



Artificial Intelligence and Sustainable Marketing Research (2020–2025): A Bibliometric Analysis of Thematic Evolution and Authenticity Discourse

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Abstract

While research on Artificial Intelligence (AI) in marketing and on sustainable marketing individually has grown, there is limited systematic understanding of how these two domains intersect, particularly in relation to authenticity. A bibliometric approach is therefore needed to map the intellectual structure, key themes, and emerging trends in this evolving research landscape. This study examines how AI technologies are transforming sustainable marketing practices by enabling authentic environmental and social impact communication. A comprehensive bibliometric analysis was conducted using publications from the Scopus database (2020–2025), with a total of 33 articles and 275 keywords examined. Network visualization and temporal analysis were performed using VOSviewer to map the intellectual structure and evolution of AI-enabled sustainable marketing research. This study reveals a rapidly evolving field characterized by increasing sophistication in AI applications and growing integration between technological and sustainability domains. The findings demonstrate a significant shift from traditional green marketing approaches to data-driven, algorithmically enhanced authenticity verification systems. This study establishes the first comprehensive bibliometrics mapping of the AI-sustainable marketing nexus, revealing how technological advancement is addressing authenticity challenges in environmental and social marketing communications. This study is limited by its reliance on Scopus-indexed publications, which may exclude relevant work in other databases or non-English publications.

Keywords: *Artificial Intelligence, Sustainable Marketing, Authenticity, Bibliometrics, VOSviewer*

INTRODUCTION

The integration of Artificial Intelligence (AI) in marketing signifies a transformative shift in business-customer interactions and market understanding (Potwora et al., 2024). The emergence of AI technology initiated a significant shift in marketing practices. Although artificial intelligence is driving productivity improvements across numerous sectors, marketing remains one of the areas poised to benefit the most (Davenport et al., 2020; Huang & Rust, 2021).

A study conducted by McKinsey & Company, which examined more than 400 AI applications across 19 industries and nine business functions, revealed that the greatest potential value of AI lies within activities connected to marketing and sales (Chui et al., 2018; Kumar et al., 2019). According to a recent McKinsey's report by Mayer et al. (2025), 92% of businesses across sectors plan to invest in generative AI tools within the next three years.

The adoption of AI in marketing has led marketers to use AI tools to boost productivity, streamline the content creation process, and drive personalization across channels. Based on a SurveyMonkey (2024) study conducted among a sample of 707 US workers, 51% use AI tools to optimize content, from email campaigns to search engine optimization; 50% use AI to create content; and 45% use AI to brainstorm content ideas.

AI helps connect marketing with sustainability by turning subjective environmental claims into data-driven communications that reduce skepticism about greenwashing. As sustainability claims become central to brand positioning and consumer decision-making, the challenge of authentic communication has intensified (Ginder et al., 2021).

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Engaging in sustainability marketing initiatives can positively impact a company's ability to maintain its existence, boost its profitability, and enhance its brand image. Usually, the goal of these sustainability projects is to reduce the amount of energy and materials used, as well as to produce goods that have a reduced environmental impact (Mohr et al., 2016; Jung et al., 2020; Fitria et al., 2024).

The tremendous rise in environmental challenges and the worldwide public's knowledge of this situation have made sustainability a strategic priority. A corporation practices "sustainability marketing" when its marketing approach is centered on promoting the environment and society (Taherdangkoo et al., 2019; Confetto & Covucci, 2021).

While AI has fundamentally transformed how marketers understand consumer behavior, personalize experiences, and optimize campaigns (Kumar et al., 2019), its most critical application may lie in addressing one of marketing's most pressing contemporary challenges: sustainable marketing authenticity. AI's ability to analyze vast amounts of customer data enables marketers to move beyond generic campaigns toward highly personalized engagement strategies (Babatunde et al., 2024), and these personalization capabilities are essential for connecting with, engaging, and co-creating with customers while fostering positive attitudes.

The same AI capabilities that enable hyper-personalized recommendations and predictive analytics can be leveraged to verify environmental claims, track supply chain sustainability in real-time, and communicate strong social impact. AI is emerging as an effective tool for detecting instances of greenwashing.

The intersection of artificial intelligence (AI) and sustainable marketing represents a critical evolution in how organizations communicate their environmental and social impact to increasingly skeptical consumers. As sustainability claims become central to brand positioning and consumer decision-making, the challenge of authentic communication has intensified (Ginder et al., 2021). Traditional green marketing approaches, often criticized for greenwashing practices, are being transformed by AI technologies that enable verifiable, data-driven sustainability communication (Papadas et al., 2017).

The urgency for authentic sustainable marketing has been amplified by several convergent factors such as rising consumer environmental consciousness, increased regulatory scrutiny of sustainability claims, and the proliferation of social media platforms that rapidly expose inauthentic corporate communications (White et al., 2019). In this context, AI emerges as both a solution and a catalyst, offering unprecedented capabilities for real-time impact measurement, personalized sustainability messaging, and transparent supply chain tracking.

Despite the growing importance of this intersection, research examining how AI specifically enables authentic sustainable marketing practices remains fragmented across multiple disciplines. While studies have explored AI applications in marketing (Kumar et al., 2019) and sustainable marketing practices separately (Kemper & Ballantine, 2019), limited research has systematically examined their convergence and its implications for marketing authenticity.

