

Blockchain and accounting information systems: enhancing sustainability reporting with triple-entry accounting

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Abstract

Purpose – This study analyses the intersection between blockchain technology, accounting and sustainability, examining how blockchain is transforming accounting practices toward greater transparency, traceability and alignment with sustainability goals. It also identifies the main intellectual, geographical and thematic structures of this emerging field, with particular attention to triple-entry accounting, environmental, social and governance (ESG) reporting, supply chain traceability and regulatory challenges.

Design/methodology/approach – The study conducts a bibliometric analysis of 57 articles indexed in Web of Science and Scopus from 2016 to 2024. Using VOSviewer software, it identifies the most influential authors, countries, publishers and thematic clusters, providing a systematic overview of scientific production, knowledge structures and emerging research trends in blockchain, accounting and sustainability.

Findings – The results show a strong increase in scientific production, confirming the growing relevance of blockchain in accounting and sustainability research. The findings highlight its application in supply chain traceability, ESG reporting, accounting automation and triple-entry accounting. Five thematic clusters are identified, suggesting future research lines on technology adoption in education, sustainable supply chains, artificial intelligence, smart contract regulation and institutional governance.

Originality/value – This study offers an integrated bibliometric view of the evolution of blockchain and accounting research toward interdisciplinary and sustainability-oriented approaches. Its originality lies in identifying research gaps and emerging trends while proposing a framework to understand accounting digital transformation. It provides guidance for future research and professional practice, supporting more digital, transparent and sustainable accounting systems.

Keywords Blockchain technology, Accounting, Triple-entry accounting, Sustainability reporting

Paper type Literature review

1. Introduction

The growing pressure from governments, investors and consumers around the world has led organizations to adopt more responsible and transparent practices, especially in recent years, which have seen turbulent periods (Lu and Zhou, 2024). This new global context has led to a significant transformation in the accounting field, from being a tool dedicated merely to the recording of financial transactions to becoming a vital strategic instrument for the



management of various aspects, including sustainability (Suta and Tóth, 2023). Thus, the role of accounting information systems has acquired a relevant weight, especially when integrated with emerging technologies such as blockchain technology (Nguyen *et al.*, 2023).

This technology, characterized by its decentralized, secure and transparent structure (Dumay *et al.*, 2018; Vollmer, 2024), is transforming the way in which various financial transactions are recorded, deriving in a concept that has gained weight in recent years: the triple entry (Grigg, 2005; Thies *et al.*, 2023), which allows automating the verification of transactions, reducing auditing costs and improving trust between different economic agents, among others.

At the same time, the growing pressure exerted by institutions on environmental, social and governance (ESG) issues has led to the incorporation of new regulations, most notably the Corporate Sustainability Reporting Directive (CSRD) in the European Union. These directives not only require companies to provide more information on sustainability matters (Marco-Fondevila *et al.*, 2023) but also to do so in a more reliable and standardized way (van Dijk *et al.*, 2024; Hristov and Searcy, 2025). In this context, blockchain could become an enabling tool for both regulatory compliance and improved organizational accountability.

Despite the increasing number of bibliometric studies in this area, most existing analyses remain largely descriptive and do not fully address how blockchain, triple-entry accounting and sustainability interact within the broader context of the digital transformation of accounting. There is a lack of integrative works that both map the current landscape and identify research gaps and emerging thematic clusters. This study aims to fill this gap by offering a comprehensive and detailed analysis that goes beyond trend quantification, thus providing a valuable roadmap for both academia and practice.

In this context of regulatory, technological and social transformation, the main objective of this paper is to analyze the current state of the scientific literature on this emerging topic, thus posing the following research questions:

- RQ1. How is scientific literature addressing the intersection between blockchain, accounting and sustainability?
- RQ1. What are the prevailing theoretical and methodological approaches in the literature on blockchain, accounting and sustainability, and to what extent do they contribute to the digital transformation of accounting?
- RQ2. What trends are emerging in this field of study?
- RQ2. What research gaps and emerging lines can be identified from the analysis of the main thematic clusters, and how do these differ from those addressed in previous bibliometric studies?

For this purpose, a bibliometric analysis is performed with VOSviewer of a total of 57 scientific articles indexed in the Web of Science and Scopus for the period between 2016 and 2024, exploring the evolution, main authors and publishers of this field of knowledge. In addition, bibliometric analysis will allow the establishment of differentiated clusters that will allow the establishment of clear themes to facilitate the establishment of a clear roadmap showing where the literature is heading in this regard.

2. New paradigms in accounting: sustainability and blockchain as transformation axes

2.1 The incorporation of blockchain technology: the new accounting theory

Accounting has evolved from a technical discipline oriented to the recording of transactions to an interdisciplinary field that interacts with sociological, economic and ethical aspects. Traditionally, accounting theory has been dominated by normative approaches focused on objectivity and quantitative measurement (Unerman and Deegan, 2011). However, more

recent studies indicate that accounting not only reflects economic reality but also influences its construction through the practices and narratives it employs (Dumay *et al.*, 2018).

In this context, blockchain technology emerges as a tool that transforms the accounting function by providing a distributed, transparent and immutable record-keeping system, which has profound implications for the reliability and accuracy of accounting information (Liao *et al.*, 2025). From the perspective of legitimacy theory (Deegan *et al.*, 2002), blockchain strengthens stakeholders' trust in the information reported, as each transaction is validated by the network and cannot be altered without consensus, which is particularly relevant in the current regulatory environment characterized by growing demands for transparency and sustainability.

On the other hand, from institutional theory (Meyer and Rowan, 1977), the adoption of blockchain in accounting systems can be interpreted as an organizational response to regulatory and mimetic pressures, contributing to institutional isomorphism in highly regulated sectors. By incorporating automatic verification and traceability mechanisms, blockchain contributes to the convergence of accounting practices geared toward transparency and accountability (Yermack, 2017).

The main conceptual contribution of blockchain to accounting is embodied in the triple-entry model (Grigg, 2005; Thies *et al.*, 2023), which represents an evolution of the traditional double-entry system. In this model, each accounting entry is not only recorded in the books of the parties involved but also in a shared register that is cryptographically validated by a decentralized network (Cai, 2021). This introduces new possibilities for continuous auditing, fraud risk reduction and process automation through smart contracts, aligning accounting practice with principles of transparency, objectivity, and efficiency (Dai and Vasarhelyi, 2017).

In addition, the integration of blockchain into accounting systems is driving changes in internal control and audit frameworks, requiring professionals to develop new skills in data analysis and emerging technology management. This phenomenon reinforces the need to adapt educational and professional models to new market demands, in line with the theory of legitimacy and institutional evolution of the accounting profession (Christidis and Devetsikiotis, 2016; Gietzmann and Grossetti, 2021).

Thus, the incorporation of technologies such as blockchain not only transforms technical procedures but also reinforces the role of accounting in building legitimacy and meaning within organizations and society. Along these lines, Vollmer (2024) argues that accounting is a way of "breaking the silence of the social," documenting and giving visibility to processes that would otherwise remain hidden. This author argues that accounting not only measures financial performance but also constructs meanings and legitimacy at the organizational and social levels, aligning with legitimacy theory (Deegan *et al.*, 2002) and institutional theory (Meyer and Rowan, 1977), as accounting practices are shaped by social norms and institutional expectations (Vollmer, 2024). However, in recent years, authors such as Dumay *et al.* (2018) highlight that accounting has moved toward new theoretical and methodological approaches, incorporating new disciplines of relevance today, including blockchain technology and sustainability.

