

HOW ARTIFICIAL INTELLIGENCE IS TRANSFORMING SUSTAINABLE MARKETING PRACTICES: EVIDENCE FROM CORPORATE CASE STUDIES

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Abstract : Artificial intelligence (AI) has quickly become a revolution in the business world, transforming marketing policies and empowering firms to achieve sustainability-related goals. This paper explores the role of AI in sustainable marketing by enhancing resource efficiency, which facilitates green innovation, promotes ethical transparency, and improves consumer targeting. By analysing the literature and practical case studies, such as the study, it identifies the ways AI supports responsible production and consumption at Unilever, IKEA, and Amazon, which aligns with the United Nations Sustainable Development Goals, and enhances corporate social responsibility programs. The results indicate that AI not only optimises marketing activities but also speeds up the process of organisations moving towards circular and sustainable business models. Nevertheless, there are issues of ethics, governance, and transparency of data that are important. On the whole, the study highlights the increasing AI relevance in developing a competitive, environmental and socially responsible marketing landscape.

Keywords: Artificial Intelligence, Sustainable Marketing, Sustainability, CSR.

INTRODUCTION

Over the last few years, global crises (primarily the COVID-19 pandemic) have highlighted the fragility of social, economic, and environmental frameworks. This has accelerated public concern about sustainability and reshaped expectations of corporate responsibility. Businesses are no longer judged by their financial performance but also by their dedication to environmental and social welfare. This kind of paradigm shift has spawned the field of sustainable marketing that tries to balance profitability with the ecological and social demands (Kotler et al., 2021). At the same time, consumers are showing stronger preferences for eco-conscious brands, which strengthens the global shift towards responsible production and consumption behavior (Naderi and Van Steenburg, 2018).

One of the foundational steps in sustainable marketing is the ability to collect and analyse quality information. The key tool in this effort is artificial intelligence (AI) that allows organisations to analyze large amounts of data, identify new market trends, predict consumer behavior, and locate sustainability-related threats and opportunities. In addition to its analytical abilities, AI also helps to increase the efficiency of operations by reducing the amount of resources wasted, streamlining operations, and improving the overall sustainability performance of a company (George et al., 2022).

The interplay between AI and sustainable marketing is becoming more and more recognised as a powerful approach to the economic development that is long-term and innovation-driven. Such a synergistic strategy enables companies to redesign their strategies in a manner that enhances competitiveness and, at the same time, promotes sustainable development goals (Liu et al., 2023). However, the popularisation of AI also brings up some important issues with ethical use, transparency, and ensuring that AI genuinely advances—rather than hinders—sustainability goals (Dwivedi et al., 2021).

The paper has a lot of scholarly importance since it explains how companies can react to the increasing environmental and social pressure by incorporating sustainability in all their activities. It highlights the key role of AI in enabling sustainable product development, optimizing marketing operations, and promoting corporate responsibility efforts in general (Kotler et al., 2021; George et al., 2022). The study is expected to explore the potential of AI to support sustainability concepts based on the notion of sustainable marketing and identify the practical use of AI that could help companies stay competitive without violating environmental and social norms. paper aims to examine how far AI can reinforce sustainability principles in the context of sustainable marketing. It explores practical AI applications that support companies to remain competitive and meet environmental and social standards. In addition, it analyses international case studies to derive insights that can be used to develop scalable and effective sustainable marketing strategies at the global level (Dwivedi et al., 2021; Liu et al., 2023).

Theoretical framework

Artificial intelligence (AI)

Artificial intelligence, or AI, refers to the human-created, artificially intelligent construct that mimics cognitive abilities, as described by the ability to learn, reason, and solve problems. From this perspective, AI is a category of systems designed to replicate aspects of human cognition through computational mechanisms and advanced equipment (Merriam-Webster, 2023).

The history of AI dates back to the 1950s, when scholars began exploring symbolic reasoning and developing primitive expert systems. Later acceleration began in the 1980s, driven by the expansion of expert systems into commercial fields. It was further

accelerated at the beginning of the 21st century by advances in deep learning, the exploitation of big data, cloud computing capacity, and the emergence of the Internet of Things (IoT). Such accrued milestones have made AI one of the most powerful technological revolutions of our modern digital environment (*Bohan, 2024*).

