Article

Global Research Trends in Consumer Behavior and Sustainability in E-Commerce: A Bibliometric Analysis of the Knowledge Structure

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Abstract: Consumers are conscious of increasing online purchases and demand sustainable consumption friendly actions. Although there is increasing interest in this topic, the research status, development, and structure of consumer behavior and sustainability in e-commerce research is scarce. This study aims to analyze the intellectual, conceptual, and social knowledge of consumer behavior and sustainability in e-commerce research to generate new understandings. Data from 104 articles were collected from the Scopus database, and a bibliometric analysis was conducted. Results revealed a close relationship between the topic and city logistics, big data analysis, customer engagement, circular economy, online services, and omnichannel retail, showing the different research approaches and the transversal themes related to the topic. This study contributes to the sustainability academic research by identifying trends and suggesting future research topics.

Keywords: consumer behavior; sustainability; e-commerce; bibliometric

1. Introduction

E-commerce has gained a strong foothold within the realm of worldwide commerce. This should not be surprising since e-commerce brings several sound benefits to international commerce by making it easier for companies to expand into foreign markets, building a faster international presence as well as to find the product-market fit and shorten the business-to-business (B2B) sales cycles [1]. The global e-commerce market is estimated to reach USD 5.55 trillion in 2022 [2]. Whereas in 2020, online sales were 17.8% of overall sales, e-commerce share is expected to jump to 24.5% by 2025, marking a 37.6% increase in just five years.

The interaction between consumer behavior and e-commerce has been paramount to its development from a mere online retail channel to a more sophisticated approach involving online retailing across several e-channels (e.g., website, mobile app, social media, Internet-enabled TV) within a multichannel e-commerce environment framework [3,4]. Another important trend is the omnichannel business perspective due to its pervasiveness since consumers are increasingly alternating between online and offline sales channels [5]. Due to the relevance of the topic, studies on consumer behavior in e-commerce have received much attention by researchers (e.g., [6–8]).

Sustainability issues in e-commerce have also been the focus of many authors, either by looking at packaging and its waste [9], cross-border e-commerce sustainability [10], e-commerce cyber-security and sustainability [11], or addressing the three dimensions of sustainability (environmental, social, and economic aspects) in e-commerce [12].

The existing literature has focused on multiple approaches that contribute to the understanding of the consumer behavior and sustainability in e-commerce such as trans-

portation [13] and last-mile distribution [14], dual-channel and carbon emissions [15], energy consumption [16], or smart package [17], among others. The assorted volume of publications related to this topic has made the task of researchers and practitioners to be up-to-date more challenging. Integrating the created knowledge into one document is necessary as it enables a robust understanding of the topic [18,19], and the mapping of existing research through the identification of the intellectual, conceptual, and social knowledge on consumer behavior and sustainability in e-commerce is absent. The synthesis of the existing studies through mapping is fundamental to generate new research lines by identifying areas that require more scientific effort, aggregating fragmented knowledge and identifying the emergence of new topics [20,21]. To answer this challenge, this study aimed to analyze the intellectual, conceptual, and social knowledge of consumer behavior and sustainability in e-commerce research to generate new knowledge. A search query was applied in the Scopus database to collect the published articles focused on the topic under analysis. A bibliometric analysis was performed for data evaluation since it permits the analysis of the bibliographic material quantitatively, offering an objective and reliable analysis [20,22]. This manuscript is structured to give an initial overview of consumer behavior and sustainability in e-commerce, setting the scene and providing the proper context to this investigation. Next, it explains the methodology used including the selection strategy as well as the data extraction and analysis performed. Then, the results are thoroughly analyzed by looking at the annual scientific production, the performance of scientific journals, the most influential articles, the authors' performance, and keyword analysis. The paper concludes with the identification of directions for future research, the limitations, and conclusions.

2. Consumer Behavior and Sustainability in E-Commerce: Related Studies

Over the last decade, the e-commerce business has been pressured to improve its sustainability performance by shareholders, governments, and society [23]. Consumers have discovered that by using e-commerce, multiple advantages are observed such as practicability, convenience, utility and habit [24], inconvenience of traffic or weather [25], and environmental issues [14]. Such pressure has led to incorporating environmental, social, and economic issues in the e-commerce processes. Subsequently, the sustainability topic associated with e-commerce and consumer behavior has gained importance over recent years [9,26]. Whereas e-commerce considers commercial transactions conducted electronically on the Internet including types such as business-to-consumer, business-to-business, and consumer-to-consumer, sustainability is made up of three pillars, namely, the economy, society, and the environment.

Having an in-depth understanding of the consumer behavior and sustainability in e-commerce requires an examination of research from a variety of perspectives [27]. This topic has seen growing interest. For instance, one of the emerging topics is collaborative consumption, which is based on sharing, lending, borrowing, renting, and gifting [28]. This type of consumption is increasing due to the emergence of modern technologies such as e-commerce. As a result, it increases sustainable resource consumption and improves resource allocation [29,30]. The sharing economy is related to this particular topic. The sharing economy has caught the interest of researchers as it relates to the access to under-utilized physical assets from one individual to another [31]. One example of the sharing economy is Airbnb. Hawlitschek et al. [32] developed an interesting study on this topic by examining the importance of consumer motives for and against peer-to-peer sharing and concluded that one of the most critical drivers for the use of peer-to-peer sharing platforms was ecological sustainability.

Moreover, other researchers such as Arman and Mark-Herbert [33] observed collaborative consumption from the circular economy and waste-free perspective, where the consumer is both the buyer and the seller in consumer-to-consumer activities. A circular economy relates to the extension of the product life and product utility and reducing the waste and carbon footprint. The authors aimed to understand the consumer perspective from the pro-environmental self-

identity perspective by conducting in-depth interviews with those who had second-hand product trading experience on Facebook. The results indicated that pro-environmental self-identity is expressed in day-to-day behavior when consumers buy, use, and sell second-hand products with involvement in the circular economy.

City logistics is another emerging topic related to consumer behavior and sustainability in e-commerce. City logistics can reduce transaction costs, enhance economic efficiency and growth, and positively impact the environment [34]. A related study was developed by Villa and Monzón [35]. The authors studied a system to provide delivery services using metro stations to collect parcels in lockers and suggested that implementing such a service would reduce greenhouse gas emissions, noise, and air pollution. Accordingly, Ignat and Chankov [36] 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 last-mile deliveries' environmental and social impact information influences the preference of e-commerce customers, leading them to choose a more sustainable option. Moreover, Gatta et al. [37] concluded that home deliveries would benefit the environment due to the higher efficiency in a study that aimed to understand the e-grocery impact by considering the consumers' shopping trips and freight movements from the distribution centers to consumers.

