
Bibliometric Analysis of Publications on the Use of Blockchain Technology in Building Customer Loyalty

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Abstract:

Purpose: The study aimed to identify the research landscape on the use of Blockchain technology in building customer loyalty. While Blockchain had been widely discussed in the context of finance and data security, its application in relationship marketing and loyalty management remained fragmented. The article sought to synthesise existing knowledge, determine thematic clusters, identify key authors, countries, and institutions, and indicate research gaps that could inspire further academic and practical developments.

Design/Methodology/Approach: A systematic literature review combined with quantitative bibliometric analysis was conducted. Following the PRISMA protocol, scientific publications were retrieved from the Scopus and Web of Science databases using the detail query. After screening and removing duplicates, a final dataset of 46 documents published between 2018 and 2024 was analysed. Bibliometric indicators such as annual publication growth rate, citation rate, and international collaboration were calculated using Bibliometrix (RStudio) and VOSviewer. Network visualisations were generated to explore co-authorship, country collaboration, keyword co-occurrence, and thematic clusters.

Findings: The results showed a dynamic increase in scientific interest. International collaboration was moderate and the average number of authors per document was 3.63. Six thematic categories were identified based on the content classification of publications: Blockchain-based loyalty programs (13 papers), Blockchain in supply chain and consumer trust (9), Blockchain integrated with customer relationship management (9), Blockchain in marketing and brand management (7), Blockchain in tourism, hospitality, and aviation (5), and Blockchain in the financial and insurance sector (3). These thematic areas illustrate the interdisciplinary character of the research, bridging information technology, management, and marketing perspectives.

Practical Implications: Blockchain enabled the creation of transparent, interoperable, and automated loyalty ecosystems. It strengthened customer trust, optimised data management, and reduced operational costs. For managers, Blockchain-based loyalty solutions fostered long-term engagement and relational value through smart contracts and token incentives. For policymakers, the results emphasised the importance of standardisation and regulation of digital assets.

Originality/Value: This paper represents one of the first bibliometric studies specifically connecting blockchain technology with customer loyalty, distinguishing itself by combining quantitative mapping with thematic classification across multiple business domains. It contributed to marketing and information systems research by mapping conceptual

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relationships, identifying emerging topics, and outlining directions for future studies. The results of the research provided a better understanding of the current state of knowledge on this issue.

Keywords: Blockchain, customer loyalty, loyalty programs, bibliometrics, co-word analysis, the PRISMA method.

JEL codes: M30, O33, D80.

Paper type: Research article.

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1. Introduction

The dynamic development of Blockchain technology in recent years has led to its increasingly widespread application across various sectors of the economy, including customer relationship management. Owing to its unique features such as decentralization, transparency, security, and transaction automation this technology is being applied to loyalty programs, which have traditionally been among the most important instruments for building long-term customer relationships.

The use of Blockchain enables the elimination of intermediaries, ensures greater transparency of participation rules, reduces the risk of fraud, and increases trust among program participants (Santos, Marinho, and Bernardino, 2023; Korath and Sangheethaa, 2024).

These characteristics make Blockchain perceived not only as a technological tool but also as a factor that strengthens customer relationships and brand loyalty (Tushti, Kumar, Ruby, Soundararajan, Venugopal, and Aggarwal, 2024).

A consistent, quantitative study that would allow for a comprehensive understanding of the current state of knowledge in this field its main research trends, leading academic centers, and dominant thematic areas has not yet been developed. This paper attempts to fill this gap by conducting a bibliometric analysis of scientific publications available in the Scopus and Web of Science databases concerning the application of Blockchain technology in the context of customer loyalty.

The main objective of the study is to identify research directions as well as key authors and academic institutions active in this area.

Previous studies on the role of Blockchain technology in building customer loyalty (Matysik, 2024) have focused mainly on qualitative analyses and conceptualizations of mechanisms such as trust, tokenization, and integration with CRM systems. However, there is a lack of quantitative approaches that would make it possible to determine the scale and structure of this research domain. The present study addresses this gap by applying bibliometric analysis based on data from Scopus and Web of Science.

