Trends and impact of digital marketing on consumer engagement in sustainable business-based fashion e-commerce: A bibliometric approach

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Abstract: This study employs bibliometric analysis to explore trends and the influence of digital marketing on consumer behavior and engagement within sustainable fashion e-commerce. Focusing on environmental, social, and economic sustainability, the research investigates how digital marketing strategies promote responsible consumption and brand loyalty. Utilizing the Biblioshiny package in R software, the study follows a structured methodology, defining research objectives, sourcing data from Scopus, and applying bibliometric tools. The analysis reveals a consistent annual increase in scholarly interest, highlighting the growing relevance of sustainable fashion e-commerce. It also identifies significant geographic research contributions, particularly from the United States, Indonesia, and Spain. Despite challenges such as limited citation recognition, international collaborations and varied publication formats have advanced the field. The findings emphasize the importance of understanding digital marketing trends to support sustainable practices in the fashion industry. This research offers practical and theoretical insights for academics, marketers, and policymakers seeking to enhance consumer engagement through sustainability-driven digital marketing. Overall, it underscores the critical role of digital marketing in shaping consumer behavior and fostering long-term brand relationships in the context of sustainable fashion e-commerce.

Keywords: Bibliometric, E-commerce, Fashion, Sustainable business, Trends and impact of digital marketing.

1. Introduction

In recent years, the development of digital technology has significantly changed the global business perspective, with one of the most significant impacts seen in the fashion e-commerce industry. The COVID-19 pandemic has accelerated the growth of the online fashion industry, pushing consumers to switch to digital platforms to meet their needs [1]. In Figure The fashion e-commerce market shows an extraordinary growth trend from 2020 to 2025, with the global market value expected to increase from US$752.5 billion in 2020 to US$1,164.7 billion in 2025, reflecting a Compound Annual Growth Rate (CAGR) of 9.1% [2].
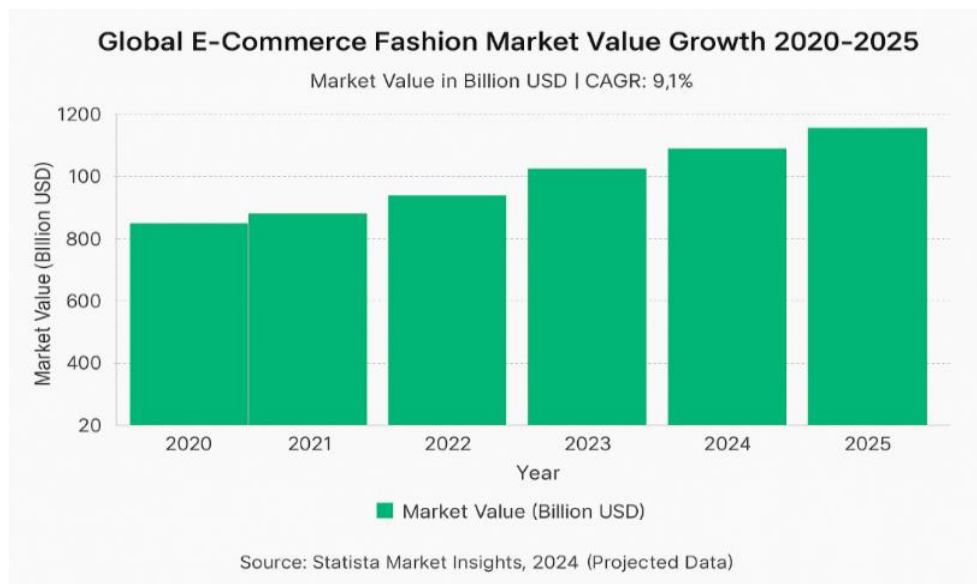
Global E-Commerce Fashion Market Value Growth 2020-2025

Market Value in Billion USD | CAGR: 9,1%

Figure 1.
Global E-commerce fashion market value growth 2020-2025.

This rapid growth is accompanied by an increasing consumer awareness of sustainability. COVID-19 became the main driver of growth in fashion e-commerce, which surged by 25.7% in 2020 and continued to grow steadily at an average of 15.8% until 2023 [3].

In the digital fashion industry, the concept of sustainability is becoming increasingly strong. As many as 72% of Gen Z and millennial consumers actively consider a brand's sustainability practices before deciding to make a purchase, and 68% of them are willing to pay more for eco-friendly fashion items [4]. With the increasing consumer awareness of the social and environmental impact of the fashion industry, digital marketing strategies have shifted to focus on sustainability values [5]. This phenomenon not only shows changes in consumer shopping patterns but also a transformation in the marketing strategies used by fashion brands to reach and engage their consumers. Digital marketing has become key in driving consumer engagement and sales on fashion e-commerce platforms [6]. Moreover, the latest trends indicate a significant shift towards sustainable business practices, where consumers increasingly demand transparency, ethics, and sustainability in the fashion products they purchase [4].

This research is based on several fundamental theories that explain the relationship between digital marketing, consumer engagement, and sustainability in the context of fashion e-commerce [7]. The Digital Consumer Engagement Theory developed by Hollebeek and Macky [8] explains how consumer interactions with brands through digital platforms create meaningful experiences and foster loyalty Hollebeek and Macky [8]. The Sustainable Consumption Value Model proposed by Sheth, et al. [9] outlines how sustainability values influence consumer purchasing decisions in the digital economy [9]. Meanwhile, the Digital Relational Marketing Theory developed by Dwivedi, et al. [10] emphasizes the importance of building long-term relationships with consumers through various digital channels to enhance engagement and loyalty [11].

