Scientific mapping for customer lifetime value research in organizations using cluster analysis method

Abstract
The aim of this research is to analyze and map international scientific publications related to Customer Lifetime Value (CLTV). This study adopts an interpretive paradigm and employs a descriptive approach using a systematic review method. By utilizing specific search terms in the Web of Science database, covering the period from 1985 to 2024, and after thorough screening and qualitative assessment of the studies, the final analysis was conducted on 639 articles.
An in-depth examination of the selected articles revealed a notable increase in international research in this field, particularly during the last twenty years. However, there have been periods of decreased research activity in years such as 2008, 2017, and 2023. The primary focus of this research has been on customer lifetime value and customer segmentation, with a significant association to the keyword "data mining," highlighting the importance of this technique in the discipline.
Moreover, it was found that countries like Iran, Canada, and Turkey have lower average citation rates, whereas the United States, France, and Germany exhibit higher average citation rates. This suggests different patterns of co-authorship among these countries. By examining the most and least productive countries and researchers through scientometrics, new research opportunities in the field of customer lifetime value can be identified, providing insights for Iranian researchers to enhance the visibility of their findings on an international scale.
Keywords: Customer Lifetime Value, Systematic Review, Scientometrics, Cluster Analysis.

Introduction

Customer Lifetime Value (CLV) is a crucial concept in marketing and customer relationship management. It estimates the financial value of all interactions a customer has with a business or brand throughout their relationship (Segarra-Moliner & Moliner-Tena, 2024). This concept represents the approximate revenue or profit a customer contributes to a business over an extended period. CLV plays a significant role in enhancing the profitability of businesses by examining the total value generated by a customer during their relationship with a brand (Valentini et al., 2024).
Customer lifecycle management encompasses a cycle that starts with managing customer information to define behaviors, and includes all processes a business undertakes—from attracting customers to selling products or services and maintaining long-term relationships. The primary goal of customer lifecycle management is to integrate customers deeply into the business so that they remain profitable over time. It involves a combination of processes, technologies, and tools aimed at adding value to the customer's lifetime (Valli, 2024).
With increasing global competition and the rising importance of effective customer communication, it is crucial to remember that retaining existing customers is significantly less expensive than acquiring new ones (De Marco et al., 2021). Additionally, in light of global financial crises, businesses are striving to manage costs and revenues effectively. As a result, managers and decision-makers are seeking effective strategies to retain customers, establish long-term relationships, and enhance the brand's share of a customer's wallet (Dandis et al., 2022).
Consequently, more researchers are focusing on CLV to understand the need for businesses to develop suitable operational approaches to enhance customer lifetime value. A review of the literature in this field reveals various methods for calculating customer lifetime value (CLTV), starting with the foundational formula of revenue minus the total sales and promotion costs introduced by Berger and Nasr (1998). Subsequently, researchers have employed methods like probabilistic models (Jasek et al., 2019), economic models (Baidya et al., 2019), sustainability models focusing on customer purchasing behavior and retention (Chan et al., 2011), computer science models utilizing techniques such as neural networks and decision trees, as well as growth/diffusion models aimed at forecasting (Venkatesan &

Kumar, 2004). However, despite the wealth of research dedicated to CLV, a significant challenge persists: the unclear documentation and systematization of the research trajectory itself (Dust Mohammadi et al.,2016). While individual studies contribute valuable insights, a comprehensive understanding of the field's evolution, its key players, emerging trends, and remaining knowledge gaps remains elusive.

It is evident that conducting scientific research without a thorough understanding of previous studies, including their strengths and gaps, can lead to significant resource waste. Therefore, researchers across all scientific disciplines, particularly in fields related to human factors like marketing and customer lifetime value, should critically review past research before initiating their studies. Scientometric methods provide researchers with a comprehensive overview, presented in the form of maps and thematic clusters, allowing for in-depth analyses of prominent researchers, commonly used keywords, overlooked keywords, active countries, and organizations that provide research funding.

Therefore, this study directly addresses the critical need for a clear and comprehensive map of the CLV research landscape. It aims to systematically analyze the existing body of literature using scientometric methods, providing a visual and thematic overview of the field's evolution, key contributors, dominant research themes, and under-explored areas. By leveraging the power of cluster analysis, this research seeks to answer the following key questions:

- What are the dominant research themes and trends within the CLV literature?
- Who are the key researchers and institutions shaping the field
- Which keywords and concepts are frequently used, and which are comparatively overlooked?
- Which countries and organizations are most active in CLV research and funding?
- What are the key knowledge gaps and potential avenues for future research?

