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The concept of sustainability in e-commerce and business

Koncept održivosti u e-trgovini i biznisu

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Abstract: The emergence of internet and digital channels has strongly affected the business processes and marketing, providing new types of relations with customers in online environment. One of the most significant impacts is made in the segment of trade with the development of e-commerce models. The paper analyses the implications of e-commerce on the environment and indicates the significant sustainability aspects in online trade. The starting point of this research is the global concern regarding the effects of online business processes on CO_2 emissions, plastic packaging waste and other ecological implications. The paper uses literature review and actual statistical analysis to provide scientific insight into the sustainability of e-commerce and its business segments such as distribution and transportation. Furthermore, the study concentrates on green solutions for delivery services and contributes to better understanding of ecological footprint in online trading. When analysing the effects of different products traded online particular focus is related to apparel industry which is recognised as one of the industries with the strongest impact on the environment.

Keywords: sustainability, e-commerce, environment, online trade, online business.

Sažetak: Pojava interneta i digitalnih kanala snažno je uticala na poslovne procese i marketing, pružajući nove vidove odnosa sa kupcima u onlajn okruženju. Jedan od najznačajnijih uticaja desio se usled razvoja modela elektronske trgovine. U radu se analiziraju implikacije e-trgovine na životnu sredinu i ukazuje na značajne aspekte održivosti u onlajn trgovini. Polazna tačka ovog istraživanja je globalna zabrinutost u vezi sa efektima onlajn poslovnih procesa na emisije CO_2, otpad od plastične ambalaže i druge ekološke implikacije. U radu su korišćeni pregled literature i aktuelna statistička analiza kako bi se pružio naučni uvid u održivost e-trgovine i njenih poslovnih segmenata kao što su distribucija i transport. Studija se takođe orijentiše na zelena rešenja za usluge isporuke i doprinosi boljem razumevanju ekološkog otiska u onlajn trgovini. Prilikom analize efekata različitih proizvoda kojima se trguje onlajn, istraživanje se posebno fokusiralo na industriju odeće koja je prepoznata kao jedna od industrija sa najjačim uticajem na životnu sredinu.

Ključne reči: održivost, e-trgovina, životna sredina, onlajn trgovina, onlajn poslovanje.

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INTRODUCTION

The digital age has far-reaching implications on marketing and business. The internet technology has led to the development of new routes and channels to market and redefined the business processes of customer communication, distribution, and buyer/seller transactions.

Digital context of contemporary business is often related to term electronic commerce (e-commerce) that refers to financial and information transactions which take place electronically between an organization and any third party. Chaffey et al. (2019) have provided similar definition indicating that e-commerce involves all electronically mediated information exchanges between an organisation and its external stakeholders. In literature, e-commerce is also known as a paradigm shift that is radically changing the traditional way of doing business (Lee, 2001).

According to Kalakota and Whinston (1997) there are four significant perspectives of e-commerce:

- Communications perspective – the delivery of information, products or services or payment by electronic means.
- Business process perspective – the use of technology towards the automation of business transactions and workflows.
- Service perspective – enabling cost cutting at the same time as increasing the speed and quality of service delivery.
- Online perspective – the buying and selling of products and information online.

The aim of this paper is to analyse the implications of e-commerce on the environment and to indicate the significant sustainability aspects in online trade. The starting point of this research is the global concern on ecological effects of online business processes resulting in CO_2 emissions, plastic packaging waste and other environmental implications. The paper uses literature review and actual statistical analysis to provide scientific insight into the sustainability of e-commerce and its business segments such as distribution and transportation. Furthermore, the study concentrates on green solutions for delivery services and contributes to better understanding of ecological footprint in online trading.

1. MATERIALS AND METHODS

The methodological framework in this paper is based on literature review and actual statistical analysis to provide scientific insight into the sustainability of e-commerce and its business segments such as distribution and transportation. The research subject is the exploration of different theoretical approaches to sustainability concept in e-commerce, and content analysis of statistical reports dealing with the effects of online business processes on CO_2 emissions, packaging waste and other ecological implications. Furthermore, the study concentrates on green solutions for delivery services and contributes to better understanding of ecological footprint in online trading.

