



Article

Factors of Customer Loyalty and Retention in the Digital Environment

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Abstract: Customer loyalty and retention are crucial for digital platforms, yet systematic studies integrating technological innovation and loyalty strategies remain scarce. This study addresses this gap by conducting a bibliometric analysis of key factors influencing customer retention in the digital environment. Our research employs a quantitative bibliometric approach using the Biblioshiny and Bibliometrix tools (RStudio 2022.02), analyzing 300 scientific articles from the Web of Science database (2021–2024). This study applies bibliometric techniques such as descriptive metrics, bibliographic coupling, co-citation, and scientific collaboration mapping to identify trends and thematic clusters. Our findings indicate that emerging technologies, including artificial intelligence and big data, significantly impact customer experience, trust, and engagement. Personalization and digital innovation emerge as fundamental drivers of customer retention, offering strategic insights for companies aiming to strengthen competitiveness in the global digital market.

Keywords: customer loyalty; bibliometric analysis; biblioshiny; digital platforms; customer retention



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1. Introduction

Customer loyalty is a strategic factor essential for companies seeking sustainability and growth, reflecting consumers' level of commitment to a brand. Loyalty goes beyond satisfaction, involving emotional aspects such as brand identification, trust, and personalized experiences. In the digital environment, this relationship becomes even more challenging due to intense competition and the ease with which customers can switch to alternative options. In this context, customer retention emerges as a fundamental process, as retaining an existing customer can be up to five times more cost-effective than acquiring a new one. Effective retention strategies include personalization, loyalty programs, omnichannel interactions, and efficient customer support. Digital marketing plays a central role in this process by enabling audience segmentation, communication automation, and the use of artificial intelligence to predict consumer behavior and optimize customer experiences. Tools such as predictive analytics, chatbots, and data intelligence facilitate faster and more relevant interactions, strengthening the relationship between companies and consumers [1].

With the accelerated digitalization of the world, companies have been adapting by promoting their sales and marketing strategies online and expanding their range of products and services to reach a broader audience [1]. In this context, it is crucial for companies

to adopt effective strategies for digital communication and interaction, consistently monitoring their results to adjust actions according to consumer needs, thereby maximizing the impact of campaigns [2]. This adaptation becomes even more relevant when considering that acquiring new customers is more expensive than retaining existing ones, making customer loyalty a critical strategy. The authors of [3,4] emphasize that establishing long-term relationships requires creating value for consumers, with loyalty programs playing an essential role in this process, as highlighted by [5].

Additionally, the intensification of competitiveness in the digital market has encouraged companies to invest in innovative strategies to differentiate themselves and retain customers. The adoption of innovations in digital marketing, such as artificial intelligence and big data, has proven effective in enhancing engagement, retention, and financial performance [6–8], and companies that prioritize digital innovation achieve significantly higher profit margins, creating sustainable competitive advantages.

Digital innovation also directly impacts customer experience, which has become a central factor in loyalty strategies. The usability and design of digital platforms enhance consumer satisfaction while simultaneously reinforcing trust and fostering loyalty bonds [9]. Furthermore, personalizing interactions in an omnichannel environment plays a crucial role, as it improves perceived value, increases engagement, and strengthens long-term loyalty [10]. Reward programs, such as discounts and freebies, are also effective loyalty strategies, encouraging repeat purchases and sustaining sales growth [11].

Among the various facets of digital innovation, social media emerges as a field of growing opportunity, as it enables companies to better understand customer opinions and needs. By facilitating real-time interactions and feedback, social media enhances the ability to personalize experiences and refine loyalty strategies, complementing the role of usability, design, and reward programs in fostering consumer engagement [12,13].

With the growing importance of social media in digital transformation, companies have been using these platforms to segment their audiences and create targeted campaigns, leveraging their vast reach to connect brands with consumers based on characteristics such as age, gender, and location [12,13]. In this context, bibliometric analysis is a well-established tool, as it allows the mapping of trends and gaps in the literature on loyalty in the digital environment, helping to identify methodological approaches and dynamics of international collaboration [14,15], as well as understanding the most relevant factors in research.

Therefore, the main objective of this research is to analyze the determining factors for customer loyalty and retention in the digital environment, focusing on effective practices for retention on digital platforms. Through a bibliometric study, this research seeks to identify the most relevant factors and evaluate how new digital technologies impact this process. The central question is the following: what are the main factors contributing to customer loyalty and retention, and how can bibliometric analysis reveal trends and gaps in the literature on this topic?

Thus, this study contributes both theoretically and practically by providing a comprehensive understanding of the factors influencing customer loyalty and retention in the digital environment. From a theoretical perspective, this research expands knowledge on retention strategies in the context of digital transformation, using a bibliometric approach to map trends and gaps in the existing literature. Furthermore, by analyzing the intersection between technological innovation and consumer behavior, this study offers an updated reference for future research in digital marketing and customer experience management. From a practical standpoint, our findings provide strategic insights for businesses seeking to enhance their loyalty practices, highlighting the role of emerging technologies, such as artificial intelligence and predictive analytics, in personalizing interactions and strengthen-

ing customer relationships. By consolidating these findings, this paper not only contributes to academic advancement but also guides market professionals in adopting more effective approaches to ensuring customer loyalty in the digital landscape.

2. Theoretical Background

Customer loyalty and retention are fundamental concepts in marketing and business management, extensively studied due to their direct impact on competitiveness and organizational performance. The literature highlights that customer retention is closely linked to building long-term relationships, brand trust, and personalized interactions [16]. In the digital environment, these strategies are further enhanced by emerging technologies such as artificial intelligence, predictive analytics, and marketing automation. Additionally, retention becomes even more critical in the context of e-commerce, where competition is intense, and customer experience plays a central role in purchasing decisions. To structure the theoretical analysis of this study, this framework will explore key models of customer loyalty and retention, emphasizing their applications in the digital environment.

2.1. *The Impact of Customer Loyalty and Retention*

According to the authors of [17], customer loyalty goes beyond being a strategy; it is a central framework for guiding business objectives and evaluating their outcomes. It is based on the premise that a company's mission is to serve consumer interests, establishing relationships of mutual benefits and trust. This contrasts with the traditional profit-maximization approach, emphasizing the importance of relationships and value generation for both parties rather than focusing solely on financial analyses.

The author of [18] states that companies often concentrate their strategies on acquiring new customers. However, the same author highlights that the costs of attracting new customers can be up to five times higher than the costs of retaining existing ones. In this context, customer loyalty can become a determining factor in a company's short- and medium-term growth or decline.

In a market study conducted in China, ref. [19] demonstrated a positive correlation between customer loyalty, technological innovation, and business continuity. This study revealed that companies capable of retaining customers have a greater capacity for business expansion, financial stability, and long-term planning.