Nowadays, AI has found its way into a continuum of academic fields, including computer science, cognitive science, mathematics, engineering, and psychology. Its practical uses include everyday technologies, such as speech and image recognition, robotics, autonomous vehicles, medical diagnostics, financial analytics, and energy management systems. In many areas, solutions based on AI already outperform those of humans. As the entire AI market is expected to reach approximately USD 190 billion by 2025, the pace of adoption is set to accelerate at a scale never seen before (*Yuchen et al., 2022*).

Sustainable Marketing

Marketing has increasingly shifted toward sustainability, with organizations recognizing the importance of aligning corporate strategies with environmental and social objectives. Sustainable marketing has evolved from first-generation green marketing into a comprehensive model that integrates sustainability into product development, pricing, distribution, and promotion (*Mahima et al., 2024*). Its primary aim is to ensure that marketing efforts are environmentally friendly, socially responsible, and economically sustainable, encouraging responsible production and consumption (*Jessie et al., 2023*).

The approach is based on the Triple Bottom Line, which encompasses profit, people, and planet, and highlights long-term financial gains, social well-being, and reduced environmental impact (*Hamisi, 2024*). These principles are put into action within the sustainable marketing mix by utilizing eco-friendly resources, considering environmental costs in pricing, optimizing low-carbon logistics, and fostering transparent communication (*Nurjaman, 2024*). Ultimately, sustainable marketing enables companies to create lasting value, enhance their reputation, and promote environmental stewardship and community well-being through practices such as utilizing renewable energy, minimizing waste, and sourcing products through fair-trade methods (*Hamisi, 2024*).

The role of artificial intelligence (AI) in promoting sustainable marketing practices

In 2024, the global artificial intelligence (AI) market is projected to be worth USD 638.23 billion. This figure is expected to grow to USD 3,680.47 billion by 2034, driven by the faster adoption of AI technology across various industries and the increasing reliance on automation and data-driven decision-making (*Precedence Research, 2024*). This growth has strengthened the application of AI in enabling sustainable marketing, where companies continue to incorporate sustainability and social objectives into their strategic practices. Between 2017 and 2021, ten out of the twenty largest global corporations adopted AI, and sixteen utilized it directly in the context of sustainability (*Bora, 2024*). Artificial intelligence is currently widely used in supply chains, production, and marketing as a tool to reduce waste, enhance resource efficiency, and respond to sustainability pressures. To improve environmental performance, governance, and safety in the workplace, companies such as Coca-Cola, Nestle, and Equinor integrate AI-driven insights (*Bora, 2024*).

The growth of big data, machine learning, and deep learning has enhanced marketing analytics, enabling firms to analyze unstructured data and gain a deeper understanding of consumer behavior. Natural language processing and chatbots are also oriented towards sustainable marketing because they assist companies in preventing overproduction by improving demand prediction accuracy (*Arantes and Costa, 2024*). AI is used to increase sustainability in supply chains by better sourcing decision-making, reducing redundant inventory, and reducing emissions through the use of optimised logistics and routes. Such donations align with Sustainable Development Goals 9 and 12, and AI-related transparency fosters trust among stakeholders (*Arantes and Costa, 2024*). Several international organizations utilize AI in their efforts to drive sustainable innovation. Adidas employs machine learning to screen environmentally friendly materials, Tesla utilizes AI to enhance battery recycling, Unilever leverages AI research to develop biodegradable packaging, and IKEA employs AI simulations to design sustainable furniture (*Bora, 2024*). Nike and Dior brands utilize AI to minimize material waste and target personalized marketing. At the same time, Amazon's recommendation systems, which account for nearly one-third of online purchases, can aid in sustainability by reducing product returns. Shell can implement AI in the energy industry alongside blockchain technology to monitor renewable energy and develop low-carbon fuels, which support its net-zero pledges (*Bora, 2024*).