The starting point in this research is the assumption that the growth of e-business has negatively affected the environment resulting in increased urban transport, greenhouse gas emissions and plastic packaging waste.

According to literature review sustainable development is a harmonious relationship between ecology and economy, to preserve the natural wealth of our planet for future generations. The most frequently cited definition of sustainable development can be found in the report "Our Common Future", which, at the invitation of the United Nations, was prepared by the World Commission on Environment and Development in 1987. It says that "sustainable development is development that meets the needs of the present, without questioning the ability of future generations to meet their own needs." The World Business Council for Sustainable Development indicates that sustainable development begins with sustainable business and businessmen who will drive change towards environmental efficiency, innovation, and social responsibility.

The development of digital technologies that affected business processes, marketing channels and customer behaviour, has provided many opportunities and benefits for stakeholders but at the same time the digital age has brought new ecological dilemmas and environmental concerns. First important steps in studying the environmental effects of e-commerce were made by the following authors.

- De Figueiredo (2000) in studying sustainable business benefits and profitability provided by e-commerce.
- Lumpkin et al. (2000) who pointed out that the internet has decreased the costs and speeded up the production processes of raw materials and hard goods.
- Leahy (2001) who indicated that the use of internet and e-commerce has caused a significant increase in packaging and shipping by air resulting in air pollution as well.
- Fichter (2002) in analysing the problems of energy consumption and the disposal of ICT infrastructure, the ecological effects of

transportation and resource productivity as well as the implications of e-commerce on consumption patterns.

- Siikavirta et al. (2002) in a study that provided a significant insight into the consequences of e-commerce on greenhouse gas emissions, which are demonstrated in the case of grocery home delivery.
- Abukhader & Jönson (2003) who compared the positive and negative environmental aspects of e-commerce. The authors stated decrease in energy demands and replacing warehousing with websites and other online channels as the most important positive implications. On the other hand, negative effects involve electricity usage and increase in retailing.

In recent years, the development of e-commerce has strongly affected the industries and consumption patterns worldwide causing even more scientific interest on sustainability issues regarding its implications on the environment. Jaller and Pahwa (2020) indicated that the growth in e-commerce provides negative effects on CO_2 emissions from transport and delivery activities. Cheba et al. (2021) explored the ecological effects of e-commerce in cities and analysed distribution routes. The study conducted by Prajapati et al. (2022) was dealing with sustainable solutions in logistics that could provide better efficiency in supply chains. In addition, Kumar et al. (2022) explored ecological innovations in supply chain and the usage of reusable containers to reduce waste and emissions. Furthermore, a significant contribution was made by Islam et al. (2023) who introduced the concept - Sustainable E-commerce with Environmental-impact Rating (SEER) that can be applied to improve eco-friendly decision making and choices in online commerce.

2. RESULTS AND DISCUSSION

The development of digital technologies has affected almost every industry and sector. With approximately 5.16 billion internet users worldwide that has been recorded at the beginning of 2023 (Petrosyan, 2023) online transactions have become basic customer need. In retail industry, e-commerce has opened new possibilities of doing business and redefined buyer/seller transactions. According to recent statistics (figure 1), in 2021 retail e-commerce sales reached around 5.2 trillion U.S. dollars worldwide. The sales are expected to grow over the next years with a forecast to reach 8.1 trillion dollars by 2026.

