Green Brand Trust

AI-generated green digital advertising can influence consumers' responses not only through the information contained in the advertisement but also through the trust that consumers develop in the advertised brand. Under signaling theory, advertising functions as a signal of otherwise difficult-to-observe environmental qualities, while green brand trust reflects consumers' acceptance of that signal. When consumers perceive environmental communication as credible, they are more likely to trust the brand's environmental commitments and claims (Chen, 2010). This trust should subsequently influence bio-cosmetic purchase intention. Consumers who trust a brand's environmental claims face less uncertainty regarding the credibility of its sustainability positioning and may therefore be more willing to consider purchasing its products. Empirical evidence supports the role of green brand trust in translating green marketing activities into purchase intention (Tan et al., 2022). Thus, green brand trust provides a psychological pathway through which AI-generated green digital advertising can become behaviourally consequential.

The same mechanism can extend to willingness to pay a premium, although this represents a stronger economic response. Consumers are unlikely to accept a higher price for environmental benefits unless they believe that the brand genuinely delivers the claimed value. Research shows that credible green signals can increase willingness to pay for green products (Berger, 2019), while

recent evidence from the green cosmetics context confirms willingness to pay a premium as an important outcome of sustainable consumption evaluations (Uturestantix et al., 2026). Therefore, when AI-generated green advertising strengthens trust in the environmental credibility of a bio-cosmetic brand, that trust should increase both consumers' willingness to purchase and their willingness to accept a price premium. Accordingly, the following hypotheses are proposed (Figure 1):

H4: Green brand trust mediates the positive relationship between AI-generated green digital advertising and purchase intention for bio-cosmetic products.

H5: Green brand trust mediates the positive relationship between AI-generated green digital advertising and willingness to pay a premium for bio-cosmetic products.

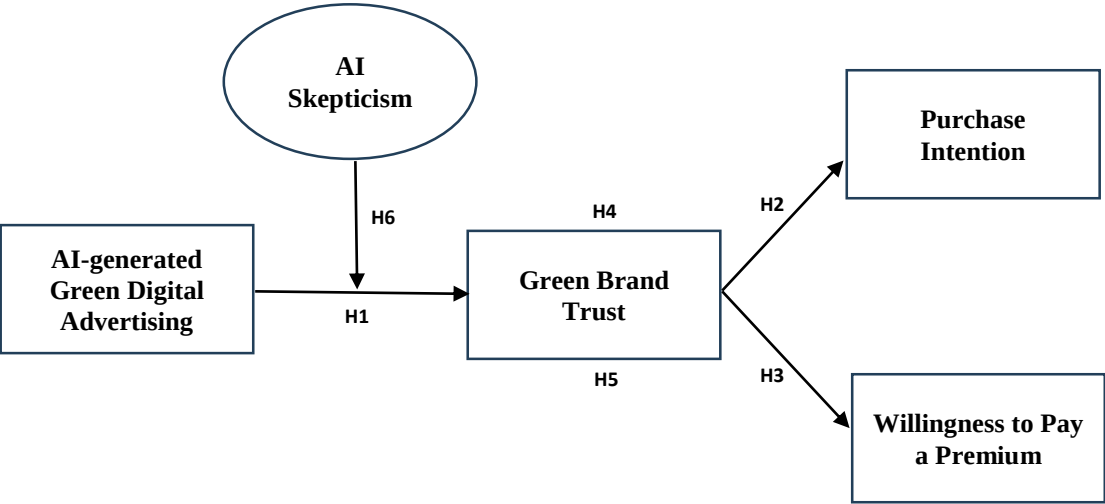


Figure 1: Conceptual Framework

Moderating Role of AI Skepticism

Signals do not have identical effects on all receivers. Signaling theory recognises that the interpretation of a signal depends partly on the characteristics and prior beliefs of the receiver (Connelly et al., 2011). AI skepticism is therefore relevant because consumers may differ in the extent to which they question information produced through artificial intelligence. AI-generated green advertising may be particularly vulnerable to skepticism because environmental claims themselves can be difficult to verify. Consumers who are highly skeptical of AI may scrutinise AI-generated advertising more carefully and discount the information communicated through it. In contrast, consumers with lower AI skepticism may be more willing to accept AI-generated environmental messages as useful information about the brand. Recent research directly demonstrates that AI skepticism can shape consumers' perceptions of authenticity and responses to AI-generated green advertising (Suh, 2026). Consequently, AI skepticism should weaken the

extent to which AI-generated green advertising generates green brand trust. The signal may still communicate environmental information, but highly skeptical consumers are less likely to accept the signal as credible. This creates a boundary condition for the proposed advertising–trust relationship (Figure 1).