In a study conducted in Brazil, ref. [20] showed that brands capable of evoking emotions in their customers have a higher capacity for fostering loyalty. An essential factor in customer retention is the trust that the brand can instill in its customers, which becomes a critical element in loyalty-building. According to [21], a customer is considered loyal when they repeatedly choose to purchase the same brand over others.

Thus, the analysis of China and Brazil not only provides a broader understanding of the key factors influencing customer loyalty and retention in different economic and cultural contexts but also contributes to advancing discussions on retention strategies in global e-commerce. By examining how these markets address challenges and adopt innovative solutions, this study offers insights both for business policy development and for the evolution of academic approaches to the topic. Furthermore, the relevance of this comparison to the Journal of Theoretical and Applied Electronic Commerce Research lies in the fact that the findings can be applied to other emerging markets, helping to develop adaptable models for customer retention in the digital environment.

2.2. *Digital Sales Innovation and Customer-Centric Marketing Strategies*

Digital marketing is more than a mere platform shift; it represents a profound transformation in how companies connect with consumers. Rather than simply adapting

traditional strategies for the online environment, organizations must rethink their marketing approaches, focusing on creating personalized and interactive experiences. This involves understanding consumer behavior in the digital world, leveraging tools like social media, data analytics, and relevant content to effectively engage and retain audiences in an increasingly interconnected and dynamic context [22] (p. 45). Ref. [16] highlights the use of tools such as social media and data analytics to create interactive campaigns. Complementarily, ref. [22] emphasizes that personalization is essential in the digital environment, strengthening loyalty and broadening companies' reach.

Perceived value also becomes a central goal in digital innovation, according to the authors of [4]. They argue that the overall customer experience on digital platforms, including usability and consistency, is as important as product quality. These factors are crucial in attracting and retaining consumers, underscoring the importance of continuous adaptation to technological changes in the digital environment.

Recent studies reinforce the crucial role of innovation in digital marketing in driving business performance. According to the authors of [6], companies integrating artificial intelligence and big data into their digital sales strategies improve audience segmentation and personalize offerings, increasing conversion rates. Additionally, the use of chatbots and virtual assistants has been identified as a practice that significantly enhances customer experience, offering 24/7 support and reducing response times. These innovations not only improve engagement but also strengthen loyalty by offering convenience and added value.

Another relevant study by [7] examines the impact of "marketing affordances" in the digital environment, highlighting how technological tools enable new forms of consumer interaction. The authors note that using augmented reality platforms, for instance, provides immersive experiences that showcase companies' competitive advantages. They also emphasize the importance of an integrated omnichannel approach, where consumers experience consistency across all touchpoints, whether on the website, app, or physical store. This convergence of channels, combined with technological innovation, fosters both customer loyalty and the acquisition of new clients.

2.3. Digital Innovation and Marketing Strategies for Customer Loyalty

Digital customer experience has emerged as an essential element for loyalty, reflecting the evolution of the relationship between companies and consumers. Ref. [17] emphasizes that loyalty transcends conventional strategies, representing a long-term commitment based on trust and mutual value. This classic perspective aligns with the argument in [18] that customer retention is more economical and strategic than acquisition, given that the costs of attracting new consumers can be significantly higher. On the other hand, the authors of [9] expand this view, highlighting the impact of digital technologies on the usability and design of platforms as critical factors for satisfaction and trust, elements that reinforce consumer loyalty.

Furthermore, ref. [22] addresses digital transformation as an opportunity to create more personalized interactions, and ref. [12] highlights the relevance of social media in this process, arguing that targeted campaigns can strengthen emotional bonds between consumers and brands. These ideas converge in emphasizing personalization as a pillar of customer experience but diverge in focus: while classical authors emphasize the importance of retention strategies grounded in fundamental marketing principles, contemporary authors incorporate technological tools such as big data and artificial intelligence. Thus, integrating these perspectives provides a robust and multifaceted understanding of digital loyalty.

Standards and regulations also play a crucial role in building effective digital experiences and promoting loyalty. Emphasizing quality management in services and products

is essential in the digital context to ensure platforms consistently meet customer expectations. Similarly, 9241-210, on the ergonomics of human–computer interactions, provides guidelines for user-centered design, essential for creating intuitive and satisfying interfaces.

Moreover, associations such as the Brazilian Association of Electronic Commerce (ABComm) based in São Paulo, Brazil, promote best practices in e-commerce, encouraging clear privacy policies and effective customer service tools to increase consumer trust. These initiatives, combined with reward programs and discounts, as suggested by the authors of [11], are effective strategies for retaining customers and consolidating their loyalty. Companies adhering to these guidelines not only improve customer experiences but also strengthen their reputation in the digital marketplace.

2.4. Interactive Marketing and Customer Loyalty

Interactive marketing is a strategic approach that places the consumer at the center of communication, fostering continuous interaction between the brand and the customer. Unlike traditional marketing, which follows a one-way communication model, interactive marketing relies on active consumer participation, enabling real-time personalization, content adaptation, and the creation of more engaging experiences. This strategy leverages digital technologies such as social media, artificial intelligence, and data analytics to better understand consumer behavior and optimize loyalty and retention efforts. In the digital environment, interactive marketing strengthens customer loyalty by creating personalized connections and increasing engagement through various channels, such as chatbots, targeted emails, loyalty programs, and gamification [23].

Marketing theory is conceived as the foundation that guides the practice of promoting voluntary changes, whether through the dissemination of ideas or by influencing lifestyles, aiming to benefit a specific audience or society as a whole [24]. While marketing as a practice dates back to the origins of civilization, its formal scientific theory only emerged during the intense competition for customers in the 20th century.

Traditional marketing focuses on unidimensional strategies, where the brand delivers its message to consumers with minimal room for interaction or personalization [25]. In contrast, interactive marketing fosters a continuous dialogue, enabling consumers to actively participate, contribute to brand co-creation, and directly influence marketing strategies, thereby establishing a deeper and more personalized connection [26].

Customer loyalty is closely tied to interactive marketing, as this approach—combining elements of relationship marketing and service marketing—prioritizes building deeper, personalized connections with consumers [27]. By emphasizing factors such as complaint resolution, commitment to relationships, trust, and service personalization, companies can enhance customer satisfaction, which in turn strengthens loyalty [28]. Interactive marketing, by focusing on meeting and exceeding customer expectations, facilitates the creation of lasting bonds, leading to customer retention and increased loyalty [29].

Interactive marketing stands out as one of the most dynamic and rapidly growing fields in the current business landscape. It embodies a strategy of shared value creation, where connection, engagement, active participation, and ongoing interaction with customers create a network of mutual influence and collaborative transformation [30]. Rooted in the digital era and the growth of e-commerce [31], interactive marketing has gained momentum with the rise of modern technologies and social media platforms, which have dramatically expanded their reach and impact [32]. Grounded in bilateral communication, it places the consumer at the center, encouraging active participation at every stage of the marketing process.

