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ECO E-COMMERCE: REBOOTING ONLINE BUSINESS FOR A GREENER FUTURE

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Abstract. *The article explores the potential for an ecological transformation of e-commerce to support a sustainable future, with a particular focus on a step-by-step strategy tailored for small and family-run businesses. The aim of the article is to identify how e-commerce tools can be combined with environmental principles to create sustainable business models within the digital space. The study employed general scientific methods: analysis and synthesis, induction and deduction, comparative and systemic approaches, as well as methods for generalizing empirical data. Findings reveal that in the face of escalating climate threats, e-commerce represents a sector with significant environmental pressure, with up to 37% of related emissions coming from shipping and product returns. The research concludes that in response to these challenges, sustainable logistics and production practices are actively emerging, exemplified by companies like Allbirds, Package Free Shop, Etsy, and Shopify. These companies integrate innovation with transparency, proving that an environmentally friendly approach can also be economically viable. For instance, Allbirds has managed to cut its carbon footprint by 12% by using sustainable materials and digital solutions; Package Free Shop promotes zero-waste culture; while Etsy and Shopify implement offsetting mechanisms and eco-packaging as standard practices on their digital platforms. Particular attention is paid to the issue of greenwashing, a form of manipulation through ecological rhetoric that undermines consumer trust. The article analyzes cases of companies that have misused "green" positioning, including Chevron, Volkswagen, Starbucks, Nestlé, and Fiji Water. It demonstrates that combating greenwashing is possible through transparency, verification, and certification, which provide credible proof of a product's sustainability. The study highlights the significant potential of small and family businesses to implement sustainable solutions due to their adaptability and local focus. Emphasis is placed on the importance of open communication, local production, and community engagement in fostering a culture of responsible consumption. The practical value of the study lies in the creation of a toolkit for integrating sustainable practices into e-commerce at the level of small brands.*

Keywords: *e-commerce, sustainable development, greenwashing, eco-strategy, microbusiness.*

Introduction

The rapid growth of e-commerce, driven by its convenience, speed, and accessibility, has become a defining feature of modern consumption. However, this development is accompanied by increasing environmental pressure, posing a serious threat to the planet. The negative impact is particularly evident through the rising carbon footprint associated with transportation, packaging, digital infrastructure, and the encouragement of overconsumption. Transport logistics is one of the main contributors to the environmental burden of e-commerce. As of 2020, shipping and product returns accounted for 37% of greenhouse gas emissions linked to the sector

[9]. By 2030, the number of vehicles involved in e-commerce logistics is projected to grow by 36%, leading to an additional 6 million tons of CO_2 emissions and a 21% increase in road congestion [3]. The growing demand for accelerated delivery is particularly concerning, with same-day delivery increasing by 36% annually and instant delivery by 17%, both of which significantly raise energy consumption and operational costs [9]. Packaging materials further exacerbate the issue: more than 40% of packaging in e-commerce consists of single-use plastics, most of which are not recyclable and end up in landfills or marine ecosystems [3]. Additionally, the digital infrastructure that supports e-commerce operations – from data centers to order management platforms – consumes large amounts of energy, much of which still relies on fossil fuels. Although research by the Massachusetts Institute of Technology has shown that online shopping can be more environmentally efficient than traditional retail, this advantage is lost in cases of expedited delivery, which can generate a larger carbon footprint than shopping in physical stores [9]. Against the backdrop of a deepening climate crisis, the need to rethink the e-commerce model becomes increasingly urgent. This requires the adoption of sustainable solutions not only in logistics chains but also in consumer behavior patterns. Systemic transformation toward environmentally conscious digital consumption is only possible through cooperation among brands, tech platforms, and responsible consumers. This study focuses on reviewing effective green e-commerce strategies, analyzing successful cases from various markets, and providing practical recommendations for small business owners. Special attention is given to solutions that demonstrate the potential to reduce environmental impact without compromising economic performance, aiming to promote the development of a more responsible and sustainable online business environment.