H6: AI skepticism negatively moderates the relationship between AI-generated green digital advertising and green brand trust for bio-cosmetic products, such that the relationship is weaker when AI skepticism is high.

Methodology

Sample and Data Collection

Data were collected from Generation Z consumers in Pakistan using an online, purposive sampling approach. The target respondents were digitally active consumers who were familiar with bio-cosmetic products and regularly used social media platforms. This approach is consistent with previous research that has examined green consumption among Generation Z consumers in Pakistan through online survey methods (Qazi et al., 2023). The use of an online questionnaire was also appropriate given the role of social media and digital advertising in contemporary consumer research (Sameeni et al., 2024b). Respondents were first screened for their familiarity with bio-cosmetic products and social media use before proceeding with the survey. Participation was voluntary, and respondents were informed that their responses would be used exclusively for academic research.

Before completing the questionnaire, respondents were shown a realistic Instagram-style advertisement for a fictional bio-cosmetic brand (Figure 2), featuring the product and environmental claims related to its ingredients, packaging, and sustainability benefits. The advertisement was generated using artificial intelligence to represent the type of AI-generated green advertising encountered in digital environments. Respondents were instructed to examine the advertisement carefully before answering the subsequent questions. The questionnaire then measured green digital advertising, green brand trust, bio-cosmetic purchase intention, willingness to pay a premium, and AI skepticism. Incomplete responses and responses that did not meet the screening criteria were excluded before the final dataset was analysed.

Measures

All constructs were measured using previously validated multi-item scales, with minor adaptations made to reflect the context of AI-generated green digital advertising and bio-cosmetic products. Unless otherwise stated, responses were recorded on a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. AI-generated green digital advertising was measured using four items adapted from Bailey et al. (2016) and Sun et al. (2021), with wording adjusted to reflect green digital advertising encountered on online platforms. Green brand trust was measured using five items adapted from Chen (2010), capturing consumers' confidence in the environmental

commitments and claims of the advertised bio-cosmetic brand. Bio-cosmetic purchase intention was measured using three items adapted from established green purchase-intention measures, including Kim et al. (2013), and contextualised to bio-cosmetic products. Willingness to pay a premium was assessed using three items adapted from Biswas and Roy (2015), reflecting consumers' willingness to pay more for environmentally friendly bio-cosmetic products. AI skepticism was measured using four items adapted from Mohr et al. (1998) and the recent AI-advertising application of Suh (2026), with the wording contextualised to consumers' skepticism toward AI-generated advertising and its claims. All items were reviewed for contextual appropriateness before data collection.



Figure 2. Simulated Instagram Post

Table 1: Measurements and Constructs

Sr. No.	Construct name and adapted from	Items
1	Green Advertising Bailey et al. (2016); Sun et al. (2021)	Digital I tend to pay attention to digital advertising messages that relate to the environment. I think brands that use environmental messages in digital advertising are good. I pay attention to products promoted through digital advertisements that relate to the environment. I find green digital advertising valuable.
2	Green Brand Trust Chen (2010)	I feel that this brand's environmental commitments are generally reliable. I feel that this brand's environmental performance is generally dependable. I feel that this brand's environmental claims are generally trustworthy. This brand's concern for the environment meets my expectations. This brand keeps its promises and commitments for environmental protection.
3	Purchase Intention Kim et al. (2013)	I intend to purchase bio-cosmetic products in the future. I am willing to purchase bio-cosmetic products. I will make an effort to purchase bio-cosmetic products.
4	Willingness to Pay a Premium Biswas and Roy (2015)	I am willing to pay more for a bio-cosmetic product than for a similar conventional product. It is worth paying a higher price for a bio-cosmetic product. I am willing to pay a higher price for a bio-cosmetic product because of its environmental benefits.
5	AI Skepticism Mohr et al. (1998); Suh (2026)	I am skeptical about the truthfulness of information provided through AI-generated advertising. I doubt whether AI-generated advertising provides reliable information about products. I am concerned that AI-generated advertising may exaggerate product claims. I question the credibility of claims presented through AI-generated advertising.

