

DIGITAL TRANSFORMATION FOR SUSTAINABILITY: E-COMMERCE STRATEGIES FOR EMBEDDING GREEN PRACTICES

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ABSTRACT

The contribution to sustainability and achieving environmental transparency and accountability across the entire value chain in business organisations can be achieved by rethinking the vast opportunities of digital transformation. To ensure reliability and public trust in the operations of businesses, this paper tries to enlighten the need for E-commerce platforms to begin encoding sustainability into their algorithms, product recommendations, and common standards. This paper discusses the next frontier to planetary sustainability in the digital age. This paper depicts the role of green digital nudges like Data-Driven Personalization, which helps consumers make better decisions and drives businesses to adopt sustainable practices through understanding their impact and options for more sustainable living at the consumer and social enterprise levels. It also highlights that to help consumers make more informed choices, the sustainable attributes of products and services transacted online must be efficiently communicated by online retailers and e-commerce platforms in a more improved way. This will replicate the transfer of attaining sustainable consumption and production values.

KEYWORDS: Sustainable Development Goals (SDG), Data-Driven Personalization, Internet of Things (IoT), Product Recommendations, Strategies, Green Digital Nudges.

Introduction

The United Nations Summit on Sustainable Development in New York in 2015 adopted a new sustainable development agenda called "Transforming our World: The 2030 Agenda for Sustainable Development." Its members consist of 193 states. Their plan includes 17 goals and 169 tasks (Org, n.d.). The goal lies in the humanitarian aspects of improving quality of life and prospects. Among those SDGs, one of the essential goals is the transition to sustainable consumption and production patterns. "Sustainable consumption and production involve promoting the efficiency of resource and energy use, constructing sustainable infrastructure, providing access to essential social services, ensuring green and decent jobs and a better quality of life for all" (Revinova, 2021). This goal includes programs and action plans to make consumption and lifestyle transitions more sustainable. The UN plans to implement this SDG agenda first among developed countries and then spread it to every member country to make the most fruitful from it. The 12th Sustainable Development Goal consists of developing sustainable consumption and production. This agenda mainly focuses on improving lifespan through digital initiatives and is widespread in every consumption and production pattern. One of the critical aspects of this SDG is the transition to more sustainable e-commerce.

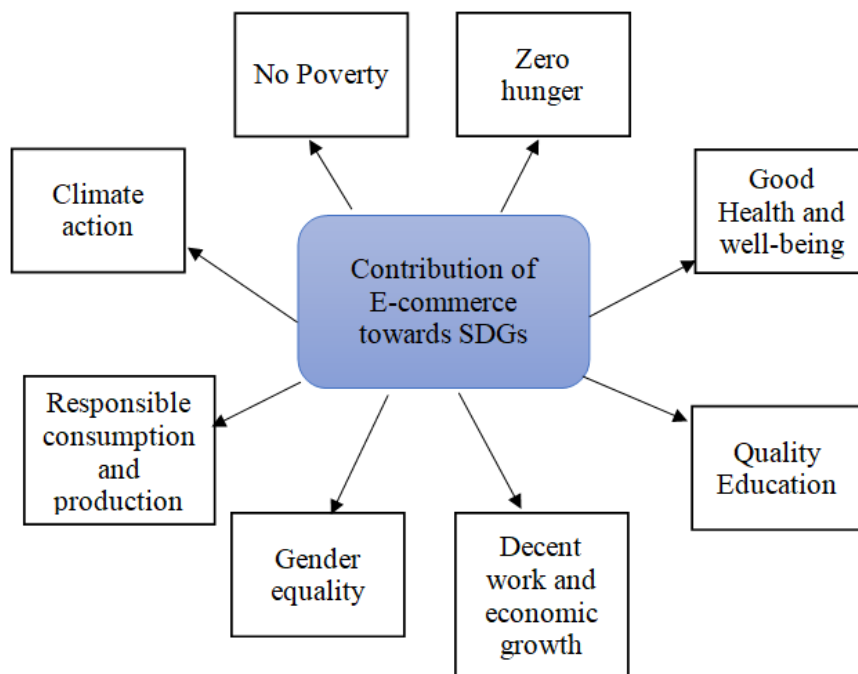
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As the burst of e-retail is incremental daily, it is essential to understand what precisely sustainable retail means. The term "sustainable retail" describes the methods and approaches retailers use to lessen their negative effects on the environment, encourage social responsibility, and satisfy customers' needs without threatening the capacity of future generations to meet their own needs. E-commerce evolves and plays a significant role, constituting the primary mechanism for implementing new economic models. In addition to attracting substantial attention among various research disciplines for several years, e-commerce has also seen considerable success in several industries. There are so many examples of agricultural products being promoted for sale, and it ensures transparency and proximity to fewer customers (Cai et al., 2015; Pool, 2001). Information is free of cost, especially regarding selling costs. The customer can easily access the products with price transparency and product discovery. It also improves transaction efficiency and reduces supplier costs in the supply chain (Zott, 2000). The contribution to sustainability and achieving environmental transparency and accountability across the entire value chain in business organisations can be achieved by rethinking the vast opportunities of digital transformation.