In this spirit, the current study aims to map the scientific landscape of customer lifetime value research in organizations using cluster analysis. To support Iranian researchers interested in this field, initial data were collected from the reputable Web of Science database, which is one of the most comprehensive and reliable sources indexing international articles. This data will then be analyzed using scientometric methods to offer a clear picture of the research trajectory concerning this important concept in business administration. The findings will assist Iranian researchers in making informed decisions regarding keyword selection, identifying potential international collaborators, and publishing their research in reputable international journals with a well-rounded understanding.

Theoretical framework

In today's competitive cloud environment, globalization, constant change, and innovation have fundamentally transformed lifestyles and consumption patterns. The impermanence of everything, including competitive advantages, is now a defining characteristic, making traditional competition methods and market understanding insufficient. Brands and businesses need to leverage resources beyond past competitive capabilities to navigate these transformations and maintain their prominent position in the minds of their audience amid the accelerating wave of change (Kumar, 2018).

The only constant in today's world is change, which has revolutionized the way modern humans live. This fundamental transformation affects both individuals as consumers and businesses alike (Sancak, 2023). In the dynamic and turbulent market landscape, businesses are seeking sustainable competitive advantages to retain existing customers at a lower cost than acquiring new ones (Rane et al., 2023).

Customer lifecycle value is essential for categorizing customers and understanding their diverse behaviors. This approach enables businesses to provide unique sales offers that enhance customer loyalty (Čermák, 2015). Customer lifetime value (CLV) represents the amount of value a customer is expected to bring to a business over a specific time horizon. It is directly related to the benefits derived from that customer group (Razmi & Ghanbari, 2009).

CLV provides service providers and product sellers with insights into their customers' situations, facilitating the development of appropriate communication channels and retention strategies. By analyzing available customer information, businesses can calculate and predict profitability, leading to informed decisions regarding customer management. The concept of customer lifetime value originates from customer relationship management and is a fundamental principle in this field (Asadi Ejgerdi & Kazerooni, 2024).

Recent years have seen significant scientific and practical research focused on developing statistical methods to calculate customer lifetime value. Most studies emphasize the net present value derived from customer transactions over their lifetime and model this concept based on customer retention and migration behaviors. Another major method for calculating CLV is the "share of wallet" approach, which compares the sales of a specific product by an organization to the total purchases of that product by customers in the entire market over a certain period (Razmi & Ghanbari, 2009).

In various calculations, Markov chain models are often employed as a foundation for analyzing customer behavior. In this model, the primary criterion for classifying customers is the amount of revenue they contribute to the organization. This approach is based on the premise that customers do not generate the same profit for the organization (Castéran et al., 2021).

Another method focuses on the customer's historical value, where past performance is indicative of future profitability. This technique utilizes the total profit earned from past interactions as a measure of the customer's future value. By considering the time value of money, profit amounts are adjusted to reflect their present value, establishing a basis for estimating the customer's future worth (Ghale et al., 2021).

In each of these approaches, researchers aim to develop criteria that help manage business expenditures and investments for customers with varying levels of loyalty. By leveraging the profit and income generated from each customer, businesses can establish effective communication paths and allocate resources more efficiently.

An important aspect of customer lifetime value (CLV) research, beyond the various measurement methods, includes the relevant variables referenced in article keywords, the countries where this research originated, and the researchers who have contributed significantly to this field. These factors can help inform future studies through scientific analysis.

A review of the literature on CLV has highlighted that the concept of considering customers as assets that require management and valuation is now widely accepted by both academics and practitioners (Hajmohamad et al., 2020). Given the emphasis on customer relationship management, understanding CLV has become increasingly important. CLV models serve as efficient tools for evaluating a company's relationship with its customers, particularly in enhancing customer-centric services. Researchers in this paper critically review the development of the CLV concept and its various applications (Chang et al., 2012).

Another study conducts an empirical statistical analysis discussing the predictive capabilities of selected CLV models suitable for e-commerce. The comparison includes models such as the extended Pareto model, Markov chain model, and status quo model, evaluated against six online store datasets with annual revenues in the millions of euros. The results indicate that the extended Pareto model outperforms the other models in most evaluation criteria and is particularly effective for non-contractual relationships in online shopping (Jasek et al., 2018).

Additionally, customer lifetime value has been identified as a reliable metric for measuring customer profitability in direct marketing. This has spurred competition among researchers to develop models that maximize CLV and strengthen the company's brand and customer relationships. A review article examines the role of dynamic programming models in enhancing CLV in direct marketing. It begins by assessing basic models that calculate, measure, simulate, optimize, or maximize CLV, before delving into dynamic programming models, including the Markov decision process and approximate dynamic programming (AboElHamd et al., 2020).