Several recent research have explored the relationship between digital marketing, consumer engagement, and sustainability in fashion e-commerce. In the Journal of Marketing Development and Competitiveness, 17(4), According to Masse [12] Investigating the impact of sustainability-focused social media content on consumer engagement in the fashion industry, the results show that brands known for having a sustainable identity achieve higher levels of consumer engagement with the sustainability content they share [12]. In Hariningsih, et al. [13] this study explores the relationship

between digital influence and the emotional value perceived by consumers in driving slow fashion purchases in Indonesia. The results show that personalized recommendations and content marketing play an important role in shaping consumer purchase intentions towards sustainable fashion products Hariningsih, et al. [13]. Štofejová, et al. [14] Research aims to examine the relationship between consumer behavior when shopping online for eco-friendly products and the factors influencing it from a sustainability perspective. Online consumers are increasingly prioritizing sustainability when shopping. Factors such as product information, environmental certifications,and consumer testimonials greatly influence the purchasing decisions of sustainable fashion products [14]. Although various studies have highlighted different aspects of digital marketing and fashion e-commerce, there is still a gap in understanding how digital marketing strategies specifically influence consumer engagement in sustainable fashion businesses. There is a lack of bibliometric analysis linking these three components— sustainability, consumer engagement, and digital marketing—within a single conceptual framework. Moreover, most research has focused on developed country markets, leaving us with a limited understanding of emerging markets [15]. And there has been no systematic research on how to integrate the latest technological innovations such as artificial intelligence (AI), blockchain,big data analytics to enhance consumer engagement while strengthening sustainability practices [16].

Based on the identified research gaps, this study aims to answer the question of how the evolution of digital marketing trends has influenced consumer engagement in the sustainable fashion e-commerce industry. Additionally, this research also aims to identify which digital marketing strategies are most effective in increasing consumer engagement with sustainable fashion products, as well as how a bibliometric approach can provide insights into the development of research in the field of digital marketing for sustainable fashion e-commerce. Despite the many advantages of digital transformation in fashion e-commerce, several challenges remain, including cybersecurity risks, data privacy issues, and the digital accessibility gap in emerging markets. Maintaining a balance between technological innovation and ethical business practices is crucial for fostering long-term consumer trust and brand loyalty [17]. The increasing reliance on data-driven marketing has also raised ethical issues related to consumer privacy and data security, prompting regulatory authorities to enforce stricter policies, such as the General Data Protection Regulation (GDPR) in the European Union. As a result, fashion brands must carefully navigate this regulatory framework while ensuring that personalized marketing strategies enhance consumer engagement without compromising data security [18].

The rapid development of digital technology has driven significant changes in marketing strategies, especially in the e-commerce sector. Digital marketing has evolved into a primary tool for reaching consumers in a more personal and effective way [19]. In sustainable business, consumer engagement is not only an indicator of marketing success but also a benchmark for the response to the sustainability values being promoted. This research is important to identify trends and the impact of digital marketing on consumer engagement in fashion e-commerce. Thus, the findings of this research can serve as a foundation for more efficient and relevant sustainable marketing strategies in the digital era [20] .

This research holds significant importance both theoretically and practically. Theoretically, this research contributes to the development of literature by integrating three fields of study that are often researched separately: digital marketing, consumer engagement, and sustainable fashion business through a comprehensive bibliometric approach. Practically, the results of this research will assist fashion industry players in designing effective digital marketing strategies to enhance engagement and sales while maintaining the sustainability principles increasingly demanded by modern consumers. The importance of this research also lies in its timing, which is very crucial. One of the industries that contributes the most to pollution in the world, the fashion industry is seeking ways to balance business growth and environmental impact as we are in the midst of digital transformation and the global climate crisis. This research comes at a time when consumers are increasingly aware of the impact of their choices. On the other hand, fashion brands face the challenge of communicating their sustainability campaigns in a genuine and significant way through digital platforms.

This bibliometric analysis offers valuable insights into the shifting landscape of digital marketing within fashion e-commerce, identifying significant trends, research contributions, and potential research avenues. By exploring the interplay between digitalization, consumer engagement, and sustainability, this study provides a comprehensive perspective on how fashion brands can leverage digital advancements to foster growth while promoting responsible consumption. Future research should examine the long-term impact of AI-driven marketing strategies, assess the effectiveness of sustainability-oriented digital campaigns, and investigate the role of emerging technologies such as the metaverse in shaping the future trajectory of fashion e-commerce. By integrating emerging digital innovations with ethical business practices, fashion brands can achieve sustainable development while aligning the evolving preferences of socially and environmentally conscious consumers.

2. Literature Review

The evolution of digital marketing within the fashion e-commerce sector has profoundly impacted consumer engagement and sustainability initiatives. The integration of social media marketing, artificial intelligence (AI), blockchain technology, and data analytics has transformed brands-consumer interactions while fostering responsible consumption practices. This literature review examines key themes in existing research on digital marketing strategies, consumer engagement, and sustainability in the context of fashion e-commerce.

2.1. Digital Marketing and Consumer Engagement in Fashion E-Commerce

Digital marketing serves as a fundamental drive of contemporary fashion e-commerce, reshaping consumer decision-making and brand interactions. Social media platforms such as Instagram, TikTok, and Facebook have emerged as influential marketing channels, allowing brands to engage with their audiences through influencer partnership, live shopping experiences, and interactive storytelling [21]. Empirical research suggests that user-generated content (UGC) and personalized marketing campaigns enhance consumer trust and brand loyalty, leading to higher engagement level, particularly in the sustainable fashion sector. The Stimulus-Organism-Response (SOR) model, widely applied in digital marketing studies, explains how external stimuli such as digital advertisements and influencer endorsement shape consumer emotions and purchasing behaviors. Findings indicate that AI-powered recommendation systems and personalized content strategies significantly enhance consumer experiences and foster greater engagement with sustainable fashion brands [22].

According to Bocken, et al. [23] the Sustainable Business Model (SBM) encompasses a business model where consumers are involved in the creation of sustainable value [23]. In this situation, digital marketing strategies such as storytelling, live shopping, and interacting on social media serve as means to create shared value in addition to being marketing tools. Through their active engagement with the brand, consumers contribute to the sustainability system. With the Sustainable Business Model (SBM), digital consumer engagement is not just a response to advertisements, but a contribution to more sustainable consumption behavior changes. This strengthens the customer relationship and channel elements in the sustainable version of the Business Model Canvas [24].