Blockchain is a technology in which networks of peer-to-peer nodes, connected through the Internet, make use of cryptography and consensus protocols to implement and develop certain processes (Figure 1). Peer-to-peer networks use distributed architecture applications that allocate and share all the processes that occur among the users participating in the network. This type of structure assumes that all network participants perform tasks and make certain decisions. In addition, all network participants maintain an identical copy of the log where all the operations that have been performed are recorded (Bible *et al.*, 2017).

Blockchain technology is transforming the way in which financial transactions are recorded, verified and reported, acting as a distributed and decentralized ledger and providing a secure, transparent and immutable basis for accounting (Dumay *et al.*, 2018). This has led to, according to Dai and Vasarhelyi (2017), dispensing with intermediaries in the verification of transactions, thus reducing costs and increasing efficiency in accounting

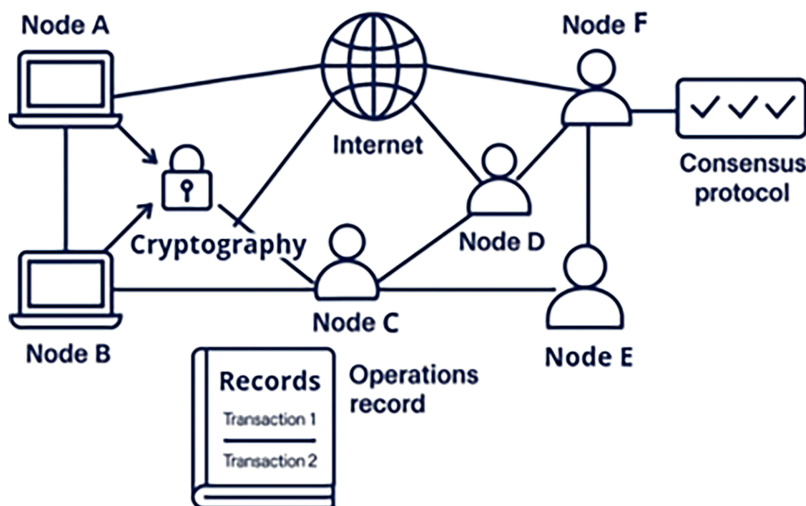


Figure 1. How blockchain works. Source: Own elaboration

processes. This innovation has led to the concept of the “triple entry”, extending beyond the traditional double entry system by including cryptographic recording.

The fundamental operation of blockchain networks is illustrated in Figure 1, where multiple distributed nodes validate, record and store transactions through the internet. Each node, representing different participants or accounting entities, maintains an identical and synchronized copy of the transaction record, ensuring data integrity via cryptography.

From an accounting perspective, this structure eliminates traditional intermediaries and decentralizes the validation of accounting entries. The consensus protocols, depicted in the figure, guarantee that each transaction is collectively verified and agreed upon before being permanently added to the ledger. This process forms the basis of the triple-entry model, in which each accounting entry is reflected not only in the ledgers of the involved parties but also in a shared, cryptographically validated record accessible to the entire network (Cai, 2021; Grigg, 2005).

In this way, the transparency, immutability, and traceability characteristic of blockchain strengthen trust in accounting information, facilitate continuous auditing and mitigate the risk of fraud, thereby aligning accounting practice with principles of accuracy, efficiency and accountability. This automation and decentralization of the accounting record represent a significant advance over the traditional double-entry system, fostering the convergence of accounting practices toward transparency and sustainability (Liao *et al.*, 2025).

In 2005, Ian Grigg, in his paper “Triple-entry accounting” (Grigg, 2005), introduced the concept of a digitally and cryptographically signed receipt stored by a third party. This receipt would guarantee the transaction and allow the parties included in the exchange to verify if there has been any alteration to the copy of the receipt held by each of them (Fullana and Ruiz, 2020). However, this mechanism would require an independent intermediary, in this case the target, to verify each transaction individually, which considerably increases the fees and time required to use this approach, as well as giving the intermediary too much power over the other two actors.

To solve the problem of fees, one of the technologies to be considered as a solution would be the incorporation of the blockchain into the platform, so that it would play the role of intermediary, distributing and automating the verification of the processes. Reducing the price of fees considerably, as well as allowing the automation of the procedure, thanks to the use of smart contracts (Mezquita *et al.*, 2019).

Beyond the “triple entry” concept, the blockchain has also driven the development of the well-known smart contracts, programs that facilitate, verify and enforce contractual agreements automatically (Szabo, 1994). In this way, the automation of accounting processes, account reconciliation or tax calculation, among others, allows the reduction of the risk of human error and fraud (Buterin, 2014; Mezquita *et al.*, 2019; Fullana and Ruiz, 2020). As Cong and He (2019) point out, these contracts establish the terms of an agreement between parties through the use of technical codes, which is a substantial improvement in the transparency of these contracts (Moll and Yigitbasioglu, 2019).

The development of smart contracts has come about thanks to the rise of blockchain technology, although its possible implementation was already designed by Nick Szabo in the 1990s (Szabo, 1994, 1997). Szabo’s idea was based on the implementation of the clauses of a contract in computer code. Once implemented, the code would be deployed over a network of servers that would make use of communication and consensus protocols in order to keep the code stored immutably. Moreover, thanks to these consensus mechanisms, every time a clause of the contract was to be executed, the process would be verified by the entire network.

Although Szabo’s idea was designed more than 20 years ago, it was not until 2008, with the emergence of Bitcoin, the first use case of blockchain technology (Nakamoto, 2019), that a large-scale implementation of his idea was not realized. Thanks to the use of blockchain technology, it is possible to maintain a distributed ledger, as a database, in which to store not only economic transactions but also the storage and management of the use of smart contracts (Mezquita *et al.*, 2019).

In addition, the importance of blockchain integration in accounting has also been analyzed from an educational point of view. The incipient demand for professionals with blockchain skills highlights the importance of incorporating this technology in the training of accountants and auditors. In this regard, Abdullah *et al.* (2024) highlight that blockchain, by enabling greater transparency and security in financial transactions, optimizes accounting processes, resulting in greater efficiency and trust. Training students in these emerging technologies not only prepares them for today’s challenges but also ensures that educational institutions contribute to the continuous evolution of the accounting profession, preparing them to face the demands of a globalized and technologically advanced market.

2.2 Blockchain, accounting and sustainability

Sustainability has emerged as a key factor in the evolution of various economic sectors, accounting and finance being one of them (Jesse *et al.*, 2023; Marco-Fondevila *et al.*, 2023; García *et al.*, 2024). The integration of sustainable practices in business not only responds to regulatory and social pressure but also has the potential to improve operational efficiency and long-term competitiveness (Bakarich *et al.*, 2020; Gallardo-Vázquez and Sánchez-Domínguez, 2023; Marín-Hernández *et al.*, 2025). In this context, blockchain technology is consolidating as a transformative tool for sustainability in various industries, including accounting.

