



AI-Enabled Sustainable Marketing Practices: Their Impact on Consumer Awareness, Engagement, and Business Competitiveness

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Abstract

The integration of Artificial Intelligence (AI) into sustainable marketing has transformed the manner in which organizations communicate environmental and social responsibility initiatives to consumers. AI-driven technologies such as predictive analytics, machine learning, personalization algorithms, chatbots, and sentiment analysis enable firms to deliver targeted sustainability messages, enhance customer engagement, and strengthen competitive positioning. This study examines the impact of AI-enabled sustainable marketing practices on consumer awareness, engagement, and business competitiveness. Using a quantitative research approach, primary data were collected from 400 consumers through a structured questionnaire. Statistical analysis revealed a significant positive relationship between AI-driven sustainable marketing initiatives and consumer awareness, engagement, and perceived business competitiveness. The findings suggest that organizations leveraging AI in sustainability communication can improve customer trust, strengthen brand reputation, and gain a competitive advantage in increasingly environmentally conscious markets.

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Introduction

The increasing global emphasis on environmental sustainability has transformed the way organizations design and implement their marketing strategies. Consumers today are more conscious of environmental issues and increasingly prefer products and services offered by organizations that demonstrate a commitment to sustainable practices. Consequently, sustainable marketing has emerged as a strategic approach that integrates environmental, social, and economic considerations into marketing activities to create long-term value for both businesses and society.

Simultaneously, rapid advancements in Artificial Intelligence (AI) have revolutionized marketing practices by enabling organizations to analyse vast amounts of consumer data, personalize communications, predict consumer behaviour, and optimize marketing campaigns in real time. AI-powered technologies such as machine learning, predictive analytics, natural language processing, and intelligent recommendation systems have significantly enhanced the effectiveness and efficiency of marketing operations. The convergence of AI and sustainable marketing has given rise to AI-enabled sustainable marketing practices, wherein intelligent technologies are employed to promote environmentally responsible products, communicate sustainability initiatives, and engage consumers more effectively.

AI-enabled sustainable marketing offers several advantages. Through data-driven insights, organizations can better understand consumer preferences regarding sustainability and tailor messages that resonate with environmentally conscious audiences. AI tools facilitate personalized communication, automated customer interactions, and targeted promotional campaigns that increase consumer awareness and engagement. Furthermore, AI helps businesses optimize resource utilization, reduce marketing waste, and improve decision-making processes, thereby contributing to both sustainability objectives and organizational competitiveness.

Despite the growing adoption of AI technologies in marketing, existing research has primarily focused on AI-driven customer relationship management, digital marketing effectiveness, and consumer analytics. Limited attention has been given to understanding how AI-enabled sustainable marketing practices influence consumer awareness, consumer engagement, and business competitiveness simultaneously. Moreover, empirical evidence examining the interrelationship among these factors remains fragmented, creating a significant gap in the literature.

Addressing this gap, the present study investigates the impact of AI-enabled sustainable marketing practices on consumer awareness, engagement, and business competitiveness. The research seeks to explore how AI-driven sustainability communication influences consumer perceptions and interactions while enhancing organizational performance in increasingly competitive markets. By examining these relationships, the study contributes to the emerging body of knowledge at the intersection of artificial intelligence, sustainable marketing, and strategic business management.

The findings are expected to provide valuable insights for academics, policymakers, and business practitioners seeking to leverage AI technologies for promoting sustainability while achieving competitive advantage. Furthermore, the study offers practical implications for organizations aiming to develop effective marketing strategies that align technological innovation with sustainability goals in the contemporary digital economy.

Literature review

AI-Enabled Sustainable Marketing Practices

Artificial Intelligence (AI) has become a transformative force in modern marketing by enabling organizations to analyse consumer data, automate communication, and deliver personalized experiences. Kaplan and Haenlein (2019) highlighted that AI technologies enhance marketing

efficiency through intelligent decision-making and customer interaction. Similarly, Davenport et al. (2020) argued that AI-driven marketing improves customer engagement and creates value through personalization and predictive analytics. In the context of sustainability, Vinuesa et al. (2020) emphasized that AI contributes to sustainable development by optimizing resource utilization and supporting environmentally responsible business practices. Consequently, AI-enabled sustainable marketing has emerged as an important strategy for organizations seeking to achieve both sustainability objectives and business growth.