In another literature review, researchers define customer lifetime value as a company's estimate of a customer's net worth over time. This paper discusses CLV's strategic significance in managing profitable customer relationships, addressing three key questions: what, how, and why. The "what" section clarifies the concept and definition of CLV, along with its drivers. The "how" section focuses on measuring CLV and provides an overview of common modeling approaches, including recent advancements. Lastly, the "why" section examines the benefits of adopting a CLV-based management approach, emphasizing the financial impacts such as reduced marketing costs, improved customer response rates, and, most importantly, enhanced overall profitability for both customers and the company (Kumar & Rajan, 2020).

In a study focused on customer lifetime value (CLV) as a fundamental concept in relationship marketing, researchers noted that while CLV has gained attention in both academic and business literature, significant gaps still exist that limit its practical application in business contexts. This paper aims to clarify the research trends concerning CLV by critically analyzing the existing literature. The study will reveal the research area, explore the concepts of CLV, review proposed mathematical models, and examine associated techniques and categories, along with their applications and limitations. The

research highlights the need for a comprehensive model to enhance the practical use of CLV (Abdolvand et al., 2021).

Another study aimed to explore the factors influencing customer lifetime value for internet service providers in Jordan. Key factors included technical quality, performance quality, brand reputation, assurance benefits, special treatment benefits, customer satisfaction, and customer commitment. The researchers conducted an online survey with a sample of 481 respondents, utilizing SPSS for data analysis and SmartPLS to test the robustness of the results. Findings revealed that assurance benefits, special treatment benefits, and brand reputation significantly influenced customer satisfaction and commitment. Notably, brand reputation was identified as the most impactful factor driving both customer satisfaction and commitment, ultimately affecting CLV. Furthermore, the study found a negligible relationship between performance quality, technical quality, and customer satisfaction (Dandis et al., 2022).

A study was conducted to investigate the effect of relationship marketing on customer lifetime value, with a focus on the mediating role of relationship quality. This study was descriptive and correlational in nature, utilizing a questionnaire for data collection. The statistical population included customers of Mellat Bank across 21 branches in Tabriz city, from which 384 questionnaires were collected using a convenience sampling method.

Data analysis, performed using structural equation modeling, revealed that relationship marketing has a positive and significant direct effect on customer lifetime value, indicated by a path coefficient of 0.51. Additionally, it positively affects relationship quality, with a path coefficient of 0.57. Furthermore, relationship marketing has an indirect effect on customer lifetime value through relationship quality, also with a path coefficient of 0.51. The significance of both direct and indirect effects suggests that relationship quality serves as a partial mediator in this relationship. By investing in relationship marketing and enhancing relationship quality, banks can foster effective relationships with customers and subsequently increase customer lifetime value (Rahimiaghdam et al., 2021).

A review of the existing literature emphasizes the importance of thoroughly examining the concept of customer lifetime value, highlighting the variety of perspectives as well as empirical and review research in this area. Accordingly, this study undertakes a scientometric and systematic review of articles published on this topic.

Methodology

The current research employs an interpretive paradigm, which is fundamental for its orientation, utilizing a meta-synthesis strategy and an inductive approach. The exploratory approach predominates the research, which is cross-sectional and yields qualitative results. The statistical population consists of articles indexed in the Web of Science database from 1985 to 2024. After screening and qualitatively evaluating these studies, final analysis was conducted on a purposively selected sample of 639 articles. This study is classified as a scientometric investigation, employing various scientometric indicators and social network analysis for both authorship and lexical occurrences. The scientometric analyses provide quantitative insights into social developments and dynamics, which are crucial for scientific advancement. This is because the conceptual development of any scientific topic requires the application of diverse and innovative methods to identify research gaps.

To achieve this, scientific mapping was performed (Jafariyan et al., 2021). Initially, the term "Customer Lifetime Value" was searched in the subject section of the Web of Science citation database. Articles in languages other than English, those published in formats other than research or review articles, and articles from unrelated fields were excluded from the analysis. Ultimately, 639 articles were included in the final analysis.

To enhance the reliability of the research and confirm the quality of the selected articles, the "Critical Assessment Skills Program" was used. Three experts in marketing and customer relations, all holding PhDs and with a history of publishing at least one article in the relevant field, along with experience in executive and managerial positions within the customer relations sector, evaluated the quality of the articles through a ten-option checklist. The selected articles were analyzed using VOSviewer software, which is well-suited for constructing and visualizing bibliometric networks, creating maps based on network data, and exploring these maps (Azhdari et al., 2020).