The relationship between consumer behavior and sustainability in e-commerce has been derived from multiple approaches by different authors, leading to many articles having been published. This bibliometric analysis aims to systematize and synthesize the extant literature and reveal new perspectives on consumer behavior and sustainability in e-commerce [38,39].

3. Methodology

3.1. Selection Strategy

To find the research published that addressed consumer behavior and sustainability in e-commerce, a search query was applied in the Scopus database. Scopus is the most organized database and of the highest quality standards [40]. Moreover, it is universally acknowledged as one of the most relevant indexed research publication databases for social sciences [41,42]. The terms used in the Scopus database included variations of consumer behavior, sustainability, and e-commerce (Figure 1). These terms have been used in previous studies [43–45]. In the first stage, the search string was applied with no restrictions, returning 20,003 documents. Following the strategy of previous works [21,44,46], the first selection criteria were to limit the search to the title–abstract–keyword search field, which returned 191 documents. The second selection criterion limited the search to journal articles, returning 109 articles. Journal articles were chosen for their academic recognition as the most up-to-date and advanced knowledge sources in the marketing field [45,47]. This approach was used in previous studies [48].

The search string was applied on 22 April 2022. The two authors manually analyzed the title and abstract of each paper to confirm whether the articles were related to the topic under study. Five articles were excluded either due to duplication or for not being related to the topic (i.e., articles not focused on consumer behavior and sustainability in e-commerce research). The final dataset included 104 articles used for analysis (Table 1).
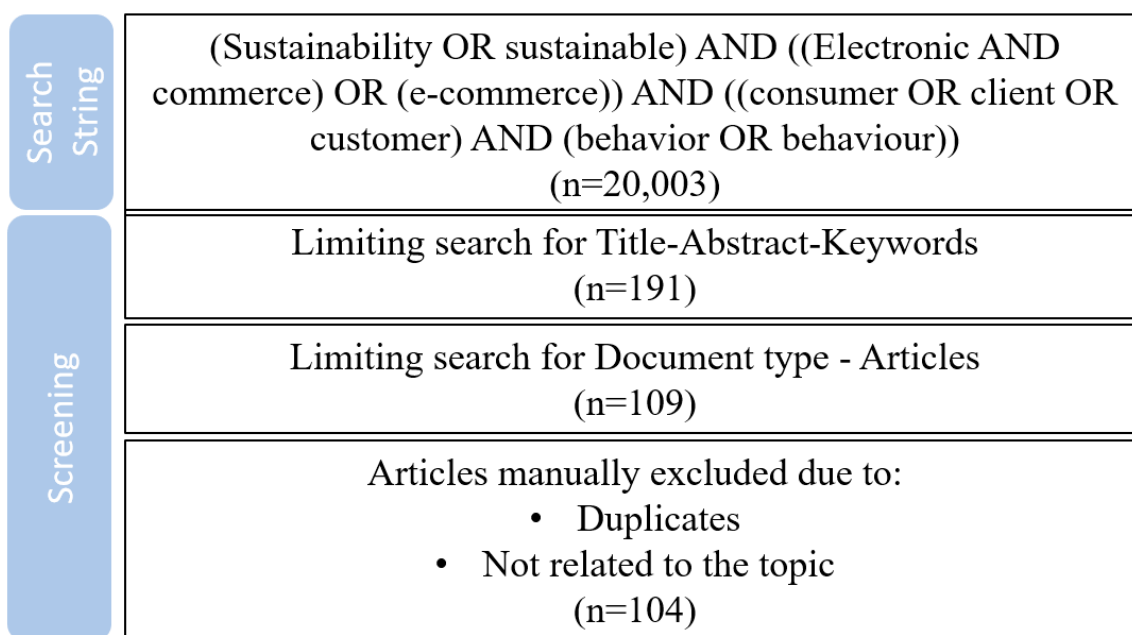
Figure 1. The selection strategy.

Table 1. The main information on the dataset.

Description	Results
Sources (Journals)	54
Period	2001:2022
Document type	Article = 104
Average years from publication	3.27
Average citations per documents	13.78
Average citations per year per doc	3.023
References	6876
Authors	342
Authors' keywords	441
Authors of single-authored documents	10
Authors of multi-authored documents	332
Documents per author	0.304
Authors per Document	3.29
Co-Authors per Documents	3.43
Collaboration Index	3.53

3.2. Data Extraction and Analysis

From each article, the variables included in Table 2 were collected.

Table 2. The extracted variables.

Variable	Description
Authors	Authors' name
Document title	Title of the document
Year	Year of publication
Source title	Publication source
Citation count	Number of citations
Keywords	Authors' keywords

This information was uploaded into a CSV file that was used as an input for the bibliometric analysis. The bibliometric analysis allows for a quantitative analysis from multiple research outputs to be conducted. It provides the advantage of analyzing the

data with objectivity and reliability [20,22]. Multiple studies with different objectives have used this approach [38,49], revealing interesting results. Data were analyzed using the CSV as input through the R package "bibliometrix" [20]. This package permits conducting multiple analyses using the variables from Table 2.

4. Analysis and Results

4.1. Annual Scientific Production

Table 3 depicts the annual scientific production. Over the 21 years of articles published on consumer behavior and sustainability in e-commerce, the 104 articles were cited 1433 times, with an average of 13.78 per article. The first article published related to the topic was the work by Malaga [50], who explored the costs to the consumer of participating in e-commerce compared to the costs of traditional retail outlets. Since 2001, 21 years of publications have been citable. The mean of total citations (TC) per year (mean of TC per article/number of citable years) was 0.65, and the mean of citations per article was 13.78.

Table 3. Scientific production.

Year	N	TC *	Mean TC * per Article	Mean TC * per Year	Citable Years
2001	1	14	14	0.67	21
2002	0	0	0	0	0
2003	1	53	53	2.79	19
2004	1	3	3	0.17	18
2005	1	89	89	5.24	17
2006	0	0	0	0	0
2007	1	6	6	0.4	15
2008	0	0	0	0	0
2009	1	18	18	1.38	13
2010	1	13	13	10.8	12
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	2	10	5	0.56	9
2014	3	25	8.33	1.04	8
2015	2	202	101	14.43	7
2016	2	96	48	8	6
2017	4	120	30	6	5
2018	6	209	34.83	8.71	4
2019	15	264	17.60	5.87	3
2020	17	145	8.53	4.26	2
2021	34	163	4.79	4.79	1
2022	12	3	0.25	-	0
Total	104	1433	13.78	0.65	

* TC = Total citations.