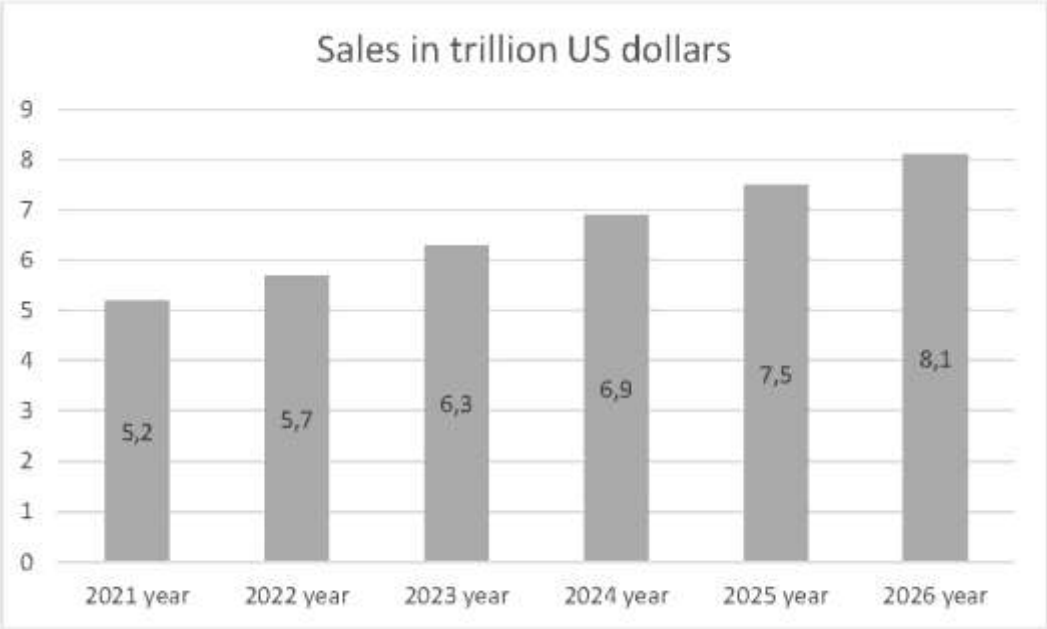

Figure 1: Retail e-commerce sales worldwide
Source: Chevalier (2022)

The most significant e-commerce markets are China, USA, and Europe. However, the highest worth is accumulated in Chinese market, reaching 1,156.3 billion dollars U.S. in 2022 (statista, 2022). The most dominant companies that lead the global e-commerce market are Chinese Alibaba group (with online sales of over 760 billion U.S. dollars), Amazon (239 billion U.S. dollars), JD.com (215 billion U.S. dollars), eBay (93 billion U.S. dollars), Shopify (33 billion U.S. dollars), Rakuten (31 billion

U.S. dollars), and Walmart (239 billion U.S. dollars) (Pasquali, 2022). Bearing in mind the ecological footprint of the industry, these companies are considered to be the most responsible for the environmental and health impacts for the products they source, market and deliver to their customers (Environmental Defence Fund, 2020).

According to literature review, the growth of e-commerce has significantly affected business activities, resulting in increase in production and delivering with environmental implications in greenhouse gas (GHG) emissions from transportation, packaging waste and higher consumption.

2.1. E-commerce related greenhouse gas emissions

When analysing the ecological footprint of e-commerce, one of the most frequently cited problems is the greenhouse gas emission. In studying these issues, a particular attention is paid on distribution channels in online business that differ in final stages of storage and distribution to the consumer. The distribution processes of products that are traded via e-commerce and demanded by customers involve shipping and delivery activities, resulting in increased fuel consumption and CO_2 emissions from transportation (Yuan et al., 2022).

Globally, the transport sector accounts about one quarter of all energy related greenhouse gas emissions. In 2020 the sector contributed to approximately 7.3 billion metric tons of carbon dioxide emissions. According to data demonstrated in figure 2, transport subsectors that are used in e-commerce such as shipping, aviation, medium and heavy trucks, and light commercial vehicles significantly participate in CO_2 emissions worldwide.

Another important aspect of sustainability of e-commerce is related to urban transportation and delivery solutions. This topic is also analysed in a study conducted by Arnold et al. (2018), who indicated that the growth in B2C commerce resulted in an increase in home delivery and additionally worsen the problems of urban transport such as traffic jams, noise, fossil fuel consumption, and pollution (Arnold et al., 2018).

