



Scientific Mapping for Customer Lifetime Value Research in Organizations Using Cluster Analysis Method

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Abstract

The aim of this research is to analyze and map international scientific publications in the field of customer lifetime value. This study, which follows the interpretation paradigm, is a descriptive study conducted using a systematic review method. The search terms defined in the Web of Science database were used, covering the period from 1985 to 2024. After screening and qualitatively evaluating studies, the final analysis was performed on 639 articles. The in-depth analysis of the selected articles revealed that international research in this field has been growing. Researchers have paid increasing attention to the concept of customer lifetime value over the last twenty years. However, there has been a drop in research attention in certain years such as 2008, 2017, and 2023. There is a need for more research on customer lifetime value, customer segmentation, and their connection with the keyword "data mining," reflecting the importance of this technique in the field. Additionally, countries such as Iran, Canada, and Turkey have fewer than the average number of citations, while countries like the United States, France, and Germany have more than the average number of citations, indicating different co-authorship patterns among these countries. Paying attention to the most productive and least productive countries and researchers through scientometrics can reveal research opportunities in the field of customer lifetime value in businesses and illuminate the horizon for Iranian researchers to showcase their research results at the international level.

Keywords: Customer lifetime value, Systematic review, Scientometrics, Cluster analysis.



Introduction

Customer lifetime value is an important concept in the field of marketing and customer relationship management, which refers to the estimation of the financial value of all interactions of a customer with a business or brand during the period of cooperation (Segarra-Moliner, & Moliner-Tena, 2024). . This concept indicates the amount of approximate income or profit that a customer provides to a business over a long period of time; Customer lifetime value plays an important role in increasing the profits of businesses, and the total value that a customer obtains during his relationship with a business or brand is examined under the title of customer lifetime value (Valentini et al. , 2024). Customer life cycle management is a cycle that starts from customer information management in order to define customer behavior and completely covers the processes of a business from attracting customers to selling products or providing services to customers and maintaining a long-term relationship with them. take The main goal of customer life cycle management is to enclose the customer deeply in the fabric of the business, so that the customer is absorbed and remains profitable forever. A combination of process, technology and tools that try to add value to the customer's life cycle are considered in customer life cycle management (Valli, 2024). Considering the increasing intensity of global competition and the increasing importance of investing in effective communication with customers, and considering the fact that the costs of maintaining existing customers are significantly lower than the costs of attracting new customers (De Marco et al. al., 2021) and looking at the global financial crisis and the efforts of businesses to effectively manage costs and revenues, business managers and decision makers are looking for an effective way to retain customers, long-term effective relationships with them and increase The share of the brand has come from the customer's wallet (Dandis et al., 2022) and accordingly, more researchers are interested in the concept of customer lifetime value, through scientific research, the need of businesses for a suitable implementation path in order to improve the lifetime value. Enlighten the customer's life. A review of the research literature in this field shows the use of multiple methods of calculating customer lifetime value since the first time when the basic formula of income minus the sum of sales and promotion costs was presented (Berger & Nasr, 1998); After these two researchers, other researchers used various methods such as probability models (Jasek et al., 2019), economic models (Baidya et al., 2019), sustainability models focusing on customer purchase behavior and maintenance and sales (Chan et al., 2011), computer science models using techniques such as neural networks and decision trees, as well as growth/diffusion models that focus on forecasting methods (Venkatesan, & Kumar, 2004) are considered in measuring customer lifetime value. have placed It is very clear that conducting scientific research without knowing the path taken by previous researchers and examining the strengths of previous research and research gaps will result in a waste of resources, and for this reason, researchers in any scientific field, especially sciences related to human factors Marketing and the topic of customer lifetime value are also included in this category, before



conducting the research, they critically review past research. Scientometric methods help researchers to in a general view and in the form of subject maps and clusters to in-depth and detailed analysis of prominent researchers, frequently used keywords as well as neglected keywords, active countries as well as supporting organizations and The provider of research grants, and based on this, the present research also draws a scientific map for customer lifetime value research in organizations using the cluster analysis method, and in order to guide Iranian researchers interested in research in the field of customer lifetime value. From the reliable web of science database, which is one of the most comprehensive and reliable databases that index international articles, primary data was extracted and analyzed with the help of scientometric methods to create a comprehensive picture based on this. From the path of research on this important and widely used concept in the field of business management, it will present and help Iranian researchers to choose the key words to be investigated, countries and international collaborating researchers, as well as in the field of publishing their research results in prestigious journals. The world should make decisions and act with full insight.