2.2. The Role of AI and Big Data in Fashion Marketing

The utilization of artificial intelligence (AI) and big data analytics in fashion e-commerce has improved consumer targeting and experience. AI-driven chatbots and recommendation systems allow firms to deliver tailored shopping experiences, enhancing customer pleasure and engagement [25]. Futhermore, big data analytics provides valuable insights into consumer preferences, allowing brands to refine pricing strategies and anticipate fashion trends in real time, thereby making digital marketing more data-centric and efficient [14]. AI-driven marketing approaches have also been instrumental in fostering sustainable consumption patterns. By leveraging predictive analytics, brands can accurately estimate consumer demand, thereby minimizing overproduction and reducing environmental impact. Additionally, the increasing of virtual fitting rooms and augmented reality (AR) try-ons are enhances

the online shopping experiences while simultaneously lowering return rates, contributing to a more sustainable e-commerce ecosystem [22].

According to Teece [26] he emphasizes that sustainable business model innovation must pay attention to dynamic capabilities, such as the use of technology to support sustainability goals [26]. With the help of big data and AI, companies can understand customer behavior and optimize their value chains to become more efficient and minimize waste. The use of big data and AI in the Sustainable Business Model (SBM) helps create environmental value through accurate demand forecasting (reducing overstock) and creates value for customers through personalized experiences. These two roles reflect the pillars of value creation and value delivery in the Sustainable Business Model (SBM) [23].

2.3. Blockchain and Transparency in Sustainable Fashion

Blockchain technology has gained traction as a mechanism for enhancing transparency and accountability within sustainable fashion e-commerce. Research indicates that blockchain-based supply chain tracking systems empower consumers to authenticate product origins and ethical sourcing, addressing concerns related greenwashing and misleading sustainability claims [27]. Empirical studies further suggest that consumers are more inclined to engage with brands that offer verifiable sustainability credentials, leading to increased trust ang long-term brand loyalty [16]. The integration of blockchain in digital marketing also strengthens brand credibility and consumer trust. Through the use of smart contracts and decentralized ledgers, fashion brands can offer comprehensive insights into their production processes, ensuring adherence to ethical labor practices and responsible sourcing standards [28]. In spite of its advantages, blockchain technology encounters obstacles, such as the necessity for extensive industry adoption and the high costs associated with its implementation.

Boons and Lüdeke-Freund [29] state that a Sustainable Business Model (SBM) should enable transparent and responsible interactions between all parties involved in the value system [29]. Blockchain technology provides high visibility to the supply chain, supporting the principles of transparency and traceability as an integral part of the Sustainable Business Model (SBM) in fashion. Blockchain strengthens the aspects of governance and stakeholder interaction in the Sustainable Business Model (SBM), allowing consumers to become more aware of sustainability processes, which results in greater trust in the brand [30].

2.4. Influencer Marketing and Ethical Consumerism

Influencer marketing has emerged as a crucial strategy in fashion e-commerce, particularly in promoting sustainable consumption. Research suggest that micro-influencers who maintain smaller yet highly engaged followings are more effective in influencing sustainable purchasing behaviors compared to celebrity endorsements [18]. Consumers trend to view influencers as credible and authentic sources of information, making influencer collaborations a crucial mechanism for enhancing brand trust and advocating for ethical fashion choices [27]. The rise of ethical consumerism has reshaped digital marketing strategies, underscoring the importance of transparency and corporate social responsibility (CSR). Modern consumers increasing demand environmentally friendly production method, fair trade practices, and responsible marketing approaches, compelling brands to incorporate sustainability into their digital storytelling [14]. Studies indicate that brands that effectively convey their sustainability initiatives through social media and digital campaigns achieve higher consumer engagement and stronger brand loyalty [22].

According to Elkington [31] with the concept of the Triple Bottom Line, businesses must pay equal attention to profit, people, and planet [31]. Modern Sustainable Business Model (SBM) encourages social change through shared value communication. Influencers act as a bridge between the brand's sustainability values and consumers in the Sustainable Business Model, helping to convey an ethical value proposition and drive consumer behavior transformation. This collaboration fosters deeper consumer relationships and encourages value-based loyalty, not just transactions [32].

2.5. Challenges and Future Directions in Digital Fashion Marketing

Despite its advantages, digital marketing in fashion e-commerce encounters several challenges. Issues such as data privacy, algorithm biases, and disparities in digital accessibility across emerging markets create obstacle to equitable consumer targeting and engagement [25]. The growing dependence on AI-powered marketing strategies has also raised ethical concerns regarding data collection and personalized advertising, leading to the enforcement of regulation, such as the General Data Protection Regulation (GDPR) [14]. Additionally, the oversaturation of digital content has intensified competition for consumer attention, making it increasingly difficult for brands to maintain engagement. The effectiveness of digital marketing strategies relies on continuous innovation and the ability to adapt to rapidly evolving consumer preferences. Future research should examine the role of new technologies, including the metaverse, virtual reality (VR), and AI-based fashion design, in shaping the future of sustainable fashion e-commerce Khairunnisa, et al. [28]. Geissdoerfer, et al. [33] states that sustainable innovation in business models requires a balance between technology, ethics, and long-term value. Therefore, the Sustainable Business Model in digital-based fashion e-commerce must be adaptive to technological changes without sacrificing principles of sustainability and social integrity [33].

