

Adoption of Artificial Intelligence in Developing Sustainable Marketing Practices: International Experiences

Isra Fellah ^{*1}, Fares Tellouche ²

¹ Accounting, Finance, Taxation and Insurance Laboratory, Larbi Ben M'hidi University -Oum El Bouaghi-, Algeria, isra.fellah@univ-oeb.dz

² Accounting, Finance, Taxation and Insurance Laboratory, Larbi Ben M'hidi University -Oum El Bouaghi-, Algeria, mehditellouche@yahoo.fr

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Abstract:

This study aims to explore the role of artificial intelligence in enhancing sustainable marketing practices through the examination of successful case studies from companies such as H&M, Unilever, and Microsoft, which have utilized AI to implement sustainable marketing practices that contribute to positive environmental and social outcomes. The study reviews how these companies employ advanced technologies to achieve sustainable results. It concludes that companies that have integrated AI into their marketing operations have successfully balanced economic growth with sustainability concerns. The study recommends that companies incorporate AI into their sustainable marketing practices to enhance their ability to achieve sustainability goals and generate positive social and environmental impacts. Furthermore, Companies should adopt inclusive practices to ensure transparency in sustainability efforts.

Key Words : Artificial Intelligence, Sustainable Marketing, H&M, Unilever, Microsoft.

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^{*}Isra Fellah, isra.fellah@univ-oeb.dz.

1. Introduction

In recent years, global challenges have led to a significant rise in environmental and social awareness. The COVID-19 pandemic served as a critical catalyst, highlighting the importance of sustainability and accelerating the shift toward more sustainable practices. Consequently, it has become imperative for companies to adopt a holistic approach that goes beyond achieving financial profitability to include taking responsibility for environmental preservation and enhancing societal well-being. This shift reflects the growing importance of embracing sustainable marketing practices to achieve a delicate balance between economic, social, and ecological objectives. Furthermore, this trend aligns with the increasing consumer demand for eco-friendly products, contributing to the promotion of long-term sustainability and supporting global efforts to mitigate environmental degradation.

Certainly, the first step towards adopting sustainable marketing practices that focus on balancing economic objectives with environmental and social responsibilities is gathering accurate and targeted data. Such data serves as a critical foundation for understanding market demands, consumer behavior, and prevailing environmental and social trends. In this context, artificial intelligence underscores its transformative role by offering advanced solutions that enable companies to collect this data adopt strategies that align with sustainability goals, and adapt to market changes. Furthermore, AI helps improve operational efficiency and reduce resource waste, directly contributing to achieving sustainability objectives and enhancing competitiveness in an increasingly complex marketplace.

The integration of sustainable marketing with artificial intelligence (AI) marks a significant paradigm shift in contemporary business practices. It represents one of the most innovative strategies for achieving sustainable economic growth, distinguished by its capacity to harmonize environmental sustainability objectives and social responsibility with cutting-edge technological advancements. This convergence enables the redesign of corporate strategies to balance better economic profitability with the imperatives of sustainable development.

However, while the potential of this integration is substantial, it also raises critical questions regarding the most effective approaches to utilizing AI technologies to support and enhance sustainable marketing practices. Addressing these challenges is essential for enabling organizations to achieve their environmental, economic, and social objectives in a cohesive and integrated manner.

This paper seeks to explore the following research question:

To what extent does artificial intelligence enhance sustainable marketing practices, and what lessons can be drawn from international experiences To achieve sustainability objectives effectively in this field?

This study is of considerable academic significance given the escalating environmental and social challenges confronting the world, which necessitate the adoption of sustainable practices by companies across their operations. The research underscores the pivotal role of artificial intelligence in advancing sustainable marketing practices by fostering innovation in product design and refining marketing processes to align with the objectives of sustainable development. In doing so, it highlights the potential for businesses to make substantial contributions to global efforts aimed at mitigating environmental degradation and enhancing social responsibility.

This paper aims to explore the integration of artificial intelligence (AI) and sustainability principles through the lens of sustainable marketing. The focus is on analyzing how AI technologies can be employed to enhance sustainable marketing practices, thereby enabling businesses to sustain their competitive advantage in a dynamic and evolving marketplace, while ensuring compliance with environmental protection principles and advancing social responsibility. Additionally, the paper aims to examine successful international case studies in this domain, drawing lessons that can inform the development of more effective and scalable sustainable marketing strategies globally.

2. Literature review

The study by **Daniela Candeloro (2020) "Towards Sustainable Fashion: The Role of Artificial Intelligence — H&M, Stella McCartney, Farfetch, Moosejaw: A Multiple Case Study"** examined the application of artificial intelligence (AI) to achieve sustainable solutions in the production and consumption of fashion. It highlighted four case studies of prominent brands in the fashion industry: H&M, Stella McCartney, Farfetch, and Moosejaw, showcasing the sustainable benefits achieved through their strategies. The study concluded that, although the use of AI in sustainable fashion is still a relatively new domain, it has shown promising results in advancing sustainability. However, it also identified challenges that limit the widespread adoption of these technologies. To address these issues, the study recommended promoting AI technologies in the sector to modernize traditional business models that negatively impact the environment. It emphasized the importance of responsibly employing these technologies to ensure companies adhere to their social responsibilities, aligning all aspects of their activities towards achieving comprehensive and integrated sustainability.