This article seeks to answer the following research questions:

- (1) What is the current state of knowledge regarding the use of Blockchain technology in building customer loyalty?*
- (2) Which countries, institutions, and authors are the most prominent in this field?*
- (3) Which scientific publications are the most influential and shape future research directions?*

Answering these questions will make it possible to assess the level of advancement of research in this area and to identify potential gaps that require further exploration. The scientific value of this paper lies in combining a systematic literature review with bibliometric analysis and visualization of networks linking authors, countries, and research topics. This approach not only organizes the existing body of knowledge but also outlines the emerging directions for the further development of this field.

2. Literature Review

Traditional loyalty programs often suffer from fragmentation, low redemption rates, and limited interoperability among brands (Santos *et al.*, 2023). Customers rarely own their points, which remain locked within centralized systems and frequently expire, reducing engagement (Santos *et al.*, 2023). Managing such programs is costly for companies, while lack of transparency and control discourages customer participation, motivating exploration of blockchain-based alternatives.

Blockchain's decentralization, transparency, and immutability directly address these limitations. It enables secure, traceable transactions without intermediaries, reducing fraud and administrative costs (Antoniadis, Kontsas, and Spinthiropoulos, 2019). Through tokenization, loyalty points can be turned into digital assets owned by customers, increasing flexibility and perceived value (Santos *et al.*, 2023). Smart contracts automate point redemption, ensuring real-time and trustworthy execution. These features promote interoperable "coalition" programs where multiple firms operate within one ecosystem, enhancing both efficiency and customer satisfaction (Antoniadis *et al.*, 2019; Santos *et al.*, 2023).

Research suggests blockchain enhances customer trust and engagement. Tokenized rewards and digital ownership create psychological attachment, raising willingness to participate and strengthening loyalty (Boukis, 2024). Case evidence shows tokenized systems improve perceived value and retention compared to conventional schemes (Antoniadis *et al.*, 2019).

Empirical implementations across industries illustrate blockchain's practical potential. Airlines such as Lufthansa and Singapore Airlines, as well as hotel chains using NFT-based memberships, have adopted blockchain to facilitate interoperable and transparent loyalty ecosystems (Antoniadis *et al.*, 2019; Boukis, 2024). By 2023, more than twenty such programs were identified globally, signaling growing institutional confidence (Abooleet and Kinnett, 2023).

Despite its promise, adoption faces challenges. Users often lack blockchain literacy, and regulatory ambiguity around tokenized rewards complicates compliance (Antoniadis *et al.*, 2019). Technical issues scalability, interoperability, and integration with legacy systems also limit broader diffusion. Stable tokens and improved standards are emerging as solutions. Overall, blockchain can make loyalty systems more transparent, efficient, and customer-centric, but further research and regulatory clarity remain essential (Santos *et al.*, 2023).