3. Methods

The methodology of this research uses a bibliometric analysis approach to investigate the scientific literature related to trends and the impact of digital marketing on consumer engagement in sustainable business-based fashion e-commerce. First, data were collected from the Scopus database, covering the period from 2010 to 2025. The keywords used in the search are digital AND marketing, sustainability*, business*. Next, to support the analysis process, this research uses Biblioshiny as the main tool. Biblioshiny is a web-based interface of the bibliometrix package in RStudio software version 4.3.1. This tool generates visual maps that depict the thematic evolution of authors' keywords and the relationships between keywords, authors, and publication sources. A total of eight main analyses were conducted, including summary statistics, annual scientific production on digital marketing and sustainability in fashion e-commerce, average citations per year, source growth, regional scientific output and impact, three-field plots, word clouds, and co-occurrence networks [34].
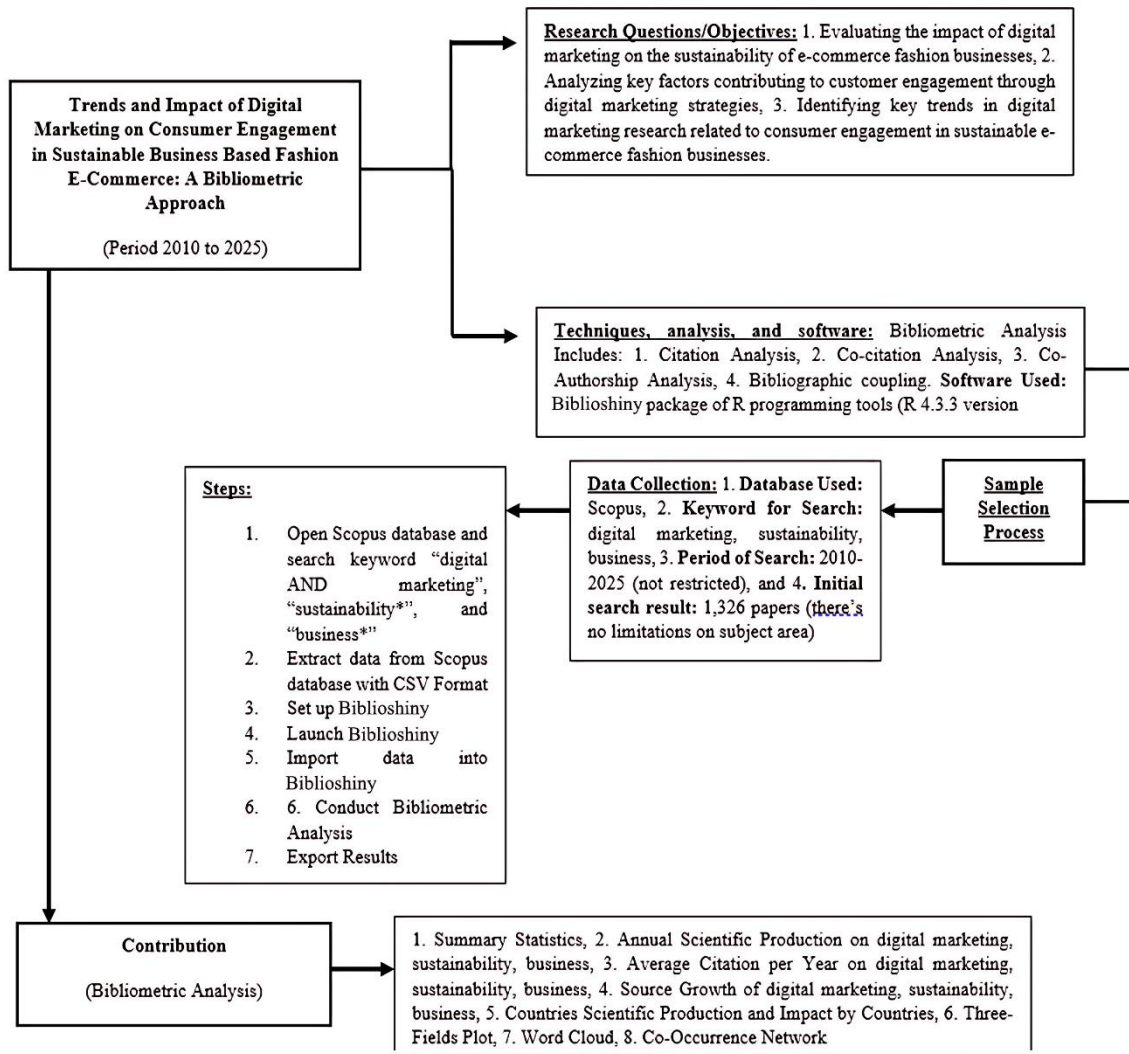
Figure 2.
Outline of the methodology.

4. Result and Discussion

4.1. Summart Statistics

Data was extracted from 2010 to 2025, as shown in Table 1. Summary Statistics of the Bibliometric. This research focuses on 1,326 documents obtained from 755 different sources, such as journals, books, and other publications. The number of documents increased by approximately 29.44% per year over those fifteen years. The majority of the research is relatively new, as evidenced by the average age of the documents in the analysis, which is 2.77 years. However, the average number of citations per document is around 14.1, indicating a substantial impact. The document contains a total of 72,556 references. Keywords from the document title (3,777) and keywords provided by the authors (3,567) are also included in the analysis. The analyzed documents were written by a total of 3,936 authors, with 167 documents written by a single author and an average of 3.22 co-authors per document. Collaboration with international authors is present in more than 26.92% of the documents. Documents of various formats, including conference papers, book chapters, and articles, were examined. This statistical data offers valuable insights into the structure, growth, and impact of research within the discipline over a specific period, which can be used to identify emerging trends and clarify the intellectual landscape.

Table 1.
Summary statistics.

Description	Results
Main information about data	
Timespan	2010:2025
Sources (Journals, Books, etc)	755
Documents	1326
Annual Growth Rate %	29.44
Document Average Age	2.77
Average citations per doc	14.1
References	72,556
Document contents	
Keywords plus (ID)	3777
Authors Keywords (DE)	3567
Authors	
Authors	3936
Authors of single-authored does	167
Authors Collaboration	
Single-authored docs	171
Co-Authors per Doc	3.22
International co-authorships %	26.92
Documents Type	
Article	696
Book	63
Book Chapter	182
Conference Paper	257
Conference Review	60
Editorial	5
Erratum	2
Note	5
Retracted	2
Review	53
Short Survey	1