The study conducted by **Jessie Do, Outi Uusitalo, Mika Skippari, and Mitra Salimi (2023) "Artificial intelligence-assisted sustainable marketing: Contribution and agenda for research"** carried out a systematic literature review to provide a comprehensive and organized understanding of research related to sustainable marketing supported by artificial intelligence. The study classified this research into sustainability levels and categories of sustainable marketing while evaluating the advantages and risks of AI-supported sustainable marketing in its contribution to sustainable development according to the United Nations Sustainable Development Goals, within the social, environmental, and economic groups. The study found that AI applications have primarily focused on issues within the low to moderate sustainability levels. It also suggested a shift towards integrative research to assess the systemic compatibility of AI within organizational structures and its impact on sustainability as AI systems evolve. Finally, the study identified underdeveloped areas promising for future research.

The study authored by **Rajat Kumar Behera, Anis ur Rehman, Muhammad Saiful Islam, Faraz Ahmad Abbasi, and Asma Imtiaz (2024) "Intelligent machines as information and communication technology and their influence on sustainable marketing practices for beneficial impact on business performance: A conceptual framework"** aimed to explore how smart machines influence sustainable marketing practices to achieve positive effects on business performance for retailers. The study proposed a conceptual framework addressing two main applications of technological sustainable marketing: incremental innovation in marketing practices and increasing business efficiency through automation. The study also discussed two main objectives of sustainable marketing: attracting customers interested in sustainability

through AI-supported sustainable marketing to enhance their well-being and building a strong sustainable brand reputation to reduce price sensitivity. The study concluded that AI-supported sustainable marketing can contribute to cost savings, increased customer satisfaction, faster time to market, and turning more opportunities into sales. It also showed that the majority of customers are willing to change their purchasing behaviours to be more environmentally friendly. It is expected that customers will experience a strong push towards sustainable marketing, which will contribute to the increased adoption of smart machines by both retailers and customers alike.

The study by **Shahrukh Khan Lodhi, Ahmad Yousaf Gill, and Hafiz Khawar Hussain (2024)** "**Green Innovations: Artificial Intelligence and Sustainable Materials in Production**"

explored the utilization of artificial intelligence (AI) to promote sustainability in the manufacturing sector through the production of recyclable products, maximizing material efficiency, and streamlining supply chains. The study focused on innovations implemented by leading companies such as Adidas, Tesla, Unilever, and IKEA, which have significantly contributed to reducing the environmental impact of manufacturing processes. It identified key areas where AI technologies enhance operational efficiency and environmental sustainability. The study also discussed the importance of responsible innovation, highlighting the ethical implications of using AI in sustainable manufacturing, including its impact on data privacy and the future of the workforce. The findings emphasized that collaboration among government, industry, and social sectors is essential to harness AI's potential for developing environmentally and socially responsible production methods. The study recommended adopting a balanced approach that leverages AI's advantages while ensuring adherence to ethical standards.

Although previous studies align with the current Research on integrating artificial intelligence (AI) into sustainable marketing, they mainly focus on specific cases or industries, such as the fashion industry or sustainable production. In contrast, the current study primarily examines the impact of AI in developing sustainable marketing practices across various industrial sectors, without being limited to a particular industry. This is achieved by presenting several successful international experiences in this field that can be leveraged in the future, which makes the research scope broader.

3. Methodology

To address the research problem, we relied on a descriptive-analytical approach. The descriptive approach involved presenting the theoretical foundations of artificial intelligence and sustainable marketing and its practices. We studied and clarified the core concepts related to both artificial intelligence and sustainable marketing. As for the analytical approach, it focused on analyzing successful international experiences in integrating AI into sustainable marketing and providing proposed insights on how to benefit from these experiences in future research.

