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A BIBLIOMETRIC REVIEW OF CONSUMER BEHAVIOR IN THE CIRCULAR ECONOMY

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Abstract: Until now, there have been several reviews of the literature regarding the consumer in the circular economy. However, bibliometric analysis has not been applied as frequently to assess the empirical evidence gathered thus far in the scientific literature. The goal of this research is to conduct a performance analysis and to determine the conceptual structure of the consumer behavior literature in the circular economy. To achieve this goal, a systematic literature review of 194 articles is conducted utilizing two methods: performance bibliometric analysis and the scientific mapping technique. We concluded that consumer behavior in the circular economy is a topic that has progressed substantially over the decade we examined, both in terms of production performance and the diversification of research topics, with behavior related to the textile industry being one of the emerging fields that is likely to receive an increasing attention in the coming years.

Keywords: consumer behavior, circular economy, bibliometric analysis, thematic analysis.

1 INTRODUCTION

The human consumption pattern embedded into our modern societies is characterized by frequently irrational purchases, and a rapid product replacement before the end of their life cycle. From the literature and the consumer markets dynamics it can be observed that there is a discrepancy between the favorable attitudes shown towards protecting the natural environment and the actual engagement in the behaviors that do not harm the environment (Johnstone & Tan, 2015, Park & Lin, 2020).

However, the interest for circular economy and sustainability in general has increased among the general population in the recent decades. Customers began to follow the principles and products provided by the circular paradigm as they grew more aware of their role in the environmental harm brought on by their purchasing behaviors (Pretner et al., 2021).

This growing interest can be observed at the organizational level as well, as circular business started to emerge. A business model that respects the principles of the circular economy may modify patterns of production and consumption, influencing how the business

grows and the relationship between the business and the consumer. To that purpose, businesses can implement a closed-loop system in which resources are returned and re-circulated after usage (Didenko, Klochkov & Skripnuk, 2018).

The notion of circularity is frequently examined in the context of companies, but academics are starting to investigate the inputs of consumers in closed-loop production models (Wang et al. 2018), emphasizing consumers' limited understanding of the circular economy (Sijtsema et al., 2020).

For example, existing studies (Pretner et al., 2021) demonstrate that customers are less willing to pay for recycled products than for products created from new materials, implying that recycled products have a higher perceived risk (Polyportis et al., 2022). Similarly, other researchers have identified a variation in green product buying behavior that can be attributed to social and demographic factors (e.g. age, education level, high monthly earnings) (Harms & Linton, 2016). Hence, the essential question that remains is whether consumers truly value such efforts and how their behavior modifies in this context (Hein, 2022).

Despite an established body of research on the industrial and organizational applications of the circular economy, important aspects of the role of consumers in the shift to a circular model of economy remain understudied.

Therefore, the purpose of this paper is to conduct a performance analysis and determine the conceptual structure of the literature on consumer behavior in the circular economy. The performance analysis will be done on the document, citation and source level. The conceptual structure will entail the knowledge synthesis through thematic mapping. To address this objective, a systematic literature review is undertaken utilizing two complementary approaches: performance bibliometric analysis and science mapping technique.

This review is divided into five sections as follows. The second section describes the methods used to perform the systematic review using the bibliometric analysis. Following that, the results section synthesizes main themes and key evidence. Discussions are also provided to place the findings in the larger perspective of previous literature findings. Last, the concluding section outlines the important contributions of this study to the literature on circular economy.

2 METHODOLOGY

2.1 Overall methodology and key steps

This study employs the typical methodology of a systematic review. Starting from the initial stage of defining the topic and research gap, the whole process is illustrated in Figure 1.

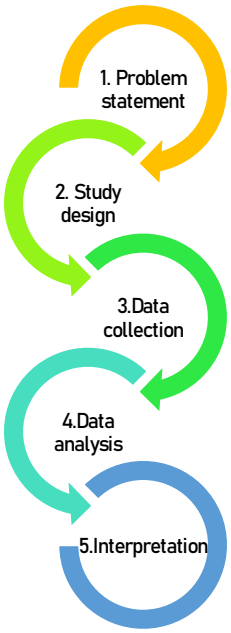

Figure 1. Overall methodological approach

In the study design phase, we established what publications should be included in the reviewing process so that transparency and replicability are ensured. For this reason, we developed clear inclusion and exclusion criteria for the papers analyzed. Specifically, we decided to include:

- Studies published ranging from 2012 until the current year in order to cover the last decade of research;
- Web of science (WoS) categories relevant to the subject: Environmental Sciences, Green Sustainable Technologies, Environmental Studies, Engineering Environmental, Business Management, Multidisciplinary Sciences, Public Environmental Occupational Health, Ecology, Sociology and Economics.