Brand app personalization has been shown to foster brand co-creation, which is entirely mediated by consumer engagement, while also enhancing perceived quality and

strengthening brand loyalty among app users [33]. In a study on ride-hailing apps, the authors of ref. [25] found that transactional interactions play a critical role in boosting customer loyalty among DiDi users, partially mediated by functional, social-hedonic, and security benefits perceived by customers. Conversely, interpersonal interactions do not directly influence loyalty, with social-hedonic benefits being the only factors fully mediating the positive relationship between these interactions and loyalty.

2.5. Bibliometric Analysis

It is indisputable that bibliometric analysis is essential in research, as it allows mapping the scientific production of the knowledge field in which the study is based and analyzing how certain data are behaving. It is observed that bibliometric analysis has the ability to identify emerging trends in the performance of articles and journals, exploring the intellectual structure of a specific domain existing in the literature [34,35].

Thus, it is evident that this method is widely used to provide information on correlations between different topics within the scientific community. Many database tools are being used to extract these reports, such as the Web of Science (WoS), Scopus, and Google Scholar [36].

Bibliometric analysis supports decision-making [37]. It is notable that specialists frequently apply bibliometric methods to obtain a quantitative and objective analysis, whether for mapping collaboration networks, selecting high-impact sources and journals, or optimizing literature reviews [38].

According to the authors of [39], bibliometric methods, such as co-citation analysis and bibliographic coupling, enable researchers to visualize the intellectual structure of a field, revealing key themes and influential authors and evolving research fronts.

Additionally, ref. [34] emphasizes that bibliometric analysis enhances the rigor and transparency of literature reviews by offering a systematic and reproducible approach. This method not only enriches academic discourse but also informs practical strategies, such as leveraging emotional engagement and data-driven personalization to foster customer loyalty. Together, these references underscore the dual role of bibliometric analysis as both a diagnostic tool and a strategic compass, guiding researchers and practitioners toward impactful and innovative solutions [40].

3. Methods

This study adopts a quantitative approach based on bibliometric analysis, a widely used method for mapping scientific trends, identifying gaps in the literature, and evaluating academic collaboration networks. The choice of bibliometrics is justified by its ability to provide a systematic overview of knowledge evolution in the field of customer loyalty and retention in the digital environment, allowing for the analysis of emerging patterns, co-authorships, and the impact of relevant publications.

The literature selection was conducted using the Web of Science database due to its comprehensive coverage and rigorous indexing of high-impact articles. To ensure the relevance of the analyzed studies, specific inclusion criteria were applied, such as publications indexed between 2021 and 2024, written in English, and belonging to related fields such as Business, Economics, Computer Science, and Information Management. The search strategy employed a combination of keywords aligned with the study's theme, including "customer loyalty", "customer retention", "digital marketing", and "e-commerce", combined with Boolean operators to refine the results. After collection, the articles were processed using the Biblioshiny and Bibliometrix tools, enabling the analysis of bibliographic coupling, co-citation, and scientific collaboration networks.

The research follows the deductive scientific method, starting from general premises to test specific hypotheses, aiming to explore the topic and formulate hypotheses [41]. The technical procedure employed is a bibliographic research approach, based on the analysis of published materials [42]. Additionally, the chosen approach is quantitative, enabling the objective analysis of numerical data and the identification of patterns through statistical methods [43].

To this end, the database selected for the bibliometric analysis was the Web of Science due to its extensive coverage of scientific sources and metrics such as citations and h-index, which assist in evaluating the impact of publications and collaboration networks. The search string used in the Web of Science is defined as follows:

("customer loyalty" OR "customer retention" OR "repeat purchase" OR "repurchase intention") AND ("digital environment" OR "e-commerce" OR "online platforms" OR "digital marketing" OR "online shopping") AND ("factors" OR "determinants" OR "drivers") OR TS = (("customer satisfaction" OR "perceived value" OR "service quality") AND ("customer loyalty" OR "retention") AND ("digital environment" OR "e-commerce" OR "digital marketing"))).

Moreover, the tool used for the analysis was Bibliometrix, developed in R, which facilitates the exploration of trends, collaboration networks, and keywords within research areas. Another significant advantage of this tool is its ability to process large datasets from sources like Scopus and the Web of Science, providing detailed analyses of citations, scientific networks, and gaps in the literature.

Bibliometric analysis has emerged as a useful approach for identifying emerging trends and detecting knowledge gaps across various disciplines. The Biblioshiny tool, in particular, has been widely used in numerous studies exploring relevant topics across diverse knowledge areas. For example, ref. [44] consolidated two decades of research on mobile commerce using this tool, offering a comprehensive view of the subject. Similarly, ref. [45] conducted a robust review on the sustainable use of water in agriculture, employing bibliometric analysis to map progress and gaps in the field.

In another study, the authors of ref. [46] explored trends, emerging topics, and significant contributions in the field of sustainable and green entrepreneurship practices, highlighting the evolution of the field over time. Ref. [47] investigated the correlation between children's excessive use of technology, home care, and parental education, bringing attention to critical discussions on the impacts of these interactions. Additionally, ref. [48] conducted an exhaustive analysis to identify studies adopting multi-criteria approaches and sensitivity analyses on a global scale, contributing to understanding challenges and advances in this area.

In their study, the authors of ref. [49] conducted a bibliometric analysis on sustainable product development in Brazil, emphasizing the need for targeted strategies to promote sustainability. Using a systemic approach, the authors of [50] analyzed how lean manufacturing and Industry 4.0 can be integrated into product development using a systemic approach. Ref. [51] explored the use of this approach for decision-making in organizations. Continuing this line, ref. [52] assessed the impact of the organizational environment on the architecture of educational decisions, proposing solutions to enhance performance. Ref. [53] highlighted the critical role of renewable energy in combating poverty in Brazil through a systematic review. Finally, ref. [54] discussed the interaction between sustainability, smart cities, and digital transformation, underscoring their implications for urban planning.

Regarding our research's analysis period, the years filtered were 2021 to 2024, considering that the pandemic caused a significant surge in digital commerce. The language filter was set to English, and the country analyzed was Brazil. The filtered categories included Business, Management, Economics, Environmental Studies, and Computer Science Infor-

mation Systems. The meso citation topics were Management and Economics, while the micro citation topics included Customer Satisfaction, Knowledge Management, Corporate Social Responsibility, Sharing Economy, and Entrepreneurship. The selected research areas were Business Economics, Operations Research Management Science, Computer Science, and Information Science Library Science. This search returned 300 articles, which were assessed through a peer-review process to ensure the quality, accuracy, and relevance of the research.

4. Results

In the results section, the data collected from the bibliometric research were analyzed to identify connections among the selected articles and the main trends within the topic. Furthermore, graphs and tables were created to illustrate these relationships, such as author networks, keywords, and existing citations. These results provided a deeper understanding of how the subject has been developed and facilitated the identification of patterns.