4. Framework

4.1 Artificial Intelligence (AI)

Artificial intelligence (AI) is a term composed of two words: "artificial" and "intelligence," carrying both technical and professional meanings. According to Webster's Dictionary, intelligence refers to the ability to grasp matters or handle new and complex situations, encompassing perception, learning, and problem-solving. The essence of intelligence lies in understanding, creativity, and reasoning. Meanwhile, artificial refers to something developed or

manufactured by humans, where natural elements are transformed into artificial ones using innovative techniques without direct natural intervention. Accordingly, AI combines human thinking and creativity with industrial innovation to produce systems capable of effectively simulating human cognitive abilities. (عزیزی & بن بردي, 2023, p. 392)

The development of artificial intelligence (AI) dates back to the 1950s when early research efforts focused on areas such as symbolic logic, reasoning, and expert systems. As computer capabilities advanced and algorithms improved, particularly with the emergence of technologies like deep learning, AI experienced a significant and rapid transformation. In the 1980s, the rise of expert systems helped expand AI applications into commercial fields, such as predictive analytics and recommendation systems. In the 21st century, big data technologies, cloud computing, and the Internet of Things (IoT) propelled AI toward immense growth, enabling its expansion into various fields. (Bohan, 2024, p. 181)

Artificial intelligence (AI) is employed across a broad spectrum of fields and is considered an essential skill that shapes the future of numerous industries. The application of AI is expanding to encompass diverse areas such as systems engineering, neuroscience, psychology, cognitive sciences, mathematics, and computer science. In its practical applications, AI is utilized in fields including, but not limited to, speech recognition, image processing, natural language processing, intelligent robotics, autonomous vehicles, energy systems, healthcare, and financial technology. In certain domains, AI has begun to surpass human capabilities. With the AI market projected to reach \$190 billion by 2025, its adoption is expected to accelerate across various sectors, thereby amplifying its impact on multiple industries. (Yuchen, Xiang, Hao, Shen, & Okyay, 2022)

4.2 Sustainable Marketing

The adaptation of the marketing function to the demands of sustainability has become a central focus of discussion and research in recent years. The concept of sustainability has evolved beyond traditional definitions, such as "green products" or "environmentally friendly." Consequently, sustainable marketing has emerged as one of the most important outcomes of the sustainability agenda within the marketing field over the past three decades. While earlier research in green marketing primarily concentrated on product-related aspects, sustainable marketing has since expanded to encompass all elements of the marketing mix, including pricing, distribution, and promotion. (Mahima, Ruchi, & Kiran, 2024, p. 1)

Sustainable marketing emphasizes ensuring that marketing practices are environmentally balanced, socially equitable, and economically viable. This approach seeks to integrate sustainability principles across all aspects of marketing, promoting responsible consumption and production while addressing social and economic challenges. (Jessie, Outi, Mika, & Mitra, 2023, p. 2) And, it can be defined as the process of promoting products, services, and activities that do not harm the environment, employees, or the communities in which the organization operates. This approach prioritizes the long-term well-being of society and the environment while maintaining the economic viability of the business. (محمد & نفا, 2024, p. 278)

Sustainable marketing encompasses three core dimensions, often referred to as the "Triple Bottom Line": profit, people, and planet. The "profit" dimension involves not only the generation of financial profit but also the creation of sustainable economic value. Organizations employing sustainable marketing strategies strive for ethical and responsible economic growth by enhancing operational efficiency, innovating environmentally friendly products, and solidifying

their position as leaders in sustainability. The "people" dimension focuses on the social impact of business practices, including the welfare of employees, communities, and consumers. Finally, the "planet" dimension addresses the efforts to minimize the negative environmental consequences of business operations. (Hamisi, 2024, p. 974)

The sustainable marketing mix represents an adaptation of the traditional marketing mix elements (product, price, place, and promotion) to integrate sustainability considerations. In this approach, the "product" is designed with an environmentally sustainable lifecycle, beginning with the use of sustainable raw materials and extending to disposal processes that minimize environmental impact. The "price" reflects the full costs associated with the environmental and social Effects of the product. The "place" focuses on reducing the carbon footprint by optimizing the supply chain for efficient distribution. Lastly, the "promotion" emphasizes the need for transparent and honest communication about the company's sustainability practices, while avoiding deceptive practices like "green washing." (Nurjaman, 2024, p. 75)

Sustainable marketing practices extend beyond the mere sale of environmentally friendly products, encompassing the creation of long-term value for the company, society, and the environment. By implementing sustainable marketing strategies, firms can enhance their reputation, attract environmentally conscious consumers, and contribute to the development of a more sustainable and equitable future. These practices involve the use of eco-friendly materials in product design, such as selecting recyclable and sustainable raw materials with minimal environmental impact. Additionally, the focus is on reducing carbon footprints by improving energy efficiency, utilizing renewable energy sources, and adopting more efficient, environmentally friendly transportation methods. Companies also adopt waste management strategies, including recycling, waste reduction, and the reuse of unused materials. Furthermore, they contribute to the sustainability of natural resources through practices such as efficient water use and sustainable agriculture. In addition, companies engage in fair trade practices that support local suppliers, ensure compliance with sustainability standards, and invest in local communities through corporate social responsibility initiatives, while promoting awareness of the benefits of sustainable products. (Hamisi, 2024, pp. 974-975)