Finindings

After conducting a thorough search, screening, and qualitative evaluation of articles during the scientific screening process to identify relevant studies aligned with the research objectives, we performed a final review of 541 articles. This culminated in a comprehensive analysis of the key authors, countries, and frequently used keywords, presented as a scientific map using VOSviewer software.

In this study, we examined 639 articles published by various authors, which yielded an H-index of 81 according to the Web of Science database. This high H-index reflects the scientific credibility of the research conducted in the field of customer lifetime value. Additionally, the average citation per article in this study is 40.01. Given that these 639 articles were cited 25,564 times by a total of 17,149 other articles, it is evident that the research on customer lifetime value holds substantial credibility.

We also analyzed the research trends based on the year of publication and citation rates (Figure 1). According to the Web of Science database, 2022 marked a peak in international research, with 44 articles published and 2,477 citations. While there has been a general upward trend in academic interest in customer lifetime value over the past two decades, there were notable declines in research focus during certain years, specifically 2008, 2017, and 2023.

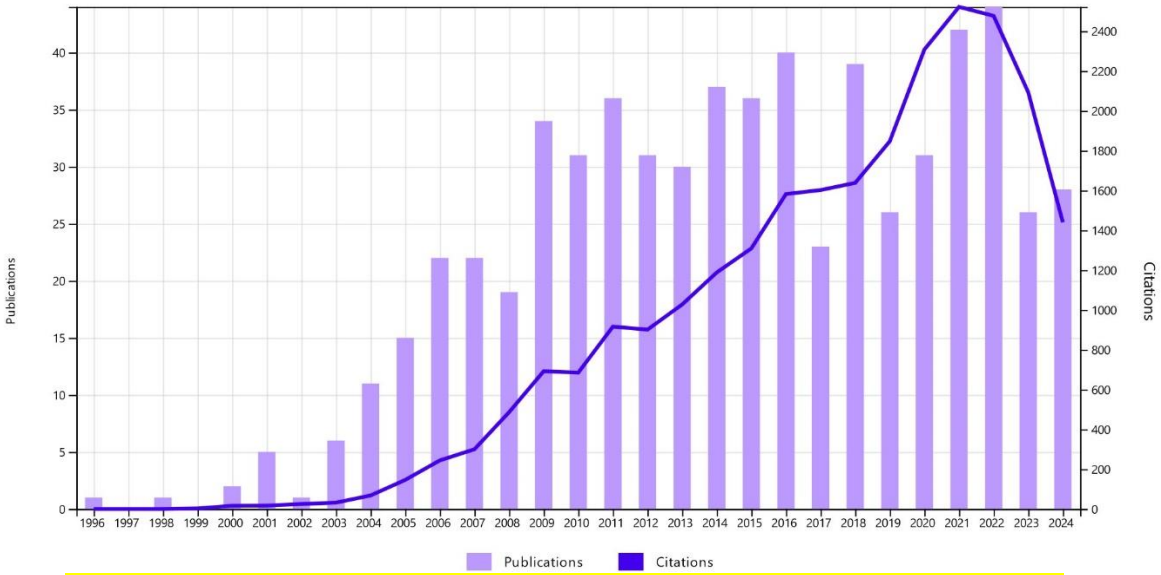

Figure (1) The process of producing scientific studies on customer lifetime value

Scientific Network Maps and Keyword Overlap

The purpose of drawing this map was to understand the structure of relationships between concepts related to the concept of customer lifetime value that have been used by the authors in the articles. In this way, by considering the main axis of each of the research conducted on the subject under study, in addition to identifying new concepts, it is possible to discover outliers but important keywords. For this purpose, all keywords used in the articles were selected as the unit of analysis, and also words that were repeated at least 5 times (threshold) or more are visible in this map. Finally, out of 2596 keywords, 187 words had a minimum threshold value. The results of this analysis can be seen in Figure 2.