Literature Review

The issue of ecological transformation in e-commerce, or a kind of "green reboot" of online business, is actively discussed in contemporary international academic and expert literature. Researchers focus on areas such as sustainable supply chains, the

integration of circular economy principles, eco-friendly packaging, the environmental impact of online trade, and the challenges posed by greenwashing.

In particular, F. Calvino [3] examines how e-commerce influences the global environmental situation, highlighting key ecological challenges and the potential to reduce harm through innovation. The study by G.P.M. Nogueira, J.J.A. Rangel, and P.R. Croce [14] employs a simulation-based approach to explore the environmental effects of fast delivery in B2C logistics, offering insights into the trade-offs between convenience and sustainability. J. Park and Z. Waqar [15] use a life cycle assessment method to demonstrate the benefits of reusable packaging in online apparel sales, while F. Ahmed [2] focuses on how women-led brands in Montreal are adapting to the circular economy. Meanwhile, K.R. Delovieres, K.C. Mondala, and M.C.E. Montalban [6] emphasize the role of government and marketing in promoting local brands within the framework of environmental awareness.

Expert platforms such as Vogue Business [4], Earth.org [9], and publications by Shopify [19,20] and Printify [12] supplement academic studies with practical examples of sustainable brand strategies – particularly companies like Allbirds and Etsy, which are actively implementing eco-conscious solutions.

Despite the abundance of publications on this topic, there is still a noticeable lack of systematic analysis. Due to the limited academic coverage of ecological e-commerce, this study primarily relied on general scientific methods of analysis, synthesis, induction, and deduction. The method of analysis made it possible to structurally identify key sustainability issues in e-commerce, such as the environmental impact of logistics, packaging, and product life cycles. Synthesis was used to generalize individual case studies (Allbirds, Package Free Shop, Etsy, Shopify) in order to identify common features of effective eco-strategies. Induction helped formulate conclusions based on empirical examples of successful practice, while deduction enabled the logical justification of a general model for ecological transformation in small business.

The study also involved comparative analysis of e-commerce platforms, critical interpretation of expert literature, and elements of case study methodology, which

allowed the incorporation of real business practices. Given the interdisciplinary nature of the topic, the analytical framework was based on expert sources, reports from industry platforms, and academic articles in the fields of sustainable marketing, logistics, and e-commerce.

Purpose of the article

The aim of the article is to critically assess how e-commerce can align with environmental values, offering a step-by-step model for businesses – particularly small and family-run brands – to achieve sustainable growth within the environmental context. In order to achieve this aim, the study sets out the following tasks: identify the main environmental challenges in e-commerce; analyze current green strategies on leading e-commerce platforms; examine the nature and consequences of greenwashing for online businesses; outline tools for restoring consumer trust through certification and transparency; investigate the role of small and family businesses in adopting sustainable practices; develop a step-by-step ecological strategy model for microbrands; justify the role of ethical advertising and storytelling in sustainable marketing.

Research results

In the context of global warming and resource depletion, e-commerce as a rapidly expanding sector is under increasing pressure to shift toward sustainability. In response to these environmental and societal pressures, a number of e-commerce companies have begun to incorporate sustainability into the core of their business strategies. This shift not only addresses regulatory and consumer demands but also illustrates that ecological responsibility can align with, and even enhance, commercial success. The following examples highlight how specific firms have operationalized these principles in practice.

Companies like Allbirds and Package Free Shop offer successful examples of how this transformation can be achieved. These businesses not only restructured their operational models but also proved the viability of a sustainable approach from both environmental and economic perspectives [17]. Allbirds, an eco-footwear brand, implemented a comprehensive strategy to transition toward an environmentally

focused model. This includes the use of natural and renewable materials—such as merino wool, eucalyptus pulp, and sugarcane—transparent carbon footprint labeling for each product, and packaging made exclusively from recycled materials. On the tech side, the company utilizes digital analytics to improve the effectiveness of marketing campaigns and enhance customer experience, leading to a 30% increase in sales within specific initiatives. Additionally, supply chain optimization based on environmental principles helped the brand reduce its average carbon footprint by 12% in 2021. The success of this model is also reflected in financial performance, with Allbirds reaching a market valuation of $1.4 billion [4].