Data Analysis

Data were analysed using SPSS and SmartPLS. The analysis was conducted in three stages. First, descriptive statistics and respondent characteristics were examined. Second, the measurement

model was assessed through indicator reliability, internal consistency reliability, convergent validity and discriminant validity. Third, the structural model was evaluated to test the hypothesised direct, mediating and moderating relationships. Bootstrapping with 5,000 resamples was used to assess the significance of the structural paths and indirect effects.

Respondent Profile

Table 2 presents the demographic characteristics and social media usage patterns of the respondents. The sample comprised 374 Generation Z consumers, with female respondents representing 55.9% and male respondents 44.1%. Most respondents were aged 22–25 years (50.0%), followed by those aged 18–21 years (29.9%). Regarding education, 58.3% were undergraduates, while 41.7% had graduate-level education or above. Most respondents reported using social media daily (76.5%).

Table 2. Demographic Profile of Respondents

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	165	44.1
	Female	209	55.9
Age	18–21 years	112	22.9
	22–25 years	187	50.0
	26–29 years	75	20.1
	30 years and above	0	0.0
Education	Undergraduate	218	58.3
	Graduate and above	156	41.7
Social media use	Daily	286	76.5
	Alternate days	61	16.3
	Weekly	27	7.2

Measurement Model

Table 3 presents the reliability and convergent validity results. Cronbach's alpha and composite reliability values exceeded the recommended threshold of 0.70, while average variance extracted (AVE) values were above 0.50. These results indicate satisfactory internal consistency and convergent validity.

Table 3. Reliability and Convergent Validity

Construct	Items	Cronbach's α	Composite Reliability	AVE
AI-generated green digital advertising	4	0.861	0.906	0.708
Green brand trust	5	0.901	0.927	0.720
Purchase intention	3	0.842	0.905	0.761
Willingness to pay a premium	3	0.867	0.919	0.791
AI skepticism	4	0.853	0.901	0.696

Table 4 presents the heterotrait–monotrait ratio (HTMT) results, with all values below 0.85, supporting discriminant validity among the constructs.

Table 4. Discriminant Validity – HTMT

	1	2	3	4	5
1. AI-generated green digital advertising	—				
2. Green brand trust	0.712	—			
3. Purchase intention	0.641	0.783	—		
4. Willingness to pay a premium	0.598	0.692	0.746	—	
5. AI skepticism	0.438	0.391	0.352	0.327	—

Structural Model and Hypothesis Testing

Table 5 presents the structural model results. AI-generated green digital advertising was positively associated with green brand trust ($\beta = 0.420$, $p < 0.001$), thus supporting H1. Green brand trust was positively associated with both bio-cosmetic purchase intention ($\beta = 0.510$, $p < 0.001$) and willingness to pay a premium ($\beta = 0.380$, $p < 0.001$), supporting H2 and H3. The indirect effects through green brand trust were significant for purchase intention ($\beta = 0.214$, $p < 0.001$) and willingness to pay a premium ($\beta = 0.160$, $p < 0.001$), thus supporting H4 and H5. Furthermore, the interaction between AI-generated green digital advertising and AI skepticism was negative and significant ($\beta = -0.180$, $p < 0.001$), indicating that higher AI skepticism weakened the positive relationship between advertising and green brand trust, supporting H6.

Table 5. Structural Model Results

Hypothesis	Relationship	β	SE	t-value	p-value
H1	AI-generate Green Digital Advertising → Green Brand Trust	0.420	0.052	8.077	0.001
H2	Green Brand Trust → Purchase Intention	0.510	0.149	10.408	<0.001
H3	Green Brand Trust → Willingness to Pay a Premium	0.380	0.055	6.909	<0.001
H4	AI-generate Green Digital Advertising → Green Brand Trust → Purchase Intention	0.214	0.035	6.114	<0.001
H5	AI-generate Green Digital Advertising → Green Brand Trust → Willingness to Pay a Premium	0.160	0.031	5.161	<0.001
H6	AI-generate Green Digital Advertising × AI Skepticism → Green Brand Trust	-0.180	0.047	3.830	<0.001

Table 6 reports the coefficient of determination (R^2) for the endogenous constructs. The model explained 38.6% of the variance in green brand trust, 26.0% in bio-cosmetic purchase intention,

and 14.4% in willingness to pay a premium. These values indicate the explanatory power of the model for the three endogenous constructs.