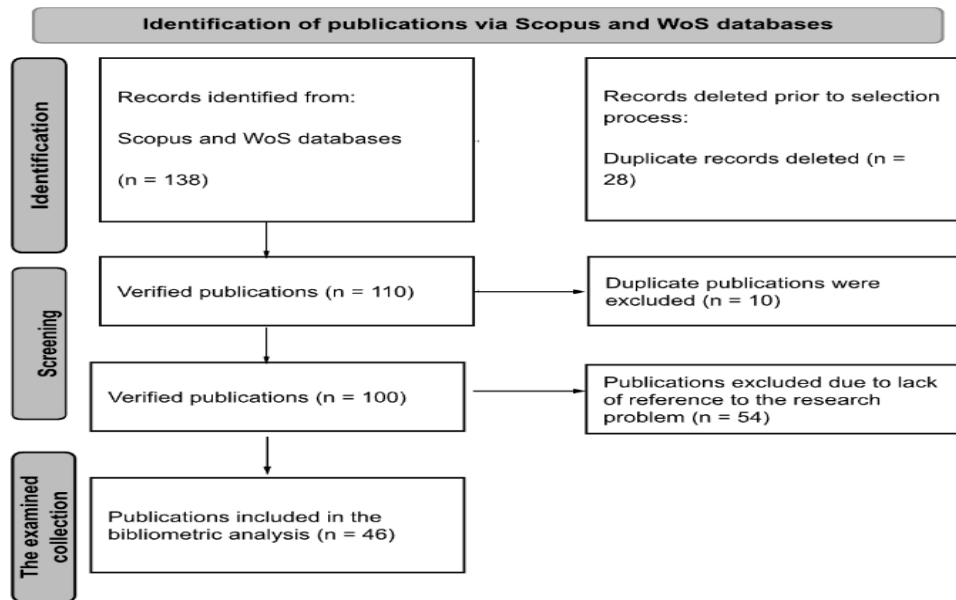
3. Methodology

In this study, a systematic literature review method was combined with bibliometric analysis. The procedure followed the PRISMA (2020) guidelines, which ensure a transparent presentation of the publication selection process. The analysis included scientific publications in English available in the Scopus and Web of Science databases. The search was conducted on September 26, 2024, using the following query: ("customer retention" OR "customer relations" OR "customer relationships" OR "customer loyalty") AND ("Blockchain").

The selection process, illustrated in Figure 1, consisted of four stages: identification of publications, removal of duplicates, relevance assessment based on abstracts, and final inclusion. Ultimately, 46 scientific publications from the years 2018-2024 were included in the analysis.

The data were exported in CSV format and processed in the R environment using the Bibliometrix package, which enables the calculation of bibliometric indicators such as the number of publications, publication growth rate, average number of citations per document, and the share of international co-authorship. To visualize the network of co-occurring author keywords, the VOSviewer software was employed, applying a normalization algorithm based on the strength of associations. The minimum keyword occurrence threshold was set to two, following the practice commonly applied in bibliometric analyses (Ejdys, 2016; Matysik and Wiśniewska, 2024).

Figure 1. Scheme of the publication selection process according to the PRISMA procedure



Source: Own work based on the PRISMA diagram (2020).

Bibliometrics, as a quantitative method for analyzing scientific output, allows the identification of developmental trends, key authors and research centers, and dominant topics within a given field of knowledge. In its classical definition, as noted by Ejdys (2016), bibliometrics serves to predict the directions of scientific research, identify knowledge gaps, and determine the degree of research saturation in a given discipline.

In the context of management and marketing, it provides a tool for analyzing the evolution of theories, assessing research intensity, and tracking thematic changes over time. Similarly to studies on consumer ethics in the context of artificial intelligence (Matysik, Wiśniewska, 2024) or the use of OpenAI technologies in corporate marketing (Wiśniewska, Matysik, 2024), bibliometrics makes it possible to observe how newly emerging research areas evolve, form networks of interrelations, and reveal scientific leaders.

Bibliometric analyses applied in research on emerging technologies (AI, IoT, Blockchain) often use tools such as VOSviewer and Bibliometrix. As emphasized by Zupic and Čater (2015), their advantage lies in the ability to graphically present networks of concepts and relationships between publications, which allows for the visual representation of the structure of a research field. Merigó and Yang (2017) further highlight that bibliometrics, combined with keyword co-occurrence analysis, enables the identification of core themes and emerging topics within a discipline.

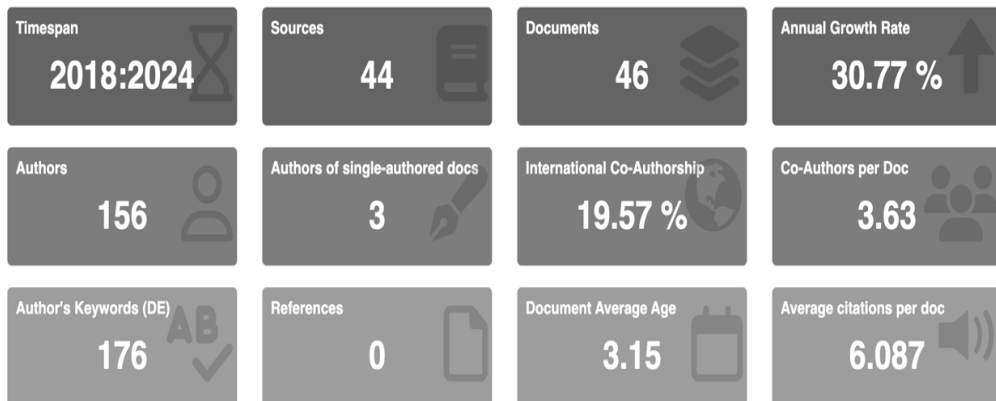
In the context of Blockchain research, such an approach makes it possible to understand how this technology permeates various domains from customer relationship management and logistics to digital marketing and the financial sector.

