A BIBLIOMETRIC ANALYSIS OF SCIENTIFIC PRODUCTION CONCERNING ONLINE CONSUMER REVIEWS AND THE SALE OF HOME APPLIANCES

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Abstract:
Nowadays, online customer evaluations have developed as an essential source of information for both businesses and consumers, replacing and augmenting previous modes of communication. The goal of this work is to perform a bibliometric analysis to investigate the scientific production surrounding online reviews and the sale of home appliances from 2011 to 2022. We used the Scopus database to acquire primary data and the VOSviewer program to analyze the data and perform the bibliometric analysis to achieve the desired objective. The major findings revealed that the year 2021 delivered the greatest amount of scientific contributions and that the United States of America contributed the greatest number of articles overall. Moreover, for the analyzed period the terms with the highest density present in scientific production are: "online reviews", "quality", "applications", "impact", "reviews", "effects", "consumer", "factors", and "purchase intent." At the end of the analysis, we conclude with some relevant future research directions emerging from our bibliometric analysis.

Keywords: online review, home appliance, sales, customer, online sales, bibliometrics.

1. Introduction

With the advent of the Internet, a new type of online communication emerged, facilitating the provision and sharing of information between service providers and customers, as well as between users themselves (Park & Nicolau, 2015; Ignat et al., 2019). Customers are consequently provided with considerably more efficient information on the quality of the product. Compared to face-to-face contact, one advantage of this type of communication is its accessibility: consumers can easily make their thoughts available to other users on-line, and potential new customers may easily obtain online reviews from existing customers (Thakur, 2018).

E-commerce is one of the many benefits of the current Internet era, allowing people to purchase goods and services online. According to studies, online shopping is the most common Internet activity, followed by e-mail and site surfing (Li and Zhang, 2002). As the need for online shopping grows, as does the pace at which Internet users convert to online shoppers, so does the need to understand and analyze the attitude, behavior, and intent of those online shoppers (Forsythe et al., 2006).

A lot of research has been conducted over the years to investigate the impact of Internet reviews on client purchase behavior. According to various research (Murali et al., 2016), the home appliance business is one of the most significant in the world and home appliances are one of the most important industries today.

This work is unique in that it presents scientific production directed at the link between internet reviews and the sale of home appliances for examination. Thus, the goal of this work is to reveal scientific connections in academic publications using bibliometric analysis. With the use of a bibliometric study, we want to observe and analyze the scientific relationships between online reviews and the sale of home appliances, as well as how they are located in the scientific literature.

To conduct a detailed analysis, we track various aspects such as geographical areas based on the number of publications, the evolution of works over time, the authors most involved in the research process, and the most publications based on institutional affiliation, but also the most addressed research areas and the most used keywords.

2. Review of the literature

According to research, our society is increasingly reliant on the opinions of customers on-line. User contributions to technology platforms encourage engagement among like-minded community members who share shopping interests, simplifying buying decision making (Gavilan et al., 2018).

Various reasons for collecting customer feedback have been investigated, the most significant of which is that information needs depend on how information is used from a customer and the social context. We will not be able to address the information demands of our clients if we are not aware of them (Fabijan et al., 2015). Furthermore, firms want feedback to improve their efficiency.

Companies that ignore customer feedback, on the other hand, should consider various factors, such as the fact that 50% of customers will switch to a competitor after an unpleasant experience, and if those experiences are not tracked, gathering and listening to feedback from customers, the churn rate will continue to rise (Wolff, 2020). Customers' loyalty is no longer based on pricing or goods. There is a substantial correlation between client loyalty and positive experiences. However, in order to deliver the greatest customer experience possible, it is vital to analyze client feedback so that a firm understands exactly what they require and what the customer's expectations are.

As the use of the Internet for commercial purposes increased, so did the manner of shopping. People no longer need to physically travel to purchase heavy appliances or things, nor do they need to wait for their purchases to arrive (Khan and Ahmad, 2016). Customer feedback is unquestionably an important resource in any sales process, as various studies have shown (Jin et al., 2022; Liu & Chen, 2022). Continuing with the specialized literature research (Kirby, 2000), it can be said that online customer evaluations may have a stronger influence on home

appliance sales. As a result, these techniques have been investigated in a variety of specialized research.