Table 6. Coefficient of Determination

Endogenous Construct	R ²	Adjusted R ²
Green Brand Trust	0.386	0.376
Purchase Intention	0.260	0.258
Willingness to Pay a Premium	0.144	0.142

Discussion

The results support the model proposed and suggest that the use of AI-generated green digital advertising can be an effective environmental signal in the bio-cosmetic context. AI content and green digital advertising's positive correlation with green brand trust indicates that consumers can use digital content to build trust in a brand's environmental stance. This result mirrors the Signaling Theory, which states that signal information will help mitigate information asymmetry if consumers observe a signal to assess other less easily observed attributes. It also builds on previous green advertising research findings that advertising-information can foster green trust and subsequent purchase-reactions (de Sio et al., 2022; Tan et al., 2022). Evidence on the topic has also been recently found to be able to impact on eco-friendly purchase intentions via green trust (Wu & Long, 2024). The significant positive correlation between bio-cosmetic purchase intention and green brand trust also shows that trust is another important communication channel that makes environmental communication significant for consumers' purchase-related assessment. This finding is in line with Chen (2010), who has identified green trust as a crucial factor when measuring green brands, and with further studies that demonstrated how trust can lead to green marketing actions and results in purchase intentions (Tan et al., 2022). This is especially pertinent in the bio-cosmetic product as consumers may not have direct access to information about the environment directly connected to the product, including that relating to supplier sourcing, manufacturing and sustainability statements. Therefore, trust can help to mitigate uncertainty about the environmental message of the brand.

Willingness to pay a premium also had a significant positive association with green brand trust. This finding suggests that trust goes beyond a purchase intention and relates to consumers willingness to incur an extra economic cost for the advertised environmental value. This is aligned to research that demonstrates that consumers' willingness to pay for green products is affected by credible green signals (Berger, 2019). It also fits with recent findings that willingness to pay a premium is a key result of green cosmetics consumption (Uturestantix et al., 2026). The discovery, therefore, indicates that when the claims they are inferring from the environmental communication are considered sufficiently trustworthy, then the communication becomes economically consequential. The two major indirect effects further solidify the link between AI-driven green digital advertising and consumer outcomes, making green brand trust the channel through which this relationship is mediated.Both major indirect effects support the link between AI-generated green digital

advertising and consumer outcomes through a green brand trust mechanism. The mediation results suggest that AI-driven adverts do not just work through an instant advertising judgment, but also through consumers' trust in the environmental credibility of the brand. This is aligned with the previous literature, which placed Green trust as a mediator between Green communication and Green purchase intentions (de Sio et al., 2022; Tan et al., 2022). Importantly, the study of the two mediation pathways indicates that the same trust mechanism can result in an intention-based response as well as a financially consequential response.

Finally, the significant moderating effect of AI skepticism indicates that consumers do not respond uniformly to AI-generated green advertising. The positive relationship between AI-generated green digital advertising and green brand trust becomes weaker as AI skepticism increases. This finding provides an important qualification to the positive role of AI in green communication. While AI can facilitate the production and delivery of sophisticated digital advertising, consumers who question the credibility or truthfulness of AI-generated content may be less willing to convert the advertising signal into brand trust. This finding is consistent with emerging research showing that perceptions surrounding AI authorship and authenticity can shape consumer responses to AI-generated marketing communications (Kirk & Givi, 2025). It also complements research showing that skepticism toward green advertising can undermine favourable consumer responses to green products (Nguyen-Viet & Nguyen, 2024; Higuera-Castillo et al., 2024). Overall, the findings suggest that the effectiveness of AI-generated green advertising depends not only on the environmental information communicated but also on consumers' willingness to accept AI as a credible source of that information.

Theoretical Contribution

This study contributes to the literature in three main ways. First, it extends the application of Signaling Theory to the emerging intersection of generative AI, green advertising and bio-cosmetic consumption. Previous green marketing research has largely examined environmental advertising as a conventional signal through which firms communicate otherwise difficult-to-observe environmental attributes. The present study introduces AI-generated advertising into this signaling process and shows that AI-generated green communication can also function as a signal from which consumers form judgements about a brand's environmental credibility. This extends signaling research beyond the conventional sender-receiver context by recognising the technological nature of the communication mechanism through which the signal is produced.