The interpretation of bibliometric maps was based on three types of analyses: authors collaboration, co-word analysis, and country collaboration. In the case of keyword analysis, the cluster structure was also examined, allowing the identification of main thematic areas. Additionally, an n-gram cloud analysis of abstracts was performed to complement the thematic overview of the analyzed dataset.

4. Research Results and Discussion

In the analyzed collection, 46 documents published across 44 different sources (journals and conference proceedings) were identified, as shown in Figure 2. A total of 156 authors contributed to these publications, with only three being single-author works, confirming the predominant collaborative nature of research in this field. The average number of authors per publication was 3.63, while the share of international co-authorship amounted to 19.57%, indicating a moderate level of global scientific collaboration.

Figure 2. Key bibliometric indicators of the analyzed collection of publications on the use of Blockchain technology in building customer loyalty (2018–2024)



Source: Own elaboration using Bibliometrix package (RStudio).

Figure 2 presents a summary of the key bibliometric indicators obtained from the analysis of 46 scientific publications on the application of Blockchain technology in building customer loyalty. The analyzed period covers the years 2018–2024, corresponding to the time when this topic began to develop dynamically. The data were generated in the Bibliometrix environment (RStudio) based on metadata retrieved from the Scopus and Web of Science databases.

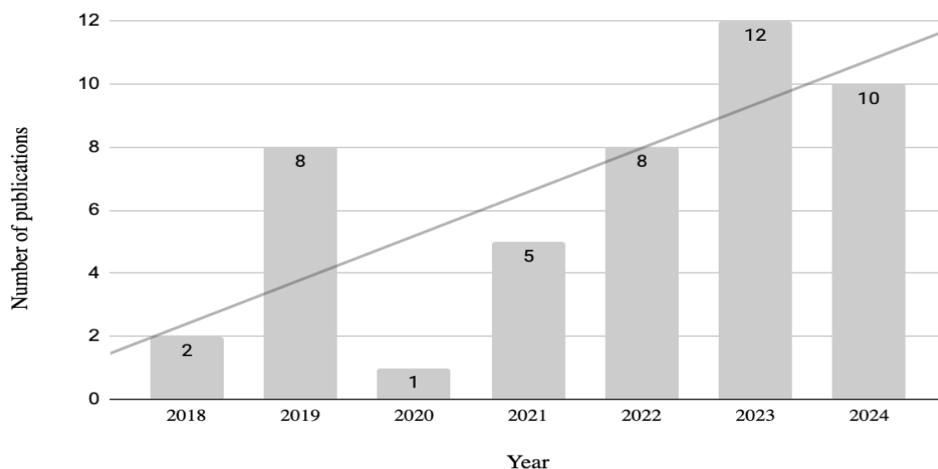
The annual growth rate of publications reached 30.77%, confirming the rapid increase of interest in Blockchain-related research within the context of customer loyalty. The average document age (3.15 years) and the average number of citations per publication (6.09) indicate an early but growing phase of development in this research area. The analyzed dataset included 176 author keywords, reflecting the broad terminological and thematic diversity typical of emerging, interdisciplinary research domains.

The data presented in Figure 2 indicate that research on the use of Blockchain technology in building customer loyalty represents a field with significant development potential, which is only beginning to consolidate its position within the structure of management sciences.

The analysis of publication trends shows a dynamic increase in scholarly interest in applying Blockchain to customer loyalty, as illustrated in Figure 3. Between 2018 and 2024, the number of publications increased more than fivefold, reaching its peak in 2024.