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

The global artificial intelligence (AI) market was valued at USD 638.23 billion in 2024, and it is anticipated to experience significant growth, reaching approximately USD 3,680.47 billion by 2034, with a compound annual growth rate (CAGR) of 19.1% during this period. This substantial growth reflects the increasing dependence on AI technologies across diverse industries, signaling a robust shift towards automation, data-driven decision-making, and enhanced customer experiences. This transformation underscores the expanding role of marketing, which now extends beyond customer relationship management to encompass broader concerns such as environmental and social sustainability. As awareness of sustainability intensifies, organizations must incorporate these principles into their marketing strategies to adapt to global shifts and meet the growing consumer demand for sustainability initiatives. Between 2017 and 2021, studies indicated that 10 out of the top 20 companies had adopted AI, with 16 companies leveraging AI to achieve benefits associated with sustainable business practices. The influence of globalization on consumption patterns and the increase in unchecked consumption are key factors driving companies like Coca-Cola, Nestlé, and

Statoil to prioritize sustainability as an integral component of their business strategies. The application of AI in fostering sustainability has seen a marked rise across various sectors, including supply chains, production, and marketing. Experts advocate for a holistic approach to implementing sustainability strategies, emphasizing that AI not only enhances environmental benefits but also contributes to improving employee safety and governance structures. (Bora, 2024, p. 7)

The integration of artificial intelligence (AI) in marketing has experienced significant advancements, particularly with the advent of big data and machine learning technologies, which have enhanced analytical capabilities, ranging from basic data processing to more advanced tasks such as mass customization and the prediction of consumer behavior. Recent developments in these technologies have increased the precision and effectiveness of marketing strategies. For instance, deep learning algorithms can process unstructured data, such as images, videos, and social media posts, thus providing deeper insights into consumer behavior and preferences. Additionally, Natural Language Processing (NLP) tools enable more accurate sentiment analysis and facilitate customer interactions through chat bots and virtual assistants. The incorporation of AI into marketing processes has become crucial for companies aiming to implement sustainable marketing practices, especially in terms of reducing waste and overproduction. Through advanced data analysis and machine learning, AI can offer precise forecasts of consumer demand, which helps to minimize waste and align product offerings with market expectations. This capability aids in preventing overproduction and supports sustainability at the production level .

Moreover, AI enhances the personalization and efficiency of marketing campaigns, with its predictive capabilities enabling proactive adjustments to strategies, thereby reducing the carbon footprint associated with traditional advertising methods and improving return on investment. In supply chain management, AI optimizes efficiency by improving sourcing decisions, analyzing risks, and matching material procurement with production requirements to avoid surplus. In this context, AI contributes to sustainability by enhancing the accuracy of demand forecasting and optimizing decision-making processes, resulting in more sustainable outcomes. Additionally, AI increases the efficiency of logistics networks by optimizing routing and scheduling, which reduces fuel consumption and emissions. AI-enabled sustainable marketing plays a central role in supporting the United Nations Sustainable Development Goals (SDGs), particularly Goal 9 (Industry, Innovation, and Infrastructure) and Goal 12 (Responsible Consumption and Production), by promoting efficient production and consumption practices. These efforts contribute to reducing the carbon footprint and enhancing the sustainable use of resources. Innovations driven by AI in sustainable marketing also impact corporate governance and social responsibility, where transparency and accountability are critical to maintaining consumer trust. Artificial intelligence (AI) offers precise analytics of environmental and social performance, thereby facilitating informed decision-making by stakeholders. While the integration of AI into sustainable marketing presents certain challenges and ethical considerations, it offers substantial potential to enhance both the efficiency and effectiveness of marketing strategies, while simultaneously advancing environmental and social sustainability. Addressing these challenges responsibly

is crucial to ensure the ethical and inclusive use of AI technologies. (Arantes & Costa, 2024, pp. 229-232)

Many leading companies have succeeded in integrating artificial intelligence into their sustainable marketing strategies, which has helped improve operational efficiency and enhance sustainability practices. AI-supported initiatives include using sustainable materials such as recyclable shoes, electric vehicle batteries made from recycled materials , and eco-friendly packaging. AI is also used to improve these materials and processes, enhancing the effectiveness of sustainable innovations and reflecting companies' commitment to sustainability. For example, Adidas used machine learning techniques to predict the performance of sustainable materials like TPU, enabling the design of high-performance, 100% recyclable running shoes. On the other hand, Tesla developed AI algorithms to optimize battery recycling processes and predict the performance of recycled materials, leading to improved battery efficiency and reduced environmental impact. Unilever has also relied on AI to boost innovation in the use of recycled plastics and biodegradable materials, helping it meet customer expectations and enhance sustainability. Ikea used AI to simulate the properties of sustainable materials like recycled wood, leading to the development of eco-friendly furniture while reducing energy consumption and waste .