Authenticity, in the context of sustainable marketing, refers to the degree to which a brand's environmental and social claims are perceived as genuine, consistent, and verifiable by consumers (Beverland, 2005; Napoli et al., 2014). Authenticity theory posits that consumers evaluate corporate sustainability communications through lenses of sincerity and legitimacy (Beverland & Farrelly, 2010), making it a central construct in understanding how organizations can credibly navigate the sustainability-marketing nexus.

This study addresses this gap by conducting a comprehensive bibliometric analysis of AI-enabled sustainable marketing research from 2020 to 2025. This study contributes in three ways: (1) it provides the first systematic bibliometric mapping of the AI-sustainable marketing nexus, charting the intellectual structure and thematic evolution of this emerging field; (2) it conceptually

integrates authenticity as a bridging construct between AI capabilities and sustainable marketing practice, grounded in authenticity theory and signaling theory; and (3) it identifies a concrete research agenda with future directions to guide scholars in advancing theory and practice at this intersection.

The research questions guiding this investigation are: (1) How has the research field of AI-enabled sustainable marketing evolved from 2020 to 2025? (2) What are the emerging trends and future research directions in AI-enabled authentic sustainable marketing?

LITERATURE REVIEW

The emergence of artificial intelligence (AI) marked the onset of a transformative era in marketing. With its unparalleled capacity to analyze data and detect patterns, AI began reshaping business practices in the late 20th and early 21st centuries as the technologies became more advanced and accessible. One of the earliest applications appeared in customer service, where automated systems and chatbots were introduced (Holzinger et al., 2023).

Marketing strategies began integrating AI in more complex forms, particularly through machine learning algorithms capable of processing vast datasets to uncover trends and insights. Moreover, academic research has played a critical role in shaping both the theoretical understanding and the practical deployment of AI within marketing contexts (Potwora et al., 2024).

A well-known case is Netflix, which revolutionized content recommendations by leveraging machine learning to deliver highly personalized suggestions, thereby enhancing the user experience (Habil et al., 2023). AI systems can now monitor and improve social media posts, email marketing campaigns, and even digital advertising placements in real time (Nair & Gupta, 2021).

AI is also essential for maximizing operational effectiveness in marketing campaigns (Potwora et al., 2024). This may entail using AI algorithms to determine optimal posting times and the most engaging content for printing firms, as well as automating email campaigns and social media marketing (Kapoor & Kapoor, 2021).

From a marketing perspective, sustainability plays a vital role in value creation for consumers (Saraswati & Wirayudha, 2022). Many business plans now include sustainability as a key component, and from a commercial standpoint, being environmentally conscious may add value and boost productivity (Confetto & Covucci, 2021; Cayolla et al., 2023). AI enables digital marketers to automate processes, create personalized advertisements, optimize campaigns, and track results, thereby improving efficiency and effectiveness (Huang & Rust, 2020).

The existing literature can be organized into three distinct but fragmented research streams. The first stream focuses on AI applications in marketing operations—covering personalization, predictive analytics, and automation—but largely ignores sustainability dimensions (Kumar et al., 2019; Huang & Rust, 2021). The second stream examines sustainable marketing theory and practice, including green marketing, CSR communication, and anti-greenwashing frameworks, without systematically incorporating AI as a technological enabler (Kemper & Ballantine, 2019; Papadas et al., 2017).

The third, nascent stream explores authenticity in brand communications, drawing on authenticity theory (Beverland, 2005) and legitimacy theory (Suchman, 1995), but has not yet been integrated with AI-driven verification mechanisms. This fragmentation across streams justifies the need for a systematic bibliometric mapping to identify thematic convergences, research gaps, and pathways toward a more integrated theoretical framework connecting AI capabilities, sustainability imperatives, and authenticity construction.

RESEARCH METHOD

This study employs bibliometric analysis as its primary research methodology. Bibliometric

analysis is a quantitative method used to examine trends in scientific production within a specific field (Wang et al., 2022). It provides an objective and systematic means of mapping knowledge structures, identifying key themes and emerging trends, and highlighting existing challenges (Donthu et al., 2021). By analyzing elements such as abstracts, keywords, authors, institutions, countries, journals, and citation counts, bibliometric methods allow the visualization of connections between studies and topics (Donthu et al., 2021).

The search keywords “sustainable marketing,” “artificial intelligence,” and “authenticity” were queried in the Scopus database following a systematic search protocol consistent with PRISMA reporting guidelines (Page et al., 2021). The time window of 2020–2025 was selected deliberately to capture research published in the post-ChatGPT and post-pandemic era, a period marked by the rapid democratization of generative AI tools and a surge in corporate sustainability disclosures.

This window allows the study to trace how AI–sustainability research dynamics have shifted as these dual forces—AI accessibility and sustainability pressure—have intensified simultaneously. Inclusion criteria required peer-reviewed articles published in English, indexed in Scopus, containing all three search terms in the title, abstract, or keywords. Documents other than journal articles (e.g., conference papers, book chapters, editorials) were excluded to ensure quality consistency. A total of 33 documents meeting these criteria were identified, yielding 275 author keywords for network analysis.

To ensure transparency and methodological rigor, the study selection process is documented using a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram, as presented in Figure 1. Presenting this PRISMA diagram strengthens the reproducibility of the review by enabling future researchers to replicate or update the search process systematically (Page et al., 2021). The diagram provides a transparent account of how records were identified through the Scopus database search, screened based on title and abstract relevance, assessed for eligibility against the inclusion and exclusion criteria, and ultimately included in the final analysis.

