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The Synergy between Green Marketing, Innovation, and Sustainability-Enhancing Green Brand Equity and Corporate Social Responsibility

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ABSTRACT

This study explores the interconnected roles of green marketing, corporate social responsibility (CSR), and green brand equity in promoting sustainable strategies and innovation. Through bibliometric analysis, the research identifies how the integration of sustainability and technological innovation enhances CSR perception and strengthens brand equity by fostering consumer trust and loyalty. The findings reveal that green marketing supported by innovation not only improves corporate reputation but also creates competitive advantages, despite ongoing challenges such as profitability trade-offs and greenwashing concerns. This paper offers practical insights for marketers, corporate leaders, and policymakers to design impactful green strategies, contributing to the limited literature on the synergy between sustainability, innovation, and brand positioning in eco-conscious markets.

1. Introduction

In this context, green marketing is not just a commercial tool but also a vehicle to drive the transformation toward more responsible economies (Peterson et al., 2021). Companies are expected not only to meet market demands but also to play an active role in addressing social issues, strengthening their reputation, and building trustworthy relationships with stakeholders (Cvitanovic et al., 2021). Integrating these practices into sustainable marketing allows for the connection of environmental actions with ethical values, thereby reinforcing the positive impact of organizations on society.

In addition, the concept of green brand equity represents an intangible asset that combines consumers' (Lin et al., 2021a) positive perception of a brand with its ecological commitment. Green brand equity is strengthened when companies (Hameed et al., 2021) adopt sustainable strategies that go beyond conventional business practices, leading consumers to perceive them as genuine advocates for the environment. In this way, green marketing, linked to brand equity, becomes a powerful competitive differentiator in a market where purchasing decisions are increasingly influenced by sustainability criteria (Al-Khawaldah et al., 2022).

Sustainable green marketing, in turn, focuses on integrating long-term sustainability practices into marketing strategies (Khan et al., 2021). This approach seeks a balance between economic profitability, social responsibility, and environmental protection, leveraging the power of marketing to raise awareness and promote more responsible consumption (Mansour et al., 2024). This type of marketing is not limited to eco-friendly products but encompasses the entire product lifecycle and its impact on the ecosystem (Larranaga & Valor, 2022a).

In this context, environmental sustainability and sustainable strategies serve as fundamental pillars for the effective implementation (Ranjbari et al., 2021) of responsible business practices. These strategies go beyond mitigating environmental impact and include designing business models that contribute to social and environmental well-being (Bocken & Short, 2021a), promoting inclusive development that respects the environment.

Finally, innovation plays a crucial role in advancing these practices (Yuan & Cao, 2022). The incorporation of emerging technologies, such as artificial intelligence, Big Data, and green technologies, allows companies to adopt more efficient and sustainable solutions, enhancing both the customer experience and the positive impact on the environment (Benzidia et al., 2021). Innovation not only improves business processes but also facilitates the creation of shared value, integrating sustainability into the core of business activities (Rong et al., 2021).

Collectively, green marketing, corporate social responsibility, green brand equity, sustainable marketing, environmental sustainability, sustainable strategies, and innovation form an interconnected ecosystem that drives a more ethical (Han, 2024), competitive business model aligned with consumer expectations and the needs of the planet.

In a business environment marked by the growing concern for environmental sustainability and technological innovation (Javaid et al., 2022), companies face the challenge of balancing their economic objectives with responsible practices that meet consumer expectations. In this context, green marketing emerges as a key tool to integrate ethical and sustainable values into business strategies, contributing not only to strengthening brand equity but also to improving the perception of corporate social responsibility (Sheykhan et al., 2024).

Moreover, technological innovation has transformed marketing dynamics, enabling the creation of more efficient, personalized, and sustainable strategies (Adama & Okeke, 2024). Technologies such as artificial intelligence, Big Data analytics, and green solutions are playing a crucial role in building brands committed to the environment (Adama & Okeke, 2024). These technologies not only enhance the customer experience but also strengthen companies' credibility in their commitment to sustainability.

Based on these premises, this study explores the relationships between green marketing, technological innovation, and sustainability, and how these dimensions impact consumer perception and brand equity. The following hypotheses are proposed to guide the analysis:

Hypothesis 1: The integration of green innovation strategies and sustainability in marketing has a direct positive effect on consumer perception of corporate social responsibility of companies.

Hypothesis 2: The use of technological innovation in sustainable marketing strategies significantly enhances the customer experience, which strengthens green brand equity.

These hypotheses form the basis for examining how companies can optimize their positive impact on the social and environmental surroundings, while simultaneously maximizing their competitive advantage.

2. Theoretical Framework

2.1 Background on Green Marketing, CSR, and Innovation

Green marketing, sustainability, and innovation have established themselves as three fundamental pillars in twenty-first-century business strategies (Park et al., 2022a). In a context marked by growing environmental concerns and the demands of more conscious consumers, companies are transforming their business models to align them with ethical values and sustainable practices (Sebhatu & Enquist, 2022). Green marketing is presented as a strategic tool to promote products and services that minimize environmental impact, foster sustainable development, and strengthen the relationship between companies and consumers (Kar & Harichandan, 2022).