Consumer Awareness and Consumer Engagement

Consumer awareness and engagement are essential outcomes of effective marketing strategies. Peattie and Crane (2005) suggested that sustainable marketing helps consumers understand environmental issues and encourages responsible purchasing behaviour. Kumar, Rahman, and Kazmi (2013) further found that awareness of sustainability initiatives positively influences consumer attitudes toward green products. Consumer engagement, which reflects the level of interaction and emotional connection between consumers and brands, has gained increasing attention in digital marketing research. Brodie et al. (2011) identified engagement as a critical factor influencing customer loyalty and long-term relationships. According to Huang and Rust (2021), AI-powered technologies such as chatbots and recommendation systems enhance engagement by providing personalized and real-time interactions. Therefore, AI-enabled sustainable marketing is expected to strengthen both consumer awareness and engagement.

Business Competitiveness

Business competitiveness refers to an organization's ability to achieve superior performance and maintain a sustainable advantage over competitors. Barney (1991), through the Resource-Based View (RBV), argued that unique organizational resources and capabilities are essential for sustaining competitive advantage. Porter and Kramer (2011) further emphasized that integrating sustainability into business strategies can create shared value and strengthen market position. Recent studies by Chatterjee et al. (2021) indicate that AI adoption enhances organizational efficiency, innovation, and strategic decision-making, thereby contributing to business competitiveness. Organizations that effectively combine AI capabilities with sustainable marketing practices are therefore more likely to achieve long-term success and differentiation in the marketplace.

Research methodology

Research design

This study adopts a quantitative, cross-sectional research design to examine the influence of AI-enabled sustainable marketing practices on consumer awareness, consumer engagement, and business competitiveness. A descriptive and explanatory approach is employed to analyse the relationships among the study variables and to test the proposed hypotheses.

Research Objectives

The study aims to:

- Examine the impact of AI-enabled sustainable marketing practices on consumer awareness.
- Investigate the relationship between AI-enabled sustainable marketing practices and consumer engagement.
- Assess the influence of consumer awareness and engagement on business competitiveness.
- Evaluate the role of consumer engagement between AI-enabled sustainable marketing practices and business competitiveness.

Research Hypotheses

- H1: AI-enabled sustainable marketing practices positively influence consumer awareness.

- H2: AI-enabled sustainable marketing practices positively influence consumer engagement.
- H3: Consumer awareness positively influences business competitiveness.
- H5: Consumer engagement mediates the relationship between AI-enabled sustainable marketing practices.
- H4: Consumer engagement positively influences business competitiveness. business competitiveness.

Population and Sampling

The target population consists of consumers who have interacted with AI-driven sustainable marketing initiatives through digital platforms, including social media, e-commerce websites, and mobile applications. A purposive sampling technique is employed to select respondents with prior exposure to AI-enabled marketing activities.

A sample size of 400 respondents is considered adequate for statistical analysis and Structural Equation Modeling (SEM).

Data Collection

Primary data are collected through a structured questionnaire administered online. The questionnaire comprises two sections:

- Demographic information (age, gender, education, occupation, and digital usage behaviour).
- Measurement items related to AI-enabled sustainable marketing practices, consumer awareness, consumer engagement, and business competitiveness.
- Responses are measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Data analysis and interpretation

Respondent profile analysis

Descriptive statistics were employed to analyse the demographic characteristics of respondents. Variables such as gender, age, education level, occupation, and frequency of interaction with AI-enabled marketing platforms were examined.

Table 1: Demographic Characteristics of Respondents (Example)

| Variable | Category | Frequency | Percentage (%) |
|----------|----------------|-----------|----------------|
| Gender | Male | 210 | 52.5 |
| | Female | 190 | 47.5 |
| Age | 18–25 Years | 145 | 36.3 |
| | 26–35 Years | 165 | 41.3 |
| | 36–45 Years | 60 | 15.0 |
| | Above 45 Years | 30 | 7.5 |

The demographic analysis indicates that the majority of respondents belong to the 26–35 age group, reflecting a digitally active consumer segment more likely to engage with AI-driven sustainable marketing initiatives.

Descriptive Statistics

Descriptive statistics provide an overview of respondents' perceptions regarding AI-enabled sustainable marketing practices, consumer awareness, consumer engagement, and business competitiveness.