Several studies have demonstrated the positive impact of blockchain technology on sustainability reporting. Bakarich *et al.* (2020) point out that the adoption of this technology improves the reliability of non-financial reports and promotes the adoption of uniform standards when assessing the different sustainable practices carried out within organizations. Along these lines, David *et al.* (2022) highlight the role of this technology in contributing significantly to global efforts to mitigate climate change and protect biodiversity.

On the other hand, the adoption of digital technologies, such as blockchain, in sustainable supply chain management has been shown to improve transparency and control. Ebinger and Omondi (2020) noted that the use of data-driven digital approaches is critical for managing sustainability-oriented transparency. Furthermore, Esmaeilian *et al.* (2020)

suggest that the integration of blockchain with Industry 4.0 innovations could enable sustainability monitoring and reporting, facilitating energy management and the implementation of smart business models.

However, the integration of blockchain technology into accounting presents significant challenges, such as the lack of a clear regulatory framework addressing the legal and tax implications of recorded transactions or the difficulty of assigning liability in case of error, which raises legal and practical questions that have not yet been effectively resolved (Coyne and McMickle, 2017; Han *et al.*, 2023).

3. Methodology: a bibliometric analysis

To observe what is the current situation of the analyzed field of knowledge, as well as its evolution, a bibliometric analysis has been carried out, a rigorous and effective tool that allows synthesizing knowledge in emerging research areas (Donthu *et al.*, 2021; Zupic and Čater, 2015; Mugwira, 2022; López-Pérez *et al.*, 2023; Boğa-Avram *et al.*, 2025), as is the case of the integration of blockchain technology in accounting and sustainability. In this sense, bibliometric analysis allows identifying trends within a specific field of knowledge (Gallardo-Vázquez and de la Cruz Sánchez-Domínguez, 2023; Kumar *et al.*, 2024), which will serve as a roadmap to follow for the development of future work.

In this context, this analysis has been carried out following the guidelines established by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology, which guarantees the transparency and comprehensiveness necessary for the correct selection of documents, as recommended by various studies in the scientific literature (Page *et al.*, 2021; Tricco *et al.*, 2018). This methodology allows for the rigorous systematization of the process of identification, screening, eligibility and inclusion of studies, a process that can be seen in Figure 2.

The first phase begins with the identification of scientific documents in two of the world's most popular databases: Web of Science (WOS) and Scopus. To do this, the same search equation was used in both databases, although adapted to each one. In the case of WOS, the following search equation was used:

TS=(“accounting” OR “accountability” OR “financial reporting” OR “management accounting” OR “auditing”) AND TS=(“blockchain” OR “distributed ledger technology” OR “DLT” OR “smart contract*” OR “digital ledger”) AND TS=(“sustainab*” OR “ESG” OR “CSR” OR “corporate social responsibility” OR “environmental reporting” OR “sustainable development” OR “triple bottom line”)

For Scopus, the following was used:

TITLE-ABS-KEY ((“accounting” OR “accountability” OR “financial reporting” OR “management accounting” OR “auditing”) AND (“blockchain” OR “distributed ledger technology” OR “DLT” OR “smart contract*” OR “digital ledger”) AND (“sustainab*” OR “ESG” OR “CSR” OR “corporate social responsibility” OR “environmental reporting” OR “sustainable development” OR “triple bottom line”)).

This search equation allows us to capture articles that explicitly include at least one of the terms related to accounting, along with articles that deal with blockchain and sustainability (sustainab*), enabling us to collect both studies with a more technical focus and others of a regulatory, ethical or strategic nature. The use of the asterisk allows coverage to be extended to all forms derived from the term, such as “sustainability” or “sustainable,” thereby increasing the accuracy of the analysis.

In addition, the equation incorporates terms related to transparency, auditing and ESG (Environmental, Social and Governance) criteria, which are fundamental to evaluating corporate responsibility and the sustainable impact of organizations. The use of the asterisk (*) allows the search coverage to be expanded to include all forms derived from the keywords, such as “sustainability,” “sustainable” or “sustainably,” thus ensuring greater inclusivity in the collection of studies.

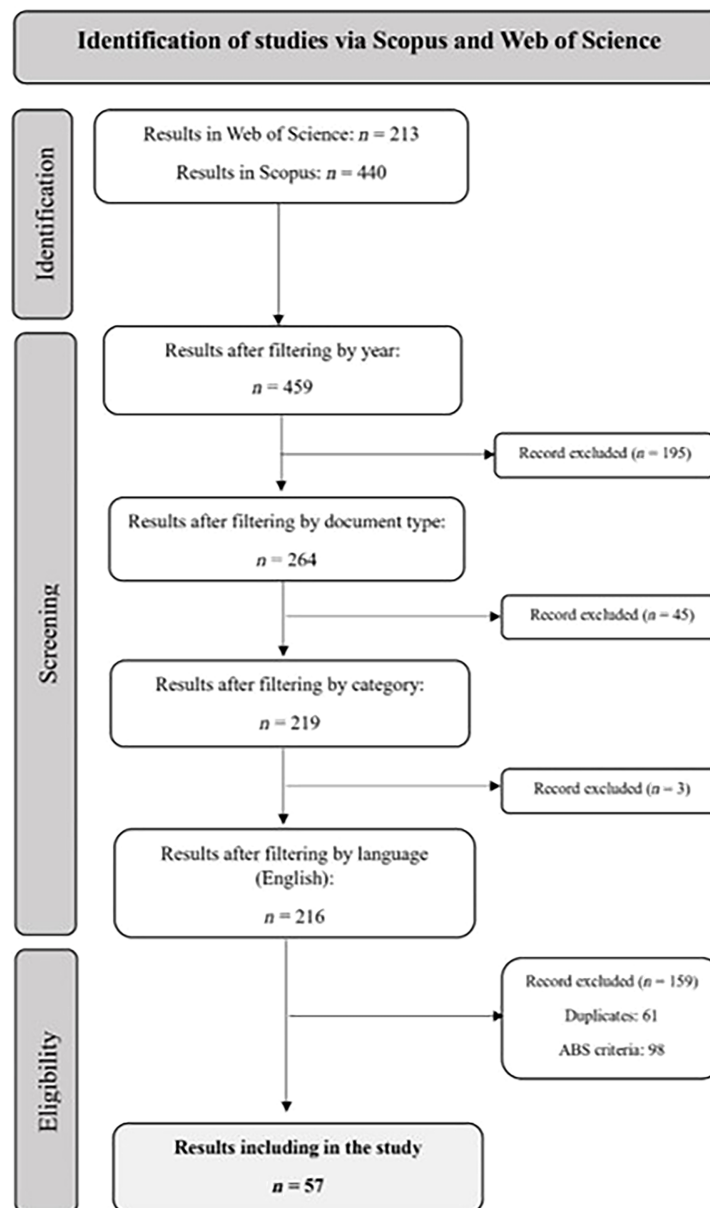


Figure 2. PRISMA diagram for the identification of studies included in the analysis. Source: Own elaboration

This comprehensive approach facilitates the identification of research that examines everything from the adoption of technology and the automation of blockchain-based accounting processes to ESG risk management, improved financial transparency, and contribution to regulatory compliance in corporate sustainability.