In light of the above, we suggest a bibliometric study to assess how online reviews affected the sales of big electrical home products in the literature. The methodology of this paper is novel in that it uses current analysis tools to assess the association between online reviews and sales of large household appliances.

3. Elements of methodology regarding bibliometric analysis

In addition, we want to look at how the internet reviews have affected the sales of large electrical equipment in the past. For this purpose, we employ bibliometric analytical approaches to highlight scientific links in academic publications. This method enables scholars to examine various study fields, thematic patterns, and the interrelationships among these topics in a large body of literature (Ellegaard and Wallin, 2015; Zhang et al., 2022; Ștefan & Breazu, 2022). To construct a networked knowledge graph of study domains, bibliometric analysis uses descriptive publishing data on authors, institutions, journals, keywords, themes, and citations, as well as sophisticated keyword mining tools to uncover links (Ziegler, 2009). Bibliometric analysis has become an attractive tool for analyzing educational research in recent years. Thus, by definition, bibliometrics is equivocal, straddling two worlds, science and the library, but also research and the dissemination of scientific output (Rădulescu, 2019).

3.1. Research data collection

Keyword searches in the Scopus database, a platform provided by Elsevier, were used to collect data and choose articles for the bibliometric study. The Scopus database (2022a) was chosen not only for the amount of information it contains, but also for its quality.

Thus, data were gathered by searching for the keywords "online reviews*," "sales" or "e-commerce*," and "household appliances*," with the linking phrases "and" and "or" used to make the connection between terms or other possible derivatives. Furthermore, the symbol "*" was used to denote derivatives of the concepts utilized in the study. The search was carried out using the requirement that the examined phrases appear in the title of the article, the abstract, and the keywords. Furthermore, no filters were applied to the language, kind, or time of presentation of the material in order to analyze all information content. Thus, 89 scientific results were discovered based on the information provided, including 64 scientific articles, 11 conference materials, 7 books, 5 reviews and 2 book chapters.

We intend to conduct a detailed analysis of various aspects such as geographical areas based on the number of publications, the evolution of the works over time, the authors most involved in the research process and the most publications based on the authors' institutional affiliation, and also the most approached research areas and the most used keywords. Finally, the database was downloaded in "RIS" format and interpreted with Vosviewer software (Van Eck and Waltman, 2019), version 1.6.17, using the "co-occurrence" analysis type and "keywords" as the analysis unit to generate a keyword linkage map and execute additional analyzes.

VOSviewer is an application that allows you to generate, display, and explore scientific bibliometric maps (Van Eck and Waltman, 2010). The VOSviewer program uses the VOS mapping approach to create a term visualization map (Van Eck and Waltman, 2007).

4. Data interpretation

For better visualization, data analysis and interpretation were performed in the form of tables and graphs.

4.1. Time evolution of research works and geographical distribution of publications

Figure 1 shows the progress of the 89 selected scientific materials between 2011 and 2022-May; as a result, the first article that investigated the influence of online reviews on the sale of home appliances was published in 2011. Despite the fact that online consumer behavior has been researched from the inception of the Internet, we can observe that specialized studies began considerably later. We cannot see a consistent implication in this field's study from 2011 to 2015, however, there is a remarkable quantitative evolution in 2018, when 11 scientific materials were released. When we compare this year to the previous year, when only three items were released, we see a 27% rise. The year 2021 had the most scientific contributions, with 26 scientific papers. Furthermore, the pandemic implications have inspired the specialist literature and researchers to examine how individuals make purchases, how they are impacted by other people's virtual experiences, and so on.