Specifically, the initial keyword search returned a total of 89 records. After removing duplicates and non-English publications ($n = 15$), the remaining 74 records were screened by title and abstract, of which 8 were excluded as clearly outside the scope of AI–sustainable marketing research. The remaining 45 were assessed for full eligibility; 12 were further excluded as non-peer-reviewed document types (conference abstracts, book chapters), yielding a final corpus of 33 documents included in the bibliometric synthesis.

Descriptive analysis of the dataset revealed the following characteristics: publications spanned 2020–2025, with the majority (approximately 73%) published from 2022 onward, reflecting the accelerating pace of research in this domain. The 33 documents were authored by researchers affiliated with institutions across 18 countries, with the highest contribution from Asia (particularly China and Indonesia), Europe, and North America.

The most prolific journals cover marketing, business information systems, and sustainability, though notably, top-tier marketing journals (e.g., *Journal of Marketing*, *Journal of the Academy of Marketing Science*) remain underrepresented, signaling a gap in high-impact theoretical contributions. Network visualization and temporal and density analyses were conducted using VOSviewer to map the intellectual structure and thematic evolution of the field.

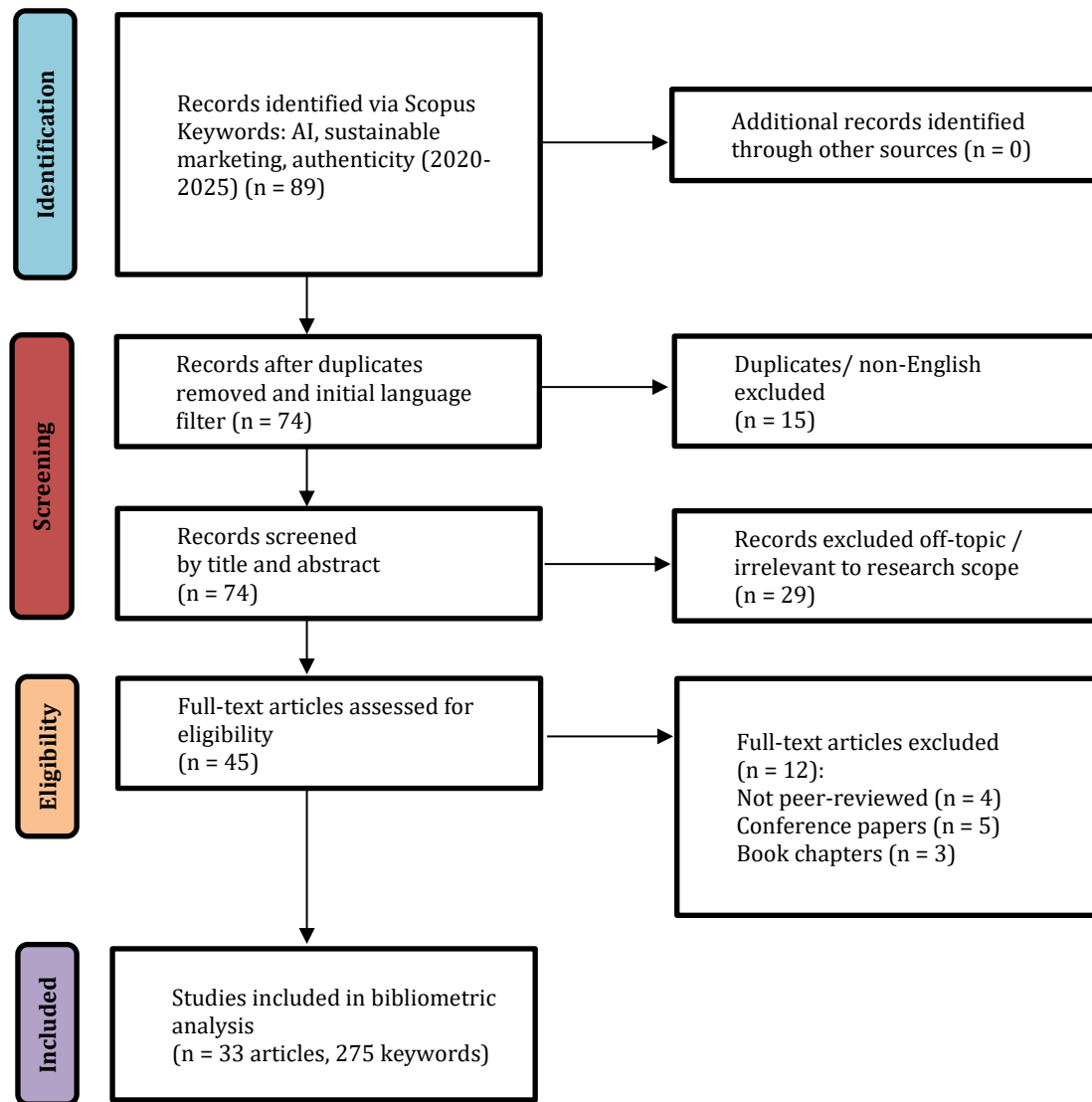


Figure 1. PRISMA Flow Diagram (the Study Selection Process) for the Bibliometric Analysis of AI-Enabled Sustainable Marketing Research (2020–2025)

FINDINGS AND DISCUSSION

Network Structure and Cluster Analysis

The VOSviewer network visualization reveals a complex intellectual landscape comprising multiple interconnected research domains. The analysis identified several distinct clusters representing key thematic areas in the intersection of artificial intelligence and sustainable marketing. The network demonstrates that "artificial intelligence" serves as the primary hub, with the highest degree centrality and betweenness centrality scores.