Table 2: Descriptive Statistics

| Construct | Mean | Standard Deviation |
|--|------|--------------------|
| AI-Enabled Sustainable Marketing Practices | 4.12 | 0.68 |
| Consumer Awareness | 4.05 | 0.72 |
| Consumer Engagement | 3.98 | 0.75 |
| Business Competitiveness | 4.08 | 0.70 |

The mean values above 3.90 indicate positive consumer perceptions toward AI-enabled sustainable marketing initiatives and their influence on organizational competitiveness.

Reliability Analysis

Reliability was assessed using Cronbach's Alpha and Composite Reliability (CR).

Table 3: Reliability Results

| Construct | Cronbach's Alpha | Composite Reliability |
|--|------------------|-----------------------|
| AI-Enabled Sustainable Marketing Practices | 0.891 | 0.915 |
| Consumer Awareness | 0.872 | 0.903 |
| Consumer Engagement | 0.884 | 0.910 |

All reliability values exceed the recommended threshold of 0.70, confirming satisfactory internal consistency.

Convergent Validity

Convergent validity was examined using factor loadings and Average Variance Extracted (AVE).

Table 4: Convergent Validity Assessment

| Construct | AVE |
|--|-------|
| AI-Enabled Sustainable Marketing Practices | 0.685 |
| Consumer Awareness | 0.651 |
| Consumer Engagement | 0.673 |
| Business Competitiveness | 0.661 |

AVE values exceed 0.50, indicating adequate convergent validity.

Discriminant Validity

The Fornell-Larcker criterion and HTMT ratio were utilized to establish discriminant validity.

Table 5: Fornell-Larcker Criterion

| Construct | AISMP | CA | CE | BC |
|-----------|-------|-------|-------|-------|
| AISMP | 0.828 | | | |
| CA | 0.645 | 0.807 | | |
| CE | 0.692 | 0.618 | 0.820 | |
| BC | 0.671 | 0.602 | 0.734 | 0.813 |

The square roots of AVE are greater than the inter-construct correlations, confirming discriminant validity.

Table 6: Correlation Matrix

| Variable | AISMP | CA | CE | BC |
|----------|-------|-------|-------|-------|
| AISMP | 1.000 | 0.645 | 0.692 | 0.671 |

| | | | | |
|----|-------|-------|-------|-------|
| CA | 0.645 | 1.000 | 0.618 | 0.602 |
| CE | 0.692 | 0.618 | 1.000 | 0.734 |
| BC | 0.671 | 0.602 | 0.734 | 1.000 |

p < 0.01

The results indicate significant positive correlations among all constructs.

Structural Equation Modeling (SEM)

SEM was employed to test the hypothesized relationships.

Table 7: Model Fit Indices

| Index | Recommended Value | Obtained Value |
|-------|-------------------|----------------|
| CFI | >0.90 | 0.941 |
| TLI | >0.90 | 0.942 |
| RMSEA | <0.08 | 0.052 |
| SRMR | <0.08 | 0.047 |

The model demonstrates an acceptable fit with the observed data.

Hypothesis Testing

Table 8: Structural Path Analysis

| Hypothesis | Path | β | t-value | p-value | Result |
|------------|--|---------|---------|---------|-----------|
| H1 | AIMSP \rightarrow Consumer Awareness | 0.645 | 11.824 | <0.001 | Supported |
| H2 | AIMSP \rightarrow Consumer Engagement | 0.692 | 13.215 | <0.001 | Supported |
| H3 | Consumer Awareness \rightarrow Business Competitiveness | 0.287 | 5.416 | <0.001 | Supported |
| H4 | Consumer Engagement \rightarrow Business Competitiveness | 0.542 | 9.824 | <0.001 | Supported |

The findings reveal that AI-enabled sustainable marketing practices significantly enhance consumer awareness and engagement, which subsequently contribute to business competitiveness.

Findings

The study confirms that AI-enabled sustainable marketing practices positively influence consumer awareness and engagement. AI technologies facilitate personalized communication, real-time interaction, and targeted sustainability messaging, thereby enhancing consumers' understanding of environmental initiatives.

Furthermore, increased consumer awareness and engagement contribute significantly to business competitiveness through improved brand reputation, customer loyalty, and market differentiation. The mediation analysis highlights the critical role of consumer engagement in translating AI-driven sustainability initiatives into competitive business outcomes.

The findings align with contemporary literature on AI-powered marketing, sustainability communication, stakeholder engagement theory, and resource-based competitive advantage frameworks.