Moreover, we refined our research based on article type and we decided to exclude other reviews, book chapters and other bibliometric analysis and papers not published in English. The abstract screening enabled us to eliminate papers not addressing the topic of consumer behavior in the circular economy.

Moving on the data collection stage, the database was generated in May 2023 by accessing the Web of Science platform for papers that contained the main keywords linked to the subject. We used the entry query string 'Circular economy' AND 'Consumer behavior'. WoS, in addition to being one of the largest databases of abstracts and citations of peer-reviewed literature, provides an in-depth account of production in a variety of scientific fields, making it a significant source for bibliometric mappings (Silva et al., 2022).

The search first uncovered 544 documents based on the criterion published between 2012 and 2023. English-language articles from the previously stated WoS categories were filtered, yielding 389 items. Finally, further reviews and book chapters were removed, resulting a total of 291 articles. After the abstract and content screening performed in order to ensure the relevance to the topic we obtained the final database composed of 194 articles that were uploaded in a BibText (.bib) format into the Biblioshiny program.

2.2 Data analysis

In order to run the Biblioshiny interface, the Bibliometrix package (v 3.0.4) was installed in the RStudio software. Biblioshiny is the user-friendly interface of Bibliometrix, a research tool focused on scientometrics (Aria & Cuccurullo, 2017).

Bibliometric analysis, in constrast to narrative literature reviews that are prone to subjective bias and are frequently less rigorous, can increase the quality and objectivity of a review by establishing a systematic and reproducible review procedure (Donthu et al., 2021).

Two types of analysis were used. The first, performance analysis, is one of the core applications of bibliometric analysis and consists of evaluating author and institution publishing statistics such as annual production, citations, author ranks, nations, journals, and fields. Most reviews include performance analysis, even those that do not tackle science mapping, as it is customary in reviews to analyze the performance of various research dimensions, which is similar to providing the socio-demographic background of participants in empirical studies, yet with a more analytical approach (Donthu et al., 2021).

The second, science mapping, uses bibliographic data to generate structural depictions of scientific fields. The thematic analysis implies the identification of thematic networks that plot on an abi-dimensional matrix, where the axes are functions of the theme network's centrality and density. An alluvial graph is used to show the thematic evolution of the consumer behavior in the circular economy by breaking the time span into times slices (Baker, Kumar & Pandey, 2020).

3 RESULTS

3.1 Overview

The results section deals with three important aspects. The first one, presents a brief

overview of the sample analyzed. The second presents the performance analysis on three different levels: document, citation and and source. Finally, the last part presents the results of the thematic analysis.

Starting with general data concerning annual scientific production (figure 2), we can observe an ascendent trend that characterizes article production.

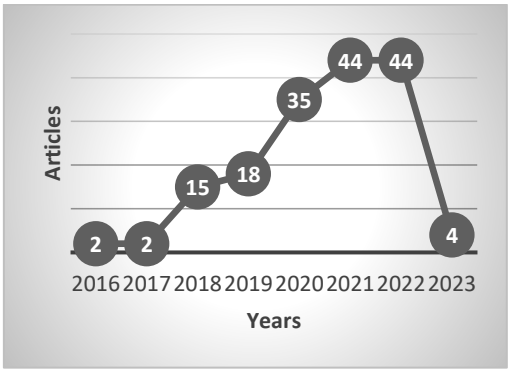

Figure 2. Annual Scientific Production

No articles between 2012-2015 were identified that fit our criteria. Starting with just 2 articles in 2016, the annual production sprung to 44 articles in 2021 respectively. In the current years we identified only 3 articles.

In terms of scientific production based on geographical location, Figure 3 illustrates the world's scientific production on the literature related to consumer behavior in the circular economy. The color intensity increases in direct proportion with the number of published papers. It seems that the topic is studied at the global level, the most prolific countries being China (63), United Kindom (55) and Italy (53).