Additionally, companies like Nike and Dior have used AI to improve their product designs and reduce material waste. For instance, Nike used AI to analyze customer data and guide the development of more sustainable products, such as sports shoes made from recycled materials. Dior, on the other hand, invested in AI technologies to deliver personalized customer experiences by analyzing their data and improving marketing strategies, contributing to sustainability by enhancing resource efficiency and sustainably driving innovation. In addition to the previous efforts, Unilever benefits from artificial intelligence to drive innovation, improve efficiency, and reinforce its sustainability goals, particularly by integrating it into research and development processes to create smarter and more sustainable products. AI-supported targeting technologies also enable the delivery of personalized advertisements, while platforms like Amazon rely on recommendation systems to boost sales by aligning with user preferences. Approximately one-third of Amazon's sales in the online retail market are attributed to these systems. These systems not only contribute to enhancing the customer experience but also support sustainable business practices by improving product discovery, reducing unnecessary returns, and strengthening targeted marketing strategies.

On the other hand, Shell invests in advanced technologies and innovative methods to build a sustainable energy future, by investing in renewable energy sources such as wind and solar power, alongside low-carbon fuels such as advanced biofuels and hydrogen to meet the growing demand for clean energy solutions. Shell also employs Web3 and blockchain technologies to enhance transparency, trace impact, and ensure security in its transition toward energy transformation, particularly by improving the tracking of renewable energy and sustainable aviation fuel (SAF), which supports its broader goal of achieving carbon removal and reaching net-zero emissions. These examples exemplify the successful integration of AI in the development of sustainable solutions, improving environmental performance, and facilitating a transition toward a more sustainable future. (Bora, 2024, pp. 10-12)

5. Case Studies

5.1 H&M Group

H&M Group is a Swedish multinational corporation within the retail apparel sector, established in 1947. Specializing in fast fashion for men, women, teenagers, and children, the company operates over 4,000 stores across more than 75 global markets and generates online sales in 60 markets. The group consists of several brands that collectively pursue a unified vision of making sustainable and aesthetically appealing fashion accessible to all. While each brand maintains a unique identity, it enhances the overall strength of H&M Group, facilitating the provision of sustainable fashion to a global customer base. (H&M Group)

Sustainability has been a fundamental component of H&M's strategy for nearly three decades, with the company emphasizing the delivery of an optimal combination of fashion, quality, price, and sustainability to its customers. H&M maintains the belief that sustainable fashion should be accessible to all individuals, rather than being restricted to a particular demographic. While notable progress has been made in this area, substantial efforts remain. Within the fashion industry, there is a need to reduce the environmental impact on the climate, enhance social outcomes, and establish a more sustainable fashion system. Achieving these objectives necessitates the implementation of transparent practices throughout all operational processes. (H&M Group)

In 2018, H&M launched a dedicated artificial intelligence division to enhance sustainability in business decision-making. Since then, the company has continued to develop innovative AI strategies, particularly focusing on improving design and production processes. In this context, H&M announced the adoption of unified circular principles to be applied during the design phase. Principles that are being developed using AI technologies, data analytics software, and 3D visualization techniques. These advanced technologies contribute to reducing waste during production, as well as saving materials, time, and energy in the design process. H&M emphasized that the main goal of its sustainability strategies is to produce high-quality, durable products using chemically safe materials, while also assessing materials and production processes, with artificial intelligence being a vital tool in achieving this objective. (Candeloro, 2020, pp. 94-95)

H&M relies on artificial intelligence to analyze data and predict future trends, contributing to the design of products that align with customer preferences and reduce waste. In the context of this digital transformation, the traditional model, which depended on design teams to identify shopper preferences and develop products, proved insufficiently effective. Consequently, the company began utilizing algorithms to analyze purchase receipts, returns, and loyalty card information. In this regard, one of H&M's stores in Östermalm, Stockholm, demonstrated the effectiveness of these modern strategies. As one of the early adopters of new technology, the store utilized big data and artificial intelligence to discover that the majority of customers were women who preferred fashion-forward items, such as floral skirts, despite the store's historical focus on selling basics for men, women, and children. Furthermore, behavioural data indicated that shoppers favoured higher-priced items, prompting the store to feature leather bags priced at \$118 and wool sweaters costing \$107, alongside more economical items such as t-shirts and shorts. (MBA, 2020)

Adam, the Global Product Information Leader at H&M, emphasizes in his article that the company's strategy is based on balancing data-driven decision-making with the preservation

of human creativity. This is achieved by utilizing artificial intelligence in a way that enhances sustainability in marketing practices. Despite the growing reliance on technology to provide recommendations and improve the customer experience, H&M underscores the importance of maintaining the human element to ensure creativity in fashion design. This suggests that technology, including artificial intelligence, should serve as a tool to support human innovation rather than replace it. In the context of sustainable marketing, the use of artificial intelligence contributes to the effective personalization of products and their distribution across global digital channels, resulting in reduced waste and improved efficiency. By integrating technology-driven data with human creativity, H&M is fostering long-term commercial sustainability, enabling the company to meet customer needs in innovative and sustainable ways. Looking to the future, the trend towards artificial intelligence in the retail industry suggests the potential for a shift in how customers interact with brands. AI may become the most reliable source for advice and guidance, highlighting the importance of striking a precise balance between technology and creativity in managing information and building strong customer relationships. (ADAM, 2024)