Package Free Shop, in turn, specializes in zero-waste retail and pursues its strategy by eliminating single-use packaging, encouraging the use of reusable containers, and engaging in active education about household waste reduction. The company localizes its supply chains and implements eco-friendly delivery methods, which helps lower the carbon footprint associated with logistics. This approach has increased the brand's popularity and influenced broader industry transformation: Package Free Shop has become a benchmark for other businesses that are now adopting similar practices and promoting a zero-waste consumption culture [1,8]

E-commerce platforms are also increasingly launching environmental initiatives aimed not only at minimizing their ecological impact but also at building consumer trust through transparency and accountability. One of the key strategies in this direction is the implementation of carbon offset programs. Etsy, for instance, became the first major platform in 2018 to fully offset 100% of CO_2 emissions generated by product deliveries, investing in carbon capture projects to achieve this [21]. Shopify supports a similar practice through the 1PLANET Carbon Offset app, which enables sellers to voluntarily offset emissions related to shipping [18].

Another important aspect is the use of recycled or biodegradable packaging. Etsy collaborates closely with EcoEnclose to provide sellers with eco-friendly packaging made entirely from recycled materials [9]. Shopify also promotes packaging reduction and logistics optimization tools, offering access to suppliers of sustainable packaging solutions [19].

Environmental badges and certifications serve as additional tools for green verification, playing a crucial role in shaping a culture of responsible consumption. Etsy offers special labels for products made from eco-friendly materials or produced locally. Shopify allows for the integration of similar certifications through third-party apps that display information about carbon footprints or material certifications.

In light of these developments, a comparative analysis of the environmental capabilities of leading e-commerce platforms becomes essential. The following table outlines their functional features and ecological initiatives, helping to assess their potential as tools for sustainable development.

Table 1. Comparison of e-commerce platforms by sustainability criteria

Criterion	Etsy	Shopify	WooCommerce
Main audience	artisans, artists	a wide range of sellers	WordPress users
Ease of setup	high (no technical knowledge required)	high	medium (technical skills required)
Customization	limited	high (large number of templates)	highest (full control)
Cost	listing fee, sales commission	monthly subscription based on plan	free plugin, but requires hosting
Support for environmental initiatives	100% CO_2 offset for deliveries; recycled packaging; partnership with EcoEnclose [7,21]	1PLANET app for CO_2 offset; delivery and packaging optimization [18]	depends on additional plugins; no built-in environmental tools
Integration options	limited third-party app support	extensive options via App Store	wide selection through WordPress plugins
Security	high (centrally managed)	high (centrally managed)	variable, depends on user configuration

Note: systematized by the author based on [5, 12]

Despite positive trends in the integration of sustainable solutions into e-commerce, there is a growing phenomenon that poses a serious threat to consumer trust – greenwashing. This term, a combination of “green” and “whitewashing,” refers to the practice of misleading consumers by exaggerating or falsifying a product’s or company’s environmental benefits [16].

The concept of greenwashing was first introduced by environmentalist Jay Westerveld in 1986. During a stay at a hotel in Fiji, he noticed that while management promoted towel reuse as an eco-friendly initiative, the hotel was simultaneously

expanding its infrastructure, causing significant environmental harm [13]. One of the most notable historical examples is Chevron's "People Do" campaign in the 1980s, which portrayed the company as environmentally responsible, especially in protecting wildlife. However, during the same period, Chevron was repeatedly involved in environmental pollution through oil spills, drawing sharp criticism from environmental groups [16].