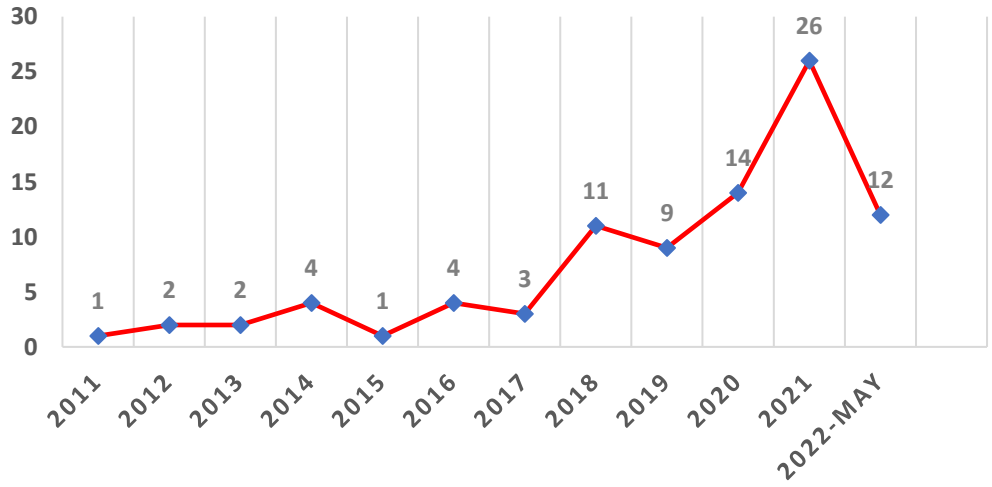

Figure 1. Evolution in time of the work on the influence of online reviews and the sale of household appliances.

Figure 2 shows the geographical distribution of the publications according to the number of publications. Therefore, we constructed the top ten countries participating in the research process using information from the Scopus database (2022a). Additionally, the regional distribution illustrated in Figure 2 highlights the number of publications in three distinct colors. Geographic locations shown in blue have the fewest scientific publications, whereas geographic areas marked in red have the most. At the same time, the green patches are on the boundary between the minimum and maximum number of publications.

We find that the United States of America contributes the most articles, with 20 scientific materials and 22% of the total number of publications examined. China

is ranked lower, with a weight of 16% in the total number of assessed items, or 15 scientific materials. Countries such as India, the United Kingdom, Canada, Australia, France, and Malaysia have the following ranks on the list. Countries having the fewest scientific contributions in this top 10 are New Zealand and Taiwan, which account for 3% of the total number of documents examined.

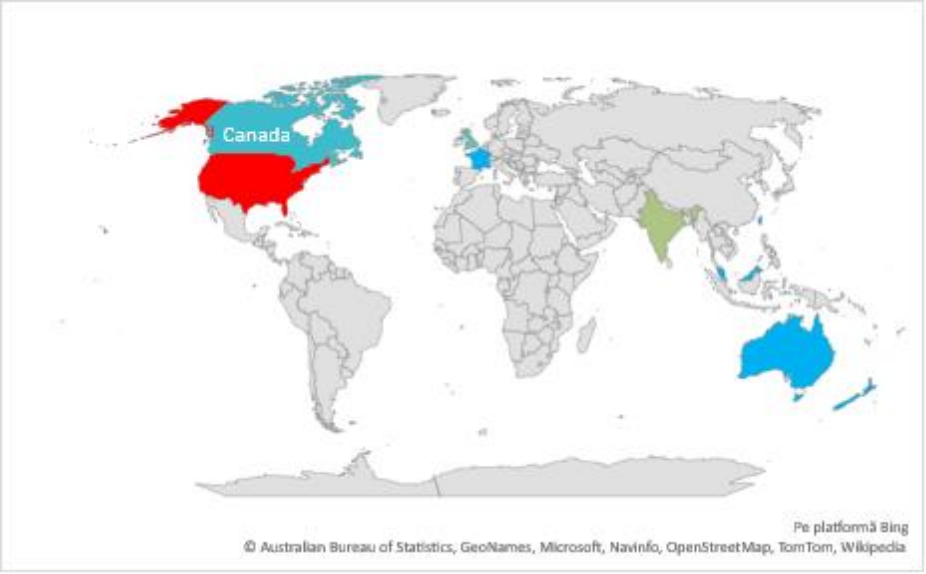

Figure 2. Geographical distribution of publications

4.2. The most involved authors in the research process and their affiliation

Table 1 lists the five main authors who have published the most scholarly resources on the subject under consideration. Using this kind of data analysis, we can see that the author Abrahams, A.S. ranks highest with 6 scientific papers. The first research study, titled "Automatic detection of defects in dishwashers from online consumer reviews," was published in 2017 and has received 50 citations to date. The author studied the influence of internet reviews on the sale of home appliances over time and even cooperated with other ranking authors. Goldberg, D.M. comes in second position, having produced a total of five scientific publications up to the time of the study (May 2022). The most actual article, from 2022, investigates novel techniques for gathering information from online evaluations in sales activity (Goldberg and Abrahams, 2022).