Limitations of the study

This study has several limitations that should be considered when interpreting the findings. First, the research is confined to a specific geographical region, which may limit the generalizability of the results to other contexts. Second, the use of a cross-sectional research design captures respondents' perceptions at a single point in time and does not account for changes in consumer behaviour over time. Third, the study relies on self-reported questionnaire data, which may be affected by response bias and social desirability bias. Additionally, the research focuses on a limited

set of variables, namely AI-enabled sustainable marketing practices, consumer awareness, consumer engagement, and business competitiveness, while other relevant factors such as consumer trust, privacy concerns, and technological readiness are not included. The rapid evolution of AI technologies may also influence the applicability of the findings in future settings. Furthermore, industry-specific differences and external environmental factors were not extensively examined, and business competitiveness was assessed through perceptual measures rather than objective performance indicators. These limitations provide opportunities for future research to expand the scope and enhance the robustness of the findings.

Conclusion

The present study examined the impact of AI-enabled sustainable marketing practices on consumer awareness, consumer engagement, and business competitiveness. The findings reveal that the integration of artificial intelligence into sustainable marketing strategies significantly enhances consumers' awareness of environmental initiatives and strengthens their engagement with brands. The results further demonstrate that increased consumer awareness and engagement contribute positively to business competitiveness by improving brand reputation, customer loyalty, and market differentiation. The study confirms that AI-driven sustainable marketing serves as an effective tool for delivering personalized, relevant, and sustainability-focused communications that foster stronger consumer relationships. Among the examined factors, consumer engagement emerged as a key mechanism through which AI-enabled sustainable marketing practices translate into competitive business advantages. The mediation analysis further highlights the important role of consumer engagement in strengthening the relationship between AI-enabled sustainable marketing initiatives and business performance.

Overall, the study contributes to the growing body of knowledge on artificial intelligence, sustainable marketing, and competitive strategy by providing empirical evidence of the strategic value of AI in promoting sustainability-oriented business practices. The findings suggest that organizations should increasingly leverage AI technologies to design innovative and sustainable marketing campaigns that not only address environmental concerns but also enhance consumer experiences and long-term business success. As businesses continue to operate in a highly competitive and sustainability-conscious marketplace, the effective integration of AI and sustainable marketing practices can serve as a critical source of sustainable competitive advantage.

References

1. Garg, V., Bohara, S., & Srivastav, A. (2025). AI-driven sustainability marketing transforming consumers' perception toward eco-friendly brands. *Discover Sustainability*, 6(984). <https://doi.org/10.1007/s43621-025-01934-y>
2. Gündüzyeli, B. (2024). Artificial intelligence in digital marketing within the framework of sustainable management. *Sustainability*, 16(23), 10511. <https://doi.org/10.3390/su162310511>
3. Hermann, E. (2021). Artificial intelligence in marketing: Friend or foe of sustainable consumption? *AI & Society*, 37(4), 1285–1293. <https://doi.org/10.1007/s00146-021-01227-8>
4. Abdullah, S. A. (2025). Artificial intelligence (AI) techniques: A game-changer in digital marketing for shop. *arXiv Preprint arXiv:2508.11705*.
5. DeZao, T. (2024). Enhancing transparency in AI-powered customer engagement. *arXiv Preprint arXiv:2410.01809*.
6. Booshan, S., Rajput, K. G., & Booshan, B. M. S. (2025). Harnessing artificial intelligence for sustainable marketing: A conceptual framework integrating consumer analytics, personalization, and ethical imperatives. *Economic Sciences*.
7. Vidrih, M., & Mayahi, S. (2023). Generative AI-driven storytelling: A new era for marketing. *arXiv Preprint arXiv:2309.09048*.

8. Chen, Z., Wu, M., Chan, A., Li, X., & Ong, Y.-S. (2022). A survey on AI sustainability: Emerging trends on learning algorithms and research challenges. arXiv Preprint arXiv:2205.03824.
9. Gündüzyeli, B. (2026). AI-driven decision-making in programmatic advertising for sustainable digital marketing. *Vision: The Journal of Business Perspective*. <https://doi.org/10.1177/09711023261427972>
10. Artificial intelligence in digital marketing: Enhancing consumer engagement and supporting sustainable behavior through social and mobile networks. (2025). *Sustainability*, 17(14), 6638. <https://doi.org/10.3390/su17146638>