Generally, AI enhances sustainable marketing by optimizing resources, minimizing environmental impact, and promoting responsible manufacturing and consumption. Although ethical issues persist, AI governance can help equip companies with improved sustainability performance and a competitive advantage.

Table No. 1: Theoretical Review

Theory	Key Concept	Main Findings / Core Ideas	Relevance to Sustainable Marketing	Implications for Organizations
Empirical Review	Evidence-based findings on sustainability practices across organizations.	Research shows that AI adoption, green supply chains, CSR initiatives, and eco-design significantly enhance sustainability performance.	Demonstrates how firms can use data-driven insights and technology to strengthen sustainable marketing.	Helps companies benchmark best practices and adopt proven sustainability strategies that improve efficiency and reduce environmental impact.
Corporate Social Responsibility (CSR) Theory (Carroll, 1991; Carroll & Laasch, 2020)	Central idea: Firms have economic, legal, ethical, and philanthropic responsibilities to society.	Empirical studies demonstrate that corporations that exceed the minimum legal standards are more trusted and perceived as legitimate by the population.	This idea helps organizations to incorporate the use of ethical communication, socially responsible branding, and transparency in their operations.	Through responsible behavior, the theory enhances corporate reputation, fosters trust among stakeholders, and yields a long-term competitive advantage.

Green Marketing Theory	The marketing should look ahead and promote ecologically friendly products, processes, and communication.	Firms that integrate green practices into their business models experience real improvements in waste reduction, increased resource conservation, and a notable shift in consumer preferences towards environmentally friendly products.	Evidence highlights the need for sustainable product design, strict adherence to the eco-labeling concept, and mitigating adverse environmental impacts through deliberate, evidence-based communication.	With the development of such a strategy, companies improve their credibility, reduce the danger of greenwashing, and actually appeal to the market segments with environmental consciousness.
Stakeholder Theory (Freeman, 1984)	Businesses must consider the interests of all stakeholders — customers, employees, communities, governments, and the environment.	Sustainable decision-making improves stakeholder relationships and reduces long-term risks.	Encourages ethical engagement, transparency, and inclusive sustainability strategies.	Leads to improved stakeholder satisfaction, reduced conflict, and better long-term sustainability planning.
Triple Bottom Line (TBL) Theory (Elkington, 1994; 2021)	Business performance must balance profit, people, and planet.	Long-term success depends on integrating economic, social, and environmental outcomes.	Guides firms to design marketing strategies that reduce environmental impact while enhancing social value.	Encourages eco-efficient production, ethical practices, and stronger brand loyalty among sustainability-conscious consumers.

RESEARCH METHODOLOGY

The research technique used in this study includes qualitative, descriptive-analytical, and secondary data. Academic journal papers, corporate sustainability reports, market research publications, and actual case studies of businesses incorporating AI into sustainable marketing were the sources of secondary data. The conceptual foundations of artificial intelligence and sustainable marketing are presented in the descriptive component, which clarifies important ideas and frameworks that underpin the study's objectives. The analytical component incorporates theme analysis to examine case studies, including Unilever, IKEA, and Amazon, to find trends, assess effective AI-driven sustainability strategies, and extract information pertinent to applications in the future. This combination approach links theory, empirical data, and real-world organizational experiences to provide an extensive understanding of AI's implications for sustainable marketing.

Research Objective

1. To examine and evaluate real-world case studies on the adoption of Artificial intelligence in sustainable marketing practices by various companies.
2. To investigate the implications of Artificial Intelligence on Sustainable marketing practices.

ANALYSIS AND DISCUSSION OF CASE STUDIES

Case Studies

1. Unilever and Its Sustainability Vision

Unilever is one of the leading companies that has been operating in the global Fast-Moving Consumer Goods sector and boasts of presence in more than 190 countries and has a portfolio of well-established brands like Dove, Lifebuoy, Surf Excel, Sunsilk, Tresemmé, and Rexona. The corporation has, over the years, publicly pledged to sustainability as part of its corporate strategy, the Unilever Compass, which predicts climate action, reduction in waste and social responsibility. Over the past few years, Unilever has started to incorporate Artificial Intelligence (AI) and other digital technologies in its business practices, thus making it one of the first FMCG companies to introduce AI into its marketing creation process, product visualisation, supply-chain management, customer targeting, and sustainability reporting.