Theoretical foundations and research background

Customer lifetime value

In today's highly competitive environment, where globalization, continuous changes and innovations have created a fundamental transformation in the way of life and consumption, and the instability of everything, including competitive advantages, is one of its distinctive features, it is no longer possible to compete with conventional methods and conventional understanding of the market. relied on Brands and businesses today need capital beyond the competitive capabilities of the past to be able to ride on these transformations and maintain their superior position in the minds of the audience along with the rapid wave of change (Kumar, 2018). The only stable concept in today's world is change, and change in everything has fundamentally changed the way people live today; A fundamental change that has affected both people as consumers or brand audiences and affected businesses (Sancak, 2023). Businesses in the conditions of dynamic competition and the turbulent and chaotic environment of today's markets seek to gain benefits. They are a stable competition based on which they can keep their existing customers loyal with lower costs than attracting new customers (Rane et al., 2023). The life cycle value of customers is one of the things that can be taken into consideration to categorize customers and pay attention to their different behaviors and, accordingly, provide unique sales offers that can improve customer loyalty (Čermák, 2015). Customer lifetime value is actually the amount of value that a customer is expected to bring to a business in a certain time horizon, which undoubtedly has a direct relationship with the amount of benefit that can be derived from this category of customers (Razmi). & Ghanbari, 2009). Customer lifetime value is a method that will provide service providers or product sellers with a view of the customer's situation and will help these businesses to develop appropriate communication



channels and strategies for customer retention; This method shows well what information is available from the customer and the business can use this information to calculate and predict the profitability of customers and make informed decisions about them. The concept of customer lifetime value originates from customer relationship management and is one of the basic principles of customer relationship management (Asadi Ejgerdi & Kazerooni, 2024). During the past years, significant scientific and practical researches have been carried out to develop statistical methods to determine how to calculate customer lifetime value, and most of the researches that calculate customer lifetime value emphasize the net present value obtained through customer transactions during their lifetime. have and are trying to model this concept through customer retention and customer migration behaviors; One of the main methods of calculating customer lifetime value is the share of wallet method, which considers the basis of calculating the customer lifetime value as the ratio of the amount of sales of a specific product by the organization to the total amount of customer purchases of the same product in the entire market and in a certain period of time. (Razmi & Ghanbari, 2009). In other calculations, they use Markov chain models as the basis, and in this model, the main criterion for classifying customers is the amount of revenue that the organization allocates, and the basis of this method is based on the fact that customers never create the same profit for the organization (Castéran). et al., 2021). In another method that deals with the customer's past value, the customer's past performance indicates his level of profitability in the future, and a measure of past results can be used as the customer's future value; In this method, the value of the customer is calculated on the basis of the total profit obtained from him due to interactions in the past, so that the profit amounts are transferred to the present time considering the time value of money and the basis for the future value of the customer is determined (Ghale et al. al., 2021). In each of these approaches and methods, the goal of the researchers is to achieve a criterion based on which the business spends and invests on customers with different levels of loyalty, and by using the amount of profit and income from the customer, the communication path can be established. He established effectiveness with the best amount of capital allocation. The important issue in customer lifetime value research, in addition to different approaches in measuring this concept, is the variables of interest in the form of keywords in the articles, the cradle countries of this issue and the researchers who have had the most scientific activity in this field, in order to conduct future research using Scientific analysis should be planned in the best way.

Research background

In a research that reviewed the research literature in the field of customer lifetime value, it has been suggested that the concept of considering customers as assets that must be managed and their value must be measured, this concept is now accepted by academics and experts. recognized. Focusing on customer relationship management has made understanding customer lifetime value more important, because CLV models are an efficient and effective way to



evaluate the company's relationship with its customers; CLV evaluation is especially important for companies in promoting customer-oriented services. In this article, researchers have presented a critical review on the literature related to the development process of the concept of customer lifetime value and CLV applications (Chang et al., 2012).