This central positioning indicates its role as a bridge connecting various research domains, from technological applications to sustainability practices. The node's size and connectivity patterns suggest that AI research has evolved from a peripheral technology consideration to a core driver of sustainable marketing innovation.

As shown in Figure 2, the network analysis reveals five primary thematic clusters:

1. **AI Technology Cluster (Green):** Anchored by "artificial intelligence," this cluster encompasses related technological concepts including "robotics," "artificial intelligence techno," "5g

- technology," and "information and communication." The strong internal connectivity within this cluster indicates mature theoretical and practical integration of AI technologies.
2. **Business Strategy Cluster (Red):** Centered around "business organizations," "decision making," and "strategic planning," this cluster represents the organizational and managerial dimensions of AI adoption in sustainable marketing. The cluster shows strong connections to consumer-related concepts, suggesting a focus on business-consumer interface applications.
 3. **Consumer Behavior Cluster (Yellow):** Dominated by "consumer behavior," "consumer behavior patterns," and "customer engagement," this cluster reflects the growing emphasis on understanding and influencing consumer responses to AI-enabled sustainable marketing initiatives.
 4. **Sustainable Development Cluster (Purple):** This cluster encompasses "sustainable development," "sustainable marketing," "green marketing," and "environmental impact," representing the sustainability-focused research domain.
 5. **Digital Marketing Applications Cluster (Blue):** Including "digital marketing," "social media," "customer engagement," and "chatbots," this cluster represents the practical implementation of AI in digital marketing contexts.

The co-occurrence analysis revealed the interconnected relationships among keywords, as illustrated in Figure 2. From the 275 keywords examined, the analysis identified 18 distinct clusters connected by 2,619 links, with a total link strength of 2,756—indicating the frequency of co-occurrence patterns between keywords. These connections illuminate the relationships and associations among the various terms used in the research.

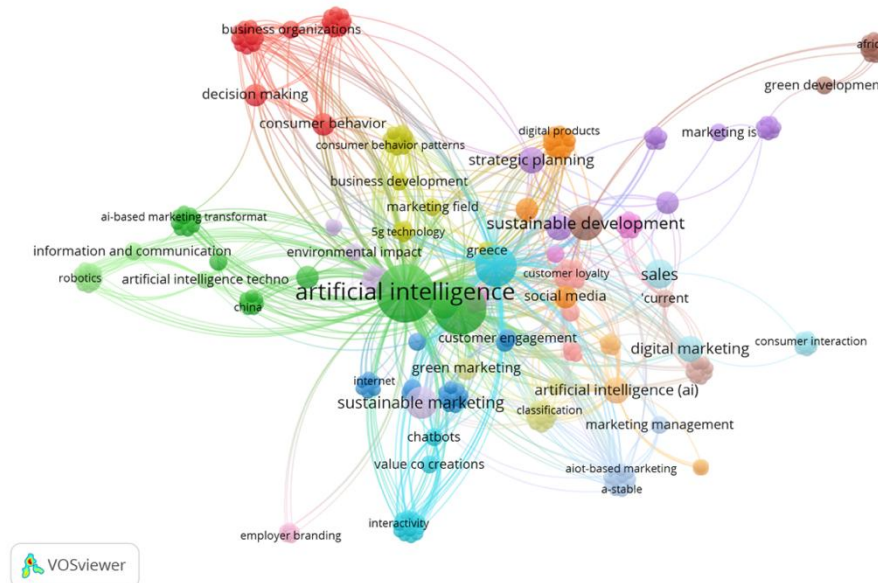


Figure 2. Network Visualization of the Co-occurrence Keywords

The most prominent keywords were "artificial intelligence" (20 occurrences), "marketing" (16 occurrences), "commerce" (10 occurrences), "sustainable development" (7 occurrences), and "sustainable marketing" (6 occurrences). Notably, these keyword clusters frequently intersect, highlighting their strong conceptual relationship with artificial intelligence as a central theme.

Temporal Evolution Analysis

The overlay visualization, as shown in Figure 3, provides crucial insights into the temporal evolution of research themes from 2020 to 2025. The color gradient from dark blue (2020) to bright yellow (2025) reveals distinct research trajectory patterns.