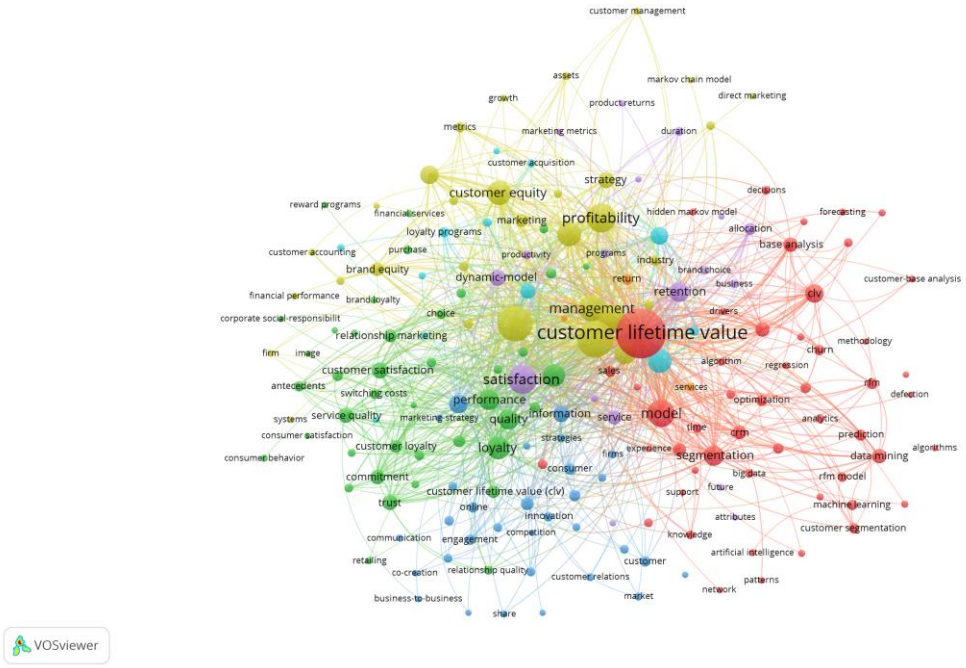

Figure (2) Keyword co-occurrence network map

As can be seen in Figure 2, words such as satisfaction, segmentation, profitability, and customer value are associated with the word customer lifetime value, and the keyword that is visible in the center of the figure with a larger circle and has a large diameter in relation to the concept of customer lifetime value and is also in the same cluster as the desired concept is “customer segmentation”. This indicates that more research is being conducted on customer lifetime value and customer segmentation. As is clear from the image, the word customer segmentation is located on the right side of the map and is associated with the keyword datamining, which indicates the importance of this technique in research related to customer lifetime value and customer segmentation.

Figure 3 shows the year-over-year trends in customer lifetime value research. The overlap map visually shows the rise or fall of a keyword. According to the guide bar on the right side of the map, yellow indicates recent keyword usage, and older keywords are blue; in other words, keywords that are dark blue are associated with articles published around 2012 and earlier, and words that are light blue to yellow tend to be published in 2020. In the keyword overlap map, it can be seen that most of the map area is blue-green. This indicates that the main keywords with large circles have been frequently used in recent years. In recent years, concepts such as predicting, machine learning, and artificial intelligence have received attention and will become the focus of research in the near future.