Simultaneously, concepts such as corporate social responsibility (CSR) and green brand equity have emerged as key intangible assets in building responsible and competitive brands. This theoretical framework explores what is known about these areas and the innovations that are transforming their application in marketing strategies.

What is known

Academic literature has established solid foundations on the impact of green marketing, sustainability, and innovation in modern business strategies. Since the 1990s, green marketing has evolved from being a promotional tool focused on eco-friendly products to becoming a strategic approach that permeates all areas of business (Longo & Magnusson, 2024). Recent studies highlight that consumers increasingly value responsible business practices, which has led organizations to adopt sustainable strategies to differentiate themselves in highly competitive markets (Le, 2022). This approach seeks not only to minimize environmental impact but also to reinforce the ethical values of brands, generating trust and loyalty among consumers.

Corporate social responsibility (CSR) is another fundamental pillar in the field of business sustainability (Meseguer-Sánchez et al., 2021). The literature shows that companies integrating CSR into their strategies not only enhance their reputation but also increase their ability to attract and retain customers (Khuong et al., 2021). Moreover, CSR is perceived as a factor that links environmental initiatives with social interests, creating a positive impact across multiple dimensions, including consumer loyalty and brand value perception (Islam et al., 2021).

For its part, the concept of green brand equity has gained relevance as a key intangible asset in building sustainable brands. Green brand equity reflects consumers' positive perception of a brand based on its commitment to sustainability. Recent research suggests that this type of equity not only drives purchase intention but also fosters long-term loyalty, positioning brands as leaders in environmental responsibility (Tran, 2023).

In terms of sustainable marketing, it is known that this approach integrates economic, social, and environmental objectives into a holistic strategy (D'amato & Korhonen, 2021). Studies such as those highlight that sustainable marketing is not limited to the promotion of eco-friendly products but encompasses the entire product life cycle, including design, production, distribution, and responsible consumption. This perspective allows companies to address environmental challenges from a systemic approach, creating a positive impact both on the environment and in consumer perception.

Research has also shown that environmental sustainability and sustainable strategies are essential to meet regulatory and social expectations in a globally increasingly aware context of environmental issues (Ni et al., 2023). Business models that incorporate these strategies manage to reduce their environmental impact and improve their market positioning. Moreover, sustainable strategies not only benefit the environment but also translate into competitive advantages, such as reduced operational costs and improved efficiency.

Finally, it is recognized that innovation plays a transformative role in the implementation of sustainable marketing strategies. Technologies such as artificial intelligence, Big Data analytics, and green technologies have enabled companies to optimize their operations, enhance the personalization of their campaigns, and reduce their environmental impact. Innovation, in this sense, is not only an enabler of sustainability but also a driver of change that propels business growth and the generation of shared value (Azmat et al., 2023).

Although these areas have been extensively studied individually, there are still opportunities to explore how the intersection between green marketing, innovation, and sustainability can create strategic synergies that enhance both environmental impact and business outcomes (Zhang, 2024). This prior knowledge establishes the foundation upon which this article seeks to build a more integrated and in-depth analysis.

What Is New

Although green marketing, corporate social responsibility, and innovation have been studied as independent areas, current research presents a significant gap by not fully addressing how these dimensions interact and enhance each other (Liu-Thompkins et al., 2022). This intersection presents a unique opportunity to explore strategic synergies that drive both business objectives and sustainability commitments (Williams et al., 2024). The novelty of this approach lies in treating these elements as an integrated ecosystem rather than isolated dimensions, allowing for the analysis of their combined impact on consumer perception, brand equity, and trust in corporate practices (Dwivedi et al., 2022).

A particularly innovative aspect is the integration of emerging technologies, such as artificial intelligence and Big Data analytics, within sustainable marketing strategies (Bag et al., 2021). These technologies not only allow for more precise and personalized segmentation but also facilitate the implementation of more responsible practices, such as resource optimization and waste reduction (Wahab & Nor, 2023). In this regard, the study suggests a framework that connects sustainability with innovation, highlighting how companies can use technology to strengthen their corporate social responsibility and enhance the customer experience.

Likewise, this work incorporates a consumer-centered perspective, analyzing how green marketing strategies and innovation influence brand perception from an ethical and environmental standpoint. In highly competitive markets, where consumers demand transparency and commitment, this research offers a novel insight by positioning green brand equity as a key competitive differentiator, driven by sustainable and innovative practices.

Finally, this approach proposes advancing the literature by considering sustainable and innovative strategies as a tool to generate shared value. This implies not only improving the financial outcomes of companies but also contributing to social and environmental well-being, aligning with the demands of a world constantly transforming toward sustainability. The proposal not only expands theoretical knowledge but also provides a practical basis for companies to integrate these concepts into their business models in a coherent and effective manner.

2.2. Green Marketing

Green marketing is defined as the development and promotion of products and services designed to minimize their environmental impact and maximize social well-being. Initially, it was limited to market niches interested in eco-friendly products, such as organic foods or recyclable goods. However, over time, it has expanded to include sustainable practices in areas such as packaging, logistics, and communication. This shift reflects a transformation in the priorities of consumers and businesses, driven by factors such as climate change, resource scarcity, and stricter environmental regulations (Ibn-Mohammed et al., 2021).