This yielded a total of 653 documents, 213 from WOS and 440 from Scopus. Filters were then applied by publication period (2016–2024), reducing the sample to 459 articles, given that

the first document available in both databases dated from 2016 (Figure 2). Next, only peer-reviewed scientific articles were selected, resulting in 264 records. To ensure thematic alignment with the study objectives, works belonging to irrelevant categories such as Energy, Agricultural Sciences, Humanities or Medicine were excluded, resulting in 219 documents. Finally, a language filter was applied, retaining only publications in English, which left a total of 216 articles.

In the eligibility phase, after eliminating 61 duplicate articles between the two databases, articles published in journals not belonging to the Academic Journal Guide (AJG) of the Chartered Association of Business Schools (ABS) were eliminated. In this way, 98 documents that did not meet this criterion were discarded, raising the level of rigor of our analysis. As a result, the final sample consisted of 57 articles, which form the basis of the bibliometric analysis developed in this study.

Once the documents were obtained, they were analyzed using VOSviewer software, a tool widely used in scientific literature to analyze and visualize bibliometric networks (Van Eck and Waltman, 2009). This software allows us to identify collaborations between different authors, organizations and countries, as well as the most influential authors as measured by the number of citations. In addition, VOSviewer allows the co-occurrence of keywords to be mapped, which is particularly useful for identifying thematic clusters, thus facilitating the proposal of future lines of research.

4. Results

4.1 Evolution and geographical distribution of scientific production

The results obtained glimpse an incipient interest by academics in the field of study analyzed, observing how the number of publications has grown exponentially since 2016, reaching 60 articles published on this subject in the year 2024 according to WOS, and 128 according to Scopus (see Figure 3), showing that blockchain technology applied in an accounting and sustainable context constitutes an emerging thematic area.

This growth shows the progress and adoption of new technologies with the aim of improving transparency, traceability and reliability of accounting and sustainability information. In addition, the increasing demands on sustainability by various institutions make non-financial information and ESG criteria a crucial aspect to be taken into account within organizations, which has encouraged the development of scientific works that address this issue.

Regarding the geographical distribution of the publications analyzed in this bibliometric analysis (see Figure 4), the United States of America is the country with the highest number of articles on the analyzed topic, with a total of 12, followed by India (11), England (9) and China (8). The strong position of China can be attributed to the country's strong momentum in the development and application of technologies such as blockchain (Ning *et al.*, 2021; Fang *et al.*, 2023). Similarly, India's high level of scientific output reflects the dynamism of its academic community regarding emerging technologies and sustainability.

For its part, the presence of the United States confirms its historic role as a key player in advancing research in accounting, digitization and corporate governance, while England maintains a prominent position thanks to its established academic tradition in social and economic sciences.

Other countries with a notable presence include Australia (7 publications), Malaysia (5), Jordan, Vietnam and Italy (4 each), and New Zealand and Canada (3 each). Although with fewer contributions, countries such as Bahrain, France, Spain and Bangladesh (2 each), along with others like the Netherlands, Indonesia, Tunisia and Nigeria (1 each), demonstrate the global interest in this research area. This broad distribution highlights the widespread relevance of the intersection between blockchain, sustainability and accounting across diverse geopolitical contexts.

These dynamics are also reflected in the patterns of co-citation and interconnection between countries, as shown in Figures 5 and 6, where the degree of collaboration and

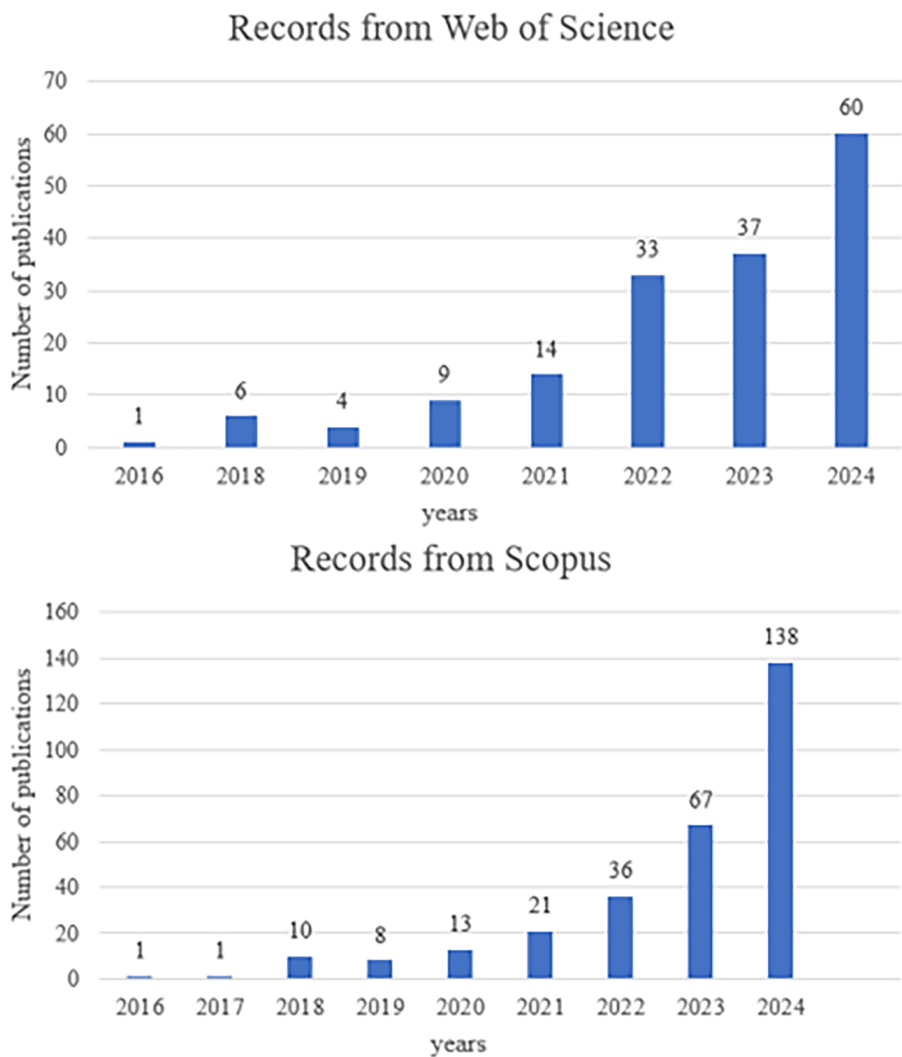


Figure 3. Evolution of publications according to WOS and Scopus. Source: Own elaboration with data from WOS and Scopus

intellectual proximity between the main centers of scientific production can be seen, showing an asymmetrical structure where the United States occupies a central position, being the main country as a connector between different regional blocks, connecting regional clusters such as India and Australia, which have high production but low impact in citations. England stands out in Europe for its coordinating role, while countries such as Vietnam and the United Arab Emirates act as emerging connectors. This structure reflects an uneven scientific collaboration, with a gap between productivity and international visibility.