4.1. Key Results of the Sample

At this stage, the main information about the sample is detailed. The analysis, presented in Table 1, covers data collected between 2021 and 2024, sourced from 111 publications, totaling 300 documents. It exhibits an annual growth rate of 1.35 and an average of 6.803 citations per document, resulting in a total of 17,954 references. In terms of content, 671 global keywords and 1115 author-specific keywords were identified. Regarding the authors, the table records 1087 authors, with 20 responsible for single-authored documents and 280 involved in multi-authored works. The collaboration metrics reveal a collaborative academic environment, with 0.276 documents per author, 3.34 authors per document, 3.84 co-authors per document, and a collaboration index of 3.33. The metric “authors per document” refers to the average number of authors contributing to each published document. It is obtained by dividing the total number of authors in the dataset by the total number of documents. This measure provides insights into the general authorship structure of the studied field. On the other hand, “co-authors per document” represents the average number of co-authors involved in each publication, emphasizing collaborative efforts in academic research.

Table 1. Key information about the sample.

Description	Results
Key Data Information	
Period	2021:2024
Sources	111
Documents	300
Annual Growth Rate	1.35
Average Citations per Document	6803
References	17,954
Document content	
Global Keywords	671
Author-Specific Keywords	1115

Table 1. Cont.

Description	Results
Authors	
Total Authors	1087
Single-Authored Documents	20
Multi-Authored Documents	280
Authors collaboration	
Documents per author	0.276
Authors per document	3.34
Co-authors per document	3.84
Collaboration Index	3.33

4.2. Sankey Diagram

According to the authors of [55], the Sankey diagram is a graphical representation that illustrates data flows with arrows proportional to the magnitude of the flows. A three-category chart was created using the Sankey diagram, linking the most relevant journals, the most influential authors, and the most prominent countries in the study.

As shown in Figure 1, the journal Sustainability from Switzerland absorbs a significant portion of the studies related to customer loyalty, with a high concentration of studies from countries such as China, Saudi Arabia, Korea, and Pakistan. Authors from China, such as Chen, and from Pakistan, such as Nawaz and Ahmad, stand out in the number of studies conducted.

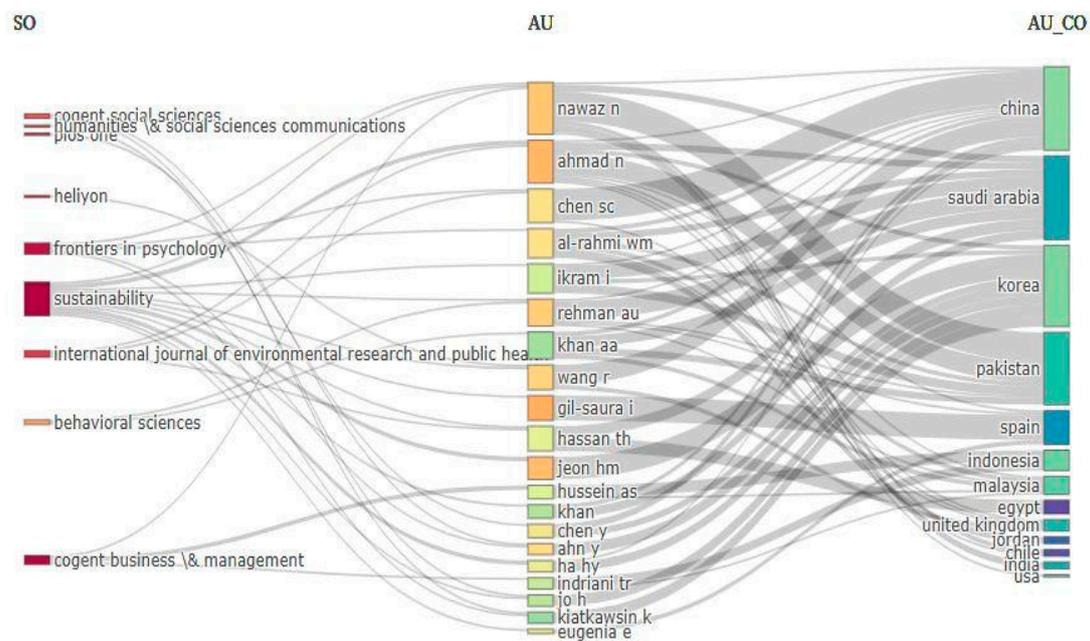


Figure 1. Sankey diagram illustrating the distribution of key journals, authors, and countries in customer loyalty research. The journals listed include Humanities and Social Sciences Communications, Plos One, Heliyon, and others, representing significant contributions to the field. (Left side: journals; center: authors; right side: countries.)

4.3. Clustering by Bibliographic Coupling

According to the authors of [56], two articles are considered bibliographically coupled if they share at least one source cited in both of their bibliographies. The degree of bibli-

ographic coupling between two articles is measured by the number of references shared between them.

Different research topics are identified through a co-word analysis; ref. [57] highlights that different research topics are identified through a co-word analysis. Ref. [58] mentions that the classification of keywords into topics is performed using a simple centrality algorithm that identifies subgroups of words with strong connections, reflecting research interests of high academic relevance.

As stated in [59], the similarity between keywords is calculated by the equivalence index, as shown in Equation (1).

$$e_{ij} = \frac{c_{ij}^2}{c_i c_j} \quad (1)$$

where e_{ij} refers to the number of publications in which two keywords appear together, c_i refers to the frequency with which the keyword appears in publications from theme i , and c_j refers to the frequency in publications from theme j .

The bibliographic coupling analysis is conducted in a two-dimensional diagram, where the X-axis corresponds to the centrality index proposed in [60]. This index assesses the level of interaction between the keyword networks. The equation used for the calculation is as follows (Equation (2)):

$$c = 10 \sum_1^n e_{kh} \quad (2)$$

where k represents a keyword from one theme, h represents a keyword from another theme, and nm refers to the network in question.

The network density, as proposed in [60], assesses the internal strength of the cluster. The equation used considers the Normalized Global Citation Score (MNGCS), which is calculated by dividing the actual count of global citations by its expected rate, taking into account the publication year. The Y-axis of the diagram represents this impact, reflecting the quality and relevance of the network.

$$d = 100 \left(\frac{\sum_1^n e_{ij}}{w} \right) \quad (3)$$

where i and j represent the analyzed themes, and w refers to the keyword count in each theme.

Based on the X- and Y-axes, it is possible to construct a graph in which the quadrants can be interpreted according to the method in [60]. The first quadrant represents the core and central themes, essential for structuring a research field. The second quadrant encompasses transversal and basic themes, which, although relevant, remain underdeveloped. The third quadrant includes underdeveloped and marginal themes, often emerging or in the process of disappearing. Finally, the fourth quadrant gathers themes of low relevance, with strong internal links (local citations) and weak external connections (global citations).