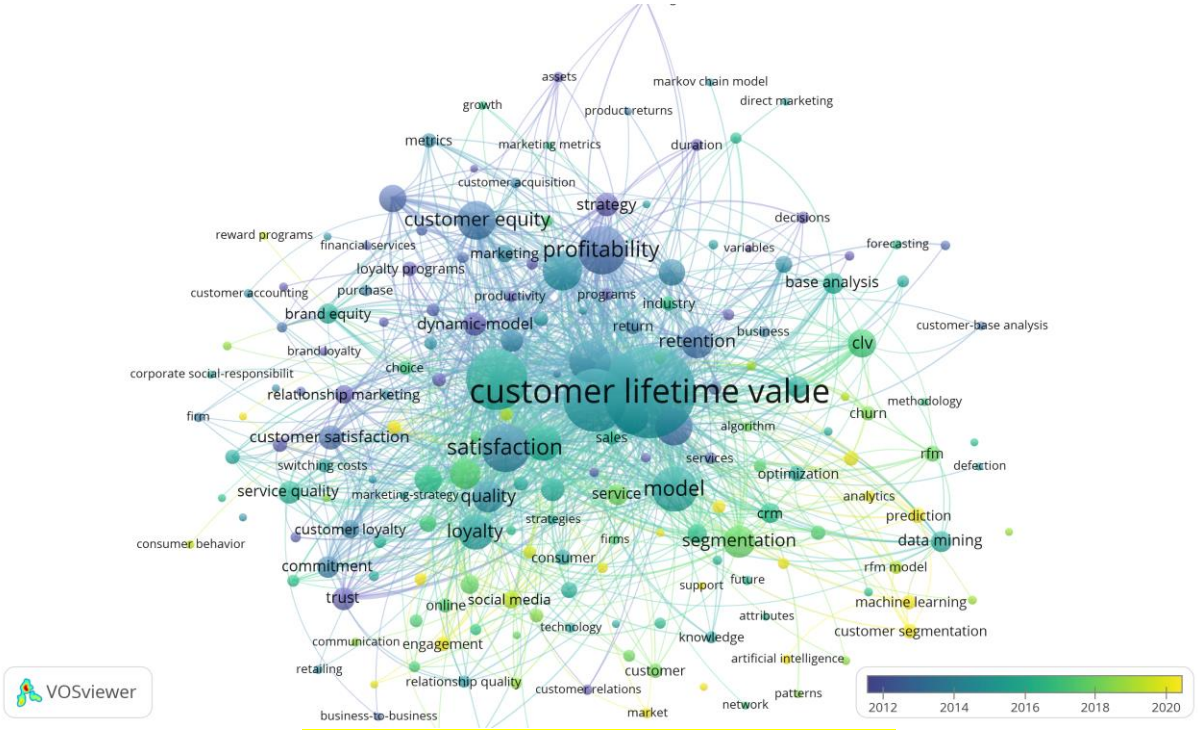

Figure (3) Overlap map of keyword co-occurrence

Bibliometric link maps and article author citation maps

Bibliometric linkage, like co-citation, is a similarity measure that uses citation analysis to establish a similar relationship between articles; bibliometric linkage occurs when two articles reference a third article in their bibliometrics. This indicates how likely it is that the two works address a related topic; if both cite one or more common documents, the two documents are bibliometrically paired. The more references two articles make to other documents, the greater the "link strength." Co-citation occurs when two articles are both independently cited by one or more other articles. Since bibliometric linkage has been criticized for its retrospective nature, and because two articles may refer to a completely unrelated topic in a third article, co-citation is a more appropriate indicator of the similarity of the cited topic (Azodi et al., 2024). To plot the bibliometric linkage graph, documents were selected as the unit of analysis and the plotting method in VOSviewer was fractional counting (figure 4). Five citations were selected as the 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 located in 9 clusters with different colors; as is clear from the figure, the hot spots or points with the most bibliometric linkages are related to the prolific author in the field of customer lifetime value, Kumar, who has strong bibliometric linkages with other authors in different years, followed by Hung.

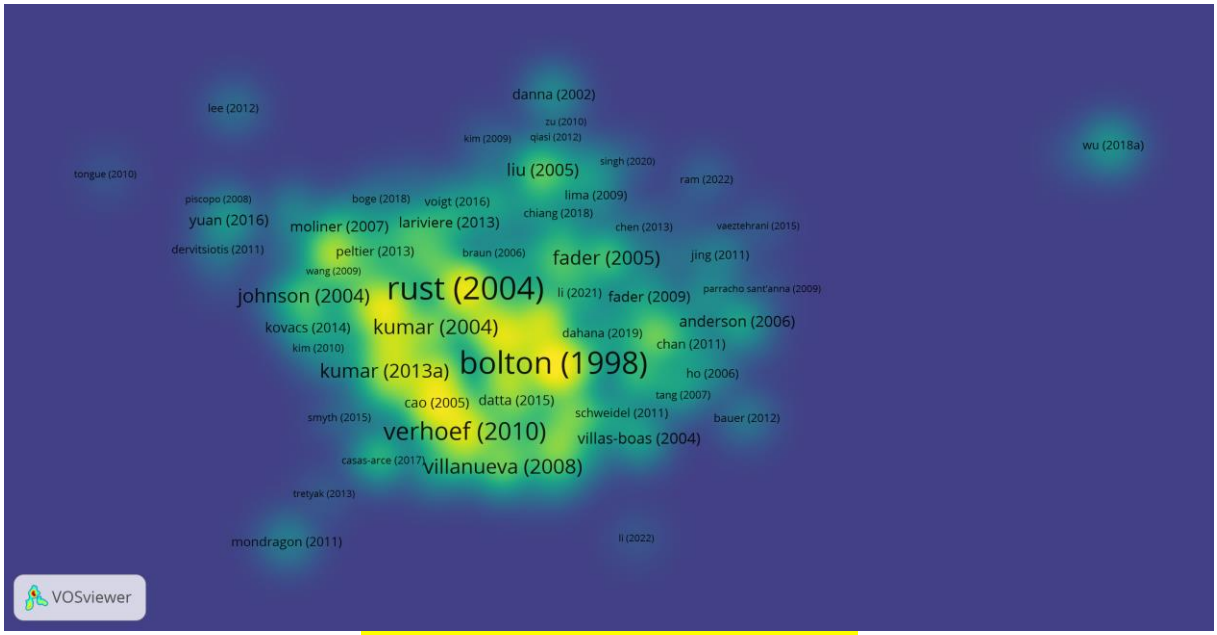

Figure (4) Bibliometric Link Density Map

In the co-citation index, other articles cite two articles simultaneously.; In Figure 5, the relationship between authors and important clusters can be distinguished, and authors in this field are based on a frequency of at least 20 citations, and 164 nodes are obtained from 14,247 authors; Each of these nodes represents articles by an author, which form communication lines between them when co-cited with other articles. The larger the diameter of these circles, or so-called nodes, the more citations are made to that author. In this figure, each color corresponds to a cluster, and each cluster has a connection intensity and hot spots. In the author co-citation network map, Kumar has the largest share of articles in the selected subject area of this study and is located in the center of the graph as the most important author. With 759 citations, he is one of the most active authors. Other authors such as Rust and Gupta are also in the next ranks, but in different clusters with different colors.