4.2. Annual Scientific Production

A summary of bibliometric data from 2010 to 2025 shows that research on digital marketing in the e-commerce industry has experienced significant development. The number of publications at the beginning of the decade was still limited and stable, indicating that this topic had not yet become a primary focus in research or business practices. However, since 2019, there has been a significant surge in line with the increasing penetration of the internet, the growth of e-commerce platforms, and the changing consumer behavior that increasingly relies on digital channels. The COVID-19 pandemic also accelerated the adoption of digital technology in business activities, prompting companies to optimize their digital marketing strategies in response to physical restrictions and the shift of consumer interactions to the online realm. The peak in the number of publications occurred in 2024, indicating that digital e-commerce marketing became a strategic issue that garnered significant attention from the academic community. The drastic decline in 2025 is likely due to a shift in research focus to newer topics, such as Artificial Intelligence, data analytics, and personalization in digital marketing, or incomplete publication data from the previous year.
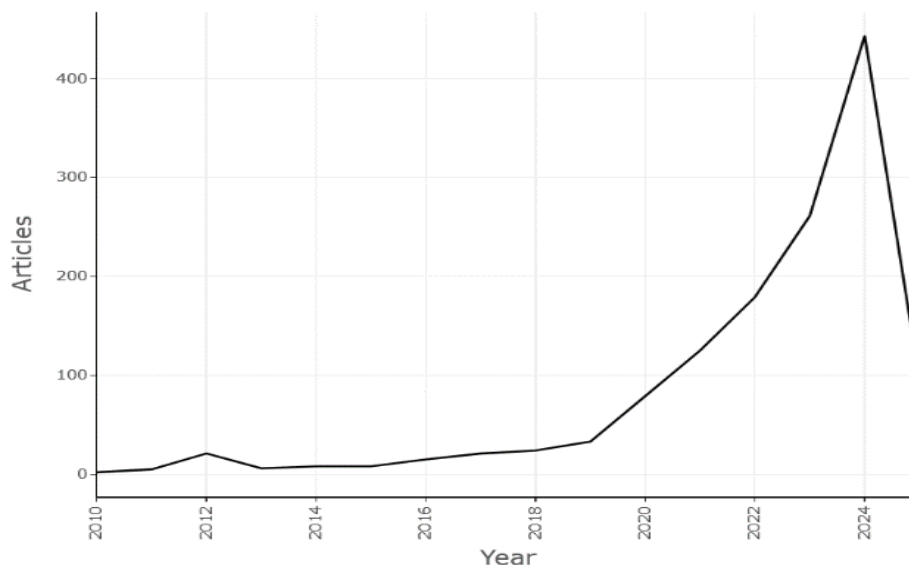
Figure 3.
Annual Scientific Production on digital impact, sustainability and business.

Overall, this graph (Figure 3) shows that digital marketing has played an important role in the development of e-commerce both academically and practically. Especially in terms of technological innovation, digital platform integration, and the development of marketing strategies that are more responsive to market changes and consumer needs, this publication trend indicates that this topic remains highly relevant for further research.

4.3. Average Citation Per Year

Based on the bibliometric graph showing the average citations per year for publications on digital marketing in e-commerce from 2010 to 2025, it can be concluded that the citation dynamics have undergone significant changes during that period. The citation rate was relatively low and stable during the early period $(2010-2015)$, indicating that its influence on the academic community was still limited despite the numerous studies conducted. The increase began to be gradually visible since 2016. However, in $2019-2020$, it reached the peak of citations as shown in the graph (Figure 3). This spike indicates that the articles published during that period had a significant impact and were frequently used as references in further research. This may be due to the urgent need to understand useful digital strategies amid the global business transformation, particularly during the COVID-19 pandemic, which pushed businesses to transition massively to digital channels. The graph shows a sharp decline in citation rates until 2025 after peaking in 2020. This decline could be caused by several factors, such as the increasing number of new articles that do not have enough time to be cited and the shift in academic attention to newer topics, such as AI, marketing automation, or Web 3.0 technology in e-commerce.
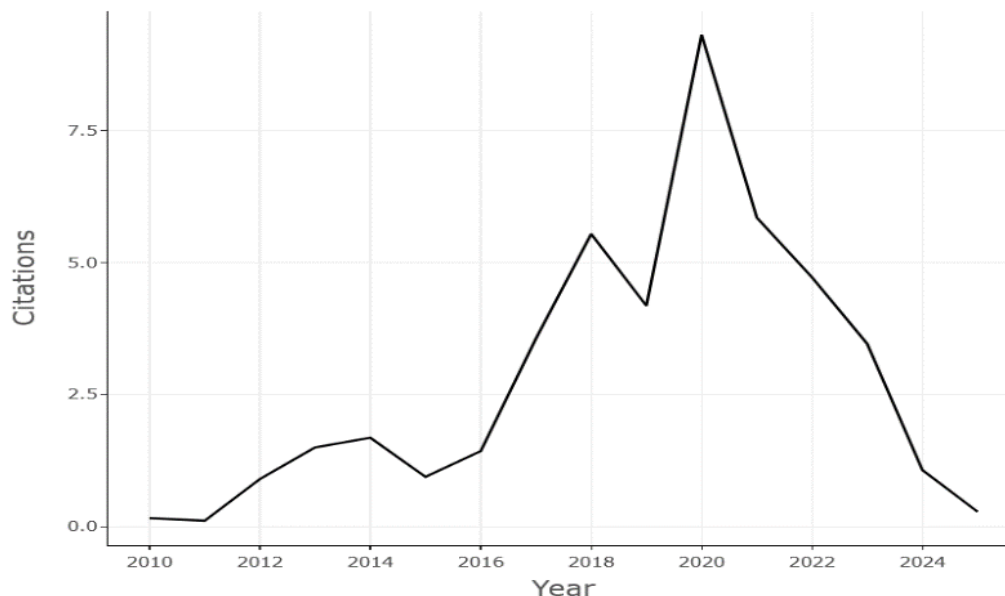
Figure 4.
Average citation per year on digital impact, sustainability and business.

Overall, this Figure 4 shows that although the number of publications continues to increase, their academic impact has tended to decline in recent years, based on the number of citations. This may indicate that theoretical approaches need to be updated or that new research focuses should align more closely with current technological advancements and market demands. As a result, in order to remain impactful in academic discourse and digital marketing practices in e-commerce, research and practice must pay attention to the relevance of content and the quality of scientific contribution.