In a more recent case, the 2015 Volkswagen scandal involved the use of devices that manipulated emissions test results for diesel vehicles. While the company marketed its cars as "clean diesels," actual emissions far exceeded legal limits. The fallout included $25 billion in fines and a major loss of consumer trust [13]. Another case involved Starbucks, which announced a switch from plastic straws to special lids. However, the new lids contained more plastic than the previous straw-and-lid combination, prompting accusations of increasing plastic use under the guise of sustainability. In 2023, Nestlé faced backlash for marketing its plastic bottles as "recyclable." Although technically recyclable, the global recycling infrastructure fails to process the majority of plastic packaging in practice, making this claim a form of informational manipulation [16].

Preventing further spread of greenwashing and maintaining user trust requires the implementation of a three-pronged accountability system, which includes:

– *transparency:* companies must openly report their environmental initiatives, including quantitative data and limitations of their programs;
– *independent verification:* involving third-party evaluators helps ensure objectivity and reduces the risk of manipulation;
– *certification*: adopting internationally recognized standards (such as Carbon Trust, Cradle to Cradle, B Corp) enables consumers to trust the legitimacy of a company's environmental claims.

Effectively combining these elements can not only prevent greenwashing but also boost overall trust in ecological transformation within e-commerce.

In the transition to a green economy, small and family-run businesses – particularly microbrands – play a key role in shaping a new paradigm of sustainable

consumption. Unlike large multinational corporations, which require time and vast resources for structural change, small brands possess a unique agility that allows them to quickly adapt to environmental challenges and regulatory shifts [22].

These businesses are often grounded in a values-driven approach, emphasizing local authenticity, ethical production, and sincere communication with customers. As a result, microbrands are capable of forming deep, long-term relationships with their audiences, strengthening trust through transparency about product origins, environmental impact, and social [6]. Moreover, these businesses are vital for job creation, especially in small towns and rural communities, where they often serve as engines of local economic development. They also support the inclusion of women in entrepreneurship, generating additional social benefits and aligning with gender equality goals in sustainable development [2].

Despite their advantages, small businesses face several structural challenges on the path to ecological transformation. One of the main issues is limited access to sustainable raw materials. Because of their smaller order volumes, such brands cannot compete with larger players on pricing, while sustainable logistics often require significant investments that are out of reach for most microbusinesses [2].

Another challenge is certification for environmental or ethical standards, which, while crucial for gaining consumer trust, is often financially and administratively burdensome. This creates a paradox: microbrands that genuinely adhere to ethical principles may struggle to provide formal proof, whereas large corporations can afford certification even if they only partially meet the criteria [6].

It is also worth noting that government support for the ecological transformation of small enterprises remains fragmented. Although certain programs exist for local entrepreneurship, the lack of systematic assistance in the form of funding, educational resources, and consulting significantly hinders small business eco-reform [6].

At the same time, small brands benefit from the power of digital platforms and social media. Direct-to-consumer models allow them to tell their stories, visually showcase ethical production practices, and build engaged communities of loyal consumers who become informal brand ambassadors [11]. This transforms

microbrands from mere commercial entities into cultural agents of change, reshaping perceptions of responsible consumption, ethics, and environmental interaction. These strategies demonstrate particular effectiveness among Generation Z and Alpha consumers, for whom environmental and social values constitute an integral component of their motivational structure in purchasing behavior. [11, 22].

Given all the above, a successful ecological e-commerce strategy for microbrands should be based on the following stages, illustrated in Fig. 1