5.2 Unilever Company

Unilever, a multinational corporation founded over a century ago, is recognized as one of the largest consumer goods companies worldwide, with a diverse portfolio of brands. The company adheres to the belief that conducting business ethically and responsibly contributes to achieving superior performance. The company is headquartered in the UK and Ireland, spanning over 190 countries globally. Unilever operates across multiple sectors, including food and beverages, with prominent brands such as Lipton (tea), Hellmann's (mayonnaise), and Ben & Jerry's (ice cream). In the personal care segment, the company offers products under well-known brands like Dove (skin and hair care), Lux, and Axe. Its cleaning products portfolio includes Omo, Persil, and Cif, while the health and home care division features products like Surf (laundry powders) and Seventh Generation (sustainable cleaning products). These diverse product categories reflect Unilever's strategic focus on meeting the varied needs of consumers globally while emphasizing innovation and sustainability. (Unilever, 2024)

According to Hein Schumacher, the CEO of Unilever, the company firmly believes that businesses have a responsibility to address the environmental and social challenges that threaten both the planet and communities. This commitment has been central to their operations for many years. From the Unilever Sustainable Living Plan to the Compass Strategy, and more recently the Climate Action Plan, sustainability has been integrated into the core of Unilever's business strategy. The company has made significant progress, benefiting from its focus on sustainability by building more resilient supply chains, achieving substantial cost savings, and attracting top talent. Looking ahead, Unilever views this as an opportunity to establish a new, third era of sustainable business leadership, continuing to shape the future of commerce with a strong commitment to sustainability. (Unilever, 2024)

Unilever utilizes artificial intelligence (AI) and digital technologies to accelerate innovation and sustainability, as presented at "The Next Web" conference in Valencia on March 31. Alberto Prado elaborated on how data and AI are instrumental in driving scientific discoveries, product development, and enhancing the resilience of supply chains. In a discussion with Javier Espinosa of the Financial Times, the role of these technologies in

improving innovation and operational efficiency was highlighted, reinforcing Unilever's commitment to sustainability. Furthermore, the company is making significant strides in understanding human biology, particularly how the human body interacts with the microbiome, leveraging large-scale data access, machine learning, and high-performance computing. These advancements allow Unilever to uncover complex relationships that are beyond the capacity of the human brain to comprehend.

Additionally, collaborations with partners in the development of sustainable plant-based alternatives to palm oil are advancing Unilever's efforts to deliver innovative and sustainable solutions that address consumer needs while adapting to future challenges. Unilever continues to refine its product design and Provide innovative solutions that address consumer needs. Utilizing virtual simulations, the company designs and analyzes products through computational models to better understand the impact and interaction of molecular compounds with greater speed and efficiency. This methodology facilitates the testing of millions of formulations in seconds, enabling Unilever to cater to regional taste preferences, such as the customized Hellmann's sauces for the British and American markets. In addition, these technologies are central to Unilever's commitment to animal-free testing. The company rejects the necessity of animal testing for product safety verification and advocates for a global ban on such practices. Artificial intelligence (AI) is employed to predict the biological responses of chemical substances, thereby enhancing both product safety and efficacy. Furthermore, Unilever integrates digital data from research and development (R&D) and the supply chain to optimize product distribution to over 3.4 billion consumers daily. This integration allows the company To adapt quickly to market change. Through the use of digital tools, Unilever enhances supply chain flexibility and operational efficiency, which ultimately reduces costs and improves sustainability.

In this regard, Alberto Prado, Head of Digital Partnerships and R&D at Unilever, asserts that "science and technology will play a pivotal role in driving innovation for a better future," emphasizing the critical role of combining digital and advanced sciences to support sustainable innovation. This statement aligns with Unilever's broader strategy of leveraging AI and digital technologies to drive innovation and meet evolving consumer demands while advancing sustainability objectives. (Unilever, 2024)

According to an article published on the Medium platform by Hilde Lorenzen, titled "AI in Corporate Social Responsibility: Unilever's Transformative Vision". In 2018, Unilever introduced its ambitious Sustainable Living Plan, an initiative designed to reconcile the company's growth with positive social impacts, placing a significant emphasis on the utilization of data analytics to monitor sustainability efforts. The effectiveness of this plan was demonstrated by the fact that 50% of the company's growth stemmed from sustainable brands. This realization led to a fundamental shift in the company's strategic focus, illustrating that profitability and purpose are not mutually exclusive but can indeed flourish concurrently. Within this framework, artificial intelligence (AI) became a critical element in supply chain management. Unilever collaborated with Blue Yonder to develop intelligent systems capable of enhancing demand forecasting and inventory management, leading to a reduction in waste. This collaboration also empowered local shea nut producers in Africa to meet production demands with greater precision while simultaneously minimizing environmental impact. AI