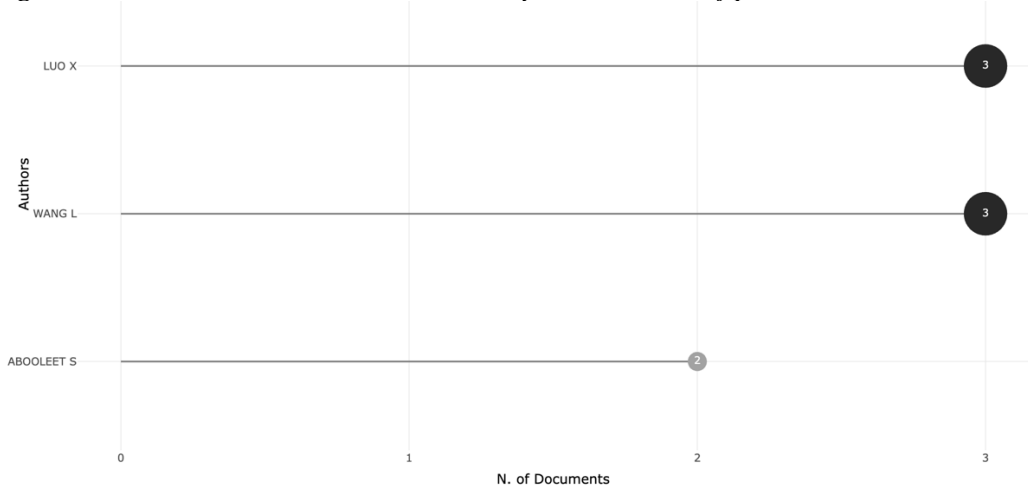
This upward trend reflects the growing importance of the topic in both academic and business contexts. From the perspective of research development, studies on Blockchain in the context of customer loyalty can be classified as an emerging field, which is confirmed by the relatively low citation counts and limited author collaboration networks.

Figure 3. Total number of publications on the use of Blockchain technology in building customer loyalty included in the databases surveyed in 2018-2024



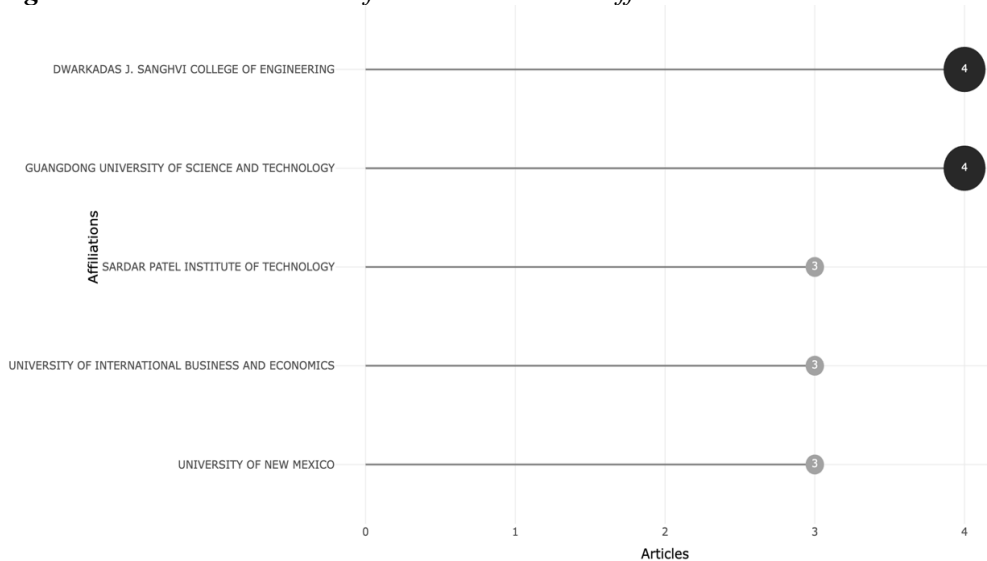
Source: Own elaboration using Bibliometrix package (RStudio).

Figure 4 presents the most frequently appearing authors of publications in the analyzed dataset.