4.2 Analysis of citation impact and publishing productivity in academic literature

[Table 1](#) shows the 15 most influential authors based on the number of citations received and total link strength, an indicator of their degree of integration into co-citation and collaboration

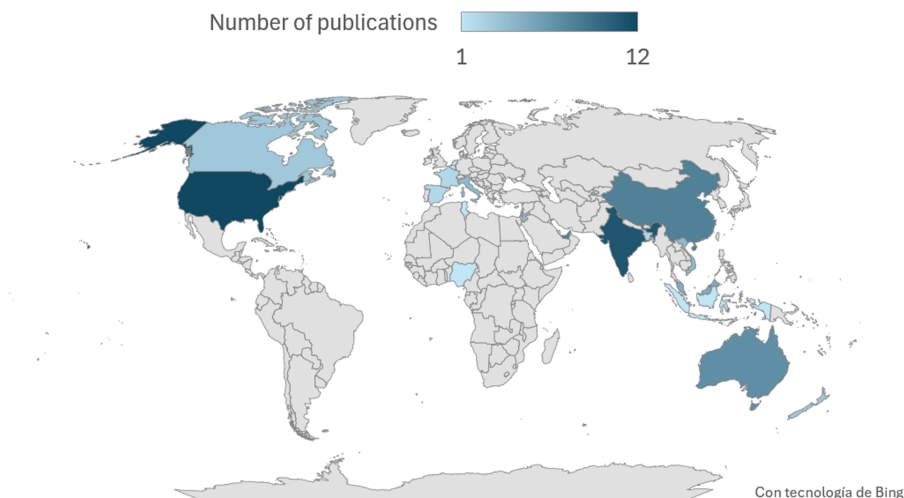


Figure 4. Geographical distribution of scientific production. Source: Own elaboration with data from VOSviewer

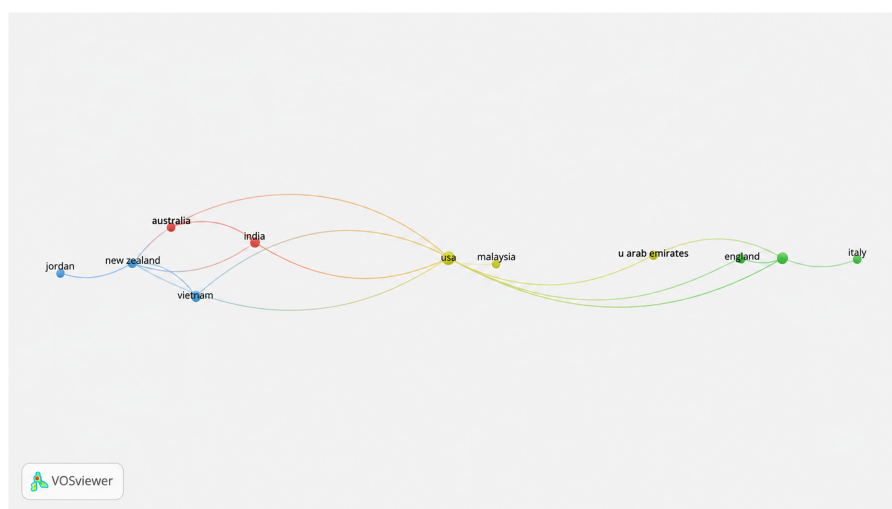


Figure 5. Geographical correlation and citations. Source: VOSviewer

networks. It is noteworthy that, except for Kshetri, N., who stands out with 1,204 citations and a link strength of 30, the rest of the authors have a considerably lower number of citations, mostly below 100, and limited connectivity within the network.

This pattern can be interpreted as a reflection of a field that is still fragmented or in an emerging phase, in which a few central authors concentrate the majority of citations, while other researchers contribute with more recent or specific works that have not yet consolidated their academic impact. For example, although authors such as Gupta, H., Khan, S.A., Kusi-Sarpong, S. and Mubarik, M. reach 98 citations, their link strength is only 1, suggesting a more isolated influence, with little interaction in established collaborative networks.

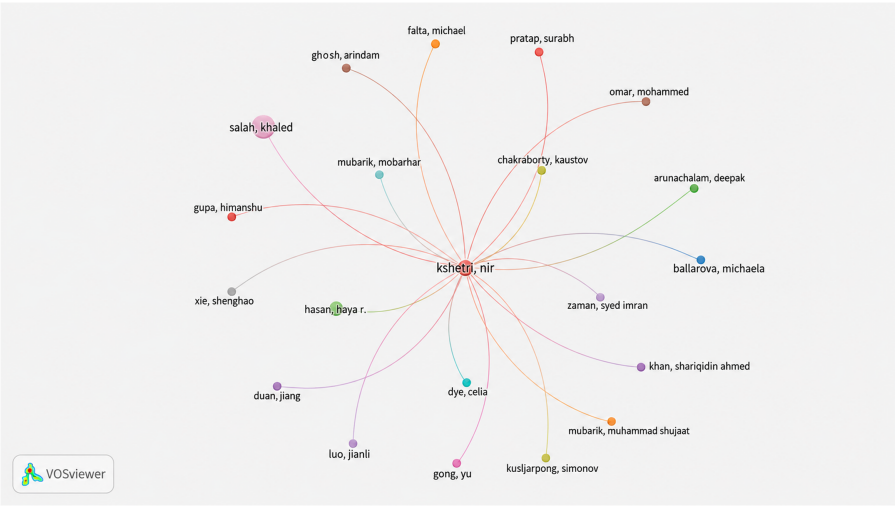


Figure 6. Co-citations between authors. Source: VOSviewer

Table 1. Ranking of most cited authors by WOS

Ranking	Author	Citations	Total link strength
1	Kshetri, Nir	1,204	30
2	Gupta, Himanshu	98	1
3	Khan, Sharfuddin Ahmed	98	1
4	Kusi-Sarpong, Simonov	98	1
5	Mubarik, Mobashar	98	1
6	Mubarik, Muhammad Shujaat	98	1
7	Zaman, Syed Imran	98	1
8	Castka, Pavel	85	15
9	Kharbat, Faten F.	81	14
10	Qasim, Amer	81	14
11	Mohr, Jakki	66	14
12	Searcy, Cory	66	14
13	Arunachalam, Deepak	56	4
14	Duan, Jiang	56	5
15	Gong, Yu	56	4

Source(s): Own elaboration with data from VOSviewer

In contrast, authors such as Castka, P. (85 citations, link strength = 15), Kharbat, F.F. and Qasim, A. (both with 81 citations and link strength = 14) present a more balanced profile, combining moderate impact in terms of citations with greater integration into the academic network. This could be related to their participation in emerging research communities or to co-authorship patterns that strengthen their visibility.

Taken together, these results suggest that the research landscape in this field is still in the process of consolidation, with well-established central references and a peripheral set of authors whose impact could increase in the coming years.

