From double-entry bookkeeping and ledger to blockchain technology: New frontiers for accounting information systems

Giovanna Centorrino, Valeria Naciti, Daniela Rupo[*]

Received: 20 December 2021
Accepted: 22 March 2022

Abstract

The paper investigates the current state of studies on double-entry bookkeeping and ledgers in accounting through a bibliometric analysis covering the1990-2021period. The study allows an interpretation of accounting information systems as they evolve, due to the impetus of recent, disruptive information technology. The authors used a sample of 230 publications, collected from the Web of Science, and adopted VOSviewer software to illustrate different relational techniques: citation, co-citation, keyword co-occurrence, and bibliographic coupling analyses. The results highlight the emergence of recent research streams that are weakly connected to the foundation of modern accounting, albeit sharing the same roots with seminal historical accounting contributions in terms of trustworthiness, morality, and communication. This study's main contribution, based on its findings, is a better understanding of the growing interest in double-entry bookkeeping and ledger, focusing on blockchain and its dimensions. Potentially, the study can shed light on the possible implications of new technologies for accounting and bookkeeping. The universality of accounting language is called upon to describe new "genealogies of calculation" by converging professional and academic efforts in a field that can benefit extensively from a transdisciplinary approach to research.

Keywords: Double-entry bookkeeping, ledger, Bibliometrics analysis, Accounting information systems, Blockchain.

[*] University of Messina, Department of Economics. Corresponding author: daniela.rupo@unime.it.

Management Control (ISSN 2239-0391, ISSNe 2239-4397), 2022, 2 – Special Issue
Doi: 10.3280/MACO2022-002-S1002

1. Introduction

Digital technologies are beneficial in many aspects such as speed of business management, efficiency through cost reduction, simplification, and rationalization of information flows. Among others, they build representations by abstracting away complicated object features and then using these newly established identities for entity control and management (Marchi, 2011). Typically, this computational process is then utilized to govern and manage "real world" things (representation targets), which subsequently do labor in the actual world (Dupont, 2017).

More recently, digital technologies have had a significant influence on accounting systems. The attempt to move from traditional double-entry accounting systems to the triple-entry system of blockchain (Dai, Vasarhelyi, 2017; Coyne, McMickle, 2017; Cai, 2021) is oriented to achieve transparent and immutable double-checked accounting operations. Beyond its high-tech and sophisticated functioning, blockchain management and control operations would be so revolutionized that some academics talk of a "direct assault" on the accounting profession's traditional methods and processes (Maffei *et al.*, 2021).

The emerging of new trends in accounting can be interpreted as an evolutionary path that finds its roots in previous knowledge. As a social phenomenon (Napier, 2001), accounting is not a static phenomenon, being linked over time to different needs and circumstances, constantly related to several collateral fields (Littleton, 1927), evolving, and reflecting the pressure of the environment, the values, and the emergent organizational missions and strategies (Hopwood, 1976).

Conversely, innovation can determine a revolutionary change in existing knowledge base, impacting accounting information systems in such a way that they are very weakly anchored to previous methods and tools (Mancini, 2018). Some disruptive technologies can break into present practice and give shaping to new logics and procedures, which seem to interrupt the continuity of existing thinking and knowledge. The intrinsic characteristics of these recent IT solutions intend to radically transform the company's information and reporting processes (Brennan *et al.,* 2019; Marrone, 2019).

In this vein, going back to Thomas Kuhn's 1970 book *The Structure of Scientific Revolutions*, we remark his core argument that science does not advance by accumulating knowledge: a sequence of tradition-shattering revolutions take place in which one "*time-honored scientific theory is rejected in favor of another incompatible with it*" (Kuhn, 1970, p. 6). The new theory,

or collection of ideas, is distinct in that it is not based on previously held beliefs.

Here, moving from the consciousness that the new frontiers of digital technologies are challenging traditional accounting (both for external and for internal purposes, namely financial and management accounting), we intend to investigate on the evolution of studies focussed on DEB and Ledger, with the aim to elaborate on the significance of such a relevant foundation of accounting, up to recent contributions on the field.

Double-entry bookkeeping, (DEB), emerged in Italy during the 13th century, is still today accepted as the basis of modern accounting and has maintained its value over time, merging various modifications into one unified method for many centuries.