4.4. Source Growth of Digital Marketing, Sustainability, Business

Based on the graph below (Figure 5), there is a drastic increase in publication trends in several leading journals related to digital marketing and sustainable business-based fashion e-commerce, particularly in the journal sustainability (Switzerland). Significant growth in the journal "Sustainability (Switzerland). "Since 2017, this journal has shown a drastic increase, especially from 2020 to 2024. The extreme surge in publications from 2022 to 2024 indicates an increased interest in sustainability marketing and ethical-based e-commerce. Journal of cleaner production, springer proceedings in business and economics, and lecture notes in networks and systems also show an upward trend, although not as rapid as "Sustainability". This indicates that this topic is beginning to penetrate the fields of Engineering, Economics, and Decision-Making Systems.

Multidisciplinary Involvement. The emergence of this topic in various journals, from systems and control to economics, indicates that sustainable digital marketing in fashion e-commerce is interdisciplinary, combining technology, management, and sustainability. The impact of digital marketing on consumer engagement. The increasing consumer awareness of sustainability has led consumers to be more interested in fashion brands that use eco-friendly production, transparent supply chains, and ethical values. Digital marketing enables the delivery of sustainable messages on a massive and personal scale through social media and e-commerce platforms. Personalization and real-time interaction, along with data-driven marketing, allow fashion e-commerce to target consumers with relevant content, increasing engagement and loyalty. Chatbots, influencer marketing, and user-generated content campaigns further strengthen the emotional connection with the brand. The role of influencers and online communities has become a significant factor in spreading sustainability values. Consumers are more engaged when they feel like part of a movement, not just mere buyers. The use of

AI technology and big data enables in-depth analysis of consumer preferences, allowing marketing strategies to be more green-targeted. For example, AI can recommend eco-friendly fashion products according to consumer preferences [35].

The displayed graph shows that the topic of digital marketing in the context of sustainable fashion e-commerce has seen a drastic increase in academic literature, especially after 2020.This is in line with the increase in global environmental awareness and digital transformation that accelerates consumer engagement in real-time, personalized, and sustainability-based values.
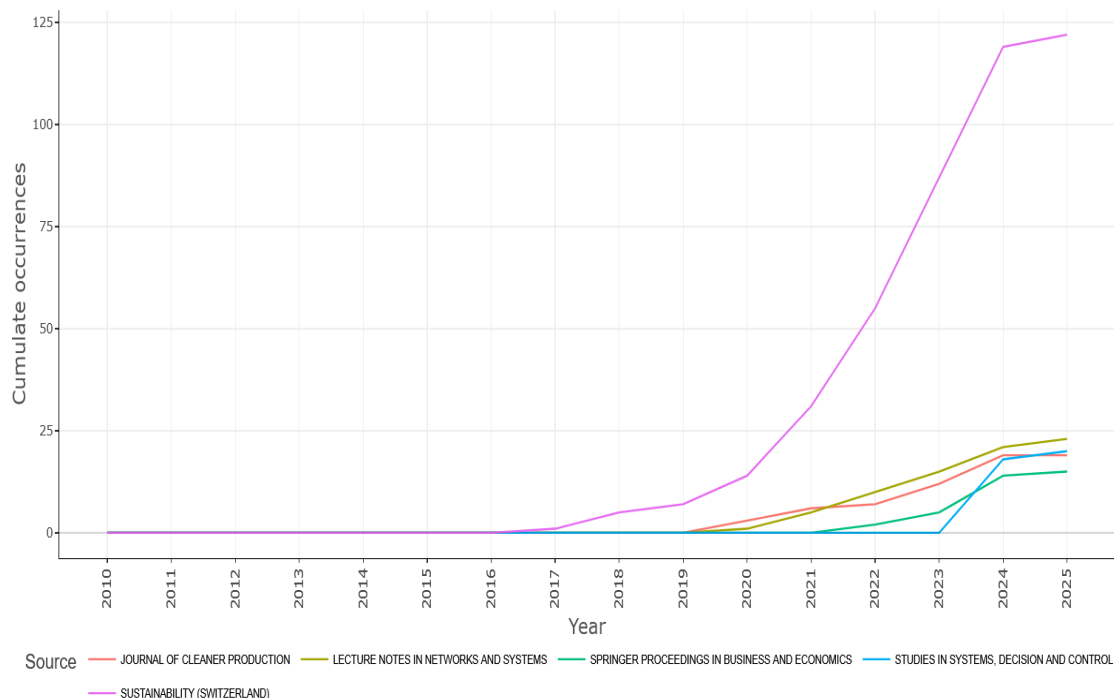

Figure 5.
Source growth of digital impact, sustainability and business.

4.5. Countries Scientific Production and Impact by Countries

Analysis of the bibliometric table of digital marketing e-commerce research shows a globally uneven geographical distribution pattern. Out of a total of 4,427 publications, Europe dominates with a contribution of 36.77% of the overall publications, followed by Asia with 33.75% and North America with 17.51%. This situation creates a significant research focus in these three regions, while Africa, the Middle East, Oceania, and South America collectively contribute about 11% of the total global publications.

From a country perspective, there is a clear concentration in several major countries. China has the highest number of publications with 585, followed by the United States (686 if combined with USA and United States), Indonesia 300, Italy 255, and the United Kingdom 210. Indonesia, which ranks third globally, shows a strong focus on digital marketing in e-commerce. This may be due to the rapid growth of the digital economy, a young tech-savvy population, and a large market potential.

Only 10 countries (11.4%) contribute the majority of publications with a frequency above 100, indicating a clear difference in research intensity. On the other hand, nearly half of the countries in the dataset (45.5%) have low research output with fewer than 20 publications. In digital marketing research, this difference reflects the broader digital divide between developed and developing economies.

Table 2.
Countries scientific production.