R. Gruss is a research associate at Adford University's Department of Management in the United States of America. The author ranks third in terms of scientific contribution, with four published scientific publications examining the effects of online reviews on the sale of home goods over time.

Ractham, P., and Yannou, B. are the authors on the final two places, each contributing three scientific works. Ractham, P. is a researcher at the Thammasat University in Thailand, while Yannou, B. is a French researcher at the University of Paris-Saclay. Both investigated the specifics of online reviews in sales activity.

Table 1. Top 5 authors according to the number of publications

Rank	Author	Number of publications
1.	Abrahams, A.S.	6
2.	Goldberg, D.M.	5
3.	Gruss, R.	4
4.	Ractham, P.	3
5.	Yannou, B.	2

Source: Authors' analysis

Table 2 shows the top five institutions where researchers are affiliated according to the number of publications. Thus, it is observed that the State University and Virginia Polytechnic Institute are on the first position in the ranking. Researchers affiliated with this university have published seven scientific materials. Furthermore, the first two authors in Table 1 correspond as affiliations to the first two positions in this ranking.

The R.B. Pamplin College of Business ranks lower in this ranking even though it is affiliated with Virginia State University. This provides access to 6 scientific papers in the period 2017-2022. On a large scale, according to Scopus (2022b), researchers affiliated with this college have so far managed to publish 1084 scientific documents in various research areas such as: Business, Management and Accounting, Social Sciences, Computer Science, Decision Sciences, etc.

The University of Auckland is recognized as the best ranked university in New Zealand. It ranks third in this research and presents five scientific studies on the influence of online reviews on sales activity. There are also scientific contributions from researchers affiliated with San Diego State University and the San Diego College of Business Administration. Thus, researchers from these institutions published seven scientific documents in the period 2020-2022.

Table 2. The main institutions to which researchers are affiliated according to the number of publications

Rank	Affiliation	Number of publications
1.	Virginia State University and Polytechnic Institute	7
2.	Virginia Tech, R.B. Pamplin College of Business, Virginia Tech	6
3.	University of Auckland	5
4.	San Diego State University	4
5.	San Diego College of Business Administration	3

Source: Authors' analysis

4.3. Research areas and most used keywords

In this part, we offer the distribution of examined publications in study topics, as well as the top ten keywords utilized in these papers.

Figure 3 also shows how the 89 materials examined were allocated throughout the study topics. It can be seen that the majority of the articles examined the impact of online reviews on sales activity from an accounting and management standpoint, since this sector has the most weight, accounting for 40% of the total number of documents examined.

We identify Informatics as a research area with a weight of 34%, and hence it is ranked lower than the first field. However, we believe that works that integrate keywords intended at analysis are usually included in the first two domains, but that an interdisciplinary approach is also visible.

Furthermore, we observe that 26% of the works examined have been published in journals or conferences in the fields of Social Sciences, Engineering, and Economics.