In another paper, empirical statistical analysis and discussion of the predictive capabilities of selected customer lifetime value models that can be used in online shopping in e-commerce have been done. The comparison of the CLV forecasting abilities, using the selected evaluation criteria, was carried out on the selected models including the extended Pareto model, the Markov chain model and the status quo model, and used six data sets of online stores with annual revenue of tens of millions of euros for comparison. Based on the results of this research, the extended Pareto model has performed better than other selected models in most evaluation criteria and can be considered good and stable for non-contractual relationships in online shopping (Jasek et al., 2018).

In another research, customer lifetime value is considered as the most reliable indicator in direct marketing to measure customer profitability, and it is stated that this motivates researchers to compete in building models to maximize CLV and, as a result, strengthen the company's brand. And the relationship with the customer is stimulated. This review article analyzes the contribution of using dynamic programming models in the field of direct marketing to maximize CLV. It starts with a review of basic models that focus on calculating CLV, measuring, simulating, optimizing or maximizing its value, then dynamic programming models including Markov decision process, approximate dynamic programming are highlighted (AboElHamd et al., 2020).

In a research conducted in the form of a review and literature study, researchers have emphasized that customer lifetime value refers to the company's estimate of the net worth of a customer over time. This article defines and discusses the concept of CLV and highlights the strategic importance of CLV index in profitable customer management. Specifically, this article discusses the CLV index around three important questions, which include what, how, and why. The "What" section provides a discussion of the concept and definition of CLV along with the drivers of CLV. The "How To" section focuses on how to measure CLV, along with an overview of common approaches currently used in CLV modeling. Also, this section deals with the recent developments of the CLV index. Finally, the "Why" section discusses the benefits of adopting a CLV-based management approach versus developing CLV-based strategies. In providing CLV-based strategies, this research has shown increased financial impact through reduced overall marketing costs, increased overall customer response rates, and most importantly, increased overall customer and company profitability (Kumar & Rajan, 2020).



In another research, researchers have considered customer lifetime value as the main concept of relational marketing and believe that it has been increasingly addressed in scientific and business articles, however, there is a large gap in the literature and this has caused CLV cannot be fully used in business. The purpose of this paper is to shed light on the research process on CLV by critically analyzing the literature. For this purpose, after revealing the research area, the concepts of CLV, proposed mathematical models in addition to techniques and categories, its application and limitations have been investigated. This research emphasizes the need for a comprehensive model to increase the use of CLV (Abdolvand et al., 2021).

In another research, the main objective is to investigate the factors affecting the customer lifetime value (CLV) for Internet service providers in Jordan, and to examine technical quality, performance quality, brand credibility, reliability benefits, special treatment benefits, customer satisfaction and commitment in this field. An online survey was conducted with a sample of 481 respondents and SPSS and SmartPLS were used to analyze the data and analyze the proposed relationships and to check the robustness of the results. The results showed that the benefits of confidence, benefits of special treatment and brand credibility have a positive and significant effect on customer satisfaction and commitment, and brand credibility appears as the most influential factor leading to customer satisfaction and commitment and finally CLV; In addition, research shows that there is an insignificant relationship between performance quality, technical quality and customer satisfaction (Dandis et al., 2022).

In another study, the concept of customer lifetime value is considered as the total value of a customer for a company over time and helps businesses in allocating resources and appropriate marketing for profitability. This literature review fills a research gap by examining how to integrate customer risk factors into CLV calculations. Researchers have conducted a systematic literature review on databases, following strict criteria for relevance and quality. This review analyzed CLV methods and results, highlighted the use of mean-variance analysis to optimize customer portfolios, and identified customer revenue volatility as a major risk factor. This study also explores the evolution of CLV research and provides valuable insights, particularly in the application of machine learning to risk-adjusted CLV. The researchers' findings provide an overview, provide a framework for future research, and help businesses refine risk management strategies, identify high-risk customers, and increase customer value through more dynamic, data-driven models (Firmansyah et al. al., 2024).