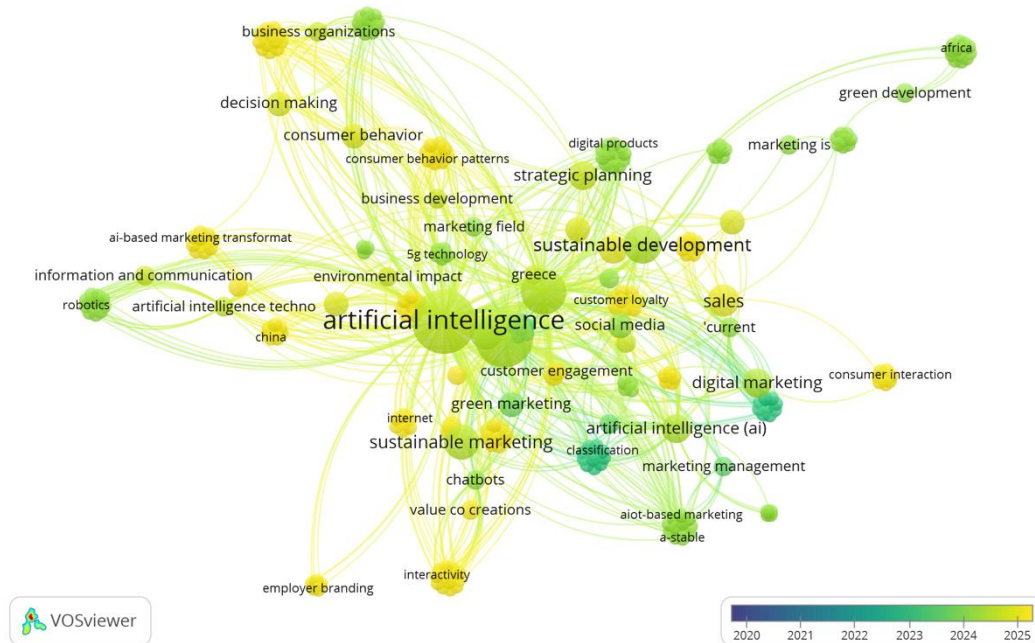


Figure 3. Overlay Visualization of Co-occurrence Keywords from 2020 to 2025

1. Early Phase (2020-2021): The darker nodes indicate that foundational concepts such as "artificial intelligence," "sustainable development," and "digital marketing" were established early in the study period. This suggests that initial research focused on establishing theoretical frameworks and basic applications.
2. Transition Phase (2022-2023): Mid-tone colors represent emerging integration concepts including "customer engagement," "green marketing," and "marketing management." This period appears to mark a shift toward more applied and integrated research approaches.
3. Recent Developments (2024-2025): The brightest nodes, including "ai-based marketing," "consumer interaction," and "marketing is," indicate the most recent research developments. These concepts suggest a maturation toward sophisticated, AI-driven sustainable marketing applications with emphasis on authentic consumer interactions.

Density Visualization Analysis

The density visualization provides a complementary perspective to the network analysis by revealing the conceptual density and thematic clustering patterns within the AI-sustainable marketing research landscape. The heat map visualization uses color intensity to represent the density of keyword co-occurrences, with brighter areas indicating higher research concentration and connectivity.

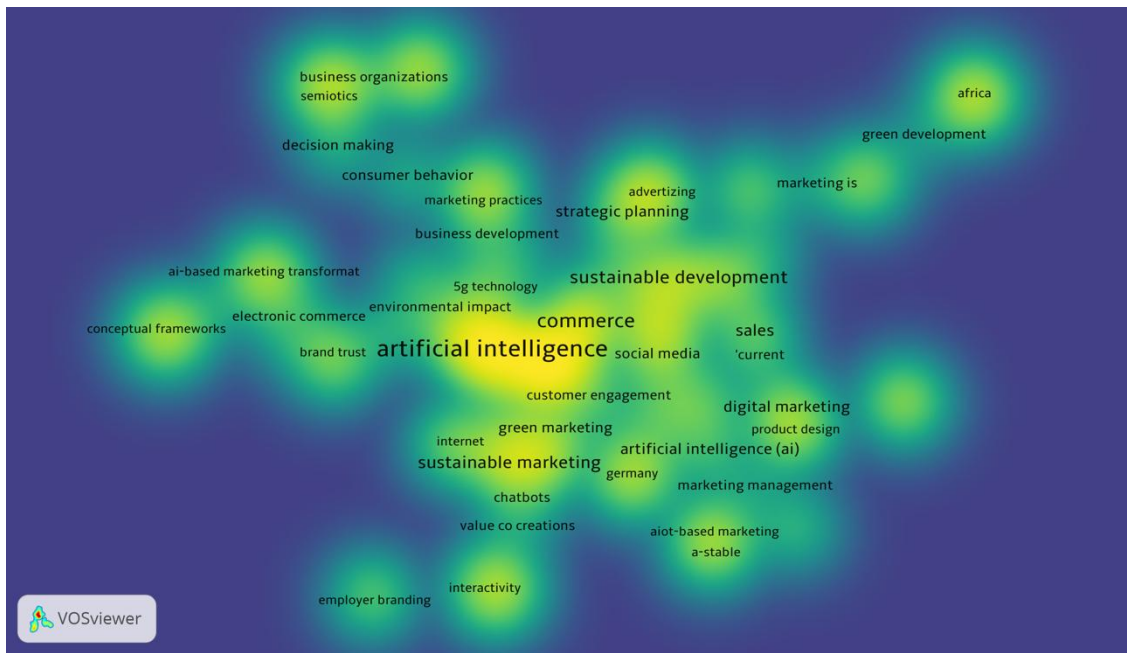


Figure 4. Density Visualization of Co-occurrence Keywords

The visualization reveals an intensely bright yellow-green core centered around "artificial intelligence," "commerce," and "sustainable development." This high-density region indicates the most mature and interconnected research area, suggesting that AI applications in sustainable commerce represent the field's primary theoretical and practical focus. The positioning of "customer engagement" within this core further confirms that consumer-centric AI applications are central to sustainable marketing research.

A secondary high-density area emerges around "sustainable marketing," "green marketing," and "environmental impact." This cluster shows significant brightness, indicating well-established research themes with strong internal connectivity. The proximity to AI-related terms suggests successful integration between technological and sustainability domains.