Green marketing consists of several essential elements that make it a comprehensive strategy for companies seeking to integrate sustainability into their operations. Sustainable products form a central axis, focusing on the design and production of goods that use renewable, recycled, or biodegradable materials (N. Verma et al., 2023). These practices consider the environmental impact throughout the product's life cycle, from the extraction of raw materials to its final disposal. Another important component is green communication practices, which focus on conveying transparent and verifiable information about the company's environmental efforts, ensuring that ecological claims are genuine and avoiding greenwashing, which can damage brand credibility (Szabo & Webster, 2021). Additionally, sustainable logistics and distribution play a crucial role, promoting low-carbon emission transport methods and minimalist packaging solutions that reduce environmental impact (Yu, 2023). Finally, green marketing includes consumer education, as it seeks to raise awareness and inform consumers about the environmental benefits of products and services, encouraging responsible purchasing decisions aligned with sustainability values.

2.3. Corporate Social Responsibility

Corporate social responsibility (CSR) is a business commitment that goes beyond obtaining economic profits, including initiatives that benefit the environment and society (Barauskaite & Streimikiene, 2021). CSR is fundamental for the public perception of companies, as it reinforces their credibility and strengthens the relationship with stakeholders (Adewo-

le, 2024). Integrating CSR into marketing strategies allows for the connection of ethical values with concrete actions, creating a positive impact both on consumers and the brand's reputation.

The economic dimension focuses on ensuring that companies operate efficiently and profitably while contributing to the economic development of communities by generating employment, paying fair taxes, and promoting ethical business practices (Kouam & Asongu, 2022). The social dimension encompasses issues such as inclusion, diversity, equal opportunities, and human rights, which involve ensuring decent working conditions, promoting the development of local communities, and supporting social causes through community impact programs (Mies & Gold, 2021). The environmental dimension is focused on minimizing the ecological footprint of companies by adopting practices such as efficient resource use, reducing carbon emissions, responsible waste management, and promoting sustainable products and services (Mahapatra et al., 2021). Finally, the ethical dimension is oriented toward adhering to principles such as transparency, integrity, and responsibility in interactions with customers, employees, suppliers, and other stakeholders, promoting a business culture based on strong ethical values (Esteves, 2024).

In the context of marketing, CSR not only enhances the public perception of companies but also becomes a competitive differentiator (Alam & Islam, 2021). Brands that integrate CSR into their communication strategies can connect with conscious consumers, who are more willing to support companies that share their ethical and environmental values (Nadeem et al., 2023). For instance, campaigns that highlight recycling initiatives, energy saving, or donations to social causes allow companies to align their narrative with the expectations of their audiences.

2.4. Green Brand Equity

The concept of green brand equity refers to the intangible value that consumers attribute to a brand on the basis of its commitment to sustainability and responsible environmental practices (Shanti & Joshi, 2022). This construct combines the consumer's positive perception of a brand's ecological initiatives with its ability to differentiate itself in an increasingly competitive and sustainability-oriented market (Santos et al., 2024). As environmental and ethical concerns have become integrated into purchasing decisions, green brand equity has become a key factor for business success in the twenty-first century.

Green brand equity not only acts as a competitive differentiator but also creates an emotional bond between brands and conscious consumers. This bond generates trust and increases the likelihood that consumers will choose the brand's products even when faced with less expensive options (Mrad et al., 2025). Furthermore, high green brand equity positions companies as leaders in sustainability, attracting key market segments that value ethics and environmental commitment.

Companies with strong green brand equity can also influence consumer purchasing decisions by using narratives that highlight their positive environmental impact. For instance, communicating resource savings, emission reductions, or the use of recycled materials not only enhances brand perception but also educates the consumer (van Langen et al., 2021) on the importance of supporting responsible practices.

The authenticity of sustainable initiatives is critical for building and maintaining green brand equity, as brands that engage in greenwashing practices may lose consumer trust and damage their reputation (Isac et al., 2024). Sustainable innovation plays an essential role by enabling brands to develop products and services that meet sustainability standards, which reinforces the perception of quality and commitment (Le et al., 2022). Transparent communication significantly influences how consumers perceive the brand's commitment to sustainability, highlighting the importance of certifications, sustainability reports, and clear and honest narratives that reinforce consumer trust.

2.5. Sustainable Marketing

Sustainable marketing is a strategic approach that integrates environmental, social, and economic sustainability into business practices, aiming to meet the current needs of consumers without compromising the ability of future generations to meet theirs. This concept extends beyond traditional marketing by incorporating ethical and responsible principles into all phases of the value chain, from product conception to its distribution, communication, and consumption. As global concerns about climate change and sustainability increase, sustainable marketing has become an essential pillar for companies seeking to balance economic growth with environmental and social responsibility (Nath & Siepong, 2022).