In the review of the research conducted at the national level, a study was conducted using the information of 74385 members of the Iran Goods and Services Numbering Center in the period of 2016-2016 and the customers were classified by the CRISP data mining technique and finally a model was designed to predict them. became. First, the members were classified into 7 classes by the RFM model and the K-Means algorithm, and then each class was ranked by the customer lifetime value calculation method. Further, by logistic regression algorithms,



decision tree and neural networks, hidden patterns between data and different customer segments were discovered. The results of this research have shown the behavior of the customers of each of the clusters in the services of the center as well as the behavior model of the future customers. By analyzing clusters, this research helps managers in providing marketing strategies, keeping loyal members and attracting or removing inactive members (Nabizadeh & Rohani, 2021).

Another research was conducted with the aim of investigating the effect of relational marketing on customer lifetime value with the mediating role of relationship quality. This research was applied in terms of purpose and correlational in terms of descriptive data collection, and a questionnaire was used to collect data. The statistical population of the research was formed by the customers of Bank Mellat (21 branches) in Tabriz city and 384 questionnaires were collected using available sampling method. Data analysis using the structural equation modeling method showed that relationship marketing has a positive and significant effect directly on customer lifetime value with a path coefficient of 0.51 and on relationship quality with a path coefficient of 0.57; Also, relational marketing has an indirect effect on customer lifetime value through the mediating variable of relationship quality with a path coefficient of 0.51. Considering the significance of the direct and indirect effect of the relationship quality variable, it plays a partial mediating role in this relationship. By investing in relational marketing and improving the quality of the relationship, banks can establish an effective relationship with customers and increase the customer's lifetime and the resulting value (Rahimiaghdam et al., 2021).

The review of the research literature shows the importance of a comprehensive review of the concept of customer lifetime value, while also showing the diversity of viewpoints and empirical and review research; Based on this, the current research deals with the scientific evaluation and systematic review of published articles in this field.

Research methodology

The method of conducting the present research is based on the research onion based on the interpretative paradigm and in terms of orientation, it is a foundation that is carried out with the meta-combination strategy of studies and based on the inductive approach. From the point of view of the purpose of conducting the research, the exploratory approach governs the research, which is single-section and from the point of view of the qualitative result. The statistical population of the current research is the articles indexed in the Web of Science database between 1985 and 2024, and after the screening and qualitative evaluation of the studies, the final analysis was performed on 639 articles as a statistical sample that were selected in a targeted manner; This study is a type of scientometric studies in which various scientometric indicators and social network analysis (both authorship and lexical occurrence) have been used. Scientometric analyzes support and support quantitative interpretations of



social developments and dynamics, which are considered necessary for the advancement of science; Since the conceptual development of any scientific topic requires the use of various and new methods to identify research gaps, this tool is used for scientific mapping (Jafariyan et al., 2021); In the first stage, by entering the Web of Science citation database, the term Customer Lifetime Value was searched in the subject section, and then articles that were in languages other than English, articles that were published in a format other than research and review articles, and articles that Based on the field of study, those that were among unrelated fields were removed and 639 articles were included in the final analysis. In order to increase the reliability of the research and confirm the quality of the selected articles, the "Critical Evaluation Skills Program" was used, with the help of three experts in the field of marketing and customer relations, who had full knowledge of the concept of customer lifetime value, all of whom have a doctorate degree. , the history of publication of at least one article in the field under investigation, as well as the history of executive and managerial activity in the field of customer relationship business, the quality of the articles was confirmed through a ten-option checklist. The selected articles in VOS viewer software, which is one of the suitable software in the field of creating and illustrating bibliographic networks, creating maps based on network data, and also illustrating and exploring these maps (Azhdari et al., 2020), were imported and analyzed. was analyzed.

Findings

After searching, screening and qualitative evaluation of the articles during the scientific process of screening to achieve the highest number of articles related to the research objectives, the final review was done on 541 articles; In the following, a comprehensive analysis of the most important authors and countries along with frequently repeated keywords is provided in the form of scientific mapping using VOS viewer software.