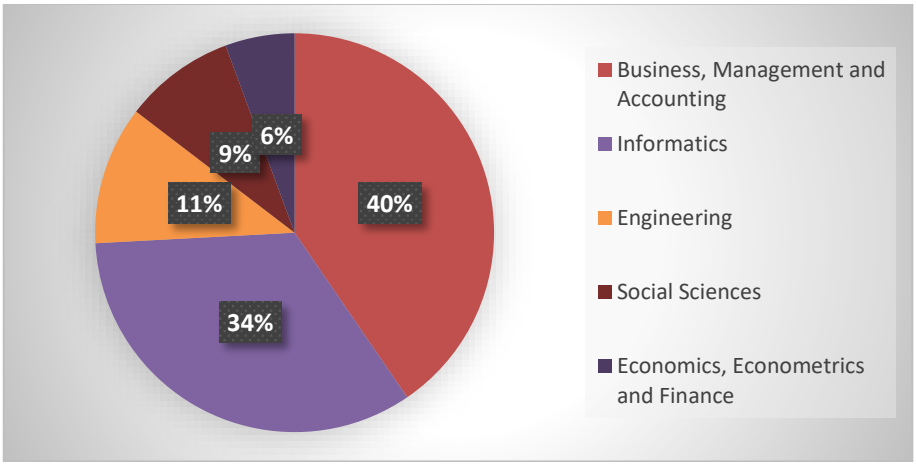

Figure 3. Distribution of the 89 scientific materials in research areas

Table 3 was constructed based on the terms most commonly used. Thus, it gives information on the top ten keywords detected in the title, abstract, or keywords of the 89 scientific papers. Analyzing the table, we see that "online reviews" is the most often used term in the analysis, appearing in 15 published items. Researchers were similarly interested in the investigation of sentiments in on-line purchasing decisions, thus they included this word in the title or abstract 13 times between 2014 and 2022 May.

The interdisciplinary approach is noteworthy, given that this top contains phrases from Management and Marketing domains such as customer behavior, costs, and purchase decision. However, we can see a more technical aspect for the study by using words: data and text mining, as well as natural language processing systems. This phenomenon might be explained by the fact that, from an organizational standpoint, businesses require IT resources to monitor the impact of online evaluations in order to promote sales.

Table 3. Top 10 words used in title, abstract, or keywords

Rank	Keywords	Number of apparitions
1.	Online Reviews	15
2.	Sentiment analysis	13
3.	Sales	12
4.	Data Mining	10
	Text mining	
5.	Electronic commerce	8
6.	Commerce	7
	Consumer behavior	
	Consumption Behavior	
	Customer satisfaction	
	Decision Making	
7.	Natural language processing systems	6
8.	Behavioral research	5
	Costs	
	Discovery of defects	
	Defects	
	Internet	
	Marketing	
	Online consumer review	
	Product Design	
	Buying intention	
	On-line social networks	
9.	Mobile data service	4
	Online product reviews	
	Online shopping	
	Buying Decision	
10.	Quality management	3

Source: Authors' analysis

4.4. Keyword analysis

The final study plan intends to analyze keywords and connection strength within the word graph created in Vosviewer software (Van Eck and Waltman, 2019) revised version 1.6.17. This study is based on a keyword analysis of 89 scientific publications, such as articles or conference papers, retrieved from the Scopus database (2022a). The option "Create a map using text data" was used to create

the keyword connection map, which employed the type of analysis "co-occurrence" and the unit of analysis "keywords."

Following processing, 217 keywords related to the issue of online reviews in the appliance sales industry were found. Given the enormous number of keywords found, only those occurring in at least two publications were chosen. As a result, 28 keywords were chosen and the keyword map is shown in Figure 4. We did not make any categories inside the database since we did not want to exclude any terms.

In terms of keyword clustering, 27 nodes can be found according to the criterion of choosing keywords that appear in more than two articles. A keyword represents a node, and its size is proportional to the number of occurrences (Bunea, 2021). Regarding the grouping of the 27 keywords, seven clusters were found and marked in various colors.

According to the data in Figure 4, the largest group is shown in red, with 7 nodes, followed by the green group with 5 nodes, the blue group with 4 nodes, the purple, yellow and turquoise group with 3 nodes and the orange group with 2 nodes.

Regarding the analysis of the first group, we notice that the term "online reviews" is the most used term and has links with terms such as: "application", "mobile data service", "quality", "review", "sentiment analysis", and even “topic”. From the connection of these words, we can see that the influence of online reviews has influenced consumer behavior in certain purchase intentions. Furthermore, a qualitative issue of the reviews was also addressed.

From the perspective of the second cluster, the most commonly used term "effect" is presented and creates co-occurrence links with terms such as: "case," "consumer," "purchase intent," and "equipment." We infer the idea that, in scientific research, the relationships between consumers' purchase intention and their effect on sales have been studied.