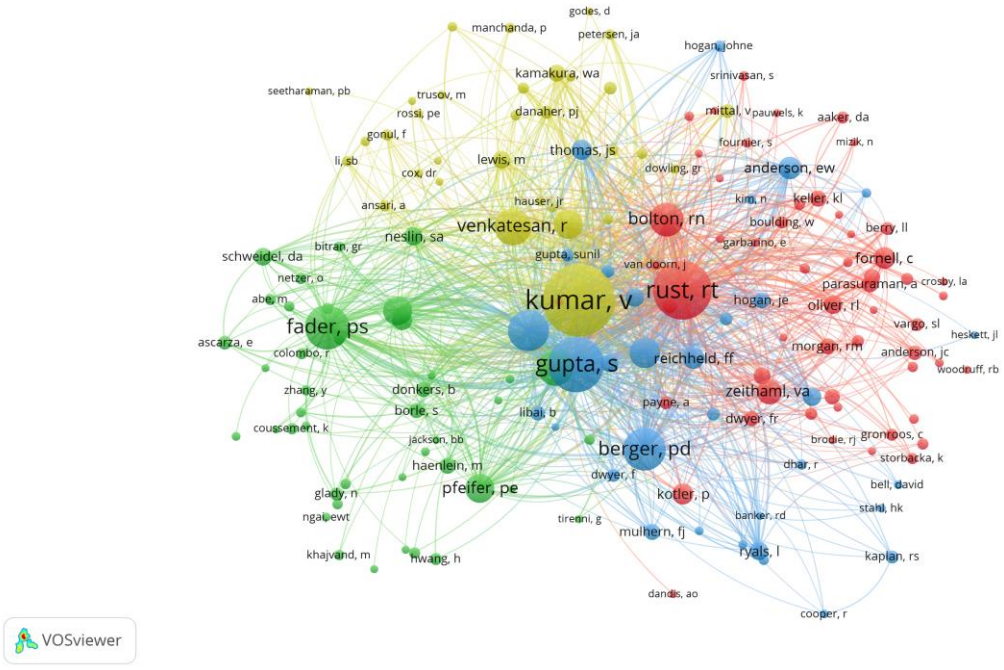

Figure (5) Author Co-Citation Network Map

Co-authorship density map of authors from different countries

In analyzing the collaboration of authors from different countries, considering three articles for each country with a threshold of five citations to articles from 64 countries, a co-authorship network of 44 nodes was obtained; In Figure 6, which is the co-authorship density map of authors from countries based on the number of articles and the average citation rate, according to the visual guide on the right and bottom of the map, the average number of citations increases as we move from deep blue to yellow. Accordingly, countries such as Iran, Canada and Turkey have less than twenty and countries such as the United States, France and Germany have more than sixty as the average citation rate, which indicates different co-authorship of these countries; Another important point is that countries such as Denmark, Portugal and Ireland are located in places far from the center and the collaboration of authors from these countries with prominent international researchers is evident with smaller circles and thinner diameters.