In the current research, for 639 articles published by different authors, based on the report of the Web of Science database, the H index was reported as 81, which indicates the strength of the scientific validity of the research conducted in the field of customer lifetime value; In addition, the average citation per article in the current research is 40.01; Considering that 17,149 articles have cited these 639 articles a total of 25,564 times, it can be said that the research conducted in the field of customer lifetime value is highly reliable.

Analysis of the research done based on the year of publication and the amount of citations

According to the report of the web of science database regarding the articles reviewed in this research, 2022 is the spring of international research indexed in this database with the number of 44 articles and the number of 2477 citations; Although the growth trend of international research has been growing and researchers have paid increasing attention to the concept of



customers' lifetime value in the last twenty years, but in this period, there has been a decrease in research attention in years such as 2008, 2017 and 2023.

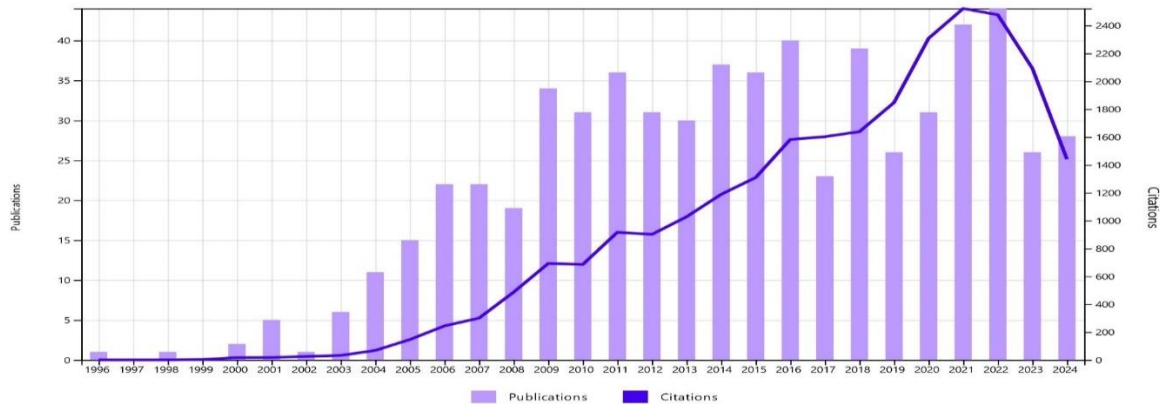


Figure 1. The process of producing scientific studies on customer lifetime value

Scientific network maps and keyword overlap

The purpose of drawing this map is to understand the structure of relationships among the concepts related to the concept of customer lifetime value, which is used by the authors in the articles. In this way, by considering the main axis of each of the researches conducted around the subject under investigation, in addition to identifying new concepts, remote but important keywords can also be discovered. For this purpose, all the keywords used in the articles were selected as the unit of analysis, as well as words that were repeated at least 5 times (threshold limit) or more can be seen in this map. Finally, among 2596 keywords, 187 words had the minimum threshold value. The results of this analysis can be seen in figure two.