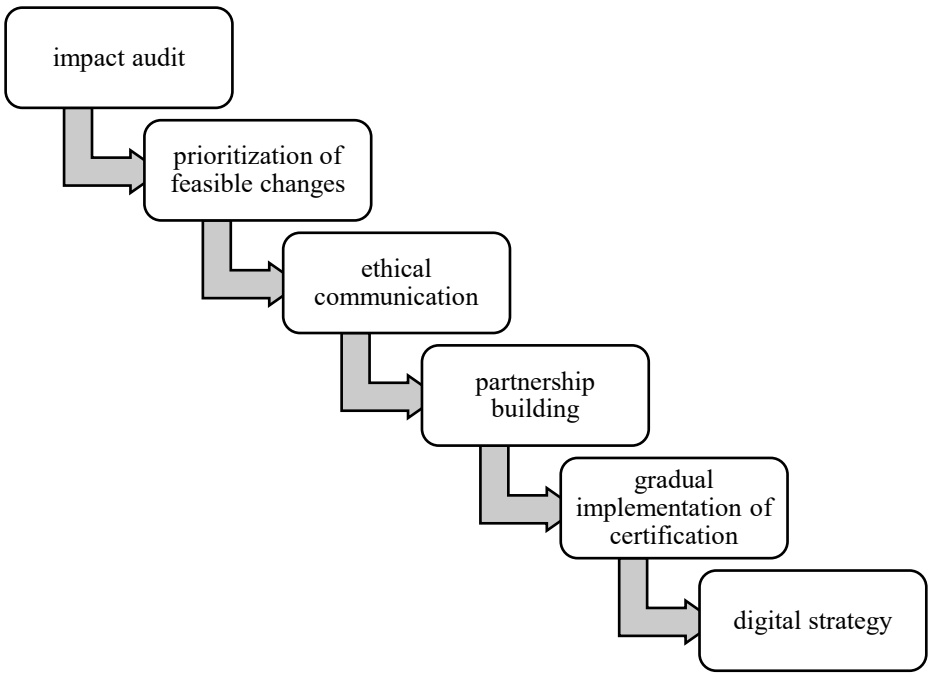

Figure 1. Stages of developing a green e-commerce strategy for microbrands

In order for small and family-run enterprises to effectively integrate sustainability principles into their business models, it is essential to adopt a step-by-step strategy that accounts for both environmental and social factors. The first step in this process involves conducting an environmental impact audit. This means assessing the full life cycle of products – from raw material sourcing to logistics and digital infrastructure.

Once the main sources of environmental pressure are identified, it becomes necessary to prioritize changes. For small businesses, the key is to implement solutions that are both effective and feasible. These may include switching to recycled packaging, optimizing delivery routes, or reducing the use of excess materials.

Within this strategy, ethical communication holds a special place. Transparency, acknowledgment of limitations, and the disclosure of real results foster a sense of trust – which is critically important in an era of information overload and rising incidents of greenwashing.

Another important element is expanding opportunities through partnerships. Collaboration with local ecosystems enables the sharing of responsibilities and the accumulation of collective knowledge and experience.

The next stage involves the gradual implementation of certifications. Certification not only serves a communicative purpose but also helps structure internal processes, creating standards for further growth.

The final component of the model is the development of a digital strategy. This allows brands not only to share their environmental narratives but also to build a sustainable digital community around them. In this context, digital tools become an essential part of ecological transformation, enhancing brand authenticity, increasing visibility, and enabling growth in line with the values of the new economy.

Therefore, despite numerous challenges, small businesses possess a unique potential to drive sustainable consumption models. With proper support, access to knowledge, and technological tools, microbrands can launch localized transformation processes that contribute to broader environmental and social goals of sustainable development.

The issue of sustainability in e-commerce is increasingly drawing the attention of both academic researchers and industry professionals, as the rapid growth of online sales is accompanied by significant environmental pressure.

One of the most pressing problems is excessive packaging. This is especially apparent in the B2C segment, where each item is individually wrapped – often with excessive cushioning or decorative elements – making recycling more difficult [10]. Additionally, the use of mixed materials, which are hard to recycle, and the inefficient use of recycled content further reduce the overall sustainability of packaging.

Another major factor is emissions related to logistics. The demand for fast delivery reduces the efficiency of supply chains, often resulting in underfilled

shipments and repeated deliveries. This significantly increases CO_2 emissions per unit of product and places additional stress on the climate system [14].

A third often-overlooked aspect is full product life cycle management. Elements of the circular economy – such as reuse, repair, returns, and disposal – are still far from being standardized in the industry. Even when green solutions like biodegradable packaging are introduced, they may be ineffective if not supported by systems for their proper use and disposal [15]. Without the necessary recycling or composting infrastructure, such initiatives remain cosmetic and fail to deliver the intended environmental benefits.