Sustainable marketing is based on three interconnected principles. The first is the balance between profitability and sustainability, where companies must ensure that their practices contribute to generating sustainable income while adopting models that minimize environmental impact and maximize their social contribution. The second principle is long-term orientation, which promotes strategies to ensure the sustainability of resources and customer loyalty over time. The third is the principle of shared value, which encourages the creation of value for all stakeholders, including companies, consumers, communities, and the environment, establishing relationships based on trust and mutual respect (Lim & Lee, 2022).

Sustainable marketing encompasses multiple components that interact to generate a positive impact. Among them is the design of sustainable products, which involves creating goods and services with a lower environmental impact by using recycled materials, renewable energies, and efficient processes (Javaid et al., 2021). Another component is responsible packaging, which advocates for the use of biodegradable or recyclable materials to reduce waste generation (Moshood et al., 2022). Awareness campaigns are also key, as

they aim to educate consumers about the benefits of sustainable products and inspire responsible behaviors (Lubowiecki-Vikuk et al., 2021). Finally, the ethical management of the supply chain ensures that all stages of production and distribution meet sustainability standards, from the extraction of raw materials to the final delivery.

Despite its benefits, sustainable marketing faces significant challenges. The initial investments required to implement sustainable practices, such as obtaining certifications or adopting green technologies, can be costly and take time to generate significant returns (Shi et al., 2022). Furthermore, the need to educate consumers about the benefits of sustainable marketing remains an obstacle, as many consumers are unaware of the implications of their purchasing decisions. Another challenge is avoiding greenwashing, which can lead to a loss of consumer trust and negatively impact brands that do not support their claims with verifiable actions.

2.6. Environmental Sustainability and Sustainable Strategies

Environmental sustainability and sustainable strategies are essential pillars in building responsible marketing practices aligned with current global challenges (Dyck & Manchanda, 2021). These approaches focus on reducing the environmental impact of business activities and promoting inclusive development that respects the planet's ecological limits (Hummels & Argyrou, 2021). Within the context of marketing, environmental sustainability and sustainable strategies are integrated to design business models that balance economic objectives with environmental preservation and social well-being.

Environmental sustainability in marketing refers to the incorporation of practices that minimize the negative effects of commercial activities on the natural environment (Udeagha & Ngepah, 2023). This approach includes the adoption of clean technologies, the efficient use of resources, and the promotion of products and services designed to be environmentally friendly (Roh et al., 2022). As environmental awareness among consumers increases, environmental sustainability becomes a key differentiator for brands seeking to position themselves as leaders in corporate responsibility.

Similarly, it also encompasses the commitment of companies to the circular economy, a model that prioritizes the reuse of materials, the reduction of waste, and the extension of the product life cycle (Diaz et al., 2021). In this context, brands that adopt circular practices can generate value both for their consumers and the environment, reinforcing their position in a market that values sustainability.

Sustainable strategies in marketing focus on integrating environmental, social, and economic sustainability into business operations, creating shared value for both companies and society. These include the design of sustainable products that minimize environmental impact by using recycled materials, clean technologies, and designs that promote recycling or reuse (Prieto-Sandoval et al., 2022a). They also encompass

education and awareness campaigns aimed at informing consumers about the benefits of sustainable products and inspiring responsible purchasing decisions while raising awareness about the importance of sustainability in daily consumption. Another key component is the optimization of the supply chain through more efficient and eco-friendly logistical processes, such as reducing emissions in transportation and collaborating with suppliers committed to sustainability. Responsible packaging is a priority in these strategies, through the development of recyclable, compostable, or reusable packaging to reduce the use of plastics and non-biodegradable materials (S. K. Verma et al., 2024). Finally, the use of green technologies such as renewable energies and Big Data allows for the identification of sustainable consumption patterns and the optimization of resources in marketing campaigns.

3. Methodology

The present analysis was conducted using a bibliometric approach with the aim of exploring the relationships between key concepts related to sustainable marketing, technological innovation, and sustainability.

Various techniques can be used to conduct a bibliometric analysis depending on the research objectives. One of the most prominent is co-citation analysis (Kleminski et al., 2022), which identifies thematic connections and key papers in a field. Bibliographic coupling is another method; it assesses the thematic proximity of recent publications based on shared references. In addition, collaboration network analysis provides insight into how authors, institutions, and countries interact within a scientific community. Thematic trend analysis is another valuable tool, as it helps identify the evolution of topics over time and uncover emerging or declining areas. Another important method is impact analysis, which measures the relevance of authors (Mishra et al., 2024), documents, or journals through metrics such as the *h*-index (Gupta et al., 2024) or the Global Citation Score. Keywords or titles can also be analyzed to gain a general overview of predominant topics and methodologies used in the field.

Finally, techniques such as chronological citation mapping can be used to track the historical evolution of a topic, and thematic density analysis (Chen et al., 2024) visualizes areas of high research activity. These techniques can be applied using tools such as VOSviewer for network and co-occurrence analysis, Bibliometrix for trends and thematic maps, and HistCite for chronological maps. Combining these methods results in a deeper and more comprehensive analysis of the study area.

The exclusive use of co-occurrence analysis in this research aims to identify emerging trends and the most current topics in the field of study. The approach focuses on terms and concepts that have gained relevance in recent years, enabling the capture of contemporary dynamics and areas of research on the rise.