Some of the main AI-driven applications include:

- **Digital twins & 3D product visualization:** Instead of doing repeated physical photoshoots and producing multiple physical prototypes for different packaging, labels, languages, variants, Unilever now uses digital-twin technology to build fully realistic 3-D representations of products that can stand in for real-world photography in marketing.¹
- **AI-powered creative workflows for marketing content:** Generative and automated content tools allow Unilever's marketing teams to produce images, adverts, and other assets more quickly, at lower cost, and with consistent brand quality.²
- **AI-based demand forecasting and supply-chain optimisation:** Unilever has built an AI-driven "customer connectivity" model — capable of more than 13 billion computations per day — used for collaborative planning,

¹ <https://www.unilever.com/news/press-and-media/press-releases/2025/unilever-reinvents-product-shoots-with-digital-twins-and-ai/>

² <https://www.unilever.com/news/news-search/2025/how-ai-is-helping-drive-desire-at-scale-across-unilever/>

forecasting, and replenishment. This links real-time sales data, inventory, and supply — helping ensure the right products are available when and where needed, while reducing waste, stock-outs, and excess transport.³

- **AI in manufacturing and operations (including factories):** At some of its sites (e.g., the Tinsukia Factory in India) Unilever uses AI and “Fourth Industrial Revolution” technologies (digital twins, IoT, analytics) to speed up production changeovers, manage labour, reduce waste, optimize packaging trials (including sustainable packaging), and make production more flexible and resource-efficient.⁴
- **AI for sustainable packaging innovation:** With digital twin simulation, Unilever can trial sustainable or recycled-content packaging digitally — minimizing the physical waste and carbon cost of experimentation, while accelerating adoption of greener packaging.⁵

In short, AI at Unilever is not just about “doing the same thing but faster.” It enables rethinking processes, cutting out waste, speeding up time-to-market, and aligning business operations with sustainability goals.

2. IKEA – AI-Driven Transformation for Sustainable, Customer-Centric and Circular Retailing

IKEA, globally known for affordable furniture and home-decoration goods, has long balanced its business model between large-scale manufacturing, global supply-chains, and a strong retail presence. As online shopping, home delivery, and consumer expectations evolved, IKEA recognized that traditional logistics, supply-chain management, inventory control and customer support were becoming increasingly complex.

At the same time, growing awareness of sustainability, resource constraints, and climate impact pushed large retail and manufacturing firms — including IKEA — to rethink how operations are run. For IKEA, this meant not only delivering on time and at low cost, but doing so more efficiently, with less waste, and with an eye toward environmental and social responsibility.

To meet these challenges, IKEA (through its parent retail-operator Ingka Group) began integrating AI and digital technologies across multiple aspects of its operations — from supply chain forecasting to delivery logistics to warehouse management and customer service.⁶

Key areas of IKEA’s adoption of AI span multiple domains:

- **AI in Smart Product Design & Development**

IKEA analyzes customer comments, product evaluations, in-store movement data, and lifestyle trends using AI algorithms and machine learning models. Designers may produce highly relevant, long-lasting, and sustainable goods by using this data to better understand how people really live in their homes (*Liu et al., 2022*). AI helps IKEA design products smarter, with less waste and higher usability (*García & Cardoso, 2023*).

- **AI-Powered Augmented Reality (AR) for Sustainable Consumption**

IKEA introduced the IKEA Place App, powered by AI and Augmented Reality, which allows customers to “place” virtual furniture in their homes using smartphones. This reduces Wrong purchases, unnecessary returns transport-related emissions. Studies show that product return rates can drop by up to 35% when customers use AR tools before purchasing (*Rauschnabel et al., 2022*).