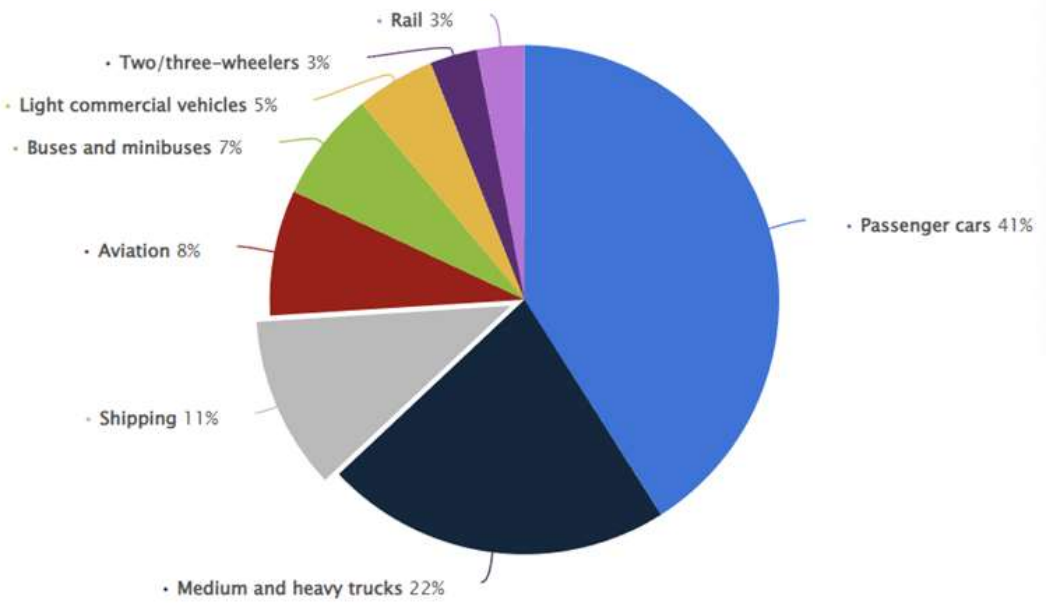

Figure 2: Transport related CO_2 emissions by subsector worldwide in 2020
Source: Tiseo (2023)

In addition to transport, retail activities are also recognised as a significant factor in e-commerce that contribute to CO_2 emissions. According to the World Business Council for Sustainable Development retail supply chains are responsible for 25% of global GHG emissions. In 2021 retail sales in e-commerce reached 5.2 trillion U.S. dollars worldwide, with the prediction to grow even more during the next period (Pasquali, 2022). The World Economic Forum (2022) predicts that if e-commerce continues to grow at 10-20% annually and reach 30-40% of total retail sales in 5-7 years, it will produce emissions of up to 0.5 giga tons of CO_2 equivalent. The figure refers only on development of the necessary supply network and does not include additional emissions by the industry. An important insight into these environmental issues is provided in a study (Zimmermann et al., 2022) conducted by the German Federal Environment Agency which demonstrates that carbon emissions from online retail

are higher on the journey from the central warehouse to the parcel centre than on the comparable route of the goods from the warehouse to the store.

Furthermore, different studies have demonstrated possibilities and solution for cleaner and more efficient transportation in delivering e-commerce products, as well as sustainable management principles that can be applied in the supply chain. In studying the effects of e-commerce and its deliveries in urban transport Cairns (1996) demonstrated the importance of algorithms for calculating the shortest routes in the case of London. In addition, Orremo and Wallin (1999) applied a scenario technique to understand the differences in emissions caused by home deliveries in compare with those of car shopping by people. The actual studies on transport related emissions in e-commerce include different approaches and eco-innovations such as transition to solar-powered electric vehicles, switch to new fuel technologies, net zero carbon programs, green packaging etc. In business practices the companies are searching for possible solutions to improve efficiency and sustainability in supply chains. For example, leading retailers such as Walmart and Target are developing partnerships with different companies across their supply chains as part of their sustainability strategies.