has evolved into a fundamental tool for innovation in various domains within Unilever, particularly in product development. For example, the "Dove" brand leveraged AI to provide personalized skincare recommendations based on the analysis of user images and survey data. Similarly, the "Axe" brand adopted a data-driven methodology to develop Axe AI deodorant, which utilized 46 terabytes of data to align with the preferences of Generation Z. Furthermore, the use of AI in the development of cosmetic products, such as the creation of Hourglass Red Zero lipstick, underscores Unilever's commitment to sustainability by offering plant-based, AI-driven products. Additionally, AI plays a crucial role in Unilever's efforts to combat deforestation, with the company employing satellite imaging and algorithms to monitor agricultural operations and predict regions at risk of deforestation. For consumers, Unilever has provided the tools to make more sustainable choices by offering environmentally friendly alternatives and presenting real-time data on their ecological impacts. These AI-driven initiatives have contributed to significant business outcomes, with Unilever experiencing a 15-35% increase in sales, alongside cost reductions and enhanced operational efficiency. The company's commitment to sustainability also positively impacts its brand image and consumer loyalty. Nevertheless, Unilever encountered ethical challenges, discovering that some AI models were unintentionally favouring suppliers who did not adhere to fair labour practices. This led the company to strengthen its ethical AI guidelines. By establishing comprehensive guidelines and fostering open dialogue with stakeholders, Unilever ensures that its AI systems are aligned with the company's values and societal expectations. (Lorenzen, 2024)

5.3 Microsoft Company

Microsoft Corporation is a global leader in the technology sector, specializing in computers and software development. In 2021, the company reported a significant profit growth of 38%, reaching \$61 billion, alongside a 17.5% increase in revenue, totaling \$168 billion. These achievements positioned Microsoft as the fourth company on the Fortune 500 list for 2022. The corporation is recognized as the largest provider of computer software worldwide, excelling in the development, distribution, and commercialization of software and consumer electronics. Among its most notable contributions are the Windows operating system, Microsoft Office suite, and the Bing search engine, in addition to the Microsoft Azure cloud computing platform. Furthermore, Microsoft's portfolio includes widely acclaimed products such as the Xbox gaming console and Surface devices, which combine the functionality of personal computers with the adaptability of touch screen technology. (Jinghan, 2023, p. 413) In 2020, Microsoft committed to becoming carbon-negative, water-positive, and waste-free by 2030. The company aims to reduce carbon emissions, replenish more water than it uses, and eliminate waste by following a circular economy model. Additionally, it has exceeded its land conservation goal by 40%. These initiatives are part of a broader strategy to enhance sustainability through innovation and policy, with a focus on ecosystem protection and reducing environmental impacts. Microsoft emphasizes that for the company to succeed, the world must Achieve as well, particularly in the field of Green sustainability. It believes that collaboration among governments, businesses, and civil society is essential. Microsoft advocates for using all available tools, including artificial intelligence, to drive sustainability

efforts forward. Integrating AI is considered vital in addressing environmental challenges and advancing global progress. (Microsoft)

Microsoft offers a range of sustainable products that leverage artificial intelligence (AI) to enhance environmental, social, and economic sustainability. One of the key products is Microsoft Azure, a cloud computing platform that utilizes AI to improve energy efficiency in data centers, with Microsoft's commitment to powering these centers with renewable energy. Additionally, Microsoft 365 provides a suite of cloud-based office applications that support remote work and collaboration, reducing the need for travel and, consequently, contributing to lower carbon emissions. It also offers Surface devices, which feature energy-efficient designs that help reduce carbon footprints. The company places a strong emphasis on environmental innovation through AI for Earth, an initiative that uses AI to address environmental challenges such as climate change and biodiversity loss by analyzing Ecological data and offering innovative solutions for environmental conservation. Furthermore, Microsoft Cloud for Sustainability is a suite of cloud tools powered by AI that assists companies in measuring and reducing their carbon footprint, helping them achieve their sustainability goals. (Microsoft)