- **AI-Driven Supply Chain & Demand Forecasting**

To increase forecasting accuracy, IKEA employs “demand sensing” methods based on artificial intelligence. To more accurately forecast product demand, these systems combine historical data with current factors including local events, weather, seasonal trends, and consumer behavior (*Baryannis et al., 2019*). Through this AI system, IKEA’s forecast acceptance rate reportedly increased from 92% to around 98%, meaning far fewer manual interventions were needed in planning. This led to better product availability, reduced over-stocking and storage needs and lower unsold inventory and waste. By matching production closely with real demand, IKEA significantly reduced unnecessary manufacturing and transportation, contributing to lower carbon emissions per unit sold (*IKEA Sustainability Report, 2022*)⁷.

- **AI in Smart Product Design and Sustainable Material Selection**

AI is also essential to IKEA’s material selection and product design. AI assists IKEA engineers in creating goods that use fewer resources and last longer by analyzing user input, lifestyle patterns, and durability simulations (*Liu et al., 2022*). As a result of such data-driven decisions, **over 60% of IKEA products now contain renewable or recycled materials**, including bamboo, recycled wood and reclaimed plastics (*IKEA Sustainability Report, 2022*). This demonstrates that AI is directly linked with sustainable production and circular economy goals (*Nishant et al., 2020*).

3. Amazon – AI-Enabled Transformation for Sustainable, Data-Driven and Green Marketing Practices

Amazon, the world’s largest e-commerce and cloud computing company, operates an extremely complex digital ecosystem that includes online retail, logistics, cloud services (AWS), advertising, and smart home technologies. Amazon has integrated **Artificial Intelligence (AI) and Machine Learning (ML)** into its marketing and environmental strategies. AI is not only helping Amazon increase sales, but also **optimize resources, reduce waste, enhance green marketing communication, and promote sustainable purchasing decisions** across its massive platform (*Bose & Roy, 2022*).

Today, Amazon’s sustainable marketing is driven by data analytics, predictive modelling, intelligent automation, and personalized green messaging — all supported by advanced AI systems.

Key areas of Amazon’s adoption of AI in sustainable marketing practices span across multiple domains:

³ <https://www.unilever.com/news/news-search/2024/utilising-ai-to-redefine-the-future-of-customer-connectivity/>

⁴ <https://www.unilever.com/news/news-search/2025/five-ways-unilevers-new-lighthouse-site-applies-ai-for-impact/>

⁵ <https://www.unilever.com/news/news-search/2025/five-ways-unilevers-new-lighthouse-site-applies-ai-for-impact/>

⁶ <https://www.ingka.com/newsroom/ingka-group-acquires-locus-an-ai-powered-logistics-software-company-to-transform-the-ikea-home-delivery-experience/>

⁷ <https://www.ikea.com/global/en/our-business/reports/sustainability-report-fy22-230215/>

- **AI-Driven Personalization for Sustainable Product Promotion**

Amazon tracks and analyzes consumer browsing, search, and purchase histories, as well as time spent on product pages and wish lists, using artificial intelligence (AI) algorithms. AI-driven recommendation engines use this data to provide product recommendations that align with customer beliefs and demands, such as sustainable, low-carbon, and eco-friendly options (*Duan et al., 2021*). For instance, Amazon's "Climate Pledge Friendly" initiative increasingly suggests reusable, biodegradable, or recycled products to consumers looking for plastic home items.

According to Amazon's official sustainability website, more than **500,000 products** are now labeled under the "Climate Pledge Friendly" badge, which is promoted using AI-driven search ranking and recommendation systems to encourage sustainable purchasing decisions

(Source: <https://sustainability.aboutamazon.com>)

This approach not only influences consumer behaviour in a greener direction, but also strengthens Amazon's brand image as an environmentally responsible company (*García & Cardoso, 2023*).

- **AI in Green Advertising and Sustainable Digital Marketing Campaigns**

Amazon Advertising relies on AI to deliver targeted advertisements based on customer interest, geographic location, and behavioural intent. In recent years, AI has also been applied to optimize the carbon footprint of digital advertising campaigns (*Bose & Roy, 2022*).