As shown in Figure 2, bibliographic coupling was performed, organizing the clusters based on the articles. The coupling was measured by the shared references between documents, using three-word title terms to label the clusters. With this information, bibliographic coupling resulted in the formation of six clusters, differentiated by colors and labels.

In Figure 2, the graph is divided into four quadrants, representing the density (development of the theme) and centrality (relevance of the theme). In the first quadrant, the term "competitive advantage" stands out. This term is central and has a high degree of development, indicating that it is a fundamental and widely explored topic in the field of study.

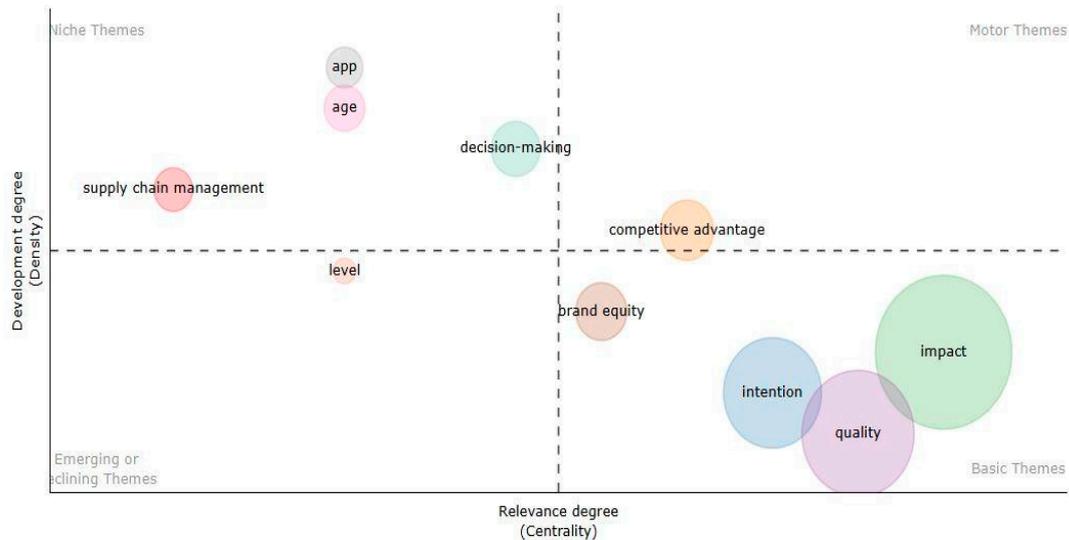


Figure 2. Bibliographic coupling.

In the second quadrant (niche themes), the terms “app”, “age”, “decision-making”, and “supply chain management” appear. These topics, while well developed, are less central in terms of relevance. This suggests that they are specific topics, relevant to more specialized areas of study, but have not yet become central.

The third quadrant presents the term “level”, indicating that, although it is a relevant topic, it has a lower degree of development and may be in an ascending or declining phase, depending on the analysis.

Finally, in the fourth quadrant, terms such as “impact”, “quality”, “intention”, and “brand equity” are found. These themes have high centrality but less development compared to the other quadrants. The presence of these terms suggests that they are essential concepts in the study but need further depth and exploration to achieve a higher level of development.

4.4. Clustering by Bibliographic Co-Citation

According to the authors of [61], bibliographic co-citation occurs when two articles are cited by a third article. In Figure 3, each cluster is composed of groups of articles, separated by colors. The larger the node radius, the more co-cited the article is. To perform the clustering, the Louvain algorithm was used, which is a heuristic method aimed at maximizing modularity in networks. This agglomerative algorithm operates on weighted networks composed of n vertices, as described in [59]. To facilitate the visualization of the results, the number of nodes was limited to 40, providing a clearer and more organized representation of the network.

In Figure 3, it is possible to identify four distinct clusters of co-cited articles, organized by color. The red cluster (central upper part) is the most expressive, containing the highest number of co-cited articles and presenting dense connections around “Fornell C. (1981)”, who is the most central. The blue cluster (located on the right) appears as the second most relevant, composed of a significant set of well-connected articles. The green cluster (positioned on the left) has a moderate number of articles, with fewer connections compared to the previous two. Finally, the purple cluster (at the bottom central) is the smallest group, with a lower density of connections and fewer articles represented. The organization and connection between the clusters suggest different theoretical currents or research groups within the analyzed field.

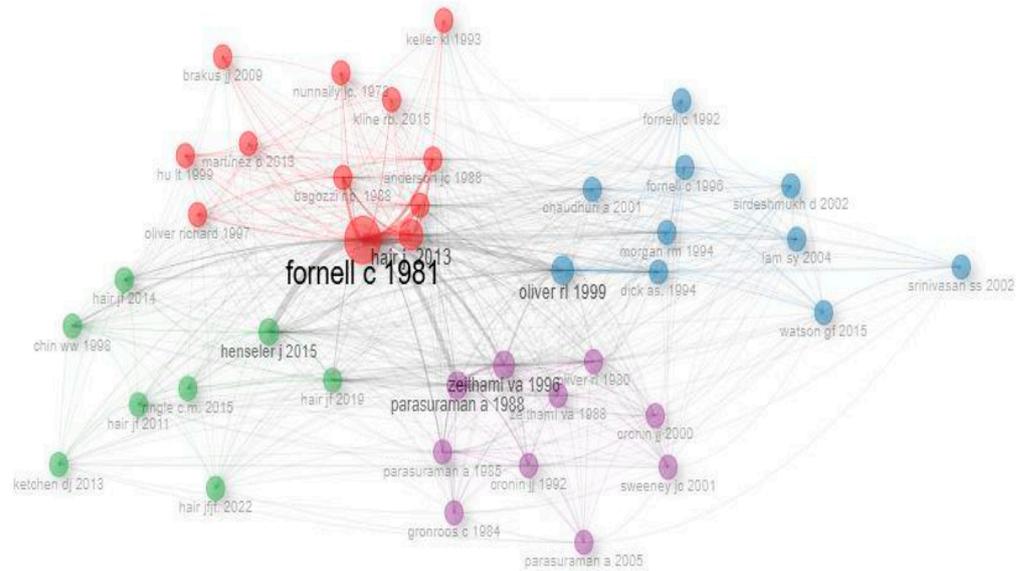


Figure 3. Co-citation network.

4.5. Clustering by Scientific Collaboration

According to the authors of [62], the scientific collaboration network is represented by nodes, which correspond to authors, and edges, which indicate co-authorship relations, one of the most recognized forms of academic collaboration. To construct this network, author clusters were formed using the Louvain algorithm to maximize modularity. The layout chosen was circular, utilizing the association normalization method. The visualization was limited to 50 nodes to ensure greater clarity in the graphical representation. The result of this configuration can be observed in Figure 4, which illustrates the network generated from these parameters.