Therefore, the procedure was structured in several stages, encompassing the collection, processing, and analysis of bibliographic data using the tool VOSviewer for the creation of the co-occurrence map.

The decision to focus on the period from 2020 to 2025 for this bibliometric analysis is rooted in several key considerations. Firstly, these years mark a significant era in global awareness and action regarding sustainability, driven by international policy developments such as the United Nations' Decade of Action to achieve the Sustainable Development Goals (SDGs). This timeframe encapsulates a period when corporations and academic institutions have increasingly prioritized green marketing, innovation, and sustainability to address both environmental challenges and societal expectations.

Secondly, this period is particularly relevant owing to the rapid evolution of digital technologies and their application in green marketing and sustainability practices. Advances in data analytics, artificial intelligence, and digital communication have enabled firms to enhance their green brand equity and corporate social responsibility (CSR) initiatives more effectively. By selecting these years, the study ensures that it captures the latest trends, technological advancements, and their implications for corporate strategies.

Finally, the chosen timeframe reflects a pivotal phase during which the coronavirus disease 2019 (COVID-19) pandemic prompted a re-evaluation of corporate and consumer priorities, accelerating the integration of sustainable practices into business models. This socioeconomic shift has significantly influenced research output in fields such as green marketing and CSR, making the analysis particularly relevant for understanding contemporary synergies between innovation and sustainability.

Data Collection

The initial phase consisted of the systematic search for scientific articles in the ScienceDirect database. To achieve this, a logical search strategy was defined on the basis of the following terms: ("Green marketing" OR "social responsibility" OR "green brand equity") AND ("sustainable green marketing" OR "environmental sustainability" OR "sustainable strategies" OR "innovation"). This search was designed to capture articles that addressed green marketing, sustainability, and innovation in an interrelated manner.

The time range was established as the period between 2020 and 2025, selecting recent and relevant publications to ensure that the results reflect current trends in scientific literature. This search yielded a total of 1350 articles. The collected data included the documents' metadata, such as the title, author, keywords, and abstract, necessary for bibliometric analysis.

Data Processing

Subsequently, the bibliographic data were processed and exported in a format compatible with the VOSviewer, a specialized software for the visualization and analysis of bibliometric networks. This processing allowed the structuring of the data for the generation of a co-occurrence map, which is based on the frequency with which key terms co-appear in the selected articles.

Table 1 is the table of terms produced by VOSviewer after processing the terms discussed previously.

ID	Keyword	Occurrences	Total link strength
4261	Sustainability	112	171
569	Circular economy	51	81
2035	Green marketing	42	63
4300	Sustainable development	42	80
595	Climate change	36	50
204	Artificial intelligence	33	38
2155	Greenwashing	31	53
4372	Systematic literature review	31	44
1993	Green innovation	29	36
901	COVID-19	28	39
316	Bibliometric analysis	24	38
875	Corporate social responsibility	23	33
4292	Sustainable consumption	23	46
962	Customer experience	22	18
1515	Environmental sustainability	22	18
546	China	20	23
2078	Green products	20	28
4032	Social media	19	23
1491	Environmental performance	18	23
2115	Green supply chain management	16	19
2425	Innovation	16	22
765	Consumer behavior	15	39
2659	Literature review	15	21
4250	Supply chain management	15	28
3584	Purchase intention	14	21
173	Anthropomorphism	13	13
226	Attitude	13	18
1923	Green consumption	13	12
2765	Marketing	13	38
3685	Renewable energy	12	9
1034	Untangle	11	10

1857	Governance	11	9		140	Altruism	6	6
3711	Resilience	11	11		237	Augmented reality	6	10
4376	Systematic review	11	8		288	Behavior	6	8
4550	Trust	11	12		319	Bibliometrics	6	1
1232	Eco-innovation	10	14		814	Consumption	6	13
2113	Green supply chain	10	11		938	CSR	6	11
2712	Machine learning	10	6		1012	Decision-making	6	6
3366	PLS-SEM	10	14		1435	Environmental awareness	6	6
4217	Structural equation modelling	10	16		1482	Environmental management	6	16
4301	Sustainable Development Goals	10	20		1553	Ethics	6	14
530	Chatbot	9	12		1969	Green finance	6	7
705	Competitive advantage	9	14		2405	Information asymmetry	6	6
1476	Environmental knowledge	9	10		2524	Internet of Things	6	8
1661	Financial performance	9	10		3273	Perceived consumer effectiveness	6	10
1789	Game theory	9	6		3297	Performance	6	7
2084	Green purchase intention	9	17		3371	Policy	6	9
4246	Supply chain	9	13		3562	Public health	6	10
4572	Uncertainty	9	7		4324	Sustainable marketing	6	16
369	Blockchain	8	17		4334	Sustainable performance	6	12
968	Customer journey	8	10		4464	Theory of planned behavior	6	10
2065	Green product	8	11		4492	Tourism	6	5
3466	Pro-environmental behavior	8	6		102	There	5	7
3760	Review	8	9		491	Carbon tax	5	2
4351	Sustainable supply chain	8	8		533	Chatbots	5	5
4463	Theory of planned behavior	8	10		633	Co-word analysis	5	7
32	Adaptation	7	11		823	Content analysis	5	7
264	B2B	7	13		879	Corporate sustainability	5	9
282	Barriers	7	5		948	Culture	5	4
322	Big data	7	7		960	Customer engagement	5	7
683	Communication	7	15		965	Customer experience management	5	10
767	Consumer behavior	7	8		971	Customer loyalty	5	6
994	DANP	7	9		1073	Development	5	7
1493	Environmental policy	7	29		1259	Ecology	5	6
1540	ESG	7	8		1277	Economy	5	14
1678	Company performance	7	9		1350	Emotion	5	5
1880	Green advertising	7	8		1363	Empathy	5	3
2083	Green purchasing behavior	7	9		1381	Energy	5	6
2128	Green technology innovation	7	4		1385	Energy efficiency	5	10
2724	Management	7	17		1418	Entrepreneurship	5	8
3678	Remanufacturing	7	9		1423	Environment	5	8
4171	Stakeholders	7	19		1442	Environmental concern	5	9
4483	Topic modelling	7	7		1473	Environmental innovation	5	8
4544	Triple bottom line	7	4		1475	Environmental justice	5	3
					1719	Food waste	5	8