The number of TC is mainly influenced by the most recent years. Since 2015, 92 articles have been published, resulting in 1202 citations, 83.9% of the total. The year with the highest number of citations was 2019, with 264 citations. The works that most contributed to the 2019 record were the articles from Yang et al. [51], with 52 citations, followed by the articles from Rai et al. [52] and Xiao et al. [10], both with 37 citations each. The year 2019 was also the most averagely cited year. Nevertheless, the most cited paper was published in 2015 [28], which alone was cited 198 times. Piscicelli et al. [28] developed a case study applied to an online marketplace for peer-to-peer sharing, aiming to recognize the role that consumer values have in the acceptance, adoption, and diffusion of collaborative consumption.

Since 2001, the number of publications has reduced including years with no publications. In 2013, a steadily growing interest was observed in the topic. However, a real interest started in 2019. This was the year that the number of publications surpassed the two-digit barrier. Since 2019, 78 articles have been published, representing three-quarters of the total, and a continuously growing trend can be observed. It should be noted that

2022 has seen already 12 articles being published, although the data collection for this study occurred in April of this year.

4.2. Journal Performance

Table 4 depicts the source impact of the articles related to consumer behavior and sustainability in e-commerce. The journal indices (*h*-index, *g*-index, *m*-index) were also calculated. The *h*-index (Hirsh index) aims to quantify the journal's impact and productivity using the number of articles and citations per publication as input [53]. The *h*-index is determined by the number of articles with a total number of citations greater than the total number of articles [53]. For instance, in a journal with five published papers, if each paper has more than five citations, its *h*-index is five. However, if a journal publishes thirty papers but only five papers have more than thirty citations, its h-index is also five. The *g*-index measures the performance of the sources using the citation evolution over time [54]. The *m*-index uses the *h*-index and the time the first article was published (*n*). Hence, *m*-index = *h*-index/n [55].

Table 4. The source impact.

Journal	No. of Articles	SJR	TC	*h*-Index	*g*-Index	*m*-Index
Sustainability	34	Q1	418	12	19	0.923
International Journal of Environmental Research and Public Health	4	Q1	2	1	1	0.500
Journal of Cleaner Production	4	Q1	406	4	4	0.500
Journal of Retailing and Consumer Services	4	Q1	92	3	4	0.333
Resources Conservation and Recycling	3	Q1	14	3	3	1.500
International Journal of Quality and Service Sciences	2	Q2	23	1	1	0.250
International Journal of Retail and Distribution Management	2	Q1	43	2	2	0.125
International Review of Retail Distribution and Consumer Research	2	Q2	8	2	2	0.500
Rivista di Studi Sulla Sostenibilita	2	Q3	8	1	1	0.200
Sustainable Production and Consumption	2	Q1	0	-	-	-
Transportation Research, Part D: Transport and Environment	2	Q1	10	2	2	1.000
Advanced Engineering Informatics	1	Q1	18	1	1	0.500
Amfiteatru Economic	1	Q2	4	1	1	0.111
Asian Social Science	1	Q3	4	1	1	0.125
British Food Journal	1	Q2	6	1	1	0.333
Business Perspectives and Research	1	Q3	10	1	1	0.100
Cleaner and Responsible Consumption	1	-	3	1	1	0.500
Cleaner Engineering and Technology	1	-	0	-	-	-
Emerald Emerging Markets Case Studies	1	Q3	0	-	-	-
Energy Efficiency	1	Q2	9	1	1	0.333
Environmental Science and Technology	1	-	18	1	1	0.071
Foresight	1	Q2	0			
Forests	1	Q1	6	1	1	0.167
Frontiers in Psychology	1	Q1	0	-	-	-
Heliyon	1	Q1	22	1	1	0.167
Information Sciences Letters	1	Q2	0	-	-	-
International Journal of Enterprise Information Systems	1	Q3	3	1	1	0.333
International Journal of Logistics Management	1	Q1	15	1	1	0.333
International Journal of Production Economics	1	Q1	50	1	1	0.167
International Journal of Sustainable Transportation	1	Q1	2	1	1	1.000
International Journal of Systems Assurance Engineering and Management	1	Q2	0	-	-	-
International Journal of Technology Marketing	1	Q3	0	-	-	-
International Journal of Transport Economics	1	Q3	6	1	1	0.200
Journal of Distribution Science	1	Q4	15	1	1	0.250
Journal of Environmental Protection and Ecology	1	Q4	0	-	-	-

Table 4. *Cont.*

Journal	No. of Articles	SJR	TC	*h*-Index	*g*-Index	*m*-Index
Journal of Intellectual Property Law and Practice	1	Q2	1	1	1	0.500
Journal of Internet Commerce	1	Q2	3	1	12	0.053
Journal of Islamic Marketing	1	Q2	0	-	-	-
Journal of Management Information Systems	1	Q1	89	1	1	0.056
Journal of Organizational Computing and Electronic Commerce	1	Q2	14	1	1	0.045
Journal of Renewable and Sustainable Energy	1	Q3	11	1	1	0.143
Journal of the Academy of Nutrition and Dietetics	1	Q1	0	-	-	-
Journal of the Association for Information Systems	1	Q1	11	1	1	0.250
Journal of Transport Geography	1	Q1	2	1	1	0.500
Kybernetes	1	Q2	0	-	-	-
Latin American Business Review	1	Q4	1	1	1	0.500
Physica A: Statistical Mechanics and its Applications	1	Q1	10	1	1	0.333
Research Journal of Textile and Apparel	1	Q2	11	1	1	0.200
Sustainable Cities and Society	1	Q1	11	1	1	0.500
System Dynamics Review	1	Q1	53	1	1	0.050
Technological Forecasting and Social Change	1	Q1	0	-	-	-
Tourism Review	1	Q1	5	1	1	0.250
World Review of Entrepreneurship Management and Sustainable Development	1	Q3	0	-	-	-
Young Consumers	1	Q1	6	1	1	0.333

The source that contributed the most to consumer behavior and sustainability in e-commerce was by far the Sustainability scientific journal (34 articles). This journal also was the one with more citations (418). Sustainability, an MDPI journal, is an open-source journal related to the human beings' environmental, cultural, economic, and social sustainability [56]. After Sustainability, the journals that published the most articles related to the topic of consumer behavior and sustainability in e-commerce were the International Journal of Environmental Research and Public Health (four papers; two citations), Journal of Cleaner Production (four papers; 406 citations), and Journal of Retailing and Consumer Services (four papers; 92 citations). Sustainability had the highest number of citations (418), and the Journal of Cleaner Production had 406 citations; with only four papers published, the latter has achieved greater reach in terms of citations. These four papers form part of the ten most cited papers (see Table 5), suggesting their high relevance to the topic. These were respectively focused on collaborative consumption [28], carbon emissions and consumer free-riding behavior, where consumers take advantage of a traditional retailer's services while making purchases from an e-tailer at a cheaper cost [15]; peer-to-peer sharing [32]; and environmental responsibility supply chain with green investment [51].