However, these challenges have clear and achievable solutions. For instance, minimalist packaging – both as a concept and a practice – reduces material use and lowers logistics costs due to lighter and more compact shipments. Companies that have implemented "smart packaging" standards report reduced environmental impact as well as increased customer loyalty, especially among eco-conscious consumers [10].

Local warehousing and last-mile delivery optimization also offer promising solutions. Establishing fulfillment centers near major customer hubs, partnering with local courier services, and optimizing routes can significantly reduce emissions, speed up delivery, and ease transport-related burdens [14]. In this case, reducing environmental harm goes hand in hand with improving business efficiency.

Another effective practice is the use of biodegradable materials, particularly in packaging. To achieve real environmental benefits, however, these materials must not only be capable of biodegradation but also be supported by appropriate disposal systems. This requires cooperation between businesses, governments, and consumers – including labeling, education, and infrastructure [15]. These efforts call for a comprehensive approach in which environmental responsibility is shared among all stakeholders in the e-commerce ecosystem.

In sustainable commerce, advertising plays a much deeper role than simply driving sales. It becomes a key means of building value-based trust between brands and consumers, enabling communication that goes beyond commercial interests and incorporates ethical, social, and environmental dimensions of consumption. At the

heart of this communicative paradigm lies authenticity – the alignment of brand messaging with real action. Honest and transparent communication helps form strong emotional connections with consumers, who increasingly seek conscious and ethical choices [18].

One of the most effective tools for building authentic advertising is storytelling – a narrative strategy that allows brands to share their identity not through technical specs but through compelling stories. Stories about local production, material sourcing, sustainable logistics, or ecological transformation become more than information; they serve as emotional links that help consumers identify with the brand.

An essential element of sustainable advertising is also data visualization – especially through infographics and video content. This makes it easier to communicate complex information, such as CO_2 emissions levels, the amount of recycled materials used, or energy consumption figures.

Influencers play a significant role in the sustainable advertising space. Acting as carriers of brand values rather than just product ambassadors, they help break down barriers between brands and consumers and foster open dialogue about the role of consumption in environmental, ethical, and cultural contexts.

Overall, advertising in sustainable e-commerce is more than a marketing tool – it is a strategic resource for cultural transformation. It not only shapes consumer preferences but also builds new models of consumption in which purchasing becomes an act of responsibility, belonging, and identity [18].

Conclusions

In the context of the growing climate crisis, e-commerce has emerged as a sector with substantial environmental pressure – with up to 37% of all emissions related to e-commerce attributed to product delivery and returns. At the same time, there is a notable rise in efforts toward sustainable production and logistics. Companies like Allbirds, Package Free Shop, Etsy, and Shopify demonstrate that innovation, transparency, and an eco-friendly approach can be both environmentally meaningful and economically viable. Allbirds has reduced its carbon footprint by 12% through the use of sustainable materials and digital solutions; Package Free Shop is fostering a

zero-waste culture; Etsy and Shopify are introducing carbon offset mechanisms and eco-packaging as sustainability standards for digital platforms.

However, greenwashing remains a serious concern – the deliberate exaggeration or distortion of a product's environmental benefits undermines consumer trust. Well-known examples – including Chevron, Volkswagen, Starbucks, Nestlé, and Fiji Water – show that even global corporations can misuse green rhetoric to mask their actual environmental impact. An effective response to this issue lies in a system of transparency, verification, and certification, which enables environmental claims to be backed by facts and recognized standards.

In this context, small and family-run businesses possess a unique potential for implementing sustainable e-commerce strategies due to their flexibility, local orientation, and authenticity. Building trust through open communication, local production, and community engagement creates the foundation for responsible consumption. The six-step strategy model – from impact audits to digital communication – offers microbrands a structured pathway toward adopting sustainable practices. Environmental advertising plays a key role in this process: through storytelling, data visualization, and influencer collaboration, it conveys brand values and helps establish new ethical standards in consumer behavior.

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