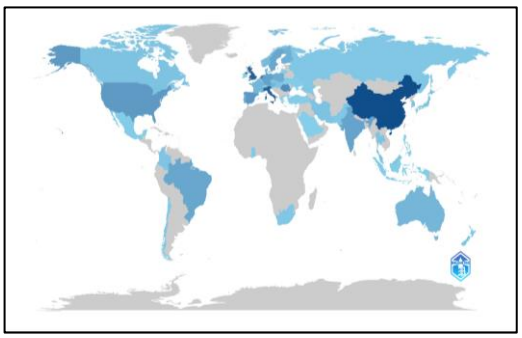

Figure 3. Country Scientific production

Next, the research was also carried out based on the average citations (both in average per year and per article) of the articles in the sample analyzed. Table 1 shows that based on the average total citations for each article the highest occurred in 2017, with a mean of 120 citations. Whereas for the average annual citation, the highest rate of citation occurred as well in 2017 at 17.14.

Table 1. Annual citations (TC=Total citations, N=Sample)

Year	Mean TC Per Article	N	Mean TC per Year	Citable Years
2016	104	2	13	8
2017	120	2	17.14	7
2018	40.93	15	6.82	6
2019	41.56	18	8.31	5
2020	26.43	35	6.61	4
2021	16.7	44	5.57	3
2022	2.41	44	1.21	2
2023	0.75	4	0.75	1

3.2 Performance analysis

3.2.1 Source level

The Hirsch (H) index measures the journal's number of published research papers, each of which has been referenced at least *h* times in other papers. The H-index is also used to calculate the m-index, which is defined as H/n, where n is the number of years since a scientist's first journal article was published (Donthu et al., 2021). Egghe (2006) created the g-index as an enhancement to the h-index with the purpose of quantifying the overall citation performance of a group of papers. Table 2 presents all the values of these indexes for describing the source local impact.

Table 2. Source local impact (TC=Total citations, N= Sample)

Element	h_index	g_index	m_index	TC	N
JOURNAL OF CLEANER PRODUCTION	17	28	2.12	992	28
SUSTAINABILITY	14	22	1.75	547	41
RESOURCES CONSERVATION AND RECYCLING	11	16	1.83	454	16
BUSINESS STRATEGY AND THE ENVIRONMENT	5	6	0.71	344	6
SUSTAINABLE PRODUCTION AND CONSUMPTION	5	8	1.25	119	8
MANAGEMENT DECISION	4	4	0.8	174	4
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	3	3	0.75	16	3
JOURNAL OF BUSINESS RESEARCH	3	5	0.75	260	5
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	3	3	0.75	38	3
WASTE MANAGEMENT	3	4	0.75	39	4

Next, the most relevant sources on this topic were analyzed. Generally, the concept 'source' refers to a journal/book/conference proceedings series, etc.

The 194 articles were distributed across 51 scientific journals, the most significant of which are shown in figure 4. Among these, Sustainability, Journal of Cleaner Production, Resource Conservation and Recycling, and Sustainable Production and Consumption stand out for having high productivity levels concerning publications on consumer behavior.