The Scimago Journal Ranking (SJR) was also accessed to reveal the relevance of the journals where the papers were published. The criteria used for the selection was the highest quartile, regardless of the topic, an approach used by other studies (e.g., [31]). It is interesting to acknowledge that the five most productive journals are first quartile journals based on the Scimago Journal Ranking (SJR) 2021 indicator, with an impact factor of 3.251, 3.390, 9.297, and 7.135, respectively, revealing the importance of the topic for academia. These four journals published 47.1% of the total articles and 64.1% of the total citations.

Consistent with the citation's numbers, Sustainability had the highest *h*-index, *g*-index, and *m*-index, with 12, 19, and 0.923, respectively. These results reflect the superlative productivity regarding consumer behavior and sustainability in e-commerce.

Among the dataset and following the SJR indicator, 38.9% of the journals were ranked in the first quartile, 29.6% in the second quartile, 24.1% in the third quartile, and only one article was published in the fourth quartile. These results reinforce the importance of the topic for academia.

Figure 2 highlights growth of the Top 5 most productive journals from 2001 to 2021. It is possible to acknowledge Sustainability's outstanding contribution to the topic. Moreover, it confirms the growing interest in the topic since 2013.
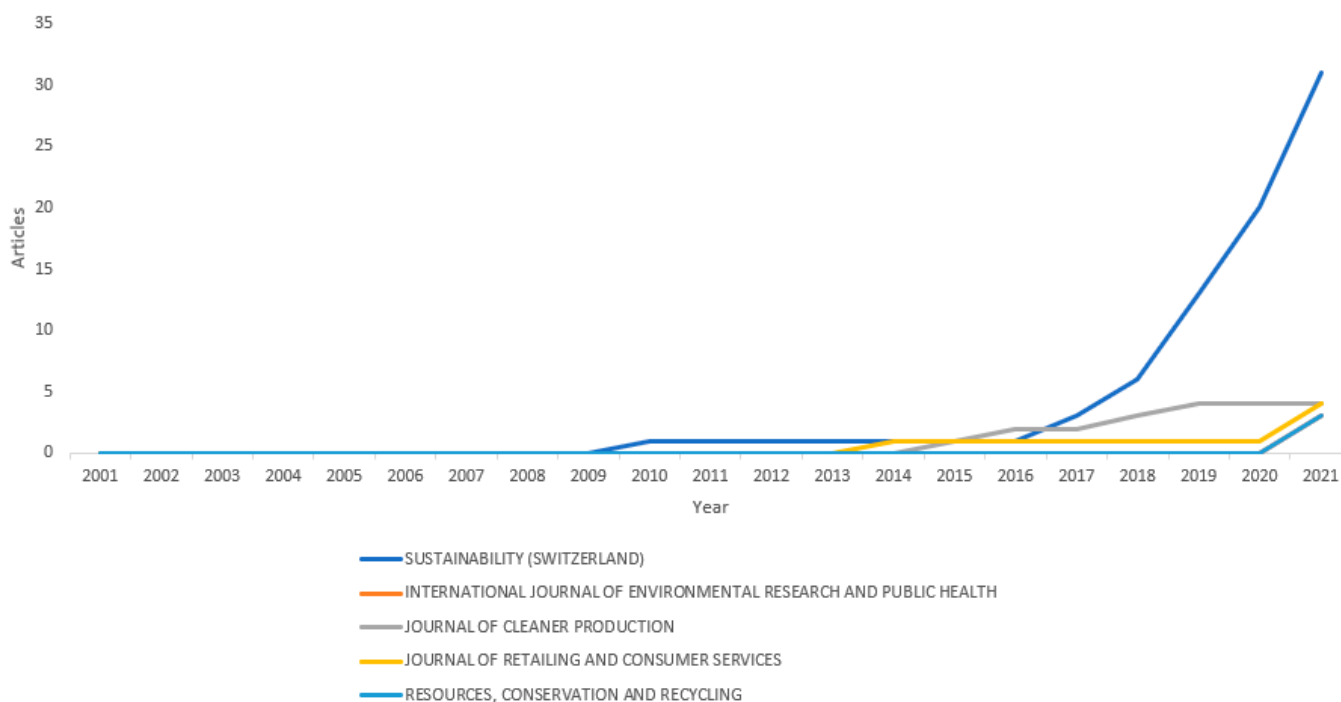

Figure 2. The source growth (Top 5 journals). Note: The orange line that should be present is overlapped by the Resources, Conservation, and Recycling blue line as both journals had zero published papers until 2020, and three papers were published in 2021.

4.3. Overview of Influential Publications

Among the 104 articles, the average number of TC for each article was 13.8 (standard deviation = 25.9). The number of citations was used to determine the impact of the most influential articles in the dataset [57]. The most cited article was the work by Piscicelli et al. [28], with 198 citations, 24.75 citations per year (Table 5). Recent articles are prominent in the list of the ten most cited articles, showing the recent interest of academia in the topic under study. Eight of the articles were published after 2015. The article with the highest average citations per year was the work of Tran [58]. This work also had the highest Normalized Citation Impact (14.809). The Normalized Citation Impact compares the performance of an article with the average performance of the remaining articles [59]. The article by Tran [58] was published in the Journal of Retailing and Consumer Services and created a methodical framework to investigate the impact of the perceived effectiveness of e-commerce platforms on economic gains in predicting sustainable consumption.

Table 5. The top10 most cited articles.

Article	Title	TC	Average TC per Year	Normalized TC
[28]	The role of values in collaborative consumption: insights from a product-service system for lending and borrowing in the UK	198	24.750	1.960
[60]	The Relationship of E-Commerce Competence to Customer Value and Firm Performance: An Empirical Investigation	89	4.944	1.000
[15]	Carbon emissions in a dual channel closed loop supply chain: the impact of consumer free riding behavior	85	12.143	1.770

Table 5. *Cont.*

Article	Title	TC	Average TC per Year	Normalized TC
[58]	Managing the effectiveness of e-commerce platforms in a pandemic	71	35.500	14.809
[32]	Consumer motives for peer-to-peer sharing	71	14.200	2.038
[61]	Relationship between Convenience, Perceived Value, and Repurchase Intention in Online Shopping in Vietnam	63	12.600	1.808
[62]	Limits to growth in the new economy: exploring the "get big fast" strategy in e-commerce	53	2.650	1.000
[51]	Dual-channel structure choice of an environmental responsibility supply chain with green investment	52	13.000	2.955
[63]	The influence of e-services on customer online purchasing behavior toward remanufactured products	50	8.333	1.667
[10]	The Effects of Online Shopping Context Cues on Consumers' Purchase Intention for Cross-Border E-Commerce Sustainability	37	9.250	2.102

Piscicelli et al. [28] explored how consumer values could affect whether collaborative consumption, and a new socioeconomic model based on sharing, renting, gifting, trading, exchanging, lending, and borrowing, was accepted, adopted, and diffused. Through a case study of Ecomodo, a UK-based online marketplace where people can lend and borrow each other's possessions, spaces, and skills, it empirically examined the values and presented the findings of a quantitative study that used Schwartz's Portrait Value Questionnaire to identify and quantify value priorities among Ecomodo users.