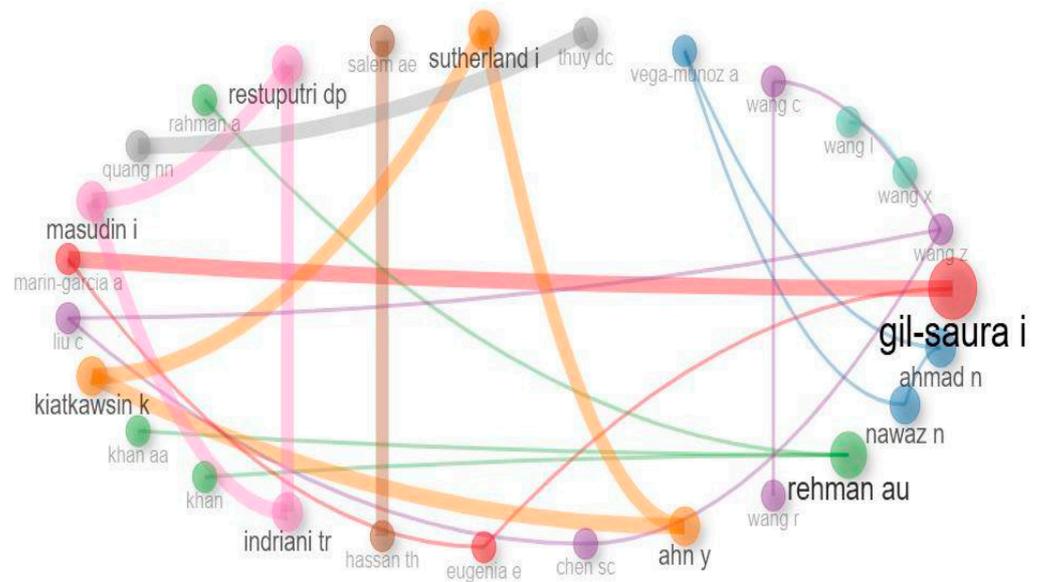


Figure 4. Clustering by scientific collaboration.

Figure 4 presents a scientific collaboration network composed of 27 authors. It is possible to identify four clusters of higher intensity, represented by different colors. The first cluster (in red) has Gil-Saura I as the central author, with strong connections to Masudin I. and Eugenia E. The second cluster (in orange) groups authors like Ajn Y, Kiatkawsin K, and Sutherland I, forming a cohesive network with multiple interactions. The third cluster (in pink) stands out with authors like Restuputri DP, Masudin I, and Idriani Tr. The fourth

cluster (in brown) consists of authors like Salem Se, Hassan Th, and Liu C, demonstrating moderate interactions among them.

4.6. Conceptual Structure Map via Factor Analysis

The purpose of the conceptual structure map is to identify and represent the conceptual structure of a given construct through the co-occurrence of words in a dataset. This mapping is often performed using dimensionality reduction techniques, such as multiple correspondence analysis (MCA), Multidimensional Scaling (MDS), or Correspondence Analysis (CA).

In the process, Natural Language Processing (NLP) methods are applied to extract relevant terms, especially from titles and abstracts. One of the steps involves the use of the Porter lemmatization algorithm, which simplifies inflected or derived words, reducing them to their root or base form.

For constructing the conceptual map, the extracted terms were obtained from the abstracts, using two-word combinations and the MCA technique. The number of terms was limited to 30 to optimize the visualization. Figure 5 illustrates the final result, presenting the conceptual map generated through multiple correspondence analysis.

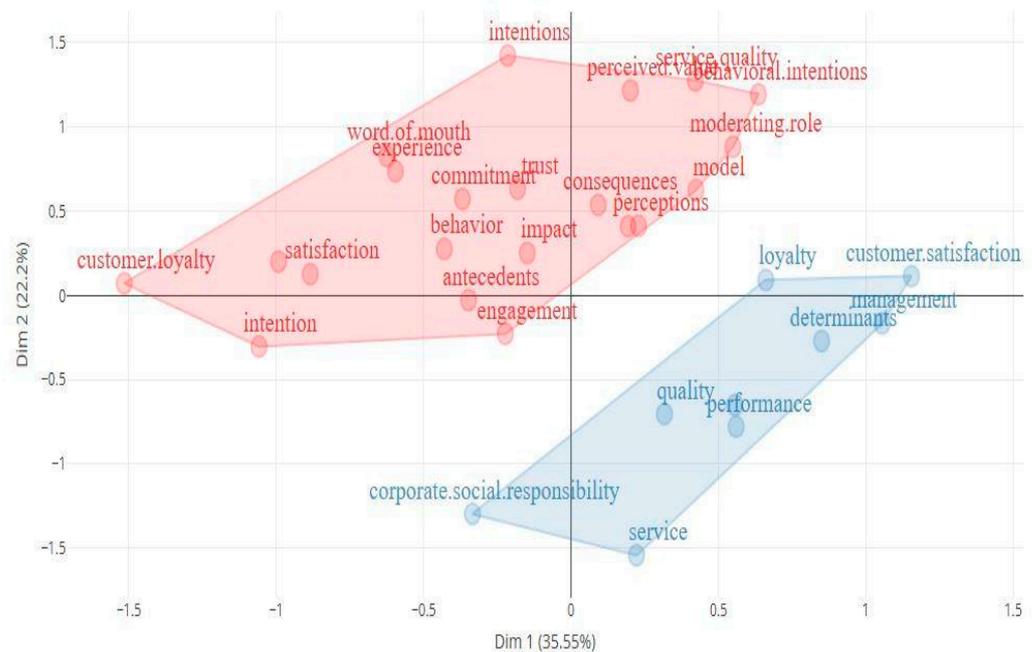


Figure 5. Conceptual structure map.

Figure 5 represents a conceptual structure map generated using multiple correspondence analysis (MCA), which identifies underlying relationships between key terms extracted from the dataset. “Dim 1” (horizontal axis) captures the primary variation in the data, potentially distinguishing between customer experience factors and corporate strategies, while “Dim 2” (vertical axis) highlights secondary variations, such as engagement-driven approaches versus technological solutions. The clustering of terms in the figure suggests that customer loyalty is influenced by two major aspects: (i) digital engagement, trust, and personalization; (ii) corporate social responsibility, quality management, and performance. This analysis helps identify how different strategies contribute to customer retention in digital environments.

4.7. Dendrogram

Figure 6 presents a dendrogram, a hierarchical representation of the similarity relationships between the analyzed terms in the study. This technique is widely used in cluster analysis to identify underlying patterns in data and structure conceptual categories based on their proximities.