2059	Green practices	5	4
2361	India	5	8
2823	Mental health	5	4
3443	Pricing	5	7
3480	Process innovation	5	6
3599	Qualitative research	5	8
3800	Satisfaction	5	7
3834	SDGs	5	9
3908	Sharing economy	5	5
4076	Social sustainability	5	7
4266	Sustainability marketing	5	4
4279	Sustainable	5	12
4287	Sustainable business model	5	6
4317	Sustainable innovation	5	7
4354	Sustainable tourism	5	8
4369	System dynamics	5	1
4400	Technological innovation	5	3
4429	Text mining	5	6
4558	Twitter	5	7
4689	Virtual reality	5	10
4718	Vulnerability	5	4

Table 1. Term co-occurrence table generated by VOSviewer.

Creation of the co-occurrence map

With the data loaded into VOSviewer, the process of generating the co-occurrence map was undertaken. This involved identifying relevant terms within the bibliographic fields, which were grouped on the basis of their frequency and mutual connections in the literature. The software created a visualization where the nodes represent specific terms, while the links indicate the strength of their relationships. The co-occurrence table generated by VOSviewer was used to validate the results and ensure the accuracy of the map.

Analysis of the map

The resulting co-occurrence map was analyzed on the basis of the observed connections between the key terms. These interrelationships were used to identify patterns, trends, and areas of convergence in the scientific literature, providing a solid foundation for validating the hypotheses proposed in this research.

In summary, the methodology used allowed for the rigorous capture, processing, and analysis of bibliographic data through a logical strategy and specialized tools, ensuring the generation of visual results that support the theoretical framework and the analysis of the relationships between the concepts of interest.

The following section presents the analysis of the generated map, highlighting the most relevant relationships between the studied concepts and their impact on the formulated hypotheses.

4. Analysis and Results

The bibliometric analysis was conducted with the aim of exploring the relationships between key concepts linked to sustainable marketing, technological innovation, and sustainability, in the context of two proposed hypotheses. These hypotheses seek to evaluate how the integration of sustainable and innovative strategies in marketing can impact consumer perception regarding CSR and green brand equity.

The generated map identifies key nodes and their interactions, representing the co-occurrence of relevant terms in the scientific literature. This approach allows not only the mapping of trends and patterns but also the validation of the theoretical connections proposed in the hypotheses. The first hypothesis evaluates whether the incorporation of green innovation and sustainability in marketing has a direct positive impact on the perception of CSR. The second hypothesis, however, analyzes how technological innovation applied to sustainable marketing can enhance the customer experience, strengthening green brand equity.

Through this analysis, the interdependencies between concepts such as green marketing, sustainability, corporate social responsibility, green innovation, and customer experience are visualized. These results not only provide evidence to validate the hypotheses posed but also identify key areas where the literature converges, supporting the theoretical framework and the research approach.
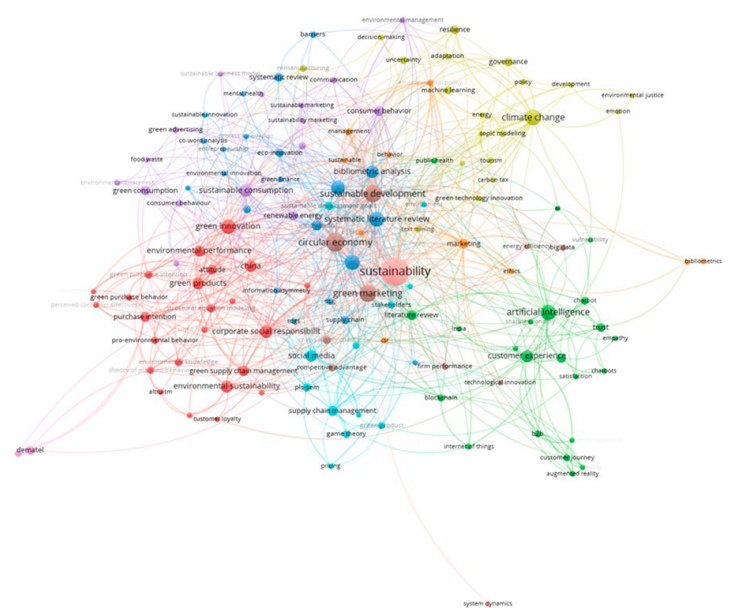
Fig. 1. Map of searched terms.