Figure 4. *The most active authors in the analyzed collection of publications*

Source: *Own study using Bibliometrix.*

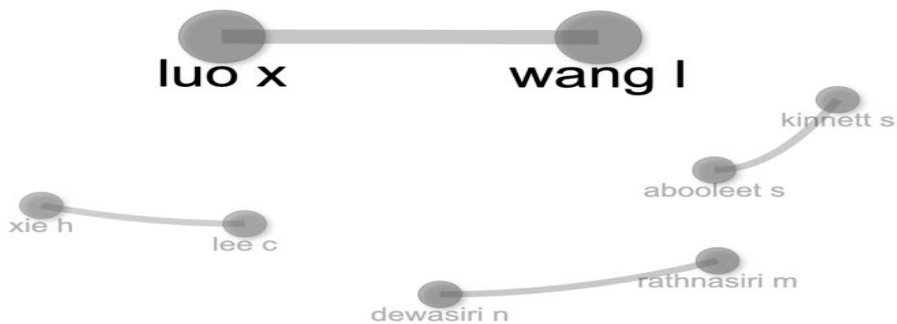
In the analysis of the most frequently publishing authors (Luo X, Wang L, Abdoelet S), a clear concentration of research output can be observed in Asian countries, particularly in China. This indicates a geographical shift of the research center on Blockchain toward Asia, which is further confirmed by affiliation data the most active institutions being Dwarkadas J. Sanghvi College of Engineering and Guangdong University of Science and Technology, as shown in Figure 5.

Figure 5. *Most common scientific units and author affiliations*

Source: *Own study using Bibliometrix.*

The co-authorship map presented in Figure 6, generated in Bibliometrix, shows only a few strong connections between authors. The most prominent relationship is observed between Luo X. and Wang L., indicating a predominantly local nature of collaboration. Most of the remaining authors form small, isolated clusters, which is typical of research areas that are still in the early stages of development.

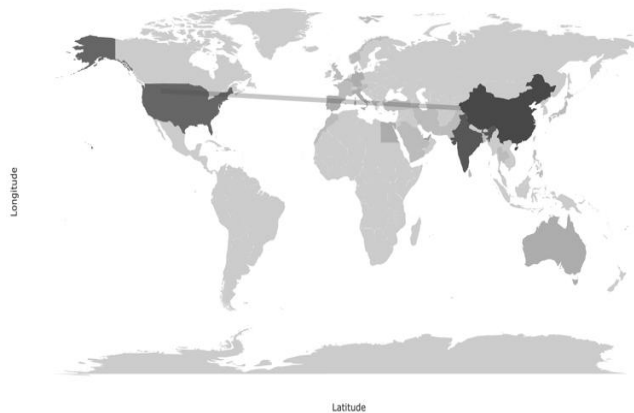
Figure 6. Co-authorship map (authors with at least two publications)



Source: Own study using Bibliometrix software.

The country collaboration map presented in Figure 7 shows the dominance of China and the United States, while international collaboration remains limited. The connecting lines between countries are sparse, indicating weak knowledge exchange across regions. In comparison with bibliometric analyses in the field of artificial intelligence in consumer ethics (Matysik, Wiśniewska, 2024) where research collaboration among institutions in the USA, Canada, and Australia was intensive the case of Blockchain in customer loyalty reveals a more fragmented research landscape and a lack of global scientific consortia.

Figure 7. Map of cooperation between countries in the analyzed collection of publications



Source: Own study using Bibliometrix software.

Table 1 presents the five most frequently cited scientific publications identified in the analyzed dataset on the use of Blockchain technology in building customer loyalty. These publications represent diverse research approaches and application sectors; however, they share a common theme Blockchain is perceived as a tool for fostering trust, transparency, and lasting relationships between organizations and their customers.