The literature review in this research has also listed few significant studies that emphasize positive environmental aspects of e-commerce related to GHG emission. For example, a recent study conducted by Xie et al. (2023) has indicated negative association between e-commerce and CO_2 emissions. Their results are also confirmed by Liang et al. (2021) who claimed that the growth in e-commerce affects the usage of smart technology that reduces CO_2 emissions. Another approach is made by Chen and Reklev (2014) who recognised the environmental potential of e-commerce, since its online activities can cause reductions in the use of vehicles and result in decline of CO_2 emission.

2.2. Packaging waste

Environmental assessments of e-commerce activities have also involved waste management, having in mind worrying statistics showing the growth in packaging used by this industry. According to IATA (2022) the e-commerce packaging market was valued at $43.1 billion in 2021 and is expected to reach $75.1 billion by 2025.

The market can be categorized by material into plastics, corrugated boards, paper, and other material. Another classification based on the end-users include fashion and apparel, consumer electronics, food and beverages, personal care products.

The environmental concerns regarding e-commerce packaging waste are particularly oriented towards the use and the disposal of plastic waste.

In 2019 the global e-commerce industry used around 2.1 billion pounds of plastic packaging. The experts anticipate that the figure will increase over the next years (figure 3), reaching 4.5 billion pounds by 2025 (Statista Research Department, 2023).

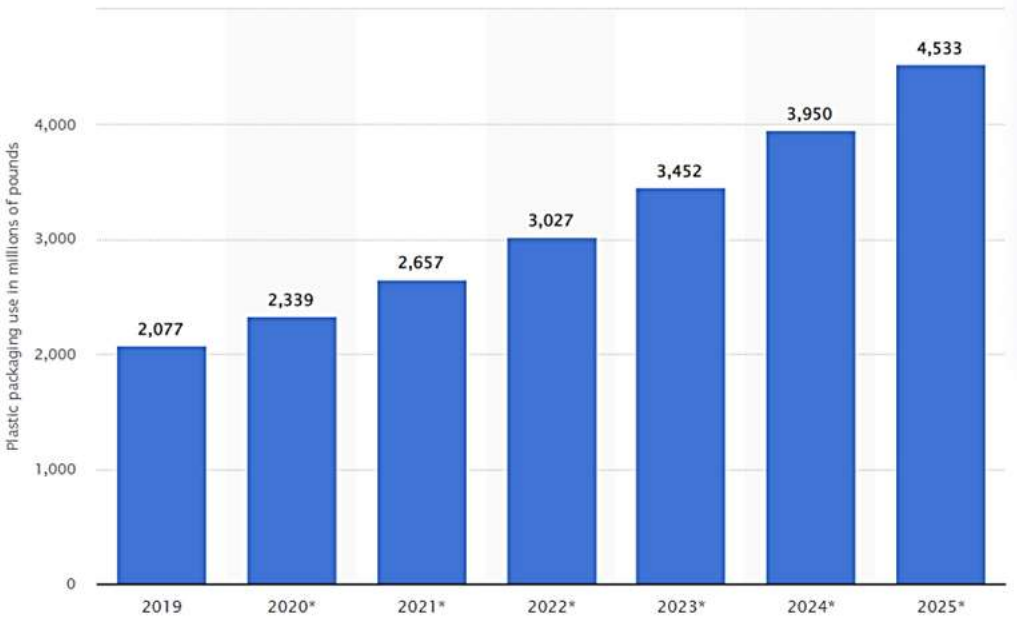

Figure 3: Annual e-commerce plastic packaging use in 2019 with projections to 2025
Source: Statista Research Department (2023)

Escursell et al. (2021) stated that if the current plastic production and waste management trends continue, it is predicted to reach 12 billion metric tons of plastic on global scale by 2050. The growth of e-commerce that affected increase in packaging waste has therefore risen the need for materials and business practices that minimize impact on the environment. In accordance with this, the authors provided findings demonstrating the importance of innovative processes in production, and indicating additive manufacturing and 3D printing as green solutions that can optimize package volume and shape, and therefore provide sustainable production.