4.1 Key Relationships Identified

4.1.1. Hypothesis 1

Hypothesis 1, which proposes that the integration of green innovation strategies and sustainability in marketing has a positive effect on consumer perception of corporate social responsibility (CSR), is supported by the interrelationships observed in the provided map. These connections reflect how key concepts such as green marketing, sustainability, and innovation converge with CSR and directly affect consumer perception.

Connection between Green Marketing and Sustainability

The map shows a strong connection between the green marketing, sustainability, and environmental sustainability nodes, indicating that sustainable marketing is intrinsically linked to environmental sustainability practices. This relationship suggests that companies integrating green strategies not only communicate ethical values but also reinforce their positioning as environmentally responsible. Consumers perceive these practices as a genuine commitment that strengthens trust in the brand.

Relationship between Sustainability and Corporate Social Responsibility

The corporate social responsibility (CSR) node is directly connected to terms such as sustainability, green innovation, and consumer behavior, which shows that consumers' perception of CSR is influenced by sustainable strategies. This implies that sustainability initiatives and green marketing impact not only consumers' environmental perception but also their overall view of the company's social responsibility.

Role of Green Innovation

Innovation plays a crucial role in strengthening consumer perception of CSR. The green innovation and technological innovation nodes are linked with green marketing, indicating that innovative technologies enable companies to implement sustainable strategies more effectively. This includes the development of eco-friendly products, resource optimization, and the improvement in the communication of their environmental efforts, which increases brand credibility.

Impact on Consumer Behavior

Nodes such as consumer behavior, purchase intention, and customer loyalty are interconnected with green marketing and sustainability, suggesting that green marketing strategies influence not only purchase intention but also consumer loyalty. This positive behavior is mediated by the perception that companies adopting sustainable practices are responsible and ethical.

Sustainability as a Mediating Factor

Environmental sustainability acts as a bridge between green marketing and CSR, reinforcing the idea that sustainability strategies enhance the perception of corporate social responsibility. This mediating link is key to understanding how sustainable practices not only benefit the environment but also generate reputational value.

The validation of hypothesis 1 is based on the connections identified in the map. The relationship between CSR, green marketing, green innovation, and environmental sustainability supports how these strategies influence consumer perception of CSR. Consumer behavior is directly linked to these practices, reflecting their impact on perceptions and decisions. Green innovation acts as a key mediating element between green marketing and sustainability, while environmental sustainability positions itself as a bridge that strengthens the connection between green marketing and CSR. Finally, consumer loyalty is tied to CSR, indicating that consumers value sustainable and responsible practices, enhancing the overall perception of companies.

In conclusion, companies that integrate green innovation and sustainability strategies into their marketing not only generate a positive environmental impact but also strengthen their perception as responsible actors in society, consolidating their position in a market increasingly oriented toward ethical and environmental values.

4.4.2. Validation of Hypothesis 2

Hypothesis 2 suggests that technological innovation applied to sustainable marketing has a positive impact on customer experience, which, in turn, strengthens green brand equity. The map analysis shows key connections between technological innovation, sustainability, green marketing, and customer experience, demonstrating how these elements interact to support this hypothesis.

Key Relationships Identified

Connection between Technological Innovation and Green Marketing

The green innovation, technological innovation, and green marketing nodes are closely related, reflecting that technological innovation is a crucial enabler for sustainable marketing strategies. Technologies such as artificial intelligence, Big Data analytics, and the Internet of Things (IoT) allow companies to optimize resources, develop sustainable products, and design more effective campaigns. These tools not only enhance the sustainability of business practices but also make them more appealing to conscious consumers.

Relationship between Innovation and Customer Experience

The nodes of artificial intelligence, customer experience, and technological innovation are strongly connected, indicating that innovative technologies significantly personalize and improve the interaction between brands and consumers. These technologies enable more satisfying experiences through message personalization, improvement in service channels, and the delivery of sustainable solutions that align with consumer values.

Impact of Green Marketing on Customer Experience

The map shows how green marketing is linked with customer experience, suggesting that sustainable practices not only influence the ethical perception of the brand but also the quality of the experience offered. Consumers appreciate brands adopting green strategies, which increases their satisfaction and strengthens their emotional connection with the brand.

Relationship between Customer Experience and Green Brand Equity

The customer loyalty, purchase intention, and green marketing nodes are connected, indicating that a positive customer experience strengthens green brand equity. When consumers perceive that a brand combines technological innovation and sustainability, they tend to associate it with positive values, increasing loyalty and purchase intention.

Innovation as a Bridge between Sustainability and Brand Equity

Technological innovation acts as a bridge connecting sustainability and brand equity. Through innovative technologies, companies can not only demonstrate their commitment to sustainability but also enhance their market perception by offering products and services that stand out for both their quality and positive environmental impact.