In addition to the quantitative indicators discussed above, a qualitative review of the five most cited authors in Table 1 provides further insight into the thematic and methodological foundations of the field. Nir Kshetri, the most influential scholar by a wide margin, has established the conceptual baseline for linking blockchain to transparency, governance and

institutional trust, shaping how subsequent studies position the technology within accountability and sustainability agendas. Building on this foundation, Gupta has advanced the discussion around blockchain adoption in sustainable supply chains, emphasizing traceability and monitoring mechanisms that connect technological implementation with ESG performance and compliance. Khan has contributed to the integration of blockchain into sustainability reporting, highlighting opportunities to improve the reliability of non-financial disclosures while acknowledging implementation and standardization challenges that remain salient for practice and policy. Kusi-Sarpong has helped consolidate the operations and supply-chain perspective, frequently bridging methodological rigor with managerial relevance to show how blockchain can support responsible sourcing and end-to-end visibility. Finally, Mubarik (Mobashar) has added to the understanding of organizational adoption and performance outcomes, illuminating how capability building, stakeholder alignment and contextual factors condition the effectiveness of blockchain-enabled initiatives. These authors illustrate the field's progression from conceptual explorations of blockchain's promise to concrete applications in reporting, supply chains and governance, positioning the technology as a structural enabler of transparency, assurance and sustainable accountability.

On the other hand, the analysis of editorial productivity makes it possible to identify the main platforms for the dissemination of scientific knowledge in a specific area. Considering that journals not included in the ABS ranking have been excluded from this analysis, Table 2 shows how Elsevier is the publisher with the highest scientific production, with a total of 16 articles, reflecting more than a quarter of the total sample analyzed (28%), followed by Taylor & Francis (23%), Emerald (21%), Springer Nature (7%) and SAGE (4%). As can be seen, the three main publishers account for more than 70% of the scientific output analyzed. Unlike other fields where the dissemination of knowledge is more dispersed, this concentration suggests that these publishers have managed to establish themselves as leaders in the publication of research related to accounting, sustainability and emerging technologies, especially in relation to digitization and sustainable corporate governance.

4.3 Keyword co-occurrence analysis

Keyword co-occurrence analysis is a bibliometric technique used throughout the literature by various researchers, allowing the identification of relationships between key concepts in the scientific literature and analyzing which terms appear most frequently in the articles analyzed. This approach, applied using VOSviewer software, facilitates the visualization of the predominant thematic connections and the grouping of terms into clusters, representing related lines of research. In this sense, Table 3 shows the 17 keywords with at least three occurrences, where the term “blockchain” stands out as the most prominent, with 40 occurrences and a total link strength of 87, evidencing its central role in sustainability and accounting research. It is followed by concepts such as “sustainability” and “management” (15 occurrences each), along with terms like “technology” and “blockchain technology” (12 occurrences each), and “supply chain” (11 occurrences), all indicating a growing interest in the application of blockchain in sustainable supply chain management.

Table 2. Ranking of publishers by number of publications

Ranking	Publishers	Record count	% out of 57
1	Elsevier	16	28%
2	Taylor & Francis	13	23%
3	Emerald	12	21%
4	Springer	4	7%
5	SAGE	2	4%

Source(s): Own elaboration with data from WOS and Scopus

Table 3. Most frequent keywords

Ranking	Keywords	Frequency	Total link strength
1	Blockchain	40	87
2	Sustainability	15	53
3	Management	15	35
4	Technology	12	37
5	Blockchain technology	12	25
6	Supply chain	11	43
7	Traceability	8	28
8	Artificial intelligence	8	19
9	Smart contract	7	17
10	Governance	6	23
11	Transparency	6	22
12	Challenges	6	21
13	Framework	6	20
14	Performance	6	15
15	Sustainable development	6	15
16	Trust	5	12
17	Bitcoin	5	12

Source(s): Own elaboration with data from VOSviewer

The prominent presence of general terms such as “management,” “technology” and “performance” suggests that the academic discourse is still taking shape and that there is room for more specialized and theoretically grounded contributions in future studies. On the other hand, terms such as “traceability,” “transparency,” “trust” and “accountability” reflect a cross-cutting concern for the principles of verifiability, integrity and trust, which are key aspects for the adoption and institutionalization of emerging technologies. These concepts align with normative and ethical debates linked to digital governance and the strengthening of organizational legitimacy in complex and dynamic environments.

Likewise, the presence of terms such as “artificial intelligence” and “governance” suggests an expansion of the field toward an integrative vision, in which blockchain is articulated with other emerging technologies within the framework of the digital transformation of organizations. This convergence points to a reconfiguration of management and control practices and the need for new theoretical frameworks that address technological complementarity from a systemic perspective.

Figure 7 shows a graphical representation of the relationships between keywords, allowing us to identify five main thematic clusters that structure the field of study. These clusters not only demonstrate the coexistence of technological, organizational and regulatory dimensions but also allow for the mapping of emerging lines of research and areas with potential for development. In this sense, co-occurrence analysis is not limited to a descriptive function but provides an analytical basis for guiding the research agenda toward topics with greater theoretical and applied added value.

While Figure 7 provides a static view of the relationships between keywords, further insight can be gained by examining their temporal evolution. Figure 8 presents an overlay visualization of the same co-occurrence network, with node colors representing the average year of appearance of each keyword in the analyzed literature. This temporal perspective makes it possible to identify not only the thematic structure of the field but also the chronological emergence of its key concepts, offering a more sophisticated bibliometric analysis that reveals shifts in research priorities over time.

Figure 8 presents an overlay visualization of keyword co-occurrence colored according to the average year of appearance in the analyzed literature. The network shows that early research (2018–2019, represented in blue tones) concentrated on foundational concepts such

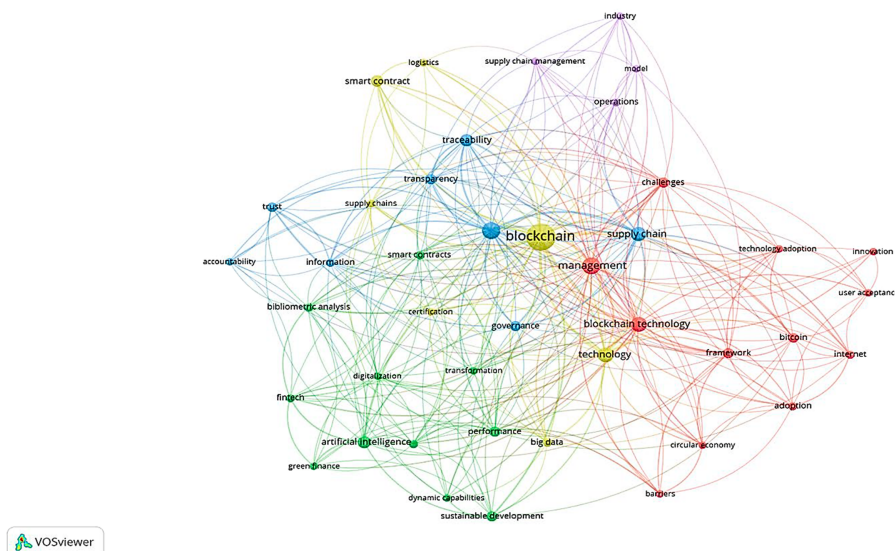


Figure 7. Keyword co-occurrence. Source: Own elaboration with data from VOSviewer