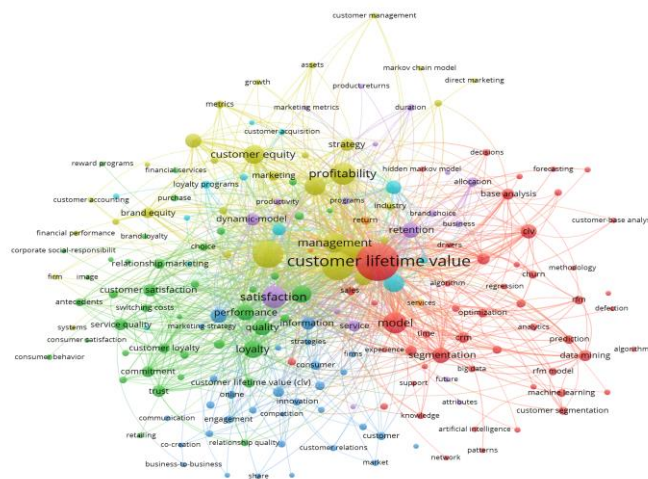


Figure 2. Keyword co-occurrence network map



bibliometric and co-citation links maps of the authors of the articles

Bibliometric linkage, like co-citation, is a similarity measure that uses citation analysis to establish similar relationships between articles; Bibliometric linking occurs when two articles refer to a common third article in their bibliography. This shows how likely these two works are to deal with a related topic, if they both refer to one or more documents in common, the two documents are bibliometrically paired. The more references two articles give to other documents, the more "link power" they have. Co-citation occurs when two articles are independently cited by one or more articles. Since bibliometric linking has been criticized due to its retrospective nature, and since two articles may refer to a completely unrelated topic in the third article, therefore, the co-citation method is a more appropriate indicator to express the similarity of the mentioned topic (Azodi et al., 2024). To draw a graphic map of bibliometric links, documents are selected as the unit of analysis and drawing method in VOSviewer, fractional counting. Five citations as the selection threshold value and out of 639 articles, 437 reached this value; This threshold was chosen to ensure greater accuracy in the analysis. These 437 authors are in 9 clusters with different colors; As it is clear in the figure, the hot spots or points with the most bibliometric links are related to the prolific author in the field of customer lifetime value, namely Kumar, who has a strong bibliometric link with other authors in different years, followed by Hung It is in the next position.

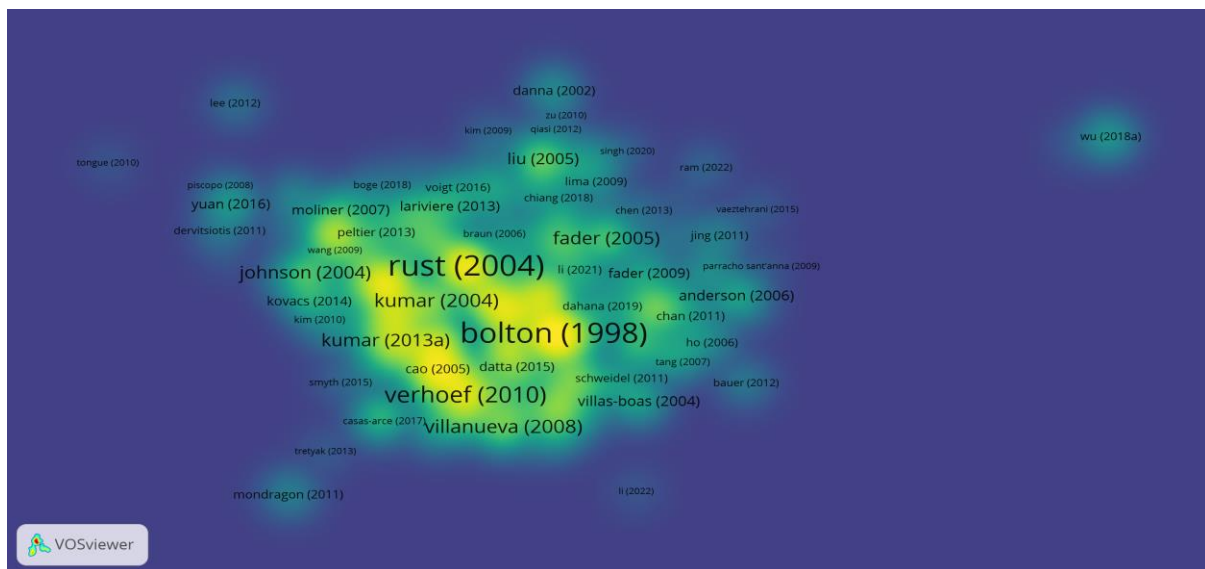


Figure 3. Bibliometric link density map

In the co-citation index, other articles cite two articles at the same time.; In Figure 4, the relationship of the authors with each other and the important clusters can be separated, and the authors of this field are based on the frequency of at least 20 citations, and among the 14,247 authors, 164 nodes have been obtained; Each of these nodes represents the articles of one



author, and if they are cited with other articles, communication lines are formed between them. The larger the diameter of these circles or so-called nodes, the more references to that author. In this figure, each color corresponds to a cluster and each cluster has intensity of connection and hot spots. In the author co-citation network map, Kumar has the largest share of articles in the selected subject area of this research and is in the center of the graph as the most important author. He is one of the most active authors with 759 citations. Also, other authors such as Rust and Gupta are in the next ranks but in different clusters with different colors.