Table 1. *Most frequently cited publications in the analyzed collection*

Article title	Number of citations
<i>Unveiling the interplay between blockchain and loyalty program participation: A qualitative approach based on BubiChain</i>	29
<i>From ambivalence to trust: Using blockchain in customer loyalty programs</i>	28
<i>Building brand engagement in metaverse commerce: The role of branded non-fungible tokens (BNFTs)</i>	26
<i>A conceptual model for blockchain-based agriculture food supply chain system</i>	25
<i>The role of blockchain technology in aviation industry</i>	20

Source: Own study based on the results of the analysis in Bibliometrix.

The most frequently cited article, “Unveiling the Interplay Between Blockchain and Loyalty Program Participation: A Qualitative Approach Based on BubiChain” (Wang, Luo, Lee, 2019), is one of the first empirical studies examining the impact of Blockchain on customer participation in loyalty programs.

Using the Self-Determination Theory (SDT) and a case study of the Chinese platform BubiChain, the authors demonstrated that Blockchain features such as decentralization, security, real-time point exchange, and resistance to fraud enhance both extrinsic motivations (economic) and intrinsic motivations (social and psychological) of loyalty program participants. This article provided a theoretical foundation for understanding how Blockchain shapes customers’ perceived value and participatory behaviors within loyalty ecosystems.

The second publication, “From Ambivalence to Trust: Using Blockchain in Customer Loyalty Programs” (Utz, Johannings, Roth, Bruckner, Strüker, 2023), shifts the research focus to the renewable energy market, analyzing how Blockchain can reduce customer ambivalence and distrust toward energy providers. Based on four iterative design science research cycles, the authors developed a Blockchain-based loyalty program model that enhances customer trust through data transparency, verifiability of information, and user control over personal data.

The third study, “Building Brand Engagement in Metaverse Commerce: The Role of Branded Non-Fungible Tokens (BNFTs)” (Lee, Ho, Xie, 2023), extends Blockchain applications to the emerging context of metaverse marketing. Using the S-O-R model (Stimulus-Organism-Response), the authors confirmed that BNFT attributes

such as rarity, prestige, and originality strengthen positive attitudes toward brands and increase customer engagement with branded digital assets.

The fourth article, “A Conceptual Model for Blockchain-Based Agriculture Food Supply Chain System” (Ehsan, Irfan Khalid, Ricci, Iqbal, Alabrah, Sajid Ullah, and Alfakih, 2022), proposes a Blockchain-based food supply chain model ensuring full product traceability from producer to consumer. The authors emphasize that decentralization and smart contracts improve communication quality among supply chain participants, enhancing consumer loyalty and trust through data transparency and security.

The final highly cited paper, “The Role of Blockchain Technology in Aviation Industry” (Ahmad, Salah, Jayaraman, Hasan, Yaqoob, and Omar, 2021), explores the potential uses of Blockchain in the aviation sector. The study highlights applications such as digital crew certifications, MRO (Maintenance, Repair, and Overhaul) systems, and most relevant to this study airline loyalty programs. The authors also present a framework for using smart contracts to automate aviation services, underlining the importance of data transparency and auditability in customer relations.

The reviewed publications despite addressing different industries share a common denominator: Blockchain is perceived as a key enabler of trust, transparency, and relational value, both in traditional loyalty programs and in new digital contexts such as the metaverse and smart supply chains.