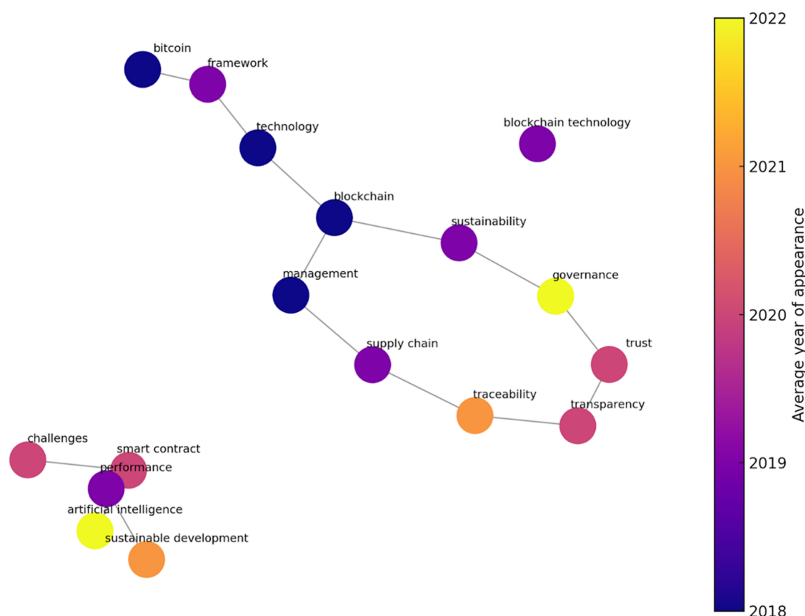


Figure 8. Temporal evolution of keyword clusters in blockchain–accounting–sustainability research (2018–2024). Source: Own elaboration with data from VOSviewer

as blockchain, management, bitcoin and technology, reflecting an initial stage of conceptualization and technical exploration. In contrast, more recent terms (2021–2022, represented in yellow tones) such as artificial intelligence, governance and traceability indicate a thematic shift toward integrating blockchain with other emerging technologies and

applying it to governance, sustainability and supply chain transparency. The spatial distribution of nodes highlights thematic clusters, where related keywords are positioned closer together, illustrating the interconnectedness of technical, managerial and regulatory dimensions. The co-occurrence links reveal that terms related to transparency and trust have become increasingly central in recent years, signaling a maturation of the research field from purely technical feasibility studies toward applications that address institutional accountability, ESG reporting and sustainable development goals (SDGs).

The keyword co-occurrence analysis revealed five thematic clusters that reflect the main research topics within the literature analyzed, addressing blockchain, sustainability and accounting (see Table 4). These clusters emerged from the grouping of frequently co-occurring terms and provide a structured understanding of the field’s conceptual landscape.

The first cluster, associated with the adoption and implementation of blockchain technologies, is characterized by terms such as *blockchain*, *education*, *information*, *model*, *sustainability*, *trust* and *user acceptance*. This grouping highlights scholarly interest in understanding how blockchain is adopted in various contexts, particularly educational settings, and how factors such as trust and sustainability influence user acceptance and the success of implementation strategies.

The second cluster centers on operations and digital supply chain management. It includes keywords like *framework*, *internet*, *management*, *performance* and *supply chain*. This theme reflects the development of conceptual and analytical frameworks to evaluate the effectiveness of blockchain applications in improving management processes, especially in the context of increasingly digitalized and globally distributed supply chains.

The third cluster is defined by the convergence of emerging technologies and sustainable development. The presence of terms such as *artificial intelligence*, *blockchain technology*, *sustainable development* and *technology* signals a growing academic interest in the synergy between blockchain and other digital technologies, particularly AI, as tools for achieving the SDGs. This cluster reflects a multidimensional approach to technological innovation in support of sustainability.

The fourth cluster focuses on technical and regulatory challenges associated with smart contracts and blockchain systems. Keywords such as *challenges*, *smart contract*, *traceability* and *transparency* emphasize the importance of addressing the legal, ethical and technical barriers that hinder the secure and effective implementation of blockchain-based solutions. This line of research is particularly relevant in sectors where data integrity, certification and auditability are critical.

Table 4. Items classification by clusters

Cluster	Items (keywords)	Topic
1 (red)	Adoption, barriers, bitcoin, blockchain technology, challenges, circular economy, framework, innovation, internet, management, technology adoption, user acceptance	Technology adoption and implementation models
2 (green)	Artificial intelligence, bibliometric analysis, digitalization, dynamic capabilities, fintech, green finance, impact, performance, smart contract, sustainable development, transformation	Digital transformation and sustainable finance
3 (blue)	Accountability, governance, information, supply chain, sustainability, traceability, transparency, trust	Governance, accountability and transparency
4 (yellow)	Big data, blockchain, certification, logistics, smart contract, supply chains, technology	Technical challenges and certification in logistics
5 (purple)	Industry, model, operations, supply chain management	Operational and industrial applications

Source(s): Own elaboration with data from VOSviewer

Lastly, the fifth cluster addresses governance and institutional control enabled by blockchain technologies. It is represented by terms such as *accountability*, *governance* and *smart contracts*. This theme captures research exploring the potential of blockchain to enhance transparency and accountability in both public and private institutions, particularly through decentralized decision-making mechanisms and automated auditing systems.

5. Conclusions

The results yielded by the bibliometric analysis developed in this paper confirm the incipient academic interest in the integration of blockchain technology in the field of accounting and corporate sustainability. This interest has grown exponentially over the last few years, manifesting itself in sustained growth since 2018, highlighting the central role of blockchain in aspects such as traceability in the supply chain, transparency in ESG reporting and process automation through smart contracts.

On the other hand, bibliometric analysis reveals who the most cited and connected authors are in this field of knowledge, as well as identifying which are the most interested publishers in this field, measured by the number of publications, with MDPI and Elsevier leading in scientific production. In addition, countries such as China, India and the United States lead the research in this area, evidencing an emerging Asian leadership in technological research linked to accounting and sustainability.

Finally, the keyword analysis allows us to identify various thematic clusters that revolve around technological adoption in education and sustainability, operations management, the application of emerging technologies in sustainable development, the technical and regulatory challenges of smart contracts and governance and institutional control with blockchain. The identification of these topics is particularly useful for the establishment of future lines of research that will shed more light on the field of knowledge analyzed.

5.1 Theoretical and practical implications

From a theoretical point of view, this paper reaffirms the interdisciplinary nature of accounting by showing how this discipline is influenced and, in turn, influences various technological, social, institutional and environmental factors. In this sense, it envisions an evolution of accounting beyond its traditional technical function, positioning it as an instrument of social construction that gives meaning, visibility and legitimacy to organizational practices (Dumay *et al.*, 2018; Vollmer, 2024).

Based on the five clusters identified, this study proposes an interpretative framework in which blockchain acts as a central nexus connecting three major theoretical dimensions: (1) transparency and organizational legitimacy (legitimacy theory), (2) standardization and responses to institutional pressures (institutional theory) and (3) technological innovation and adoption (technology adoption and diffusion of innovations models). This framework contributes to filling theoretical gaps identified in previous literature by integrating the blockchain–AI–ESG convergence into a socio-technical system applicable to accounting.

On the other hand, it strengthens the concept of triple-entry accounting introduced by Grigg (2005) while advocating the development of theoretical models capable of explaining the tensions between the immutability of blockchain records and the flexibility required in accounting information to adapt to regulatory changes. This finding opens a line of debate that invites the combination of classical accounting theories with approaches such as dynamic capabilities and digital governance to better understand how organizations can integrate decentralized technologies while preserving regulatory adaptability.