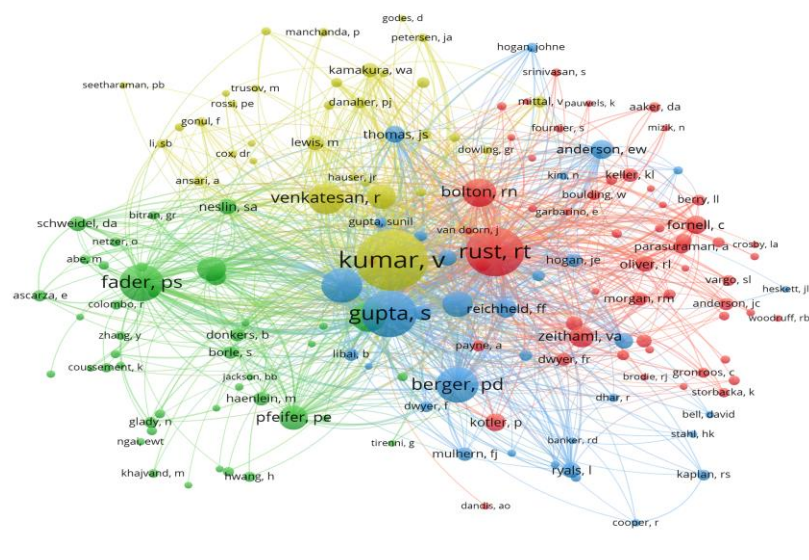


Figure 4. Co-citation network map of authors

Density map co-authored by authors from different countries

In the analysis of the collaboration of authors from different countries, by considering three articles for each country with a threshold limit of five citations to articles from 64 countries, a total of 44 nodes, the authors' co-authorship network has been obtained; In figure number five, which is the co-authored density map of the authors of the countries based on the number of articles and the average number of citations, according to the visual guide on the right and bottom of the map, as we move from the blue color to the yellow color, the average number of citations increases. According to this, countries such as Iran, Canada, and Turkey have cited less than twenty, and countries such as America, France, and Germany have cited more than sixty as the average amount of citations, which shows that these countries have different co-authorships. Another important point is that countries such as Denmark, Portugal and Ireland are located far from the center and the collaboration of the authors of these countries with prominent international researchers is evident with smaller circles and thinner diameter.