2.3. E-commerce implications on consumption

The development of B2C e-commerce has brought new ways of communication with consumers that has strongly affected their purchasing behaviour and habits. The growth in online shopping that was registered over the previous years is inevitably associated with overproduction, increased waste and higher consumption by customers who demand, buy, and use products. Therefore, it can be stated that e-commerce activities and transactions are interrelated with consumers' needs, demands and purchasing behaviour.

To provide sustainable development in online business it is important to rise the consumer awareness about ecological questions and the consequences of overproduction and consumption patterns. In literature, the term sustainable consumption originate from 1994, when the following definition was proposed at the Oslo Symposium: "the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of further generations" (Ministry of the Environment, 1994).

The review of recent studies has demonstrated that global consumers have higher awareness about environmental issues and evaluate ecological aspects in purchasing products. According to a study conducted by Nielsen, 81% of global consumers consider that it is very important for companies to implement strategies to improve the environment (Nielsen, 2018). Another survey provided by McKinsey in 2020 indicated that 67 percent of all respondents and 75 percent of millennial consumers consider sustainability before making a purchase (Granskog et al., 2020). In addition, research conducted by Eurobarometer (2020) has found that a majority of Europeans think that protecting the environment is very important to them personally. The most important environmental issues for Europeans are climate change (51%), followed by air pollution (46%) and the growing amount of waste (40%). An important insight into the environmental awareness of global consumers is demonstrated in 2021 when approximately 750,000 people signed a petition demanding that one of the leading online retailers Amazon provide a plastic-free packaging option at checkout. (https://www.greenbiz.com, 2022).

Further research of e-commerce related consumption has included the analysis of product categories that are purchased online in European Union. According to data presented in figure 4 the majority of online customers (68%) used e-commerce to buy clothes, shoes and accessories. The importance of fashion products for consumption patterns is also demonstrated in the fact that the consumption of apparel worldwide amounted more than 168.4 billion pieces in 2021. It is estimated that this number will increase in the following years to 197.3 billion pieces in 2026 (Statista Research Department, 2022, Jun 3). Having in mind this fact it is important to emphasize the environmental aspect of the fashion industry and the main concerns regarding the consumption of its products.

In analysing the ecological footprint of fashion business, the following data demonstrate the negative effects:

- The CO_2 emissions from apparel industry amounted 1.01 gigatons in 2019 (Smith, 2022).
- The fashion industry is projected to use 35% more land for fibre production by 2030 - an extra 115 million hectares that could be left for biodiversity or used to grow crops to feed an expanding population (WRAP, 2017).
- The apparel and footwear industries generate between 8 and 10% of global pollution impacts (European Parliament, 2021).
- Water used by the fashion industry today amounts 93 billion cubic meters annually (UNCTAD, 2019).

Having in mind the stated ecological implications, the crucial factor to apply sustainability concept in online purchasing of apparel products is consumer awareness. The rise of environmental awareness has resulted in encouraging statistics. The share of sustainable denim in stock has greatly increased since 2019 (Smith, 2022). In addition, in 2021 the sales share of sustainable clothing items within the global apparel market was approximately 3.9 percent. The experts predict that this figure will increase to 6.1 percent in 2026 (Statista Research Department, May 17, 2022).