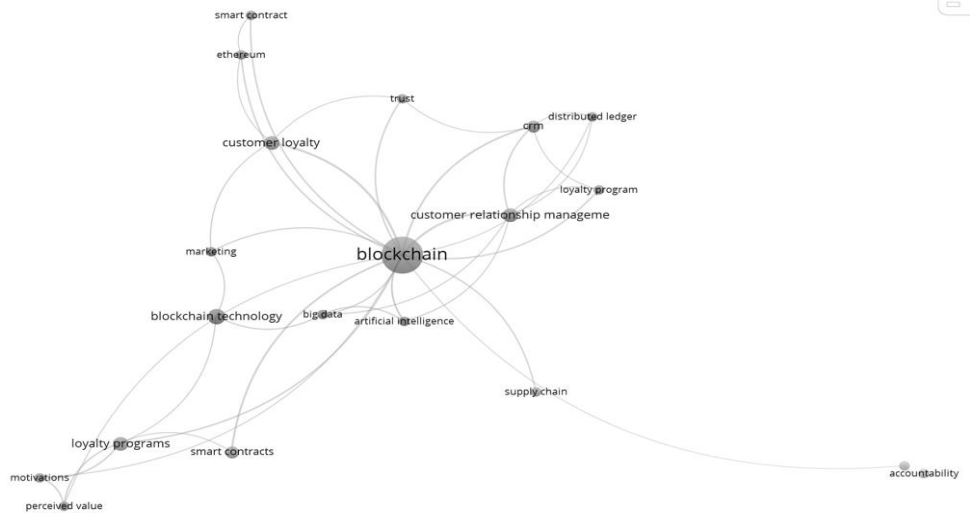
The keyword co-occurrence analysis, presented in Figure 8, constitutes the main component of the thematic structure assessment. The network map generated in VOSviewer highlights the central position of the term Blockchain, directly linked with concepts such as customer loyalty, loyalty programs, trust, CRM, smart contract, marketing, and supply chain. The structure of the network confirms that research on Blockchain in the context of customer loyalty is multifaceted and interdisciplinary, integrating digital technologies, relationship marketing, and data management.

The map presented in Figure 8 reveals five main thematic clusters that represent the dominant research directions:

1. Cluster 1 includes concepts related to building trust, loyalty, and smart contracts (customer loyalty, trust, smart contract, ethereum). It refers to the application of Blockchain in transparent customer relationship management.
2. Cluster 2 focuses on customer relationship and database management (customer relationship management, distributed ledger, loyalty program), indicating research on the integration of Blockchain with CRM systems.
3. Cluster 3 centers on technological and analytical connections (blockchain technology, marketing, big data, artificial intelligence), describing the use of

- Blockchain in data analysis and digital marketing.
4. Cluster 4 covers the area of motivation and perceived value in loyalty programs (loyalty programs, smart contracts, motivations, perceived value), representing research on consumer behavior.
 5. Cluster 5 concerns issues of accountability and transparency in Blockchain systems (accountability), forming a peripheral yet important ethical and regulatory theme.

Figure 8. Map of co-occurrence of author's keywords (co-word analysis)



Source: Own study in VOSviewer.

The central position of the node “blockchain” and its dense network of connections with terms related to loyalty and trust indicate that this technology serves as a bridge between technological and relational aspects.

Nodes located closer to the center of the map represent concepts of greater importance to the overall research field, while those on the periphery correspond to new or specialized research areas that may define future scientific directions.

The n-gram clouds from abstracts shown in Figures 9a and 9b confirm that the most frequently occurring concepts are “Blockchain,” “customer loyalty,” “loyalty programs,” “supply chain,” “technology,” and “CRM.”

The arrangement and frequency of these expressions suggest that the dominant research direction remains the implementation of Blockchain within traditional loyalty structures and the exploration of new forms of customer engagement.

This topic is still in its early stage of development, as evidenced by the limited number of publications and the fragmented structure of citation networks. The most frequently studied areas include Blockchain-based loyalty programs, trust mechanisms, tokenization, NFTs, and integration with CRM systems.

Blockchain can serve as the foundation for modern loyalty programs by ensuring transparency, automation, and personalization of customer experiences, while simultaneously reducing operational costs and improving data management. From an academic perspective, this field opens opportunities to study trust, information security, and token economics. The analysis revealed a growing interdisciplinarity of this topic, combining computer science, management, and consumer psychology.

The limitations of the present analysis concern the scope of the databases used and the date of the search query. Future studies should expand the analysis to include other academic databases as well as empirical research on the effectiveness of loyalty programs, ethical considerations, and regulatory aspects.

This quantitative analysis serves as a starting point for qualitative and conceptual studies that may deepen the understanding of how Blockchain technology influences customer loyalty, contributing to the development of coherent theoretical frameworks and practical applications.

***AI Note:** Artificial intelligence-based tools were used in the preparation of this article. Translation from the national language and linguistic correction were performed using ChatGPT. The literature review was supported by Scite.ai and NotebookLM. The GPT-4o mini model from OpenAI was used to select articles based on abstracts.*

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