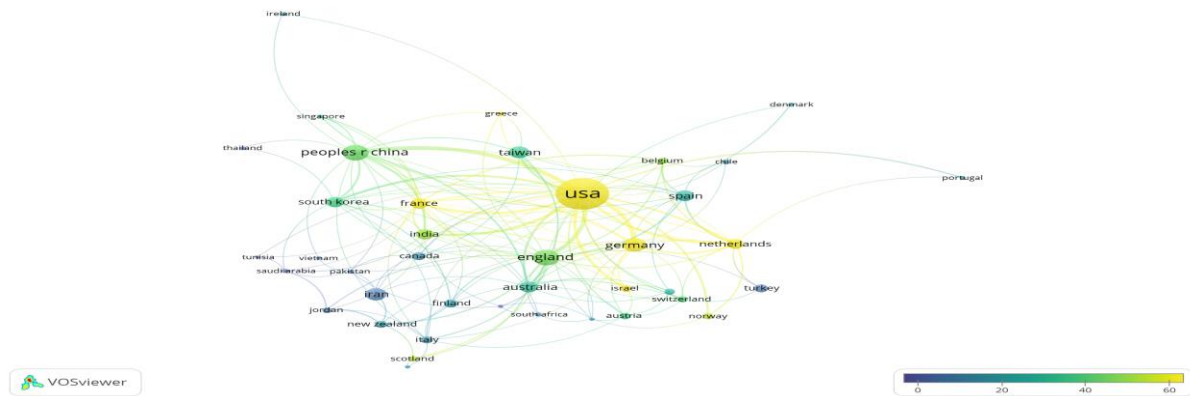


Figure 5. Co-authored network density map of countries

Discussion and conclusion

The aim of this study is to draw and analyze the scientific mapping of international research in the field of customer lifetime value using the scientometric method during the years 1985 to 2024 and to identify the subject structure of selected articles in the Web of Science database and the graphic maps of bibliometric links, citations, and Their occurrence and co-authorship were drawn. The results of these analyzes revealed the articles of highly cited and active authors in this field, and in this way, while providing a path for future researchers to exploit articles with more citations that certainly have more valuable scientific content, it revealed that the more If we refer more to active authors in productive countries and research cradles in our researches, the possibility of Iran's name and Iranian authors becoming more colorful in the field of international research will increase. Based on the results of the co-citation of the authors and the introduction of the most active and most cited authors, it was concluded that Iranian authors do not have a share of related maps and this can be due to the weak cooperation of Iran as a sponsor of international research and the lack of joint research activity of Iranian authors with other countries. be; Therefore, in order for Iranian authors' articles to be presented in the world, they should cooperate with hot authors in these fields or at least refer to their articles, and with the help of organizations supporting research in the field of customer lifetime value in the world, lay the groundwork for more publication of their scientific research results at the level become international By performing the co-occurrence analysis of key words, the result was obtained that which topics are more and which key words have been given more attention in scientific communities; The results of this research showed that customer lifetime value is closely related to concepts such as customer satisfaction and customer segmentation, and the data mining technique is closely related to these concepts as a technique to calculate customer lifetime value in recent years. Along with artificial intelligence, it has received the attention of researchers. Also, some keywords such as financial performance or direct marketing are outliers and do not have a strong relationship with customer lifetime value; In other words,



these keywords may have an effect on customer lifetime value in terms of theoretical foundations, but these words have not been paid attention to in research or have not been used simultaneously in research. Although scientometric researches do not offer suggestions by themselves, they can be helpful in understanding the current situation and guiding scientific trends in the field under investigation; Therefore, researchers are advised to focus on hotspots or key words with larger circles in their researches, to also focus on outlying points and far from the center of the maps, and simultaneously use both types of nodes as words in their researches. consider the key to be evaluated in order to lay the groundwork for the growth of Iranian research in this field. The results of the current research will help researchers in the field of marketing and customer behavior to explain the study process in these fields based on the identified influential words and reduce the research gap as much as possible. The results of the investigation of the hot spots or the points where there are the most bibliometric links were that Kumar is a prolific author in the field of customer lifetime value who has a strong bibliometric link with other authors in different years, and after him Hung in The next place is located. In the author co-citation network map, Kumar has the largest share of articles in the selected subject area of this research and is in the center of the graph as the most important author, he is one of the most active authors with 759 citations. Also, other authors such as Rust and Gupta are in the next ranks but in different clusters with different colors. This valuable result helps Iranian researchers to have a valuable basis of highly cited articles and active authors in the critical analysis of the background in their research and to avoid repetition and rework. In this research, it was found that countries like Iran, Canada and Turkey have less than twenty as the average number of citations, and countries like America, France and Germany have more than sixty as the average number of citations, which shows co-authorship. These countries are different; Another important point is that countries such as Denmark, Portugal and Ireland are located far from the center and the collaboration of the authors of these countries with prominent international researchers is evident with smaller circles and thinner diameter; Therefore, interested researchers are advised to look for research opportunities and cooperate with public and private institutions and organizations to conduct global research while exploiting the results of research conducted in countries that are the cradle of research in the field of customer lifetime value. to be

Future researchers are suggested to examine other variables related to the concept of customer lifetime value and cooperate with other world-renowned authors and use other scientific methods and other software to investigate research challenges and research gaps. to pay The limitation of this research is related to the selection of articles from the Web of Science database, which, although it is one of the best and most reliable scientific databases in the world, covers some related studies later and with a time delay.



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