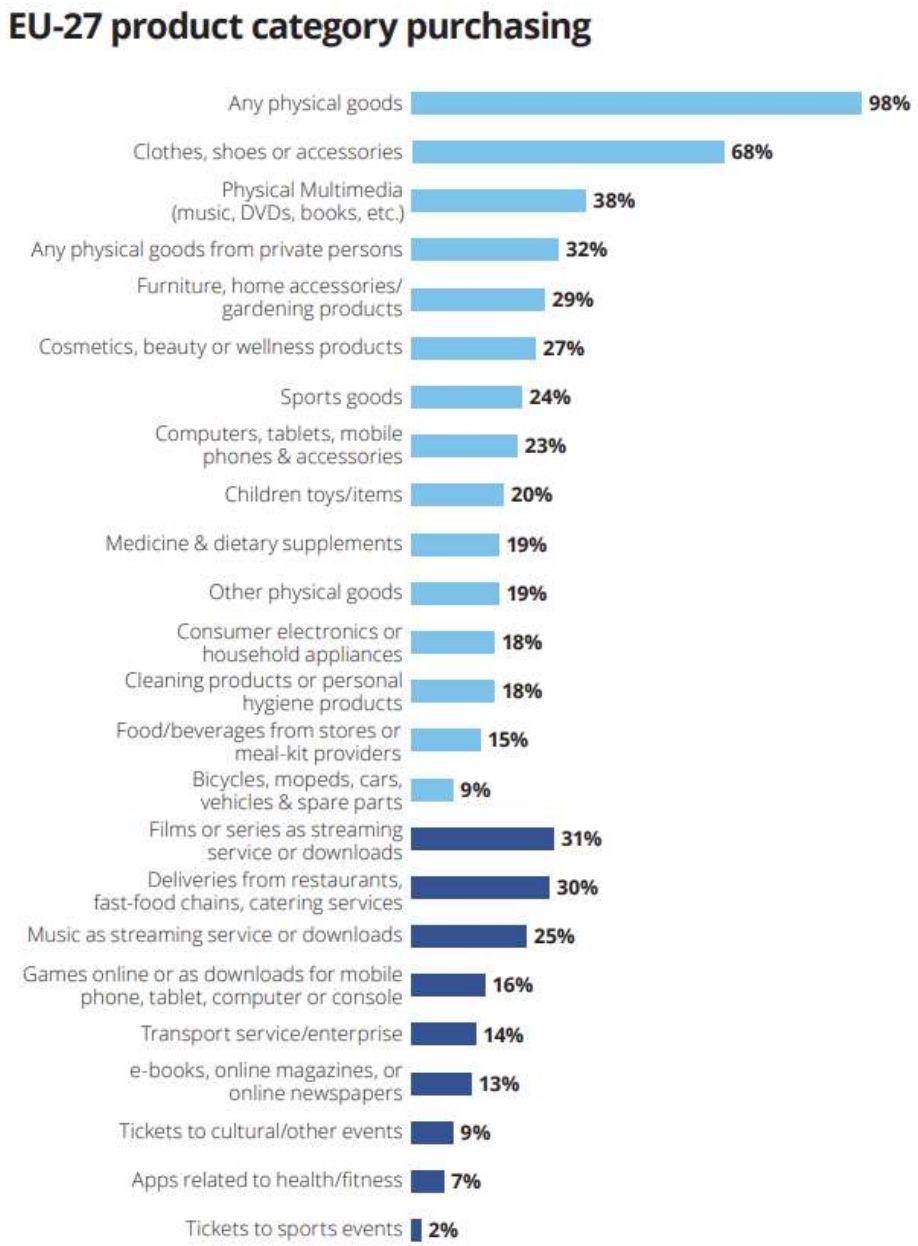

Figure 4: The product categories purchased online in EU (individuals who purchased online)
Source: Eurostat (2021)

CONCLUSION

The findings presented in this paper provide scientific insight into the environmental aspects of e-commerce and online business. Theoretical background of the research has introduced relevant studies dealing with positive and negative implications of e-commerce activities and processes for sustainability. The most dominant theoretical approach in the literature is that the growth of e-commerce is related to overproduction of resources and products, increased retail, shipping, urban deliveries, and other transport activities that have significant effects on greenhouse gas emissions, plastic packaging waste, electricity usage and consumption patterns. Furthermore, the paper presents recent findings from global statistical reports indicating the main ecological concerns related to e-commerce and predictions. However, the research was limited only on global ecological footprint of the industry, with special emphasis on the online shopping in apparel industry which is recognised as a significant polluter. Besides the negative aspects, the study has recognised positive implications of online trade that refer to decrease in energy demands, replacing warehousing with digital solutions, and the potential of smart technologies that can reduce CO_2 emissions. The paper contributes to

better understanding of the sustainability concept in e-commerce and provides scientific basis for further research.

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