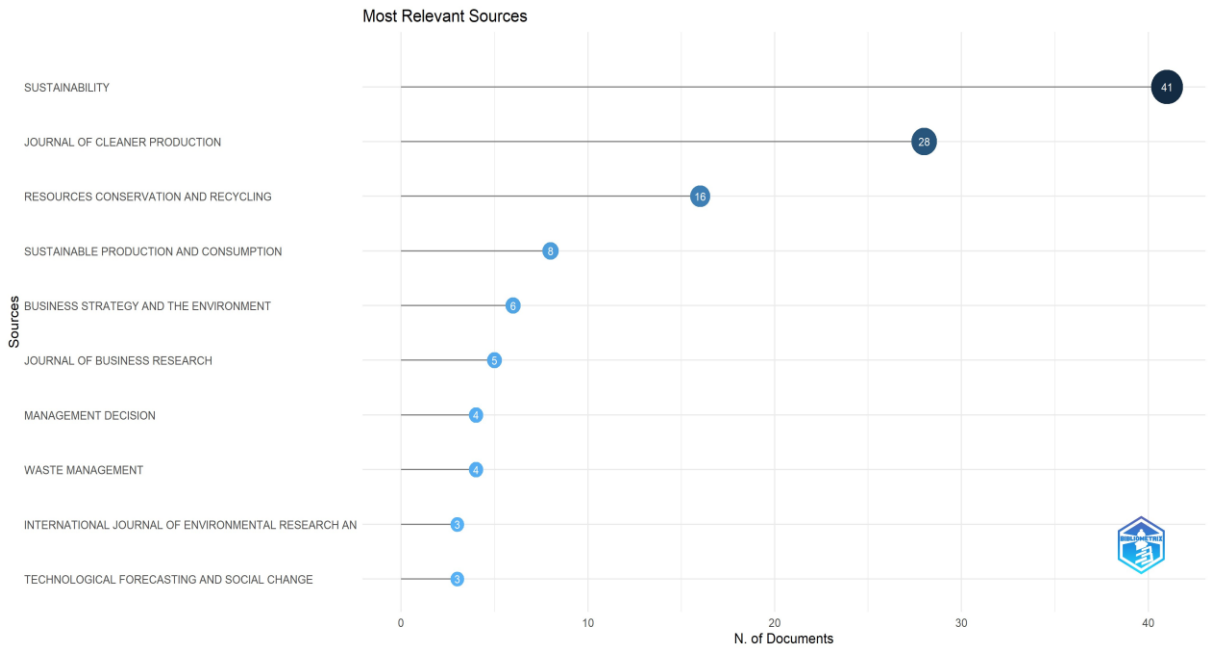

Figure 4. Most Relevant Sources

3.2.2 Citation level

Taking into account the citation dimension table 3 presents the first ten most citated paper on this topic. The most cited article, written by Hazen and colleagues (2017) received 194 total citation, with an average of 27.71 citations annually. In this paper, in order to evaluate customers' decisions to buy remanufactured products, the authors integrate macro level aspects like pricing, incentives, and environmental advantages with the role of consumer views. The results eventually implied that a consumer's perception of remanufactured goods is a significant moderating factor when predicting their propensity to switch to such goods.

Table 3. Most Cited Papers (TC=Total Citations)

Paper	TC	TC per Year	Normalized TC
HAZEN BT, 2017, BUS STRATEG ENVIRON	194	27.71	1.61
KHAN F, 2019, RESOUR CONSERV RECYCL	174	34.8	4.18
VAN WEELDEN E, 2016, J CLEAN PROD	167	20.87	1.60
PATWA N, 2021, J BUS RES	123	41	7.36
CONFENTE I, 2020, J BUS RES	104	26	3.93
CODERONI S, 2020, J CLEAN PROD	97	24.25	3.67
VEHMAS K, 2018, J FASH MARK MANAG	85	14.16	2.07
MAGNIER L, 2019, J CLEAN PROD	74	14.8	1.78
SHARMA A, 2019, MANAG DECIS	73	14.6	1.75
WIESER H, 2018, J CLEAN PROD	66	11	1.61

Another important aspect to consider when analyzing the citation level are the most local cited sources. Local citations are a metric used by bibliometrix to calculate the number of citations a document earned from other documents in the

collection under analysis. Local citations estimate a document's importance within the studied collection. As it can be observed from figure 5, Journal of Cleaner Production is leading with 1203 citations, followed by Resource Conservation and Recycling with 424 citations.