In order to develop a lasting competitive advantage in e-commerce, competency was presented by Saeed et al. [60] as a critical factor in organizational performance, arguing that this effect is mediated by the creation of "customer value" through website functionality. The relationship between customer value, electronic commerce expertise, and both short- and long-term firm performance was investigated using empirical primary and secondary data from over 100 companies. The empirical results demonstrated that businesses with strong e-commerce capabilities performed better, and that this relationship was at least in part mediated by the value that customers derived from using websites. In addition, the findings also demonstrated how businesses could improve their short-term profitability by giving customers value prior to a purchase.

He et al. [15] investigated the influence of government e-commerce taxes on carbon emissions as well as the effects of consumer free riding on the carbon emissions throughout the life cycle of a product in a dual channel closed loop supply chain. Consumer free riding occurs frequently when customers take advantage of a traditional retailer's services while making cheaper purchases from an online retailer. The results revealed that although consumer free riding behavior may assist manufacturers economically, it also increases the overall carbon emissions throughout the supply chain. Government taxes on e-commerce can help to lower both consumer free riding and total carbon emissions. In order to maximize social welfare, this research also showed that the government could need to fund the online retailer.

Given the significant effects of the COVID-19 pandemic on business operations, Tran [58] proposed a systematic approach to investigate the relationship between the consumers' perceptions of the economic benefits of e-commerce platforms and sustainable consumption. The conceptual model used in this study was based on the uses and gratification theory with the border condition of pandemic fear included. This study revealed a positive moderating influence of pandemic fear on the interactions among the perceived effectiveness of e-commerce platforms, the economic advantages, and sustainable consumption.

Hawlitschek et al. [32] created a theoretical model based on a wide range of potential consumer reasons to explore the relative weight of consumer motives for and against peer-

to-peer sharing. The five most significant drivers and criteria for platform use intentions, according to this research, are financial incentives, trust in other users, a modern lifestyle, effort expectations, and ecological sustainability.

Pham et al. [61] looked at the direct and indirect effects of the dimensions of online shopping convenience on the repurchase intention through customer-perceived value with the aim of giving online merchants numerous approaches to improve their online shopping service. According to the findings, access, search, assessment, transaction, and possession/post-purchase convenience are the five characteristics of online buying convenience. Perceived value and repurchase intention are directly impacted by all dimensions. The findings further highlight the critical significance of the perceived value in situations when a component both directly affects the repurchase intention and mediates the link between convenience and repurchase intention.

Oliva et al. [62]'s formal dynamic model of competition between online and click-and-mortar enterprises in business-to-consumer e-commerce addressed the "get big fast" strategy used by e-businesses. Demand, market share, service quality, employee skill and retention, content development, market valuation, and other important variables were endogenously generated by the model. This study investigated the sustainability of expansion plans for e-commerce businesses under various scenarios for the consumer, competitor, and capital market behavior.

In order to explore the dual-channel structure strategy of a green company and further examine its environmental performance under fuzzy uncertainties, Yang et al. [51] modeled the environmental responsibility behaviors of both the manufacturers and customers. The dual-channel structure approach with the consideration for behavioral features is produced by solving game models. While the high degree of environmental responsibility on the part of the manufacturer and the cost of going green are barriers, the degree of greenness and the uncertainties surrounding consumer demand have urged manufacturers to start their own online channel. Dual-channels might not be helpful in protecting the environment, despite increasing the green level. Furthermore, the store may profit from the implementation of a direct channel when the environmental costs are relatively modest.

Xu et al. [63] investigated the effects of e-service offerings in four online transaction phases (i.e., information, agreement, fulfillment, and after-sales phase) on the customer purchasing intention toward remanufactured products in both auctions and fixed price transactions through an empirical study based on the new, manufacturer remanufactured, seller remanufactured, and used products transaction data from eBay. The findings showed that the customers' willingness to pay (WTP) in both types of transactions was primarily influenced by e-service offerings made during the information phase. The results showed that e-services in all four online transaction phases significantly influenced the customers' WTP in auctions, but not in fixed price transactions, indicating that e-services in auctions have a stronger positive influence on the consumers' WTP than fixed price transactions. The findings also demonstrated that buyers were willing to pay more for seller-remanufactured goods than for used goods in both types of transactions, and even more for manufacturer-remanufactured goods and brand-new goods.

Finally, Xiao et al. [10] analyzed the online shopping context that determines the consumers' purchase intentions and pinpointed four cues including online promotion cues, content marketing cues, personalized recommendation cues, and social review cues, which support this consumption behavior in cross-border e-commerce. In order to analyze the impacts of these four cues and brand familiarity on the customers' buy intentions in cross-border online shopping, the authors suggested a theoretical model based on cue usage theory and the stimulus-organism-response model. This article also looked at how the perceived emotional value and perceived functional value interacted. The findings revealed that these four cross-border online shopping context cues greatly increased the customers' likelihood to make a purchase. The four cues and the perceived functional value were strongly negatively moderated by brand familiarity, which also had a negative

influence on the relationships between the online promotion cues, social review cues, and perceived emotional value.

4.4. Authors' Performance Analysis

　　Identifying the most contributing authors is relevant as they are essential in the field's structure and growth [64,65] and positively influence the future of the research topic. Among the dataset, 342 different authors contributed to the field. Table 6 highlights the most productive and cited authors, respectively, based on the number of articles published and citations. The most productive author was Rai HB., with four articles, and Macharis C., and Verlinde S., with three articles each. This same ranking applied to the number of citations. Rai HB. was the most cited in the list (59 citations), and Macharis C., and Verlinde S. had 57 citations each. This result is related to the fact that three papers were published in common [52,66,67]. However, Rai HB. was the author with the highest fractionalized frequency (1.83). In the fractionalized frequency, each author receives a credit for each article, depending on the number of authors [68]. For an article with only one author, the author receives one point. If an article has two authors, each author receives a half-point, and so on. This analysis allows an understanding of how academics interact with each other through co-authorship [47,69]. From the list, the author with the fewest points was Adreopoulou Z. Using the number of articles and fractionalized frequency, it is possible to conduct a Pearson correlation with the aim to understand the relationship between the total and adjusted appearances. The Pearson correlation result was 0.75, revealing a strong relationship between the total and adjusted appearances, suggesting that the most productive authors co-authored with a reduced number of authors and that a relatively small group of researchers was studying consumer behavior and sustainability in e-commerce. This result was confirmed by the works of Rai H.B., Macharis C., and Verlinde S., who had three papers that were developed together [52,66,67].