Cluster three, highlighted in yellow, shows co-occurrence links between the most used word "impact" and terms such as: "evidence", "online consumer reviews", and "online shopping". Moreover, the term "impact" creates co-occurrence links with all the clusters in the map, as a result studies have been developed on the impact of online reviews on the intention to purchase a product and even on the effects.

Clusters four, five, and six, highlighted in yellow, purple, and turquoise, show co-occurrence links between terms such as: "e-commerce", "analysis", "customer satisfaction", "product", "factor", "literature review", "intention", "role". In other words, we observe with the help of the links created within the map that there is a significant influence between these factors.

The last cluster, highlighted by the orange color, presents co-occurrence links between the terms: "mediating role" and "satisfied user".

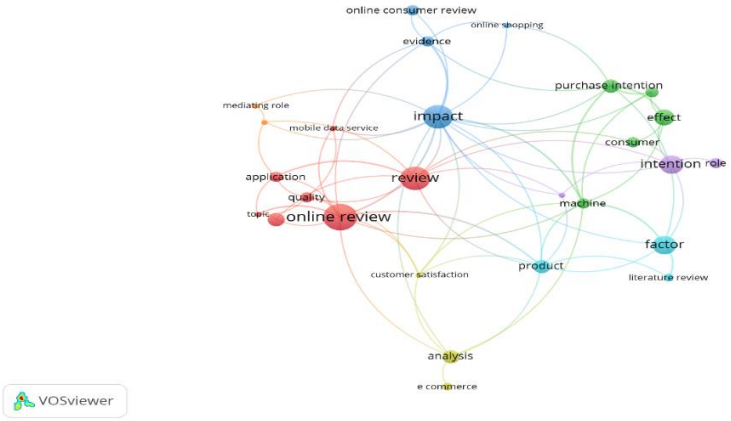

Figure 4. Link map of key terms

Moreover, Figure 5 shows the evolution over time of the key terms identified in the analysis process, with the help of the function in Vosviwer (Van Eck and Waltman, 2019) called "Overlay View".

According to the axis of progression in time within the map, we can observe that the scientific relationships between the examined phrases manifest in the first decade of 2018. Additionally, the map depicts the change of colors over time. Thus, in the map we indicate the words researched in the first period in dark blue, and the most recently studied components in yellow.

However, only terms from the period 2018-2021 were retained based on the criteria for choosing keywords that appear in more than two publications. Returning to Figure 1, we can see that most studies were conducted over this period of time, so Figure 5 depicts the progression of the most commonly used phrases over time.

In the first decade of 2018, terms such as "online reviews", "quality", "online consumer reviews", "literature review", "analysis", and "online trade" were used in scientific studies. Later, the researchers analyzed in the period 2019-2020, key concepts such as: "impact", "factors", "products", "reviews", "applications", "roles", "topic", and "consumer satisfaction".

The period of 2021 was characterized by research that includes keywords such as "purchase decision", "consumer", "effects", and "mediator role". We note that research has turned to a psychological side, in which consumer satisfaction is studied with the help of online reviews.