Microsoft employs artificial intelligence to develop innovative solutions in the field of sustainability, thereby enhancing its sustainable marketing efforts. By providing advanced technologies and sustainable solutions, Microsoft assists other companies in achieving global sustainability goals. These initiatives are integral to Microsoft's broader commitment to promoting sustainability through the application of cutting-edge technological innovations. Through the AI for Good Lab and the Climate Research Initiative, in collaboration with institutions like MIT and UC Berkeley, Microsoft develops innovative solutions such as carbon capture. The company also invests in sustainability via the Climate Innovation Fund, supporting companies like LineVision that use AI to enhance transmission line efficiency and contribute to energy sustainability. Additionally, the Airband Initiative strives to provide internet access to 250 million people in underserved communities by 2025, including 100 million in Africa. Microsoft continues to innovate by improving the energy and water efficiency of its data centers and AI systems, reducing reliance on fresh water for cooling, and investing in water recovery in stressed regions. The company has pioneered advanced cooling methods, such as liquid cooling, to support AI chips while minimizing energy and water consumption. Microsoft also contributes to the Green Software Foundation to promote carbon-conscious software practices and supports decarbonisation policies to expand the use of carbon-free electricity. In September 2022, the company set priorities to reduce carbon emissions and achieve its sustainability goals. Moreover, Microsoft enhances its AI governance to ensure trust in using AI for sustainable infrastructure, including energy networks and water utilities, with a commitment to developing AI responsibly. Recognizing the importance of building a workforce capable of harnessing AI for sustainability, Microsoft launched initiatives like the AI Skills Initiative and partnered with INCO, a global non-profit, to offer the Green Digital Skills Certification Program, training 30,000 individuals from 140 countries in sustainability and green design principles. To ensure AI contributes effectively to achieving net-zero emissions, Microsoft emphasizes the need for continuous evaluation of its impact, considering factors like energy consumption of AI infrastructure, the speed of carbon

removal from global power grids, and AI's role in enabling sustainability solutions. The company stresses the necessity of collaboration between businesses, governments, and civil society to create the right conditions for AI to accelerate sustainability, all while ensuring AI is used ethically and responsibly to help achieve global sustainability goals. (Microsoft, 2023)

6. Discussion

Artificial intelligence is progressively being utilized as a central tool to enhance sustainable marketing practices through its diverse applications. Based on the case studies examined in this article, the primary forms of these interventions can be summarized as follows:

✓ The analysis of big data and the prediction of behaviours:

Artificial intelligence is employed to analyze large datasets, enabling the identification and prediction of consumer trends. This approach minimizes resource waste and ensures the production of goods that align with market expectations, as exemplified by the practices of both H&M and Unilever.

✓ Enhancing Supply Chain Efficiency:

Artificial intelligence is utilized to enhance the efficiency of supply chains, minimize waste, and ensure the sustainability of operations, as demonstrated by Unilever.

✓ Innovation in Product Design and the Development of Sustainable Products:

Artificial intelligence technologies are used to develop sustainable materials such as recyclable footwear and energy-efficient furniture, as seen in companies like Adidas and IKEA. Additionally, Microsoft utilizes AI in designing products that reduce carbon footprints, exemplified by cloud-based tools for emission analysis and reduction.

✓ Personalization and Customer Experience:

Artificial intelligence tools are utilized to personalize products and services in order to meet customer needs, thereby enhancing loyalty and minimizing waste related to overproduction. This approach is exemplified by companies such as Unilever and Dior.

✓ Enhancing Social and Environmental Responsibility:

Technologies such as Microsoft's "AI for Earth" play a pivotal role in addressing environmental challenges, including climate change and biodiversity loss, by offering data-driven sustainable solutions. Furthermore, Microsoft employs artificial intelligence to optimize energy and water usage in its data centers, thereby reducing its environmental impact. These efforts reflect Microsoft's commitment to improving energy efficiency and developing solutions aimed at reducing emissions across its operations.

✓ Achieving Sustainable Development Goals:

Artificial intelligence contributes to advancing the United Nations Sustainable Development Goals (SDGs), particularly in areas related to responsible consumption and sustainable production, by enhancing resource efficiency and reducing waste.

✓ Enhancing Transparency and Accountability:

Technologies such as blockchain and artificial intelligence are utilized to trace product sources and ensure compliance with environmental and social standards, as exemplified by Shell.

7. CONCLUSION

In conclusion, it is evident that artificial intelligence plays a pivotal role in enhancing sustainable marketing practices by enabling companies to personalize customer experiences,

analyze data with greater accuracy, and achieve positive environmental and social impacts. The use of technologies such as machine learning and big data analytics assists companies in making marketing decisions based on a deep understanding of consumer needs and sustainable market requirements. Drawing from the successful examples of companies like Unilever, H&M, and Microsoft, it is clear that integrating AI with the principles of sustainable marketing is a crucial step towards achieving sustainable success and innovation. By leveraging these technologies, companies can enhance their marketing performance and meet the growing consumer expectations for sustainability, thereby contributing to the promotion of social and environmental responsibility in the business world.

The research provides future benefits by deepening the understanding of the role of artificial intelligence in advancing sustainable marketing practices, with an emphasis on the opportunities and challenges companies may encounter when implementing these technologies. Moreover, the study offers practical insights that assist companies in integrating AI into their marketing strategies, thereby enhancing their capacity to achieve sustainability objectives and generate positive social and environmental impacts. Additionally, the research paves the way for further exploration in the field of AI evolution and its applications in sustainable marketing, contributing to the expansion of academic knowledge in this critical area.

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