A wide variety of studies have been conducted on several topics related to DEB (Carnegie, 2014). Experts in sociology of accounts, economists and accounting historians have attempted to investigate not only the origin and development of DEB but also the environmental, socio-economic context and cultural conditions that gave it prominence (Hopwood, Miller, 1994), exalting its multi-dimensional significance in relation to: the development of capitalism (Sombart, 1915; Littleton, 1933; Yamey, 1964, 1975, 2005; Winjum, 1972; Carruthers, Espeland, 1991; Bryer, 1993, Goldberg, 2001; Funnel, 2001; Soll, 2014; Walker, 2016; Antonelli *et al*., 2017); the religious, moral and rhetoric routes of modern accounting (Aho 1985, 2006); its political nature as a technology of domination in-itself on the production and perpetuation of power (Miller, O'Leary, 1994; Riccaboni *et al.*, 2006); the intellectual foundation of DEB (perspective, proportionality, harmony, order and balance) and the relevance of such aspects in research (Parker, 2015) and education (Dean *et al.*, 2016).

DEB sounded as revolutionary at the time of its foundation, attributed to Luca Pacioli (Pacioli, 1494); since then, a rapid, wide diffusion was witnessed, and it is still today considered the most widespread accounting method. One of the most relevant subjects in the horizons of accounting relates to the ledger, developed as an early, important DEB mechanism (Littleton, 1928). Accounting literature has, over time, dealt with this subject, along with today's reawakened interest linked to the introduction of a new configuration regarding the so-called Distributed Ledger Technology (DLT), a digital system behind blockchain for recording the transaction of assets, in which transactions and their details are recorded in multiple places at the same time. Unlike traditional ledgers, distributed ledgers have no central authority to validate the transactions recorded in them (Pimentel, Boulianne, 2020).

The new technology has the potential to change accounting behaviors. Indeed, the introduction of the blockchain has taken data protection and security to a much higher level than previous technologies. In the context of accounting information systems (AIS), blockchain would serve distributing transaction verification, storage, and administration power among a group of computers to avoid illegal data modifications (Søgaard, 2021). The system might provide real-time tracking and monitoring of physical item actions, as well as automate the recording and assessment of business performance by combining other developing technologies, such as Internet of Things (IoT), whose aim is generally oriented at enhancing the digitisation of corporate environments, and that is now giving new imptus to digital trasformation of reporting practices as well (Valentinetti *et al.,* 2021).

Accordingly, our paper provides a systematic overview of the considerable amount of knowledge gathered over time, thus allowing us to deeply understand that process of change that was interesting in the past, and still can affect the company in the present and the future (Doni, 2007). The analysis highlights the evolution of significance given to the ledger and DEB, and new dimensions of meanings thanks to the development of technology challenges ahead for the future.

By going through available literature, to the best of our knowledge, there are no studies that provide a bibliometrics analysis on DEB and ledger, which this study has attempted to present. Using bibliometrics analysis, this study explores the journals that have published the maximum number of papers, the most cited papers, hence the most relevant outcomes of the studies in this field. Moreover, analyzing the most frequent keywords, and the relationships among them, the study offers a picture of the network of research, and allows for identifying future research directions.

The analysis intends to provide answers to the following research questions:

1. *Is there any overlap between the studies conducted so far on the recent frontiers of accounting and the studies on double-entry bookkeeping and the ledger, as intended in traditional accounting?*
2. *Is the body of knowledge on the ledger and the DEB anchoring the development of technology-based accounting, as challenged by the blockchain technology?*

The remainder of this paper is organised as follows: Section 2 explains the research methodology and procedure of this study, Section 3 describes the results and findings of this analysis, based on the research objectives and questions. Finally, Section 4 provides the discussion, conclusions, and limitations of this study.

2. Research design

Literature review is a typical approach for transforming the contents of literature into objective and systematic forms to identify, specify, map, and assess contents (Milne *et al.,* 2008). However, literature reviews have failed to retrieve the linked intellectual domain (Tranfield *et al.,* 2003). Bibliometrics analysis solves this problem by quantifying existing literature, identifying research gaps and direction for future research in the burgeoning topic (Chiu *et al.*, 2019). Bibliographic data is used to establish internal linkages in literature, analyse citation and co-citation levels, and algorithmically discover clusters (Naciti *et al.,* 2022).

This study was essentially a 3-step process:

- data acquisition, which entailed searching for bibliographic data and obtaining the findings from the Web of Science (WoS) database (see table I). In bibliometric investigations, Web of Science is commonly utilized (Farajnezhad et al, 2020; Korom, 2019) since it is the world's oldest, most widely used and authoritative database of research publications and citations;
- exanination of result obtained through the VOSviewer software;
- data visualisation, which converted the research conclusions into network and density maps that were interpreted further.