Table 6. The most productive (at least two articles) and cited authors (Top 10).

Most Productive Authors	No. of Articles	Freq. Fract.	Total Citations	Production Year-Start	Most Cited Authors	No. of Articles	Total Citations	Production Year-Start
Rai H.B.	4	1.80	59	2019	Cooper T.	1	198	2015
Macharis C.	3	0.83	57	2019	Fisher T.	1	198	2015
Verlinde S.	3	0.83	57	2019	Piscicelli L.	1	198	2015
Andreopoulou Z.	2	0.45	8	2014	Grover V.	1	89	2005
Ebrahimi P.	2	0.53	2	2021	Hwang Y.	1	89	2005
Fekete-Farkas M.	2	0.53	2	2021	Saeed K.A.	1	89	2005
					He R.	1	85	2016
					Lin Z.	1	85	2016
					Xiong Y.	1	85	2016
					Gimpel H.	1	71	2018

　　Although Rai H.B., Macharis C., and Verlinde S. were the most productive authors, Cooper T., Fisher T., and Piscinelli L. were the most cited, with 198 citations each. This result was derived from the paper "*The role of values in collaborative consumption: Insights from a product-service system for lending and borrowing in the UK*" [28] published by these three authors.

4.5. Authors' Keywords Analysis

　　Through the authors' keywords, it was possible to identify the growth of the authors' keywords by frequency between the years 2001 and 2022. One can acknowledge that the keyword "Electronic Commerce" has been a constant throughout the years, and its growth is enduring. Related to this keyword, "E-Commerce" has had outstanding growth since 2012. These results suggest a growing trend. Although the keyword "Sustainable Development" emerged in 2017, the keyword "Sustainability" stood out in 2018 and has seen an abrupt growth, suggesting a trend. In this context, the interest in "Consumer Behavior" has also seen steady interest since 2003. However, in 2018, the interest has grown

immensely. Although the data collection occurred in the early months of 2022 (April), all of the keywords in Figure 3 equaled or surpassed the numbers of the previous year (2021).
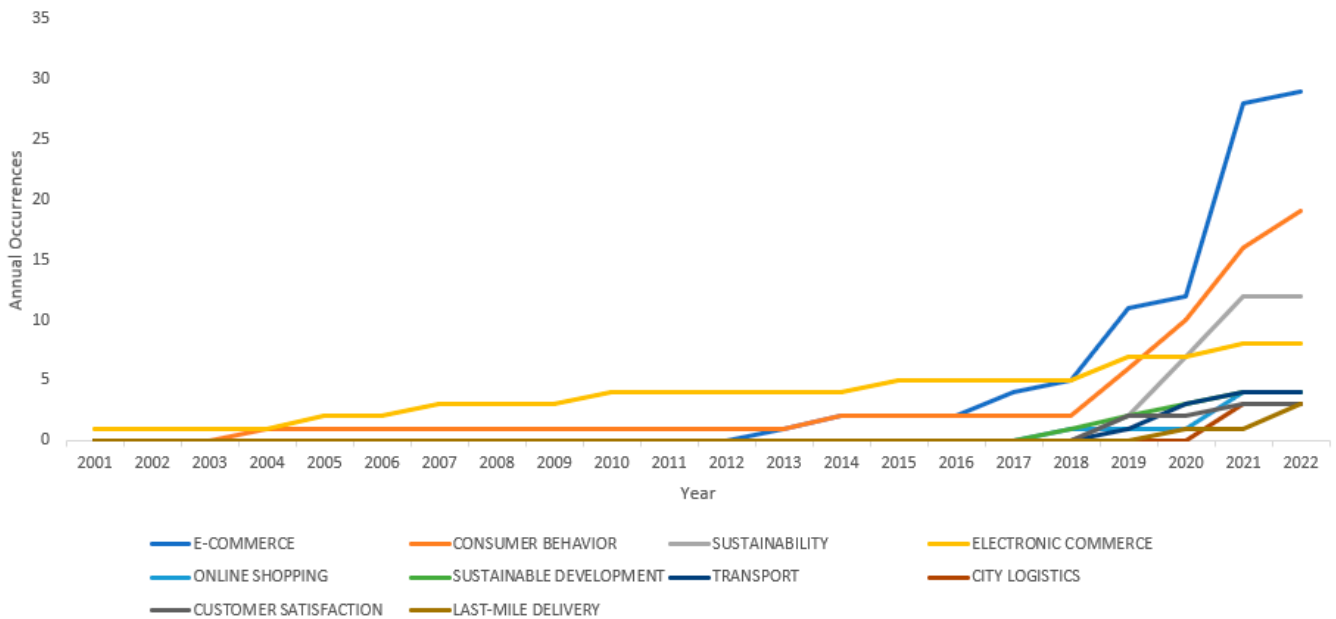

Figure 3. The word dynamics (author's keywords).

A complementary analysis was performed to acknowledge the most frequent keywords (Figure 4). The authors used 441 different keywords. The most frequent keyword was E-Commerce, cited 29 times, followed by Consumer Behavior, cited 19 times, and Sustainability, with 11 citations.

Figure 4. The word cloud.

Figure 5 highlights the author's keyword co-occurrence network. This analysis reflects the literature's relationship and conceptual map [70] regarding consumer behavior and sustainability in e-commerce. Each color represents a cluster. The size of the keyword

edge represents the frequency that such a keyword is mentioned. In turn, the thickness of the lines between the edges indicates the frequency of co-occurrence. The red cluster provides quantitative support and suggests the interconnection between e-commerce and, for instance, last-mile delivery. Last-mile delivery is pivotal in the environmental sustainability of city logistics in the e-commerce market [71]. Changing the channel-shopping from the physical to online can reveal positive and negative effects on transport and environmental sustainability, depending on the last-mile delivery procedures [37]. This is recognized as an emerging area of research [26].

Figure 5. The keyword co-occurrence network.