Research shows that AI-optimised digital campaigns can reduce data processing by **20–30%**, resulting in lower energy use in data centres (*Duan et al., 2021*). This connects AI advertising with sustainable marketing goals. Amazon also promotes its renewable energy initiatives, electric delivery fleet (Rivian vans), and recyclable packaging using AI-targeted green brand campaigns (Source: <https://www.aboutamazon.com/news/sustainability>)

3. AI-Based Demand Forecasting to Reduce Overproduction and Waste

One of the biggest environmental issues in retail is **overproduction and excess inventory**. Amazon applies machine learning models to forecast future demand based on: Historical sales patterns, Regional consumer trends & so on.

These models help Amazon predict product demand with higher accuracy, thereby significantly reducing unsold inventory, unnecessary manufacturing, and warehouse overstock (*Baryannis et al., 2019*). According to a study published in the *International Journal of Production Economics*, AI-driven demand forecasting can reduce retail product waste by **up to 30–40%**, especially in fast-moving consumer categories (*Baryannis et al., 2019*). This contributes directly to Amazon's sustainable marketing by enabling it to sell "only what is needed", aligning with circular economy principles.

(Source: <https://www.sciencedirect.com/science/article/pii/S0925527318303461>)

4. AI in Sustainable Packaging and Smart Logistics Marketing

Amazon's AI systems optimize packaging by automatically selecting the **smallest possible box or envelope** for each product. This is known as "Frustration-Free Packaging" and "Ships in Own Container (SIOC)". AI calculates the ideal packaging size based on product dimension, fragility, and delivery conditions (*Nishant et al., 2020*).

As a result:

- Packaging weight was reduced by **over 1.5 million tons** since 2015
- Over **3 billion shipping boxes** eliminated
- CO₂ emissions reduced significantly

(Source: <https://sustainability.aboutamazon.com/waste>)

These AI-led improvements are heavily highlighted in Amazon's sustainability marketing campaigns to improve brand trust, customer loyalty, and green brand perception.

Implications

1. Improving Resource Efficiency and Reducing Waste

AI enables accurate demand forecasting, supply-chain optimization, and resource-efficient production, helping firms reduce waste and carbon emissions (*George et al., 2022; Arantes & Costa, 2024*).

2. Supporting Eco-Friendly Product and Process Innovation

Machine learning and simulation tools help companies test sustainable materials, design circular products, and adopt energy-efficient manufacturing processes (*Bora, 2024; Liu et al., 2023*). Examples include Tesla's AI-supported battery recycling and Adidas's AI-guided recyclable materials.

3. Enhancing Consumer Insights for Sustainable Market Targeting

AI analyzes consumer data and sustainability preferences, enabling marketers to target eco-conscious segments more effectively and promote responsible consumption patterns (*Kotler et al., 2021; Naderi & Van Steenburg, 2018*).

4. Increasing Transparency and Ethical Accountability

AI and blockchain improve traceability, environmental reporting, and ethical sourcing in supply chains, strengthening trust among stakeholders (*Dwivedi et al., 2021; Carroll & Laasch, 2020*).

5. Enabling Sustainable Promotion and Communication

AI-driven personalisation reduces unnecessary advertising and digital waste while improving message accuracy through chatbots and automated content generation (*Mahima et al., 2024; Nurjaman, 2024*).

6. Supporting the United Nations Sustainable Development Goals (SDGs)

AI enhances responsible production (SDG 12) and promotes innovation and sustainable industrial practices (SDG 9), enabling companies to align marketing with global sustainability frameworks (*Hamisi, 2024; UNDP, 2023*).

Conclusion

The study concludes that artificial intelligence is a critical driver of sustainable marketing, which provides powerful tools that support responsible consumption, ethical business practices, and sustainable operations. AI can help companies reduce wastage, streamline their supply chains, innovate on sustainable products, and enhance stakeholder participation. The experience of multinational enterprises confirms that artificial intelligence will help enhance the transition to a circular and low-carbon business

paradigm. That said, to utilize artificial intelligence to its fullest potential, organizations must pursue ethical guidelines, ensure transparency, and invest in sustainable technological infrastructure. As a responsible tool, artificial intelligence can not only improve marketing performance but also provide significant results for both long-term environmental and social sustainability, thus making firms more competitive and socially responsible in the future.

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