In addition, this work advances the theoretical debate by linking technological adoption in accounting to broader socio-technical governance systems. It suggests that blockchain's role extends beyond transactional integrity to reshaping institutional trust mechanisms, stakeholder

engagement, and decision-making processes, thereby offering a new lens for understanding accounting's institutional evolution in the digital era.

By articulating these elements, the study not only consolidates existing theoretical perspectives but also sets the stage for the development of hybrid theoretical frameworks that merge accounting theory, organizational legitimacy, institutional theory and socio-technical systems thinking, providing a more holistic understanding of the accounting discipline in the context of digital transformation and sustainability.

From a practical point of view, it is clear that the incorporation of blockchain technology can substantially improve the transparency and reliability of non-financial information reports, and more specifically, in aspects related to sustainability. Thus, it not only responds to regulatory requirements such as the CSRD in Europe but also improves the confidence and reputation of the company in the face of the green demands made by the different stakeholders. In this sense, it is essential to transfer these concepts to real practical cases that allow to evaluate the effective application of this technology in the business environment, thus contributing to reduce the uncertainty generated by this new accounting paradigm. However, the transition to blockchain-based systems also raises concerns related to data governance, standardization and the cost-benefit balance of implementation, which must be carefully evaluated to ensure the effective and responsible adoption of this technology.

The integration of blockchain technology into accounting and sustainability reporting systems has transformative potential not only for the private sector but also for public administrations, which face growing challenges in transparency, efficiency, traceability and citizen trust. Blockchain provides a distributed, immutable and verifiable record that public agencies can leverage to ensure the traceability of financial resources, public aid and contracts. As reflected in the bibliometric analysis, particularly in the governance and accountability cluster, the adoption of decentralized systems and automated audits can reduce opacity, prevent corrupt practices and facilitate real-time public access to reliable information. Furthermore, initiatives such as the European Corporate Sustainability Reporting Directive (CSRD) set a regulatory precedent that also impacts public entities, especially in the standardization and reliability of non-financial information. Blockchain can serve as an enabling tool to comply with these regulations, ensuring data integrity while reducing verification and auditing costs. Its application in public procurement and infrastructure projects also holds great potential, as supply chain traceability is critical to ensuring sustainable and ethical practices. Blockchain enables tracking of materials, suppliers and emissions, facilitating verification of ESG criteria in public tenders and contracts.

In addition, decentralized decision-making mechanisms and real-time validated information can foster collaborative governance and social oversight of public policies, reconfiguring traditional institutional trust mechanisms and enabling a more direct and verifiable link between administrations and citizens. In summary, blockchain adoption in the public sector should be considered not only as a technological innovation but as a structural change that strengthens institutional integrity, improves operational efficiency and reinforces commitment to the SDGs. However, implementation requires addressing specific challenges such as system interoperability, training public employees in digital competencies, and adapting legal frameworks to new forms of information management.

In the field of education and training, it should be noted that the growing interest and development of blockchain technology requires an update in accounting, auditing and finance curricula, integrating the digital competencies necessary to train future professionals in the area in order to guarantee their employability, as well as to ensure the transformation of the accounting sector toward a more digital, ethical and sustainable model, while being critically aware of the limitations and trade-offs involved in the adoption of emerging technologies.

5.2 Limitations and future lines of research

Despite having several theoretical and practical implications, and forming a useful analysis to observe the current situation and evolution of this field of knowledge, the present work has some limitations that should be mentioned. First, the practical nature of this type of study has not been considered in our analysis. In this sense, case studies, surveys or other qualitative and/or quantitative methodologies that could provide a more practical view of the application of blockchain in accounting and sustainability reporting could have been taken into account to substantially improve the work. Finally, one of the main limitations of bibliometric analyses lies in their difficulty in assessing the quality of the scientific articles analyzed, thus restricting their usefulness for more precise qualitative assessments.

However, the bibliometric analysis carried out in this study and, in particular, the analysis of keyword co-occurrence, highlights five thematic groups, which are shown in Table 4 and which serve to identify future lines of research (Table 5). In this sense, cluster 1 (red) focuses on technology adoption and innovation frameworks, including keywords such as “adoption,” “blockchain technology,” “user acceptance” and “circular economy.” Future research should explore the development and testing of theoretical frameworks that address the drivers and barriers to blockchain adoption in various organizational contexts, particularly in relation to circular economy models. Furthermore, studies could examine how blockchain can foster innovation through enhanced transparency and decentralized decision-making, while identifying sector-specific challenges that hinder widespread implementation.

Cluster 2 (green) focuses on digital transformation and sustainable finance. This cluster includes terms such as “fintech,” “green finance,” “artificial intelligence” and “smart contract.” Future studies could investigate the integration of blockchain with other emerging technologies (e.g. AI) to improve ESG risk management, automate green financing mechanisms and enhance performance indicators in sustainability reporting. Additionally, the role of blockchain in fostering digital transformation within financial ecosystems and its implications for ethical investment and sustainable development warrant further investigation.

Cluster 3 (blue) addresses governance, accountability and information transparency in the context of sustainability and supply chains. The presence of terms such as “traceability,” “trust,” “accountability” and “governance” points to the potential of blockchain to enhance institutional integrity. Future research should explore the design of blockchain-based mechanisms that improve trust between stakeholders, ensure data accuracy and traceability across supply chains and promote transparent governance models aligned with ESG standards.

Table 5. Future lines of research by thematic clusters

Cluster	Topic	Future lines of research
1 (red)	Technology adoption and implementation models	Develop evaluation models for blockchain adoption in circular economy contexts; identify sector-specific drivers and barriers to implementation
2 (green)	Digital transformation and sustainable finance	Explore the integration of blockchain and AI in ESG management and green finance; assess their impact on firm performance and sustainable development
3 (blue)	Governance, accountability and transparency	Investigate the role of blockchain in enhancing traceability, stakeholder trust and decentralized governance in supply chains
4 (yellow)	Technical challenges and certification in logistics	Design scalable and interoperable blockchain-based systems for logistics and certification; address issues of privacy and data management
5 (purple)	Operational and industrial applications	Assess how blockchain-based systems enhance operational efficiency, reduce costs and support resilient and sustainable supply chains

Source(s): Own elaboration with data from VOSviewer

Cluster 4 (yellow) relates to technical challenges and certification in blockchain logistics, as evidenced by keywords like “big data,” “certification,” “logistics” and “smart contracts.” This cluster highlights the need for research into the development of robust technical infrastructures that support blockchain implementation in logistics and certification processes. Future lines of inquiry could focus on ensuring interoperability across blockchain platforms, establishing certification protocols for sustainability standards and addressing scalability and privacy concerns in logistics applications.

Cluster 5 (purple) is centered on blockchain applications in operational and industrial models, particularly in supply chain management. Key terms such as “industry,” “model” and “operations” suggest exploring the application of blockchain to optimize operational efficiency. Future studies could analyze how blockchain-enabled systems contribute to resilient and adaptive supply chains, reduce transaction costs and support real-time data sharing across partners. Additionally, the role of blockchain in reshaping industrial practices toward more sustainable and accountable models deserves further attention.

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Further reading

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