Figure 6 shows a thematic map based on the co-occurrence of the authors' keywords. The thematic map uncovered the typological themes using co-word analysis. The results identified themes within the research topic [72]. Therefore, the thematic map analysis highlights the specific research areas of interest in consumer behavior and sustainability in e-commerce, revealing clusters of linked terms. The selected criteria for analysis were the top 100 words and a minimum of five clusters. Figure 6 also revealed 12 clusters, represented by different colors. The results suggest that a higher number of niches characterizes the topic of consumer behavior and sustainability in e-commerce. The cluster that dominated the topic was e-commerce (purple cluster). As expected, due to our research topic, e-commerce studies strongly related to consumer behavior, and sustainability such as the influence of the online shopping context on the consumer purchase intention within the realm of cross-border e-commerce sustainability [10]. However, this analysis showed that this topic had a relationship to city logistics [35], big data analytics [73], customer engagement [32], the circular economy [33], online services [74], and omnichannel retail [52], showing the different research approaches and the transversal themes related to the topic. In fact, online retail has led to a new paradigm in terms of transactions in a transversal way [66], and COVID-19 has made a significant contribution to this change [75].
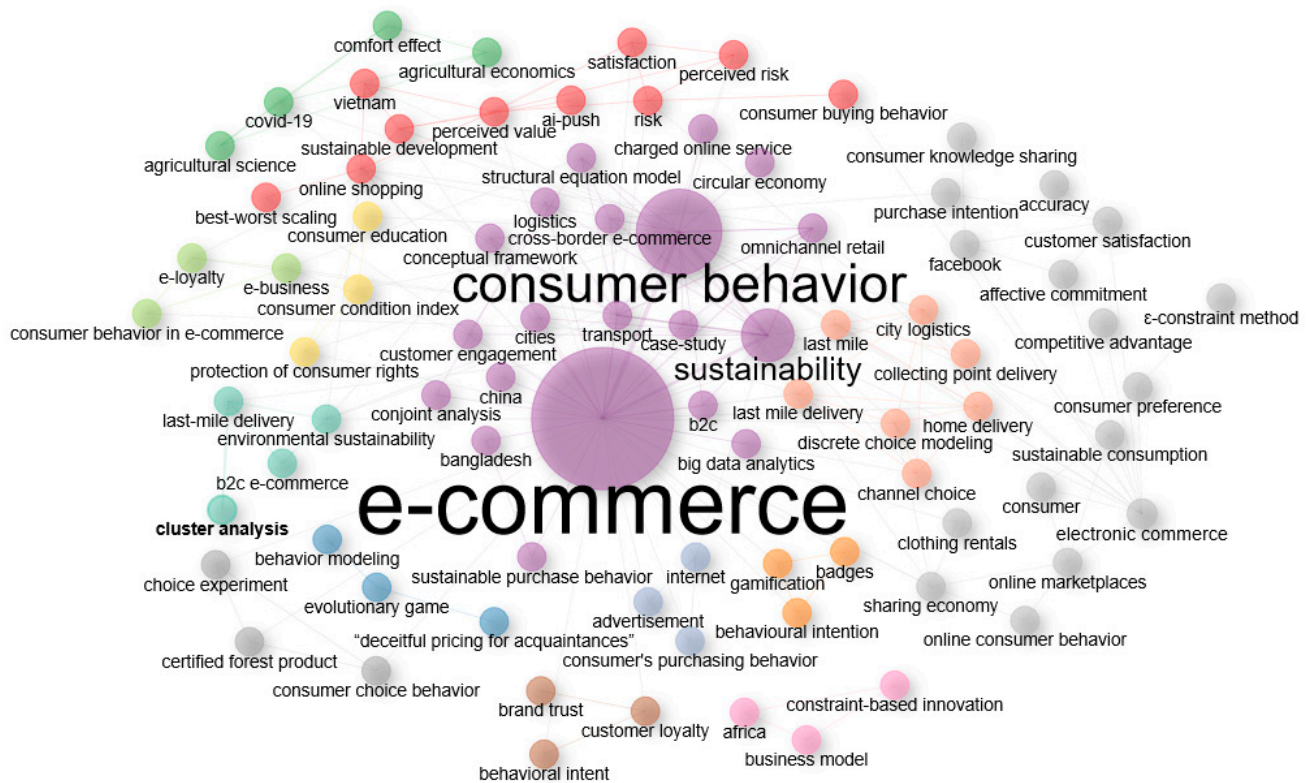
Figure 6. The thematic map of the authors' keywords.

A thematic map analysis of themes (Figure 7) revealed the e-commerce, consumer behavior, and sustainability at the center stage of the basic themes, but with each one emphasizing different foci. First, the e-commerce research showed major attention to online marketplaces [76] as well as to online gamification mechanisms [77]. Second, (online) consumer behavior studies looked at consumer perception, more specifically, the perceived risk and perceived value [78], and customer loyalty [79]. Third, sustainability considered sustainable development [80], sustainable purchase behavior [81], and sustainable consumption [82].

The motor themes were not only related to e-commerce and e-business, but showed more specificities. On one hand, a consumer focus took place covering the consumer preference [83], customer engagement and satisfaction [84], and e-loyalty [85]. On the other hand, two ranges of topics were also addressed, namely environmental sustainability [13], and an operational one envisaging both logistics and last-mile delivery [26].
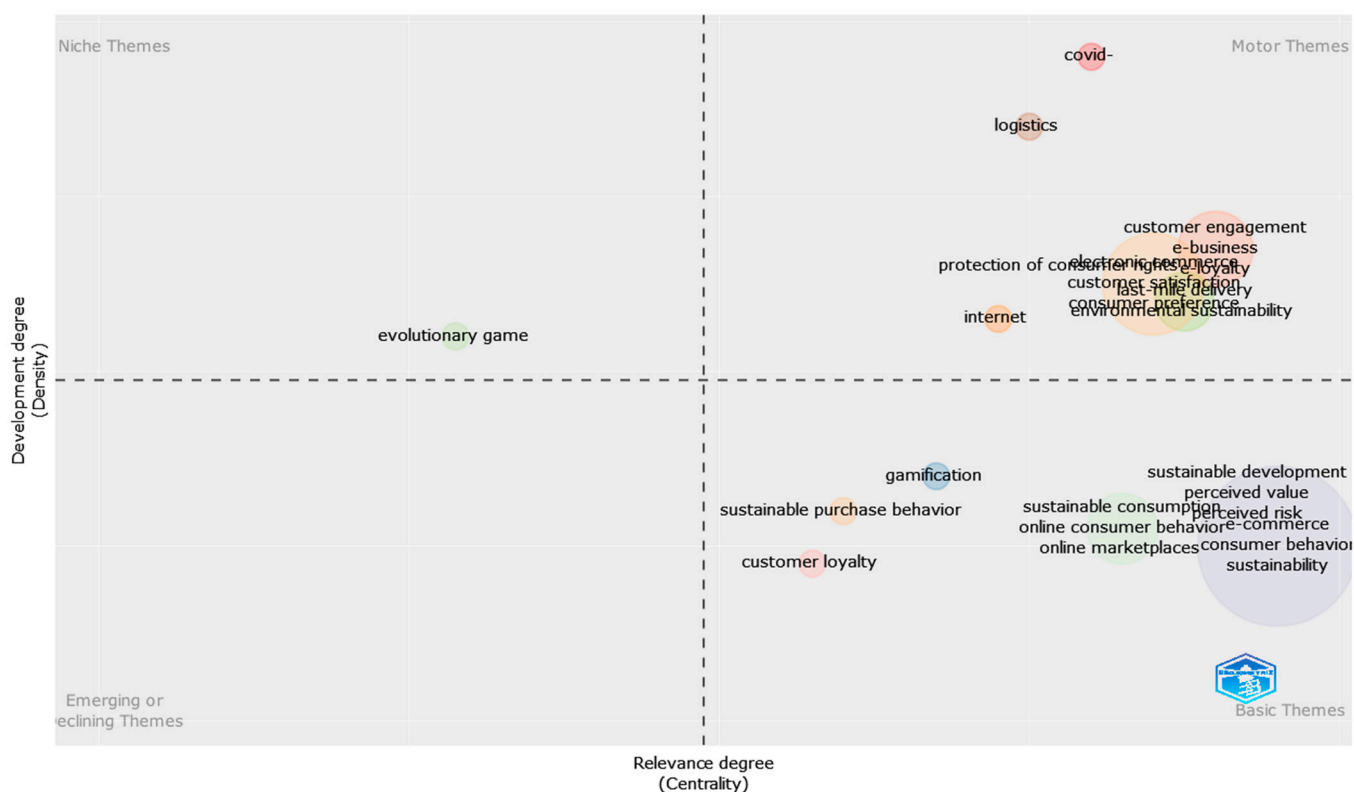
Figure 7. The thematic map (motor, niche, basing and emerging or declining) themes.