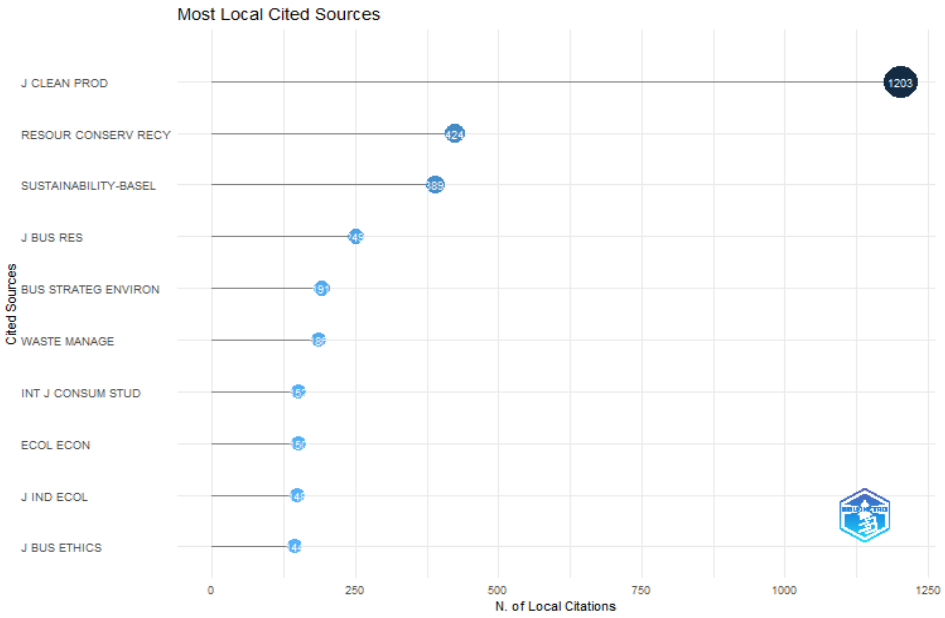

Figure 5. Most local cited sources

3.2.3 Document level

Figure 6's Word Tree Map shows words that frequently appear in the sample of papers; the more words that show up, the greater the square size.

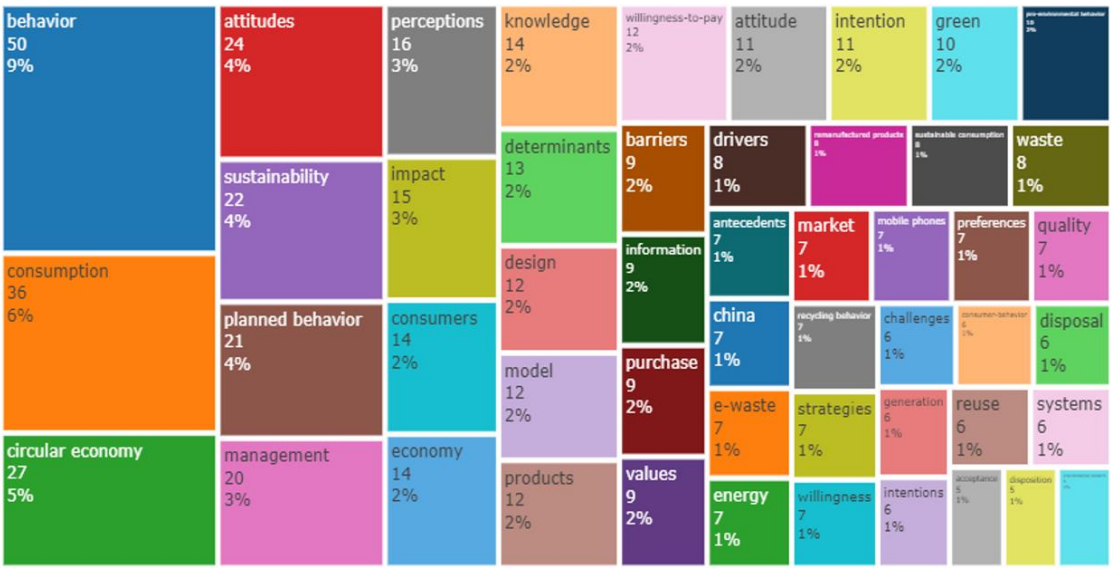

Figure 6. World tree map of key words

Moreover, taking into account the frequency of keywords employed by the authors as quantitative criteria, Figure 7 illustrates how the trends in circular economy consumer behavior manifested over time. It is important to mention that the width of the point means a higher use intensity, whereas its position on the suitable evidence the recent use of the term.