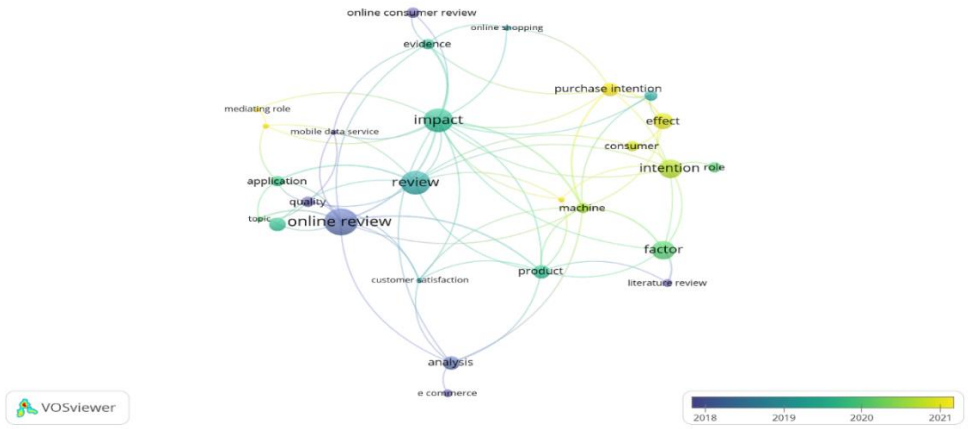

Figure 5. Time evolution of keywords

The density of essential phrases used in scientific analysis may be shown using VOSviewer (Figure 6). Each keyword density node is represented with a color dependent on the density of items at that node. In other words, the color of a node is determined by the number of items in its vicinity. The terms in the red zone are more common, whereas the keywords in the green zone are less common.

The density map is particularly useful for understanding the overall structure of a map and seeing which areas are most important on the map. In the present case, we note that the terms with the highest density are: "online reviews", "quality", "applications", "impact", "reviews", "effects", "consumer", "factors", and "purchase intent".

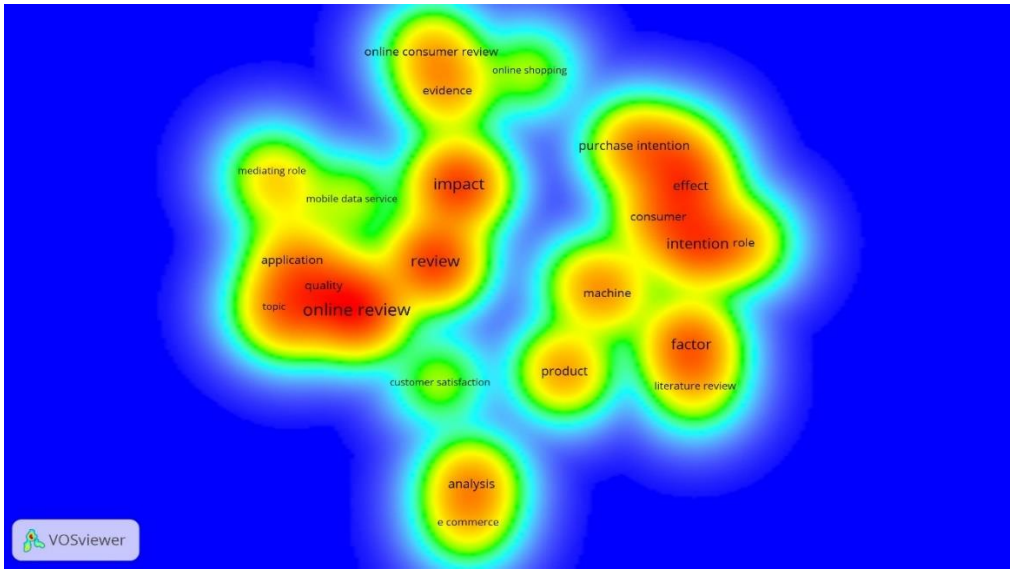

Figure 6. Density of the analyzed key terms

5. Conclusions

We can conclude that there is an upward trend in researching the factors that influence consumers to make purchases based on online reviews. The results show that most scientific materials were published during the years 2020-2022. At the same time, we noticed that the United States of America contributes the largest number of publications, respectively, with 20 scientific materials and 22% of the total number of publications analyzed.

There were other interesting results in the analysis; however, the most important core represented the realization of the map of the connection of the keywords identified in the Scopus database. Thus, we identified 27 nodes, according to the criterion of selecting keywords that appear in more than 2 articles, based on which seven clusters were made that were highlighted in different colors. These results determined the future research directions we propose below.

5.1. Future research directions

Given the density of key terms, the findings of our bibliometric analysis study highlighted certain crucial elements about future research paths on online reviews and the sale of home appliances. As a result, we offer and challenge experts from all over the world to find answers and share insights on the following questions. *What effect do online reviews have on purchasing intent? Can an online review accurately represent the quality of a product to be purchased? What is the function and impact of online reviews on customer purchasing intentions? What effect do online reviews have on consumer satisfaction?*

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