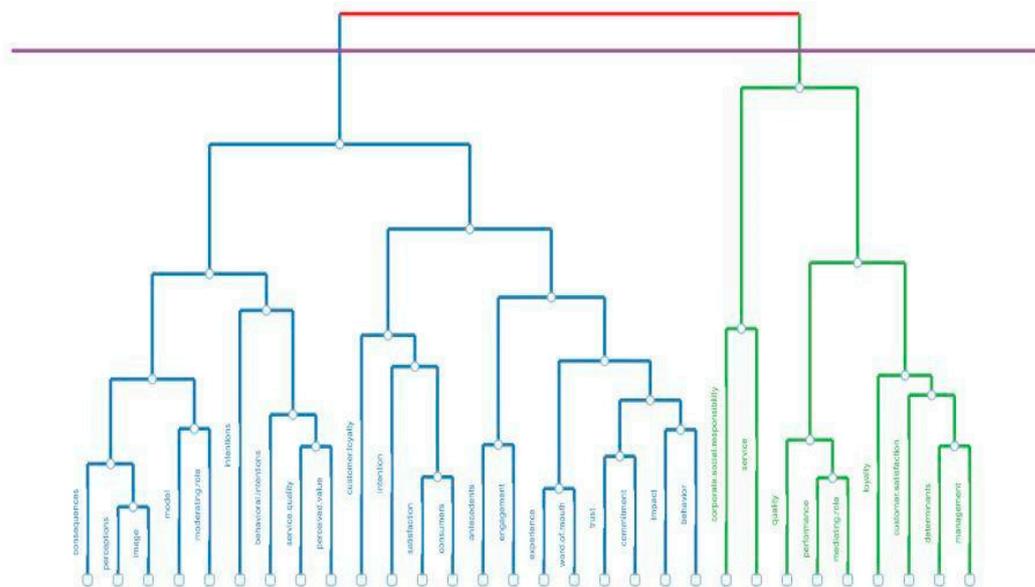


Figure 6. Dendrogram.

The dendrogram was constructed using the hierarchical clustering method, which organizes concepts into a tree-like structure where the branches indicate the closeness and relationship between the analyzed elements. As we move through the hierarchy, we can observe which terms share closer characteristics and how they connect within broader categories.

The results shown in Figure 6 reveal two major groups, as indicated by the blue and green colors. This segmentation suggests that there is a similarity among the concepts within each group, reinforcing that certain customer loyalty factors share common characteristics.

The dendrogram analysis provided a better understanding of the underlying structure of the keywords, helping to identify trends and patterns within the analyzed literature. Additionally, the hierarchical segmentation allows for a clear visualization of how different concepts are interrelated, offering insights for future research on the factors influencing customer loyalty and retention in the digital environment.

4.8. Integrative Analysis

As a general result of the bibliometric analysis, brand value as well as brand intention and its impact on customers were identified as emerging factors to be explored for customer loyalty in the digital environment. Moreover, competitive advantage emerged as a fundamental and well-established factor in this loyalty process, as customers perceive it as a priority when committing to a company.

Our findings also indicate a distinction between the psychological aspects of the consumer experience—such as customer loyalty, satisfaction, trust, word of mouth, behavior, commitment, and intentions—and the company’s operational and structural factors, including corporate social responsibility, service, quality, performance, and management determinants. The intersection between these groups suggests that certain concepts, such

as customer satisfaction, serve as a bridge between these two domains. This demonstrates that customer loyalty drivers can stem both from internal corporate strategies and from direct customer interactions.

These results are largely derived from studies conducted in countries such as South Korea, China, Saudi Arabia, and Pakistan, with significant contributions from leading researchers in the field, including Nawaz N., Ahmad N., and Chen S.C. The primary journal associated with these studies is the Swiss publication *Sustainability*.

The structural and measurement models in this study aim to clarify the relationship between key bibliometric indicators and customer loyalty and retention. The measurement model captures how constructs such as digital engagement, trust, service quality, and corporate social responsibility influence customer behavior through bibliographic coupling and co-citation networks. The structural model further examines how these constructs interact in forming a loyalty-driven framework. Additionally, the asymmetric citation outcome model highlights how influential publications shape theoretical advancements in customer retention, emphasizing studies that generate disproportionate citation impact. These insights allow us to understand not only which concepts are most influential in customer loyalty research but also how they are disseminated and adopted across different contexts.

5. Discussion

It is noticeable that there are two groups separated by the blue and green colors, indicating similarity between the terms belonging to each group.

This research highlights the importance of emerging technologies, such as artificial intelligence, big data, and augmented reality, in strengthening customer loyalty in the digital environment. These tools create personalized experiences, optimize engagement, and promote sustainable retention by reducing acquisition costs and increasing consumer trust. An example of such a tool would be using artificial intelligence on an e-commerce platform to recommend personalized products based on the user's purchase history and preferences, significantly increasing repurchase intent. Additionally, the bibliometric analysis identifies central trends, such as "competitive advantage", and emerging gaps in the literature, reinforcing personalization as one of the pillars of loyalty and demonstrating its direct connection with consumer trust and repurchase intention.

5.1. Managerial Implications

This study's findings provide practical guidelines for companies seeking competitive advantages in the digital market. This study emphasizes that personalization is a pillar of loyalty, directly connecting to consumer trust and increasing repurchase intent. The application of innovative technologies not only meets the demand for personalization but also consolidates consumer trust and loyalty, optimizing costs and improving overall performance. Companies can adopt these strategies to enhance customer experience and strengthen their operations, expanding retention and generating a sustainable competitive advantage, such as implementing chatbots to offer 24/7 support, quickly answering product and delivery questions, improving satisfaction, and promoting customer loyalty.

5.2. Theoretical Contributions

As the authors of [63] emphasize, bibliometry enables the development of indicators for analyzing scientific production in a specific area of knowledge. This study contributes to the academic literature by presenting a bibliometric analysis approach to identify and understand the factors of customer loyalty and return in the digital environment. The results obtained can serve as a basis for future research and further developments on the subject.

Identifying the factors of customer loyalty and return in the digital environment allows for the identification of new technologies and tools being researched, developed, and used, contributing to innovation in both the service and industrial sectors. This bibliometric study is, therefore, directly related to SDG (Sustainable Development Goal) 9, which addresses industry, innovation, and infrastructure for the 2030 agenda. SDG 9 highlights, among other factors, the importance of technological modernization and innovation as drivers of sustainable development [64].

Finally, the hypotheses of this study were confirmed through bibliometric analysis. The results showed that factors such as personalization, trust, and technological innovation are crucial in increasing customer engagement in the digital environment. Moreover, the use of tools such as artificial intelligence and big data emphasizes the importance of creating more personalized and efficient experiences. Thus, the results support the hypotheses and help in understanding which strategies can improve customer loyalty and retention.