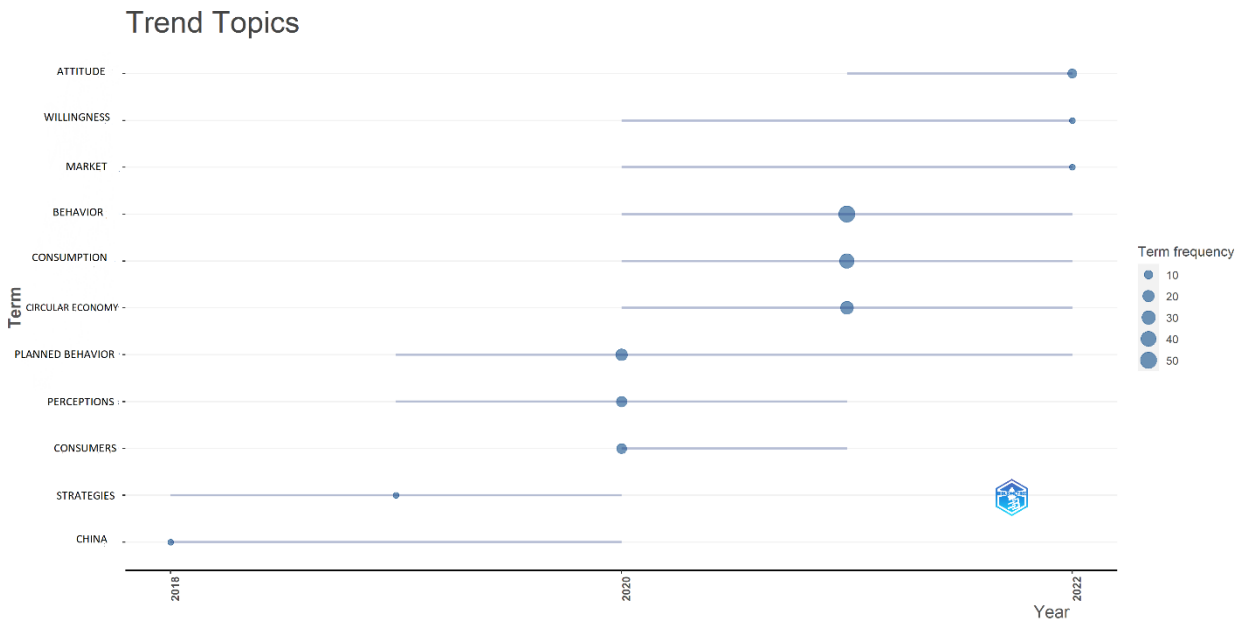

Figure 7. Trend topics

3.3 *Conceptual structure analysis: thematic analysis*

The most popular extracted keywords from research articles can also be subjected to data mining and statistical analysis using the Biblioshiny software tool. The result is reached using a semi-automatic technique that examines the titles of all references to the study object and adds pertinent keywords other than the author's keywords, allowing the findings to capture a wider range of variance (Taqi et al., 2020).

Then, under the form of a word cloud, keywords connected to a word frequency more than or equal to 10 are shown.

The clusters on the map are organized and grouped on the basis of two parameters: centrality and density. The thematic map obtained is depicted in figure 8.

Due to its great density and centrality, the upper right quadrant represents the driving themes that should be explored and further researched. In this specific case, the themes revolve around the subject of consumer barriers in adopting circular economy behaviors and the clothing apparel industry.

The basic themes encompassing clearly established research issues in this area are shown in the bottom-right corner of the figure: planned behavior, supply chain, product-service systems, etc.