This comprehensive analysis is imperative for gaining insights into the potential outcomes and navigating the path toward a sustainable e-commerce landscape (Goyal et al., 2019). This knowledge will enable us to address the identified deficiencies, enhance the existing positive impacts, and develop strategies that promote sustainable e-commerce practices.

Role of Data-Driven Personalization in Sustainable Development

There are so many classifications available in the sustainable E-commerce literature. One categorisation is based on contribution towards business development (Novak K., n.d.). Here, in this paper, the categorisation is based on the e-commerce contribution toward sustainable development goals. It is shown below,



Since Artificial Intelligence (AI), Deep Learning (DL), Machine Learning (ML), Internet of Things (IoT), and big data-driven analytics impact every aspect of our lives and have brought about significant changes in recent years, it is essential to study about the contributions that offered towards preserving of sustainability by this technology.

SDG 1 aims to eradicate poverty globally, but the COVID-19 pandemic has increased extreme poverty. Unidimensional indicators like income and consumption levels estimate poverty, but economists call for the development of multi-dimensional approaches. Big data and data-driven models are used to

map poverty among people, households, and regions (Blumenstock et al., n.d.; Jean et al., n.d.; Levin et al., 2020); to create and carry out policies aimed at reducing poverty (Jean et al., n.d.); and to track and predict the results of these programs and policies (Sheng, 2021).

SDG 2 aims to end hunger, achieve food security, and promote sustainable agriculture. Hunger is caused by various factors such as poverty, political instability, low agricultural productivity, and natural disasters. Comprehensive measures are needed to reduce grain consumption, improve agricultural productivity, and allocate public funds for agricultural development (Tireuov et al., 2018). Robust policymaking and implementation are necessary to ensure food supply and sustainable production (Blesh et al., 2019; Zeigermann, 2020).

SDG 3 aims to improve global health by reducing maternal mortality, neonatal and under-5 mortality, combating epidemics, and decreasing deaths from traffic accidents. Extensive data-driven health systems can help address issues related to maternal mortality by enabling early prediction, monitoring, online diagnosis, and medical consultation (Li et al., 2021; Ngiam & Khor, 2019; Rodríguez et al., 2016). AI-based and data-driven decision support systems can help reduce neonatal and under-5 mortality rates by providing affordable and accurate neonatal care (Betts et al., 2021).

SDG 4 seeks to provide all people access to free, fair, and high-quality primary and secondary education, particularly in remote areas with limited infrastructure. With the help of artificial intelligence (AI) and data-driven frameworks, digital learning (D-learning) can facilitate flexible and efficient learning, track student progress, and give access to educational resources (Kumar Basak et al., 2018).

SDG 5 focuses on gender equality and empowerment of women and girls, but there are challenges in data collection and gaps in gender-disaggregated statistics (Buisson et al., 2022). Efforts like the SDG Gender Index and Equal Measures 2030 aim to address these issues and use data-driven tools for advocacy and data collection.