In addition to the factors analyzed in this study, such as personalization, trust, and digital innovation, other elements may play a significant role in customer loyalty and retention in the digital environment. Aspects such as efficient customer service, data security, and corporate sustainability practices have become increasingly relevant in consumers' decision-making processes. User experience, for example, is not only linked to platform usability but also to the support provided in case of issues and the company's transparency regarding data usage. Business models based on subscription services and loyalty programs have also proven to be effective retention strategies, encouraging customers to maintain long-term relationships with brands.

Expanding this bibliometric analysis could provide new insights into the influence of additional factors on customer retention and the impact of different markets and digital economy segments. If the analyzed literature was broadened to include studies on small- and medium-sized enterprises, emerging markets, and specific industries, such as fintechs and edtechs, the results might reveal distinct patterns and alternative loyalty strategies. Furthermore, future research could explore the interaction between artificial intelligence and consumer behavior, assessing how recommendation algorithms and chatbots shape perceptions of trust and long-term engagement. By widening the scope of investigation, it would be possible to gain a more comprehensive understanding of the challenges and opportunities for strengthening customer loyalty in the digital environment.

5.3. The Evolution of Customer Loyalty: From Traditional Strategies to Digital Innovation

Classic marketing theories reinforce the importance of customer loyalty and retention, especially in the digital context. Ref. [65] emphasizes that loyalty goes beyond simple promotional strategies; it is a continuous process of creating value for the consumer, which must be sustained through long-term relationships and personalized experiences. In the digital environment, these principles are enhanced by the use of emerging technologies, such as artificial intelligence and data analytics, which enable greater segmentation and predictability of consumer behavior. Furthermore, ref. [57] highlights that customer experience has become one of the main competitive differentiators in the digital age, making it essential for companies to continuously adapt their strategies to meet the expectations of hyper-connected consumers. Incorporating these perspectives strengthens the theoretical foundation of this study, reinforcing the need for innovative approaches to enhance customer retention in e-commerce and digital platforms.

5.4. Key Findings on Digital Innovation and Customer Loyalty

The findings of this study align with prior research that emphasizes the role of digital marketing strategies in fostering customer loyalty and retention [3,16]. Similar to the work

of [10], our results highlight the significance of omnichannel experiences in improving customer engagement and brand commitment. Additionally, studies such as those by the authors of [6,7] reinforce our conclusion that digital innovation, including big data analytics and artificial intelligence, significantly impacts firm performance and customer relationship management. This study builds on previous bibliometric analyses (e.g., [34]) by providing a more detailed segmentation of the psychological and structural drivers of customer loyalty. Future research should explore the evolving role of technology in customer retention strategies, particularly the use of AI-driven personalization and blockchain applications in loyalty programs.

As pointed out in [66], effectively communicating research findings should go beyond merely presenting data; it should incorporate compelling narratives that clearly and impactfully highlight contributions. Following this approach, our results not only confirm the relevance of personalization and digital innovation in customer retention but also demonstrate, through a detailed bibliometric analysis, how these strategies shape consumer engagement in the digital environment. The adoption of artificial intelligence and big data is not just a trend but a central factor in building hyper-personalized experiences, aligning with the concept of storytelling based on strategic insights. Thus, this research not only validates pre-existing theories but also contributes to expanding knowledge by segmenting the psychological and structural drivers of customer loyalty, providing a clear roadmap for future investigations and business applications.

6. Conclusions

This research achieved its primary objective by analyzing the determining factors for customer loyalty and return in the digital environment, focusing on effective practices to promote this retention. Through a bibliometric study, key elements that directly influence consumer loyalty were identified, and the most relevant aspects of this audience were understood to meet expectations in the digital context. Our analysis mapped trends and gaps in the literature, providing a broader view of strategies that drive customer satisfaction.

Several previous studies have employed bibliometric review as a methodology to conduct analyses and gain a deeper understanding of various realities. These works demonstrate that bibliometric analysis is a well-established approach for mapping trends, identifying research gaps, and enhancing conceptual frameworks in different fields. Following this same logic, the present study adopts this methodology to achieve a more comprehensive understanding of the investigated topic, ensuring a structured and evidence-based analysis [26,32,44,46–49].

To assess the fulfillment of this study's main objective, data collected in the bibliometric research were analyzed to identify connections between the selected articles and the main trends of the subject. Some graphs were generated to aid in better understanding the topic. Tables were also created to illustrate the relationship of key information about the sample. The Sankey diagram showed the concentration by countries concerning customer loyalty. Bibliographic coupling clustering illustrated, through four quadrants, the development and relevance of the topic, niche themes, and term analysis in relation to ascension or decline within the analysis.

This study successfully identified the key factors influencing customer loyalty and retention in the digital environment, highlighting effective strategies that enhance engagement and long-term consumer relationships. Through a bibliometric analysis, this research mapped trends, gaps, and key themes in the literature, providing valuable insights into how digital technologies and business strategies impact customer loyalty.

Our findings indicate that customer loyalty and retention are primarily influenced by the following factors:

- Personalization and Customer Experience—The ability to tailor services and interactions to meet individual customer preferences significantly enhances engagement and satisfaction.
- Trust and Brand Reputation—Consumers are more likely to remain loyal to brands that maintain transparency, ethical business practices, and consistent quality.
- Technological Innovation and Digital Transformation—Emerging technologies, such as artificial intelligence (AI), big data, and machine learning, play a crucial role in improving customer interaction, predictive analytics, and service automation, thereby increasing retention rates.
- Omnichannel Strategies and Interactive Marketing—A seamless integration of multiple digital and physical touchpoints strengthens customer relationships by providing a consistent and immersive experience.
- Loyalty Programs and Incentives—Reward mechanisms such as discounts, exclusive content, and membership benefits contribute to sustained engagement and repeated purchases.
- Social Media and Community Engagement—Active participation in social platforms fosters brand advocacy and creates stronger emotional connections between businesses and consumers.

These factors collectively shape the customer journey in the digital landscape, reinforcing the need for companies to adopt data-driven strategies that enhance customer retention, trust, and long-term value creation. The study's bibliometric approach not only mapped the evolution of these themes in academic research but also provided empirical evidence of their significance in business practices.

Despite its contributions, this study has certain limitations. First, the bibliometric analysis is limited to publications indexed in the Web of Science, which may exclude relevant research from other databases. Second, while this approach allows for a comprehensive mapping of trends and collaborations, it does not provide a qualitative assessment of the content of individual studies. Additionally, the selection criteria focused on articles published between 2021 and 2024, which may not fully capture the historical evolution of customer loyalty and retention theories. Future studies could expand this analysis by incorporating different databases, using content analysis techniques, and considering a broader temporal range to enhance the robustness of findings. Furthermore, future research could further explore the interplay between customer experience, technological adaptation, and evolving consumer expectations, offering deeper insights into sustainable retention strategies in digital commerce.

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