COUNTRY	FREAQ	COUNTRY	FREAQ	COUNTRY	FREAQ	COUNTRY	FREAQ
INDIA	356	KOREA SELATAN	40	OMAN	21	IRAK	5
CINA	346	SWEDIA	39	SINGAPURA	21	QATAR	5
INDONESIA	306	YORDANIA	38	SLOVENIA	21	KOSTA RIKA	4
ITALIA	215	TURKI	38	REPUBLIK CEKO	18	KENYA	4
INGGRIS RAYA	210	MAROKO	36	SWISS	18	MONGOLIA	4
AMERIKA SERIKAT	160	SLOVAKIA	36	UGANDA	18	KAMERUN	3
MALAYSIA	142	AUSTRIA	35	BANGLADESH	17	CILE	3
JERMAN	139	KOLOMBIA	31	LITHUANIA	15	ETHIOPIA	3
SPANYOL	124	BELANDA	30	NORWEGIA	15	ISLANDIA	3
AUSTRALIA	109	NIGERIA	30	KROASIA	11	LIBANON	3
RUMANIA	103	KANADA	29	UZBEKISTAN	11	MAURITIUS	3
PORTUGAL	82	HONGARIA	29	BELGIA	10	SELANDIA BARU	3
BRASIL	75	IRAN	29	EKUADOR	10	FILIPINA	3
PRANCIS	72	PERU	29	TANZANIA	10	SRI LANKA	3
ARAB SAUDI	70	SERBIA AND MONTENEGRO	29	TUNISIA	9	ARGENTINA	2
AFRIKA SELATAN	65	MEKSIKO	26	ZIMBABWE	9	GUINEA	2
YUNANI	63	DENMARK	25	AZERBAJJAN	8	KYRGYZSTAN	2
UKRAINA	58	SIPRUS	24	GHANA	8	NIKARAGUA	2
POLANDIA	53	LATVIA	24	BENIN	7	PAPUA NUGINI	2
THAILAND	52	BAHRAIN	23	KUWAIT	7	BELARUA	1
PAKISTAN	50	IRLANDIA	23	MALTA	7	FIJI	1
UNI EMIRAT ARAB	41	MESIR	22	BULGARIA	6	KAZAKHSTAN	1
FINLANDIA	41	JEPANG	21	GEORGIA	6		

With this uneven geographical distribution, there is an impact on the global understanding of digital marketing. The dominant models and strategies may be more influenced by Western and East Asian perspectives, creating differences in understanding how digital marketing functions in various cultural and economic contexts. Given the significant differences in market characteristics, there is a need to develop more contextual digital marketing approaches, conduct comparative analyses between mature and emerging markets, and enhance cross-regional research collaboration to enrich the global understanding of digital marketing practices in e-commerce.

4.6. Three-Field Plot

The three-field diagram illustrates the correlation between keywords, authors, and cited references in research publications (Figure 6). This diagram illustrates the relationship between researchers (CR), research themes (AU), and publication journals (DR), providing a holistic view of the intellectual structure of this field. In the left column (CR), it shows different groups of researchers, which can represent specific institutions or philosophical paradigms. The left column (CR) shows researchers who have made significant contributions to the field of digital marketing. Some researchers show a broader influence, which can be seen from how closely they are related to various research themes. The main focus of digital e-commerce marketing studies is seen in the center of the diagram (AU). Main topics include "digital business transformation," "marketing information systems," and various aspects of digital consumer behavior. These topics serve as important focal points that connect researchers and publication journals, highlighting the most actively discussed conceptual areas. The right column (DR) displays target publication journals with various specializations, indicated through color coding. The

uneven publication pattern is indicated by the distribution and thickness of connections, with some journals attracting more research on specific topics.
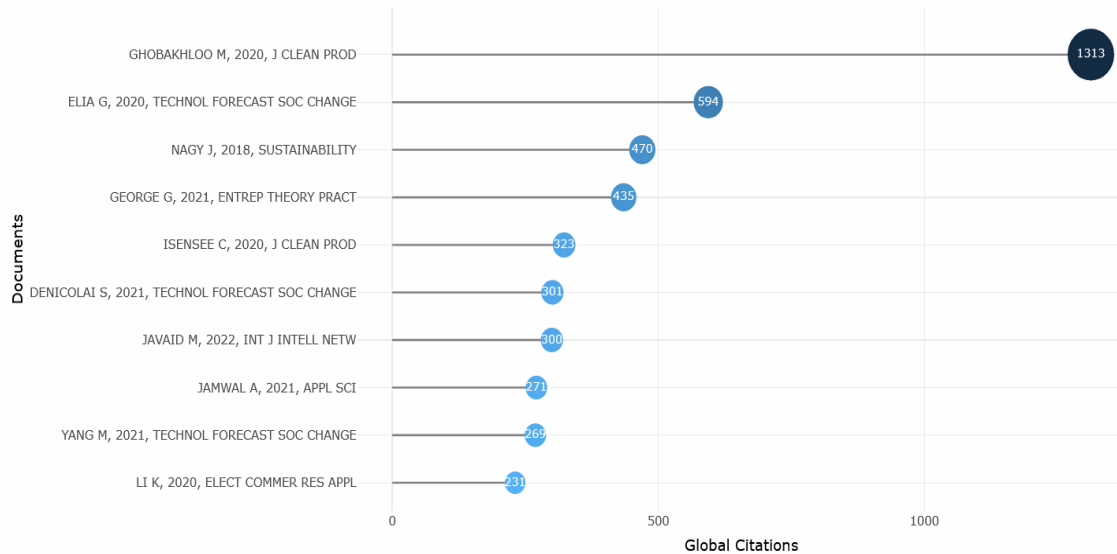

Figure 6.
Three-field plot.
Source: Scopus-indexed journal publications on E-Commerce, Fashion, Sustainable Business, Trends and Impact of Digital Marketing (2010-2025).

4.7. Word Cloud

Word Cloud analysis shows the importance of key terms in research discussions, with "Sustainable Development" and "Sustainability" being the most frequently referenced concepts (Figure 7). This indicates that the academic discourse places significant emphasis on economic, social, and environmental sustainability. The importance of technological advancement in achieving sustainability goals is underscored by other key terms, including "Digital Transformation," "Digital Technology," "Artificial Intelligence," and "Innovation."Moreover, the use of terms such as "Environmental Impact," "Supply Chain," "Business Model," and "Climate Change" indicates that researchers are investigating sustainability from various angles, such as economic, ecological, and technological. This visualization offers valuable insights into the interconnection between sustainable development and digitalization, as well as the dominant themes in sustainability research.