Moreover, the area encompassing "digital marketing," "social media," and "marketing management" displays notable density, indicating mature research integration in digital sustainable marketing applications. The gradient patterns suggest this cluster serves as a bridge between traditional marketing concepts and AI-enabled sustainability practices.

The region containing "strategic planning," "business development," and "decision making" shows moderate density levels, indicating developing but not fully mature research areas. This suggests opportunities for theoretical advancement in strategic applications of AI for sustainable marketing.

The area around "consumer behavior," "marketing practices," and "advertising" displays medium density, suggesting ongoing research development with potential for deeper integration with AI and sustainability themes. The gradient pattern indicates this area is transitioning from peripheral to more central research focus. Terms like "5g technology," "internet," and "electronic commerce" show moderate density, indicating foundational technological research that supports but does not dominate the field's development.

The emerging low-density areas containing "Africa," "Germany," and regional applications show lower density, indicating emerging research opportunities in geographic and cultural contexts of AI-sustainable marketing. Concepts like "chatbots," "value co-creation," "interactivity,"

and "employer branding" appear in lower-density regions, suggesting these are either nascent research areas or highly specialized applications requiring further development and integration.

Furthermore, terms such as "AIoT-based marketing" and "a-stable" occupy lower-density positions, indicating emerging technological applications that have not yet achieved mainstream research integration.

Thematic Map Analysis

A thematic map analysis based on keyword co-occurrence was conducted to examine the importance and development of study topics in the field of AI-enabled sustainable marketing. The analysis positions research themes across four quadrants based on centrality (x-axis) and density/development intensity (y-axis) as shown in Figure 4. Centrality measures the importance of a theme within the overall research network, while density indicates the internal development and maturity of the theme.

1. Motor Themes (High Centrality, High Density)

Positioned in the upper-right quadrant, this theme demonstrates both high importance and advanced development. The cluster including "artificial intelligence," "marketing," "sustainability," "commerce," and "bibliometric" represents the most mature and central research area. These themes show strong internal cohesion and high network centrality, indicating they are well-developed driving forces of the research field. The convergence of "green marketing," "customer engagement," and "content marketing" forms another motor theme. This cluster exhibits high centrality due to its connections across multiple research domains, and high density reflecting mature theoretical development and practical applications.

2. Niche Themes (Low Centrality, High Density)

The upper-left quadrant has high internal development but lower network centrality, such as "chatbots," "digital marketing," "sustainable marketing," and "AIoT-based marketing." The high density indicates mature research within this domain, but the moderate centrality suggests limited integration with other research streams such as "sustainable development goals," "benchmarking," and "data mining". Research themes related to cultural contexts, "cultural dimensions" and "business organizations," show high internal development but lower centrality, indicating specialized research niches with potential for broader integration.

3. Basic Themes (High Centrality, Low Density)

Positioned in the lower-right quadrant, themes including "social media," "data analytics," and "strategic planning" demonstrate high importance to the overall network but relatively low internal development. This suggests these are foundational concepts that require further theoretical and empirical development within the AI-sustainable marketing context. Basic technology concepts like "5G technology" and "business informatics" show high centrality but lower density, indicating their importance as enabling infrastructure while requiring more specialized development in sustainable marketing applications.

4. Emerging or Declining Themes (Low Centrality, Low Density)

Located in the lower-left quadrant, this area contains emerging or highly specialized themes related to "big data," "business development," and "consumer behavior" that show both low centrality and low density, indicating they are either nascent research areas or highly specialized niches. Themes related to specific industry applications or technical specifications, such as "decision making" and "emerging technologies," occupy this quadrant, suggesting opportunities for

future development and integration with core research streams. This positioning suggests these are either emerging specialized areas or declining from previous prominence.