The objectives of **SDG 8** are to advance decent work for everyone, employment, and sustainable economic growth. SDG 8 has been significantly hit by COVID-19, which has resulted in employment losses and a drop in the global GDP. AI and big data can potentially boost the economy and create jobs. Artificial Intelligence and Machine Learning (AI) in finance can help increase financial inclusion and banking service accessibility (Truby, 2020).

SDG 12 calls for organisations to use big data and predictive analytics to ensure sustainable production and consumption patterns. SDG 12's indicators—which centre on resource productivity, CO2 emissions, circular material usage, waste formation, and harmful chemical consumption—have flaws (Gasper et al., 2019). SDG 12 and marketing and AI are intricately related because they can both encourage sustainability initiatives and lead to more consumption (Hermann, 2023).

SDG 13 centres on achieving climate resilience through digitisation through targets 13.1, 13.2, and 13.3. Target 13.1 uses data-driven models to improve warning and prediction systems to lower the number of deaths linked to climate change (Warren, 2010). The integration of climate change measures into national policies and disaster management strategies is the focus of Target 13.2. Accurately estimating catastrophe mortality through integrating numerous data sources can assist policymakers in implementing preventive measures (objective 13.2) (Saulnier et al., n.d.). Target 13.3 emphasises the necessity of broadening education, raising awareness, and developing capacity for mitigating climate change.

Existing Strategies for Sustainable E-commerce

Sustainable Transition (ST) is generally understood as a fundamental and multi-dimensional transformation of large socio-technical systems toward sustainable production and consumption in the long run (Zhang, 2023). Other significant issues relating to unsustainable patterns in social-technical systems include production and consumption, which cannot be resolved by minor adjustments but require a transition to new systems (John Grin et al., 2011; Siikavirta et al., 2002). As previous research has consistently shown, e-commerce plays a significant role in production and consumption. Examples of these industries are the food sector (Siikavirta et al., 2002), the purchasing and manufacturing cycles (Gunasekaran et al., 2002), the making and use of packaging (Escursell et al., 2021), and the supply chain. Information and communication technologies (ICTs) and electronic business-to-business data exchange interfaces (EDIs) have made it easier to manufacture and process food, which helps to satisfy better consumer expectations for high-quality products and sustainable food production (Hartmann M et al., 2010).

Similar to how it affects consumption, technical innovation in e-commerce significantly impacts the process of service production and reshapes how businesses connect with their customers (Ba & Johansson, 2008). Simple information flow and communication boost sales of a range of goods and offer a more practical means of obtaining goods and services. Additionally, e-commerce makes communicating more accessible for businesses and customers and provides a more practical way to motivate customers to co-create value (Zhang & Berghäll, 2021). As a result, companies are better equipped to satisfy customer requests while minimising excess inventory. Since e-commerce incorporates more information flow and rewrites the conventional ways production might be processed and consumed, it constitutes a fundamental revolution in the entire show and consumption journey. The most significant benefit of e-commerce is that it can help reduce energy consumption so that it can be used to lead a more sustainable future (Zhang, 2023).

Another emerging topic is collaborative consumption, which is based on sharing, lending, borrowing, renting, and gifting (Rita & Ramos, 2022). It enhances resource allocation and boosts sustainable use (Belk, 2014). This particular topic is relevant to the sharing economy. Researchers are interested in the sharing economy because it allows people to share unused physical assets. Airbnb is one case of the sharing economy. By analysing the significance of consumer motivations for and against peer-to-peer sharing, Hawlitschek et al. created an intriguing study on this subject. They concluded that ecological sustainability was one of the most important factors influencing the adoption of peer-to-peer sharing platforms. Furthermore, collaborative consumption has been seen from the circular economy and waste-free perspective by other researchers like Arman and Mark-Herbert, where the customer is both the buyer and the seller in consumer-to-consumer transactions. A circular economy focuses on cutting waste and carbon emissions while extending the useful life of products.