Figure 7.
Word cloud.

4.8. Co-Occurance Network

Network visualization emphasizes the interconnection of various concepts related to digital marketing, consumer engagement, and sustainability in fashion e-commerce, as shown by the co-occurrence analysis (Figure 8). The terms "sustainability" and "sustainable development" are central nodes, indicating their fundamental role in shaping the discourse around sustainable business models. The increasing significance of technology in advancing sustainability initiatives in fashion e-commerce is indicated by terms such as "digital transformation," "digital technology," "environmental sustainability," and "supply chain. "Terms like "carbon footprint," "climate change," and "circular economy" indicate the industry's emphasis on ethical business practices and environmental impact mitigation. Additionally, the use of digital tools to enhance strategies and align with sustainability goals is demonstrated through the use of key marketing terms, including "business model," "competition," and "consumer engagement. "This analysis offers a thorough examination of the changing landscape of digital marketing in sustainable fashion e-commerce, highlighting the need for innovative strategies to promote responsible consumption and engage consumers.

Figure 8.
Co-occurance network.

5. Discussion

5.1. Trends and Impacts of Digital Marketing in Fashion E-Commerce

The discussion on trends and the impact of digital marketing in e-commerce has proven to be very relevant, especially regarding sustainability, which is currently a global focus. The results of the bibliometric analysis show a significant increase in the number of related publications from 2010 to 2024, with the highest peaks in 2023 and 2024 (Figure 2). This surge indicates the increasing scientific and industry attention towards digital marketing strategies to strengthen the global position of fashion businesses. Additionally, this trend is also reinforced by the dominance of keywords such as "digital transformation," "innovation," "digitalization," and "sustainability" in Word Cloud (Figure 6) and the Co-occurrence Network (Figure 8).

Influencer marketing and e-commerce are the most popular digital marketing trends in practice. The role of micro-influencers has proven to be more effective because they provide a more authentic impression compared to traditional advertisements [36]. Platforms like TikTok, Instagram, and Facebook not only serve as promotional spaces but also as direct sales channels through shoppable posts and TikTok Shop. This strategy enhances sustainability value because it allows brands to convey ethical and transparent narratives directly to consumers [37]. These findings are in line with the research by Thanasi-Boçe, et al. [21] which states that social media strategies influence purchase intentions for fashion brands. Additionally, research by Štofejová, et al. [14] states that more significant consumer engagement increases when digital technology is used alongside sustainability education [11]. According to the Sustainable Business Model [23] digital marketing strategies aim not only to increase transactions but also to convey shared value between the brand and consumers [23].

Moreover, technological changes are evident in bibliometric analysis, with keywords such as "artificial intelligence," "blockchain," and "digital transformation" becoming important parts of the current research theme structure. This shows that digital marketing in the fashion industry today is not only about promotion, but also about how technology can create efficiency, transparency, and sustainable value throughout the entire business ecosystem.

5.2. Trends and Impacts of Digital Marketing in Fashion E-Commerce Consumer Engagement as the Foundation of E-Commerce Fashion Sustainability

Consumer engagement is one of the most important nodes that appears in the results of bibliometric analysis, as seen consistently in the co-occurrence map (Figure 8) and its strong influence in the three-field plot (Figure 6). This engagement does not only occur passively, such as making transactions or clicks, but also actively involves participation in brand communities, social interactions, and commitment to sustainability values. Theoretically, Customer Engagement Theory explains that emotional, cognitive, and behavioral involvement of consumers with a brand drives loyalty and advocacy [38]. In the context of sustainability, this is reflected in the way consumers choose brands based on their ethical values, not just product quality [39]. According to research conducted by Wu and Long [27] value-based digital engagement such as green trust has a positive effect on consumer purchasing decisions [27].

Additionally, the Theory of Planned Behavior [40] asserts that attitudes, social norms, and perceived behavior control influence the intention to purchase sustainable products [40]. This shows how brands encourage positive consumer behavior control by facilitating digital transaction processes, such as AI-based recommendations, instant payments, and user-friendly interfaces in fashion e-commerce. From a geographical perspective, Table 2 shows that India, China, and Indonesia are the countries with the highest scientific contributions in this field. This shows that fashion e-commerce is not only dominated by Western countries but also attracts attention in developing countries. More than 26% of the analyzed journals are the result of international collaboration, indicating that issues of sustainability and consumer engagement are cross-national and cross-cultural.

Overall, consumer engagement in sustainable fashion e-commerce is not only important for marketing but also crucial for building a sustainable business model in the long term [27]. Effective

digital marketing not only conveys messages but also builds emotional and social connections that encourage consumers to be more committed to sustainability [38].

6. Conclusions

Overall, consumer engagement in sustainable fashion e-commerce is not only important for the marketing context but also crucial for building a sustainable business model in the long term. Effective digital marketing not only conveys messages but also builds emotional and social connections that encourage consumers to commit more to sustainability. Moreover, it has been proven that consumer engagement is crucial for supporting the sustainability of digital fashion businesses. This engagement is not only viewed from transactional behavior but also encompasses emotional aspects and values supported by digital technologies such as AI, blockchain, and intelligent recommendation systems. The results of the bibliometric analysis show that topics such as "sustainability," "digital transformation," and "innovation" are the main interconnected and continuously evolving topics. In the context of the Sustainable Business Model theory, consumer engagement and digital technology not only enhance business efficiency but also create shared value that supports long-term sustainability missions. Thus, this research not only enhances our understanding of digital trends and practices in the fashion industry but also provides a theoretical and practical foundation for building more responsible and future-oriented digital marketing strategies. Further studies are needed to see how new technologies such as the metaverse, augmented reality (AR), and advanced artificial intelligence (AI) influence consumer engagement and the development of sustainable innovations in the digital fashion industry.

Open Data:

The extracted data can be accessed on https://data.mendeley.com/datasets/wmvd3b9cdp/1

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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