The relationships observed on the map support hypothesis 2 by showing that technological innovation and sustainable marketing are interrelated, enhancing the customer experience. This positive experience, in turn, contributes to building strong green brand equity. Consumers value technological strategies that promote sustainability, which reinforces their trust in the brand and encourages loyalty.

The use of technological innovation in sustainable marketing not only enhances the customer experience by offering personalized interactions and responsible products but also strengthens green brand equity by aligning consumer perception with ethical and sustainable values. This underscores the importance of integrating technology and sustainability as strategic pillars to build strong and responsible brands.

5. Discussion

The results of this study highlight the strategic interdependence between green marketing, innovation, and corporate social responsibility (CSR), confirming that their integration contributes significantly to the development of sustainable competitive advantages. The bibliometric evidence demonstrates that the synergy between these domains not only strengthens green brand equity but also fosters more authentic and impactful CSR perceptions among consumers.

Technological innovation emerges as a critical enabler in this process. By incorporating advanced tools such as artificial intelligence and data analytics, organizations can implement marketing strategies that are both environmentally responsible and operationally efficient. These technologies facilitate greater transparency, improve the accuracy of sustainability claims, and enable the development of green value propositions that resonate with increasingly conscious consumers.

The consumer experience plays a pivotal role in reinforcing brand equity when sustainability is embedded throughout marketing practices. The coherence between environmental discourse and actual organizational behavior enhances trust, encourages loyalty, and positions the brand as a credible actor in the transition toward sustainable consumption. This alignment becomes particularly relevant in markets where ethical considerations and environmental concerns increasingly influence purchasing decisions.

The conceptual contribution of this research lies in framing green marketing, CSR, and innovation as an interconnected ecosystem rather than isolated constructs. This approach offers a more comprehensive understanding of how firms can articulate sustainability as a core value, not only in their communication strategies but also across product development, stakeholder engagement, and value creation processes.

At the same time, the findings suggest important managerial and ethical tensions. The challenge of balancing profitability with environmental stewardship remains unresolved, particularly for firms operating in sectors with high ecological impact or limited consumer awareness. Furthermore, the instrumentalization of innovation for sustainability purposes requires careful governance to prevent superficial practices or unintended negative consequences.

Overall, the discussion affirms that embedding sustainability and innovation into marketing is not merely a response to external pressures but a foundational element of corporate strategy. This orientation supports the emergence of business models capable of generating long-term value for both organizations and society under conditions of environmental urgency and evolving consumer expectations.

6. Conclusions

The analysis conducted supports the validity of both hypotheses, highlighting the importance of green marketing, technological innovation, and sustainability as fundamental pillars in the configuration of effective business strategies. The first hypothesis emphasizes that the integration of green innovation and sustainable practices in marketing has a direct and positive impact on consumers' perception of corporate social responsibility (CSR), strengthening trust and loyalty toward companies. The second hypothesis confirms that the application of innovative technologies, such as artificial intelligence, in sustainable marketing strategies, significantly enhances the customer experience, which reinforces the equity of the green brand.

These findings not only demonstrate the critical role of sustainability in modern marketing strategies but also highlight how innovation can be a key enabler in meeting consumer expectations and business objectives while simultaneously contributing to environmental well-being.

6.1 Limitations

One of the main limitations of this study lies in the absence of empirical evidence that allows for the direct validation of the hypotheses in real-world contexts. Although the bibliometric analysis provides a solid theoretical foundation, it is not complemented by data obtained through case studies, surveys, or experiments that confirm the findings in practice. Furthermore, the focus on specific terms such as "green marketing," "sustainability," and "innovation" limits the scope of the analysis, overlooking potential contextual variables such as cultural or sectoral differences that could influence the results. It should also be considered that the results may be subject to a high level of generalization, as it does not address how sustainable and innovative strategies may be perceived differently by specific consumer segments. Finally, the absence of a longitudinal analysis prevents the observation of the evolution and impact of these strategies over time, restricting the conclusions to a static time frame.

6.2 Future research lines

It is essential to conduct empirical research to evaluate the effectiveness of sustainable and innovative marketing strategies in consumer perception. This could include designing surveys to measure the relationship between sustainability and corporate social responsibility, or experiments that assess the impact on purchase intention and brand loyalty. Additionally, it would be valuable to broaden the scope of bibliometric analysis by incorporating related terms such as "sustainable digital communication" or "environmental regulations" to identify broader connections. It is also relevant to investigate how these strategies vary across different economic sectors, such as fashion, technology, or food, which would allow for a better understanding of their particularities and adaptations. In addition, segmenting consumers on the basis of variables such as age, gender, educational level, or cultural values would facilitate a more detailed analysis of perceptions and behaviors associated with green marketing. It is also recommended to develop longitudinal studies that allow for the observation of the evolution and sustainability of these strategies over time, offering a dynamic perspective. Finally, exploring emerging technologies such as blockchain or the Internet of Things (IoT) could open new possibilities for integrating green marketing into innovative tools that would enhance its impact and effectiveness.

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