5. Future Research Directions

This paper had the goal of providing a bibliometric analysis of the knowledge structure and to identify global research trends in consumer behavior and sustainability in e-commerce. It is expected that researchers can use this manuscript as a baseline from which to move to new endeavors, aiming at addressing the uncovered research gaps and developing future investigations to add to the current knowledge in this area.

A major issue is related to the so-called last mile problem of business-to-consumer e-commerce sustainable distribution as well as the associated impact of the e-commerce development of green logistics challenges involving sustainability as well as reverse logistics in the electronic markets. E-commerce correlates with the last-mile problem since the final mile (the last leg of a supply chain management, i.e., from warehouse to customer) is the most expensive and time-consuming portion of delivery, accounting for up to 53% of the overall shipment cost, despite the fact that buyers desire free and quick shipping.

Another important question is to look at e-commerce supply chains, their environmental sustainability, and competitiveness [86]. Packaging sustainability in e-commerce is an increasing relevant theme due to the fast e-commerce growth worldwide and its environmental implications including waste and possible trade-offs to take into consideration. Social, environmental, and economic factors must be taken into account as a whole and not separately in order for e-commerce to be really sustainable, and in order to ensure that the beneficial consequences exceed the negative ones, a trade-off is necessary. For example, if e-commerce firms invest more in fine-tuning their digital marketing strategies including better customer targeting with the right products, it will reduce the likelihood of returning purchased products, hence diminishing pressure on reverse logistics and consequently on the environment.

Social responsibility and social sustainability in e-commerce are pertinent areas deemed for further investigation. Sustainable development goals in e-commerce effects constitute a very suitable topic that need to convey improved economics for sustainable e-commerce business models that can be leveraged by existing artificial intelligence developments. Sus-

tainable business models have the potential to be advantageous to e-commerce businesses in many ways and hence should be further researched. By lowering carbon emissions (for example, by selecting suppliers closer to their warehouse), they can implement environmentally friendly practices in the supply chain, lowering the operational costs and benefiting the environment. Additionally, an online merchant can use data to more sustainably manage the shipping operations (e.g., reducing both the cost and environmental impact of packaging by consolidating orders into fewer packages and using logistical data to optimize the shipping process). Additionally, selecting environmentally friendly packaging (e.g., cardboard, paper, and die-cut inserts) can help save on supply costs and provide more flexibility and customization options). Additionally, future studies on artificial intelligence (AI) are required since AI has the potential to assist in a variety of ways including (1) overcoming inefficient transportation with algorithm-optimized delivery routes for distance, fuel use, and time, thereby reducing the fuel consumption, CO_2 emissions, and costs; and (2) overcoming inefficiency from excess inventory, overproduction, overprocessing, and product/service defects since AI can better predict market demand and reduce excess inventory, leading to improved customer experience, a cut in inventory costs, and diminishing existing waste.

Consumer satisfaction is a key ingredient in successful e-commerce. Hence, paying attention to sustainable e-commerce by incorporating social media, mobile marketing, and local marketing is germane in this area.

Last but not least, sustainability in e-commerce should also be investigated with a more comprehensive holistic perspective embracing critical topics such as ethics, law, and cyber-security. E-commerce that is ethical and compliant with the law should provide fair wages, timely tax payments, and decent working conditions. E-commerce should also encourage cybersecurity sustainability, which entails spending time, effort, and money in a way that reduces the risk, lowers costs, and increases the effectiveness, both immediately and over the long-term.

6. Conclusions and Limitations

E-commerce has recently accelerated its expansion, especially in the setting of a pandemic [82], and it is anticipated that this increase will continue in the years to come. An incremental environmental impact was brought on by an increase in Internet sales. Customers expect that businesses have ecologically sustainable practices since they are aware of this [12]. Companies struggle to come up with novel strategies to be environmentally sustainable and satisfy customer expectations because their main goal is to make economically sustainable profits and income.

This paper embarked on a mission aiming at performing a literature analysis targeting the relevant theme of consumer behavior and sustainability in e-commerce. Using an appropriate search query over the Scopus database, a total of 104 journal articles were found to have been published from 2001 (the first paper) up to April 2022. Altogether, 342 different authors have been engaged in this research area. This manuscript deep dives into more detailed data, bringing information regarding a number of issues such as scientific output per year, the impact of journals acting as outlets of the published papers, the most influential articles according to their citations, the most productive authors, the and most frequent keywords used in the achieved publications.

This bibliometric analysis has limitations that need to be stated. First, the data collection included only articles from the Scopus database excluding articles published in other databases. However, it should be highlighted that every database has its limitations [87]. Therefore, future studies could extend their research to more databases. Second, although the terms used in the search string were comprehensive, they might not be fully inclusive. However, the search was likely to identify most of the studies that addressed the topic of this study. Third, although the authors of this paper used the objective of this bibliometric analysis in the manual article selection stage, there is always an inherent subjectivity in the analysis. Fourth, using the citation count as the criterion for some analyses might not be

entirely reliable since multiple reasons lead a researcher to cite a work in their paper [88], for instance, factors related to the journal or author prestige, editorial policies, or the method employed by the authors [89]. Overall, this study expects to inform researchers about new perspectives on consumer behavior and sustainability in e-commerce when planning future research projects. Moreover, it plays the role of a capstone paper as part of the Special Issue on Consumer Behavior and Sustainability in Electronic Commerce published by the Sustainability scientific journal.

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