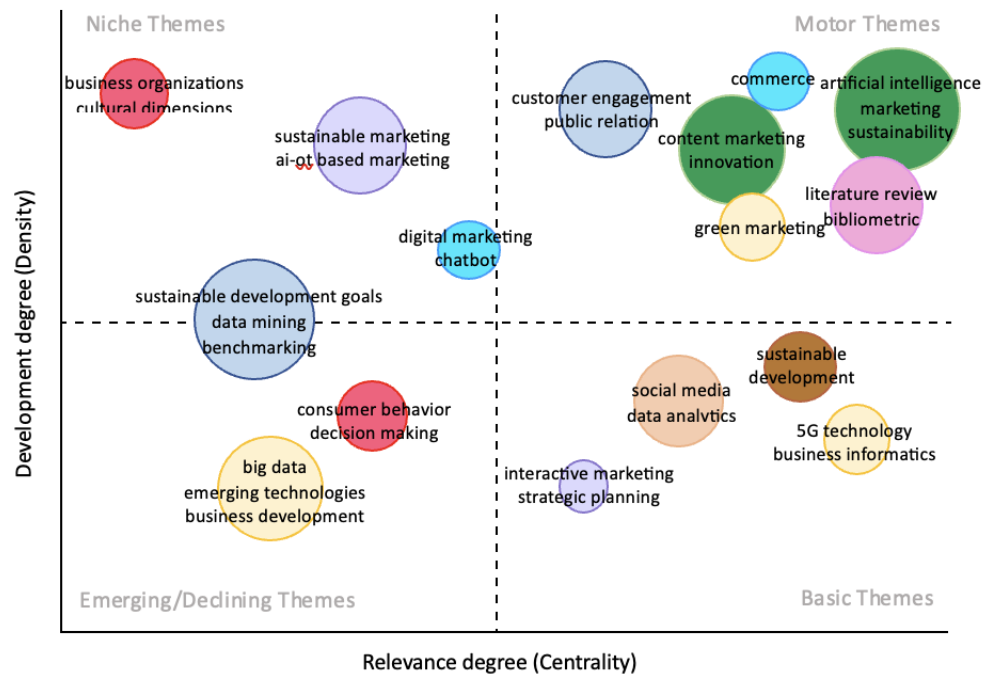


Figure 5. Thematic Mapping of Keywords

The bibliometric analysis reveals a rapidly maturing research field characterized by the strategic convergence of artificial intelligence and sustainable marketing, with authenticity emerging as a critical bridging concept. The network visualization demonstrates that AI has transformed from a peripheral technological tool to become the central organizing force in sustainable marketing research, evidenced by its position as the primary hub connecting five distinct thematic clusters.

This structural dominance, combined with the strongest link strength between "artificial intelligence" and "sustainable marketing", indicates that researchers increasingly view AI not merely as an enabling technology but as fundamental to reimagining how sustainable marketing operates. The thematic map further validates this centrality, positioning AI-digital marketing integration as a motor theme with exceptional centrality and density, confirming it as the most mature and influential research domain.

Meanwhile, the density visualization reveals an intensely bright core around "artificial intelligence," "commerce," and "sustainable development," suggesting these concepts have achieved the highest degree of research integration and conceptual maturity. This convergence addresses a critical challenge in sustainable marketing: the authenticity gap between environmental claims and actual practices. The network structure indicates that AI is being positioned as the technological solution to this credibility crisis, enabling real-time verification, transparent communication, and authentic engagement that traditional marketing approaches cannot achieve.

The temporal evolution from 2020 to 2025 reveals a three-phase development pattern that answers the first research question about field evolution. The overlay visualization shows that research progressed from establishing foundational concepts (2020-2021) through an integration phase (2022-2023) to sophisticated application development (2024-2025). Critically, the analysis

identifies 2022-2023 as a paradigm shift period when research transitioned from exploring isolated AI applications to investigating integrated AI-sustainable marketing ecosystems.

This shift is evidenced by the migration of themes from peripheral and basic quadrants toward motor theme positions in the thematic map, particularly for concepts like "customer engagement," "green marketing," and "marketing management." The density visualization corroborates this evolution, showing clear gradients from lower-density peripheral regions to high-density cores, indicating that research has moved through establishment, development, and maturation phases.

Significantly, the temporal patterns reveal that while foundational AI and sustainability concepts were established early, their integration gained momentum only in recent years, with the brightest nodes in 2024-2025 representing sophisticated applications like "ai-based marketing" and "AIoT-based marketing." This evolution pattern suggests the field has matured from theoretical exploration to practical implementation, with increasing emphasis on authentic, verifiable sustainability communication enabled by AI technologies.

The cross-disciplinary integration evident in the cluster analysis—where technology, marketing, sustainability, and consumer behavior domains show strong interconnectivity—indicates that the field has successfully transcended traditional disciplinary boundaries to create a genuinely interdisciplinary research domain.

Addressing the second research question on emerging trends and future directions, the analysis reveals four critical frontiers at the intersection of technological capability and sustainability authenticity. First, AI-enabled verification systems represent the most significant emerging trend, evidenced by the temporal evolution toward "AIoT-based marketing" (AI + IoT) and the moderate but growing connections between technology infrastructure and sustainable marketing applications.

The thematic map positions these as emerging/declining themes (low centrality, low density), indicating nascent status with substantial growth potential. This suggests future research will focus on developing real-time verification systems that can authenticate sustainability claims through technological means, moving from traditional trust-based marketing to evidence-based communication.

Second, interactive and personalized sustainability communication emerges as a key trend, with concepts like "chatbots," "value co-creations," and "interactivity" showing increasing prominence in recent years. The network analysis reveals these as specialized applications with weaker but notable connections, suggesting research is shifting from broadcast-style sustainability messaging toward engagement-based approaches that allow consumers to participate in and verify sustainability claims.

Third, geographic and cultural adaptation represents an important emerging frontier, with regional terms like "Africa," "China," and "Greece" appearing as emerging themes with high internal development but lower centrality. The density visualization confirms these as lower-density areas, indicating opportunities for pioneering research in culturally adapted AI marketing applications.

Fourth, the thematic map identifies strategic planning and business development as basic themes requiring enhancement—high centrality but low density—suggesting significant opportunities for research on organizational strategies and business models for implementing AI-enabled sustainable marketing at scale.

Furthermore, the future research directions point toward three strategic imperatives: advancing motor themes through more sophisticated theoretical and practical development, particularly in verification and authentication systems; elevating basic themes by developing specialized knowledge on strategic implementation of AI-sustainable marketing; and pioneering peripheral themes by exploring specialized applications, geographic contexts, and emerging

technologies like AIoT.

Most significantly, the consistent emphasis across all visualization methods on authenticity-related concepts—customer engagement, consumer behavior, brand trust, verification systems—confirms that the field is coalescing around a central challenge: using AI to bridge the authenticity gap in sustainable marketing.

This represents not merely a technological evolution but a fundamental reconceptualization of how sustainable marketing operates, moving from claim-based communication to evidence-based, technologically verified, and interactively engaged sustainability practices. The research landscape is thus positioned at a critical juncture where established cores provide a foundation for expansion into emerging frontiers, with authenticity serving as the conceptual bridge between technological capability and sustainability imperatives.