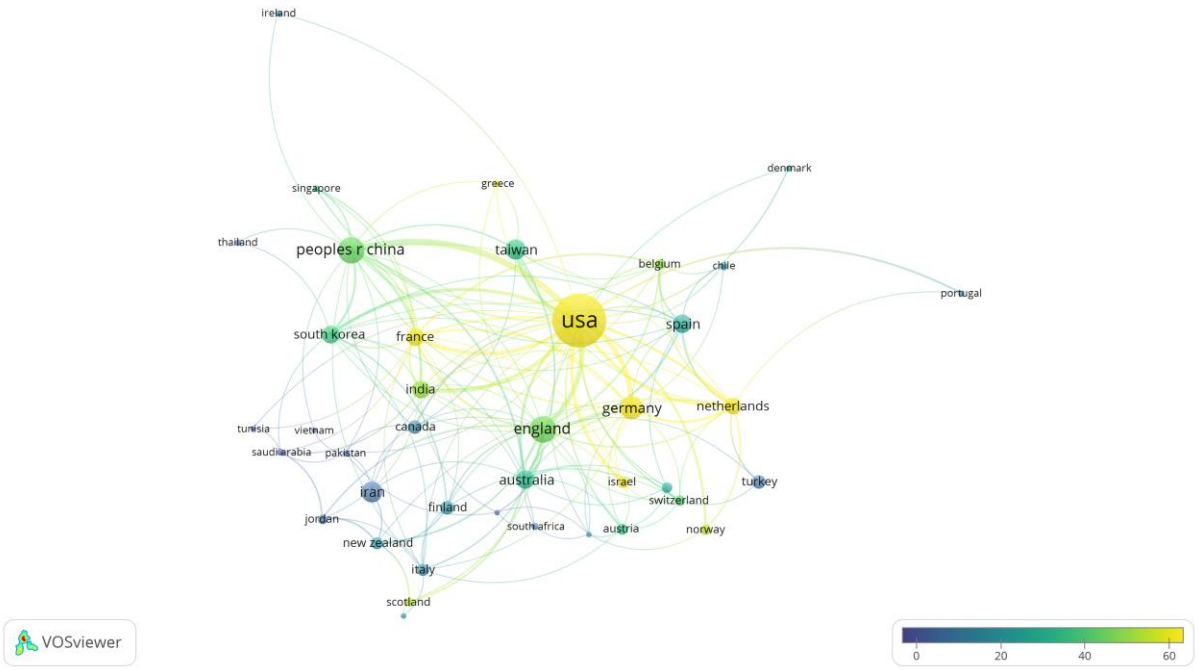

Figure (6) Map of co-authorship network density of countries

Discussion and Conclusion

The aim of this study was to create and analyze a scientific mapping of international research on customer lifetime value using the scientometric method from 1985 to 2024. The study sought to identify the thematic structure of selected articles in the Web of Science database and produce graphical maps illustrating their bibliometric, co-citation, event, and authorship links.

The findings revealed the articles of highly cited and active authors in this field. This not only provides a pathway for future researchers to explore more frequently cited articles, which likely contain valuable scientific content, but also suggests that by citing active authors from high-performing, research-rich countries, Iranian authors may gain greater recognition in the international research community.

The analysis of co-citation patterns indicated that Iranian authors are underrepresented in these relevant maps. This may result from Iran's limited collaboration as a sponsor of international research and a lack of joint research activities involving Iranian authors and researchers from other countries. Consequently, for Iranian authors to gain visibility worldwide, they should collaborate with leading authors in these fields or reference their works. Support from organizations focusing on research in customer lifetime value could also facilitate the international dissemination of Iranian authors' scientific results.

Moreover, a keyword co-occurrence analysis revealed which topics have garnered more attention and which have received less focus within scientific communities. The results indicated a close relationship between customer lifetime value and concepts such as customer satisfaction and customer segmentation.

Data mining techniques, alongside artificial intelligence, have increasingly been employed by researchers in recent years to calculate customer lifetime value. Conversely, some keywords, like financial performance or direct marketing, were identified as outliers, indicating a theoretical connection to customer lifetime value but insufficient usage in concurrent research.

Although scientometric studies do not inherently provide recommendations, they can enhance the understanding of the current state of research and guide trends in the field. Researchers are encouraged to concentrate on hotspots or keywords with broader representation in their studies, as well as on outliers that are less central. By considering both types of nodes, researchers can pave the way for growth in Iranian research in this discipline.

The study's findings on hotspots, or points with significant bibliometric links, highlighted that Kumar is a prolific author in the field of customer lifetime value, maintaining strong bibliometric connections with various authors over the years, followed by Hung. Kumar is central in the author co-citation network map, ranking as the most important author with 759 citations. Other authors, such as Rust and Gupta, also rank highly but are located in different clusters.

This valuable insight helps Iranian researchers utilize a solid foundation of highly cited articles and active authors in analyzing their research background, minimizing redundancy. The study also discovered that countries including Iran, Canada, and Turkey have an average citation rate of less than twenty, while countries like the United States, France, and Germany exceed an average citation rate of over sixty. This suggests differing levels of co-authorship in these regions. Another important observation is that countries such as Denmark, Portugal, and Ireland are positioned further from the center, indicating the collaboration of authors from these nations with prominent international researchers occurs in smaller clusters.

Future researchers are encouraged to leverage the results from countries that are at the forefront of research in customer lifetime value, actively seeking opportunities for collaboration with both public and private institutions to conduct global research. They should also consider exploring other variables associated with the concept of customer lifetime value.

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