Second, the study identifies green brand trust as the central receiver-side mechanism through which the signal becomes behaviourally meaningful. Rather than treating advertising as having a direct influence on purchase-related outcomes, the findings show that consumers' trust in the brand's environmental commitments provides the psychological pathway connecting AI-generated green advertising with both purchase intention and willingness to pay a premium. This extends existing green trust research by demonstrating that trust can connect an AI-mediated environmental signal with both a behavioural intention and an economic response. The inclusion of

willingness to pay also moves beyond the dominant focus on purchase intention by demonstrating the potential economic consequence of successful green signaling.

Third, the findings introduce AI skepticism as a boundary condition within the signaling process. This is theoretically important because it demonstrates that the effectiveness of a signal depends not only on the characteristics of the message but also on the receiver's orientation toward the technology through which the signal is communicated. The findings therefore add a receiver-level qualification to Signaling Theory: the same environmental signal may generate different levels of trust depending on how consumers evaluate the credibility of AI-generated communication. This is particularly relevant as generative AI becomes increasingly integrated into marketing communication. The model consequently provides a more contemporary explanation of green advertising effectiveness by connecting the signal, the trust mechanism, the downstream consumer and economic outcomes, and the technological skepticism that can constrain the signaling process.

Practical Implications

The findings provide several practical implications for bio-cosmetic brands using AI in digital marketing. First, firms can use AI to develop and scale green advertising content, but AI-generated communication should not be treated simply as a production tool. Because AI skepticism weakens the advertising-trust relationship, brands should support AI-generated environmental messages with specific and verifiable evidence. Rather than relying on broad expressions such as “eco-friendly” or “100% green,” advertisements should communicate concrete information about ingredients, packaging materials, sourcing, certifications, recyclability or measurable environmental practices.

Second, brands should incorporate human oversight and accountability into AI-assisted green communication. Clear information about the basis of environmental claims, links to supporting evidence, certification information and transparent brand-level sustainability practices can help consumers evaluate the signal rather than relying solely on the sophistication of the advertisement itself. This is particularly important for consumers who are sceptical of AI-generated communication.

Third, managers should distinguish between generating attention and building trust. The findings suggest that attractive AI-generated content is not sufficient to produce stronger purchase responses unless consumers develop confidence in the brand's environmental claims. Consequently, digital campaigns should integrate advertising content with credible product information, transparent sustainability pages, customer reviews and third-party certifications. Social-media communication can also incorporate credible informational content because research shows that trust is important in green social-media consumption contexts (Zhao et al., 2024).

Finally, firms seeking to justify a price premium should communicate why the product costs more and what environmental value the additional price represents. This is particularly relevant for bio-cosmetics, where sustainability claims may be associated with higher production or sourcing costs.

Demonstrating the tangible basis of the premium can help connect green brand trust with consumers' willingness to pay rather than assuming that environmental positioning alone will justify a higher price.

Limitations and Future Directions

This study has several limitations that provide opportunities for future research. First, the use of a cross-sectional, self-reported survey limits the ability to establish temporal or causal relationships among the constructs. Future research could employ longitudinal designs or controlled experiments comparing AI-generated and human-generated advertisements. Such designs would also allow researchers to examine whether disclosure of AI authorship changes consumer responses, particularly because AI authorship can influence perceived authenticity (Kirk & Givi, 2025; Sameeni et al., 2024a). Second, because the study used a single advertising stimulus and a Pakistani Generation Z sample, the findings may not generalise across countries, age groups, product categories or advertising formats. Future studies could replicate the model across markets and compare bio-cosmetics with food, fashion and other green product categories. Recent green advertising studies across different consumer and product contexts demonstrate the value of such comparative testing (Higuera-Castillo et al., 2024; Nguyen-Viet & Nguyen, 2024). Third, all focal variables were collected through the same survey, creating the possibility of common method variance (Podsakoff et al., 2003; Malhotra et al., 2017). Future research could combine self-reported perceptions with behavioural measures such as actual clicks, product selection or observed willingness to pay.

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