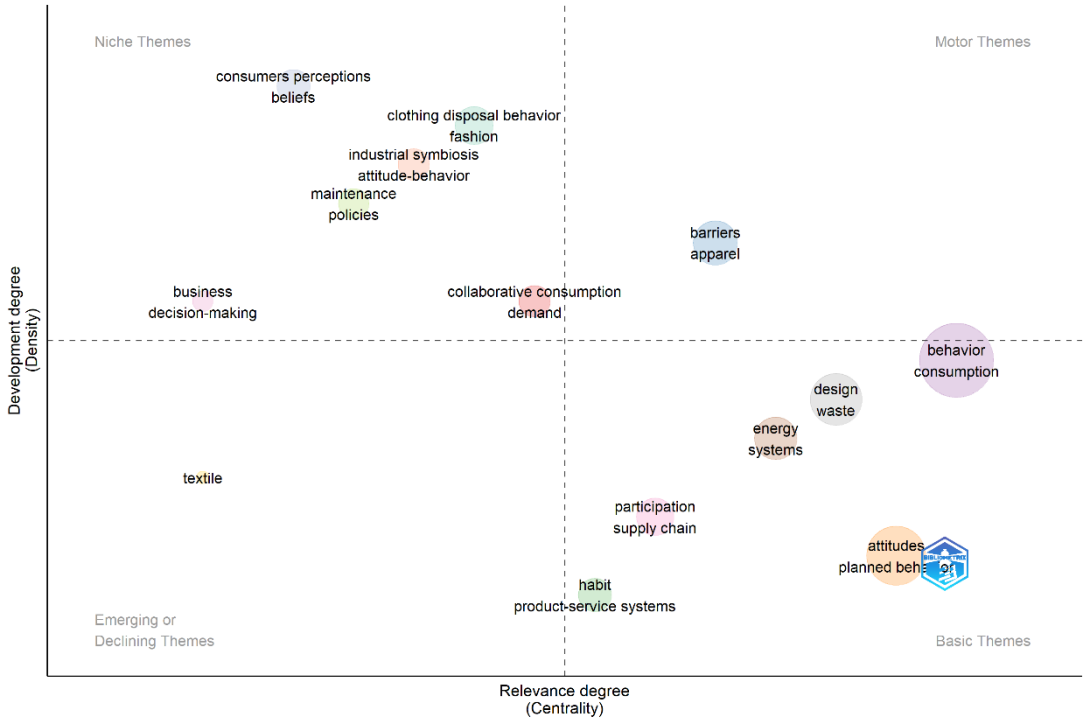

Figure 8. Thematic Map

According to Cobo et al. (2011), the upper left quadrant contains highly specialized, supporting subjects that are only marginally relevant to researchers. The themes in in this area cover subjects like clothing disposal behavior, business and decision making, the attitude-behavior relationship, etc., is a topic addressed separately and has only sporadic significance to the consumer behavior literature.

Lastly, the lower left quadrant contains marginal and moderately developed themes that are either rising or vanishing (Donthu et al., 2021). In this regard, the themes presented here may be indicative of emerging or declining study directions in the consumer behavior topic. Thereby, it is implied that the textile topic (which is near to the lines of centrality and density) has gained a great deal of interest recently in the scientific literature, considering its low centrality and density.

4 DISCUSSIONS

4.1 Implications and further research directions

To fully tap into the potential of the circular economy's inner loops, consumers' attitudes and behaviors toward the circular products and services involved must shift. Consumers will only be encouraged to keep what they purchased if they are able and motivated to repair and maintain them and if their positive assessment of their quality and functionality does not change (Szilagyi et al., 2022). Similar to this, for refurbished or recycles goods and distributed ownership models to be considered feasible options to standard new product purchases, customers must see them as having broad benefits and minimal risks (Didenko, Klochkov & Skripnuk, 2018).

The bibliometric approach has grown in popularity in recent years because of the widespread availability and adoption of bibliometric software and databases, that enable the collection and evaluation of vast amounts of scientific data in business research. Due to the novelty and high productivity during the past decade of this subject, this methodology is extremely valuable to the literature on the circular economy. Literature reviews are crucial for understanding the theories that explain consumer behavior and the empirical data that corroborates those theories. Therefore, bibliometric review enables researchers to identify those themes that require further research and analysis.

Therefore, in order to encourage consumers to embrace more circular business models and repair/reuse habits, another important study direction should focus on empirically understanding the barriers (internal and external consumer behavior traits).

4.2 Limitations

Firstly, the bibliometric data obtained from Web of Science was not created specifically for bibliometric analysis and hence may have inaccuracies that could compromise any analysis carried out with such data.

Second, considering its quantitative nature and the fact that the relationship between quantitative and qualitative results is frequently ambiguous (Wallin, 2005), qualitative inferences of bibliometrics data are prone to high subjectivity. In this sense, future studies on this topic ought to apply caution when making qualitative claims regarding bibliometric observations and augment those findings with content analysis when required (Gaur & Kumar, 2018).

Finally, bibliometric studies are only capable of providing a short term projection of the research field (Wallin, 2005), therefore the authors ought to refrain from premature assertions about the research area investigates and its long term influence.

5 CONCLUSION

The objective of this study was to examine the findings of previous studies on customer behavior in the circular economy. We were able to identify the most popular research areas in this area as well as those that need greater attention from researchers using bibliometric analysis. Additionally, we looked at the sources, productivity through time, and citation count for this body of literature. Hence, we draw the conclusion that consumer behavior in the circular economy is a topic that has advanced significantly over the past decade that we studied, both from the perspective of production performance and the diversification of research topics, with the topic of behavior related to the textile industry being one of the emerging fields that is likely to undergo a transformation in the years to come. In order to understand the importance of the user behaviors in the product lifecycle in this field and to examine the potential for nudging those behaviors via specific interventions, more interdisciplinary study on the consumer topic is required (Parajuly et al., 2020).

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