City logistics is another emerging topic related to consumer behaviour and sustainability in e-commerce. City logistics can reduce transaction costs, enhance economic efficiency and growth, and positively impact the environment. Villa and Monzón developed a related study. The authors studied a system to provide delivery services using metro stations to collect parcels in lockers. They suggested implementing such a service would reduce greenhouse gas emissions, noise, and air pollution. Accordingly, Ignat and Chankov examined whether e-commerce customers changed their last-mile delivery preference if additional information about the environmental and social sustainability impact was available. Their results suggest that displaying the environmental and social impact information of last-mile deliveries influences the preference of e-commerce customers, leading them to choose a more sustainable option. Moreover, Gatta et al. concluded that home deliveries would benefit the environment due to the higher efficiency in a study that aimed to understand the impact of e-grocery by considering consumers' shopping trips and freight movements from the distribution centres to consumers.

Communicating Sustainable Attributes

The public needs to be encouraged to gain awareness of sustainability concepts and engage in sustainable practice. Grönroos & Voima, 2013 suggested the "value co-creation" concept that enables the customer to interact dialogically with service providers. E-commerce provides an advantageous opportunity in information exchange to facilitate this process. To help consumers make more informed choices, online retailers and e-commerce platforms must improve on effectively communicating the sustainable attributes of products and services traded online (Zhang, 2023).

The Next Frontier in Planetary Sustainability

According to experts, digital nudges like eco-friendly filter options, campaigns of environmental impact of products, and utilising video game engagement techniques can raise public awareness of risks and encourage the adoption of strategies to lower greenhouse gas emissions. By applying collectively, these green digital nudges assist customers in making better decisions and encourage businesses to implement sustainable practices. Incentives and digital engagement models are also being used by mobile apps such as Ant Forest, developed by Ant Group, to encourage 600 million people to make sustainable decisions. Green energy points are awarded to users who make low-carbon decisions, which they can use to plant trees.

Digital product passports, which contain relevant information on product origin, composition, environment, and carbon performance, are another core standard for digital sustainability pioneered by the European Union. Digital product passports will strengthen consumer protection and increase trust and rigour in environmental performance claims. In the digital age, they are the next frontier for planetary sustainability.

Future Directions in E-commerce Sustainability

Among the significant challenges are the so-called "last mile problem" of sustainable business-to-consumer e-commerce distribution and the impact of electronic market development on green logistics challenges involving sustainability and reverse logistics.

The most costly and time-consuming process, the last mile problem, in e-commerce is shipping goods from warehousing to the customer, which will be much more expensive than the customer's expectation as he expects free shipping and delivery. Regarding the sustainability of the supply chain, competitive strategies also need to be considered. For e-commerce to be genuinely sustainable, social, environmental, and economic factors must be considered together, not separately. If e-commerce firms impose good digital marketing strategies and improve product recommendation technologies according to consumer preference, reverse logistics can be avoided, which will prevent environmental hazards.

The social responsibility and sustainability of e-commerce demands further research. Sustainable e-commerce business models can benefit businesses in various ways. Implementing environmentally friendly practices in the supply chain can lower costs and reduce emissions. Selecting ecologically friendly packaging can save costs and offer more customisation options. Future studies on artificial intelligence are needed to optimise delivery routes and reduce waste.

The prosperity of electronic commerce primarily relies on the satisfaction of consumers. Thus, it is imperative to direct attention towards establishing enduring electronic business by integrating social media, mobile marketing, and local marketing. It is of utmost importance to comprehensively and holistically examine issues such as ethics, legislation, and cyber security. Ethical and legal electronic commerce should provide equitable remuneration, timely tax remittance, and satisfactory working conditions.

In particular, small businesses need to develop their e-commerce and e-literacy skills. Women entrepreneurs need to be part of e-commerce development. Through e-procurement, governments can encourage local businesses to use the Internet. It is also necessary to address trade barriers and tax issues in e-commerce. Cooperation between international stakeholders and support between stakeholder groups is essential for fostering inclusive e-commerce.

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- classifications): biochemistry; ecology and environment The International Journal ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES. 6(1), 446–455. [https://doi.org/10.9770/jesi.2018.6.1\(27\)ï](https://doi.org/10.9770/jesi.2018.6.1(27)ï)*
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