AI fundamentally transforms sustainable marketing through real-time verification, enabling immediate authentication of sustainability claims through AI and Internet of Things (IoT) integration, replacing slow manual verification processes. Secondly, personalized communication delivers customized sustainability messaging aligned with individual consumer values and preferences at scale.

Third, automated compliance monitoring continuously tracks regulatory requirements and ensures sustainability claims meet evolving standards. Last but not least, a transparent supply chain that provides end-to-end visibility of environmental and social impact across entire supply chain networks.

Strong connections between "customer loyalty," "consumer engagement," and AI-related terms confirm that technology is positioned as a solution to authenticity challenges, supporting the premise that AI enables more credible and verifiable sustainability communications. Network emphasis on "consumer behavior patterns" and "customer engagement" indicates AI's capability to deliver personalized yet authentic sustainable marketing messages, moving beyond basic automation toward sophisticated personalization maintaining sustainability authenticity. The presence of "Africa," "China," and "Greece" indicates growing recognition of cultural and geographic factors, suggesting a shift beyond Western-centric approaches toward globally inclusive frameworks.

CONCLUSIONS

This bibliometric analysis provides the first comprehensive examination of how artificial intelligence enables authentic sustainable marketing practices. The research reveals a rapidly evolving field characterized by increasing sophistication in AI applications and growing integration between technological and sustainability domains.

The findings demonstrate that AI fundamentally transforms sustainable marketing by enabling real-time verification, personalized communication, automated compliance monitoring, and transparent supply chain communication. These capabilities address core authenticity challenges that have historically limited the effectiveness of sustainable marketing efforts.

The study establishes a foundation for understanding computational approaches to marketing authenticity and provides practical guidance for organizations seeking to implement AI-enabled sustainable marketing strategies. As consumer skepticism toward sustainability claims continues to grow, and regulatory requirements become more stringent, AI emerges as an essential capability for authentic sustainable marketing communication.

The research contributes to both academic understanding and practical application by mapping the intellectual structure of this emerging field and identifying specific mechanisms through which AI enables marketing authenticity. For researchers, the study provides a comprehensive foundation for future investigations into AI-sustainability intersections. For

practitioners, it offers evidence-based insights for developing authentic, verifiable sustainable marketing approaches.

From a theoretical perspective, this study advances the integration of authenticity theory and signaling theory into the AI-sustainable marketing conversation, proposing that AI functions as an authenticity-enabling mechanism that reduces information asymmetry between firms and consumers. This theoretical synthesis provides a foundation for future model-building and empirical testing.

From a methodological perspective, the bibliometric approach reveals structural patterns invisible to narrative reviews. However, the relatively small corpus ($n = 33$) underscores the nascency of this specific intersection and the need for longitudinal tracking as the field grows. From a managerial perspective, practitioners should view AI-enabled sustainability verification not merely as a compliance tool but as a strategic asset for building consumer trust and differentiation in markets where greenwashing skepticism is high.

From a policy perspective, the findings highlight the need for regulatory frameworks that recognize AI-verified sustainability disclosures, potentially enabling standardized, machine-readable sustainability reporting that enhances accountability and comparability across firms and sectors.

LIMITATION & FURTHER RESEARCH

This study has several limitations that should be considered when interpreting its findings. First, the small sample size ($n = 33$ documents) reflects the nascency of this specific research intersection but also limits the robustness of co-occurrence patterns; findings should be interpreted as exploratory rather than definitive.

Second, bibliometric methods are subject to inherent method bias: highly-cited foundational works exert disproportionate structural influence on network maps, potentially obscuring emerging perspectives. Third, keyword-based search strategies introduce distortion risk, as different authors use varied terminology for similar constructs (e.g., “green marketing” vs. “sustainable marketing”); future studies should employ broader keyword combinations or synonym mapping.

Fourth, the study is constrained by a single-database design (Scopus), which may exclude high-quality work indexed only in Web of Science, Google Scholar, or discipline-specific databases. Fifth, the 2020–2025 timeframe, while theoretically justified, introduces timeframe bias by excluding pre-2020 foundational work that may have shaped current discourse.

Six concrete future research directions emerge from this analysis. First, a mixed-method systematic review combining bibliometric mapping with content analysis of cluster-specific articles would provide deeper interpretive insight beyond structural patterns. Second, qualitative or experimental studies should examine consumer responses to AI-verified sustainability claims compared to traditional self-reported CSR communications, testing authenticity theory propositions empirically.

Third, cross-country comparative research is needed to examine whether the AI-sustainability-authenticity nexus operates differently across cultural and regulatory contexts, particularly in high-growth markets such as Southeast Asia and Sub-Saharan Africa. Fourth, the AI ethics dimension—including algorithmic bias in sustainability targeting, data privacy in green consumer profiling, and accountability in automated compliance monitoring—is a critical but underexplored frontier warranting dedicated research streams.

Fifth, longitudinal bibliometric updates at two-to-three-year intervals would allow researchers to track whether currently peripheral themes (e.g., AIoT-based verification, geographic adaptation) migrate toward the motor theme quadrant. Sixth, researchers should investigate the

role of emerging regulatory environments (e.g., EU Green Claims Directive, SEC climate disclosure rules) as institutional forces shaping the AI-authentic sustainable marketing relationship.

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