Table 1 - *Research parameters*

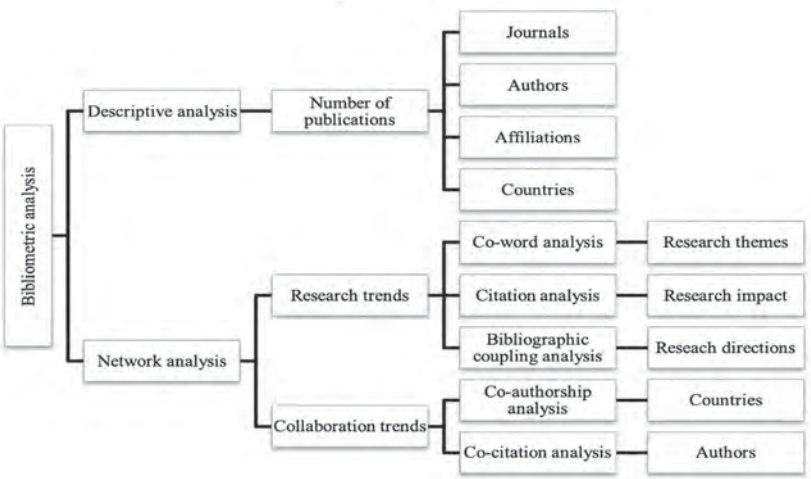
Eligibility criteria	We considered in the eligibility phase: articles, conference proceedings, book chapters and other forms of scientific disseminations. By searching Web of Science electronic databases and applying the codes defined by the authors; we mapped and clustered bibliometric data.
Publication time frame	All years available on WOS
Language	English
Search strategy	We selected the following codes to be searched in the source database: TS = ("accounting" AND "ledger"), TS = ("accounting" AND "double entry bookkeeping" OR "double entry book-keeping" OR "double entry bookkeeping") Codes were separately searched on the title, abstract, and keywords sections of each record for both the identification and screening phase. The source of the database is "indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years".

For the identification of the keywords to be included as a research string the authors consulted the literature to identify a relevant combination of

search terms. Two of the writers independently examined the articles and compared the findings, to avoid alterations and duplicates to the classification scheme.

Following bibliometrics management and accounting studies (Chiu *et al*., 2019; Lombardi *et al*., 2021) we use VOSviewer software, created for building and visualizing econometric networks developed by Van Eck and Waltman of Leiden University in the Netherlands. It can visualize data and form networks for journals, researchers, keywords, and publications based on co-citation, coupling, and co-authoring links (Waltman *et al.,* 2010; Van Eck, Waltman, 2017). The topologies of bibliometrics analyses and the expected outcomes are depicted in the diagram below (Figure 1).

Figure 1 - *Bibliometric analysis diagram*



Source: *Zainuldin M.H., Lui T.K. (2021)*

2.1. Sample characteristics

Following the criteria set out above, we have identified 230 publications that have been cited 1689 times up to 2021, with 7.34 citations per article on average and a h-index of 19. Moreover, half of these articles were published in the last five years (Figure 1A in Appendix - www.sidrea.it/bookkeeping-ledger-blockchain). This demonstrates that the topic has undergone rapid expansion in recent years, with the fewest items published in the span 1990-2003 and the most in 2019 (the year 2021 refers only to the first six months).

Lastly, regarding the typology of the selected items, we found a greater number of scientific articles, followed by proceedings (Figure 2A in Appendix - www.sidrea.it/bookkeeping-ledger-blockchain).

3. Descriptive analysis

The top ten journals by number of published articles are listed in Table 2. These journals have published more than 25% of all articles in our sample, with 58 out of the total 230 publications having been recorded. The *Accounting History* and *De Computis-Revista Espanola De Historia de la Contabilidad* journals have published a total of 9 articles each, while the *Accounting History Review*, *Accounting Historians Journal*, *Accounting Organizations and Society*, published 8-5 papers. Thus, the main contributions to the field fall in accounting and business journals. The journal that has the most citations is *Accounting Organizations and Society* (300), followed by *Journal of Emerging Technologies in Accounting* (105).

Table 2 - *The top ten sources*

SOURCE	documents	citations
Accounting History	9	24
De Computis-Revista Espanola de Historia de la Contabilidad	9	4
Accounting History Review	8	53
Accounting Historians Journal	7	29
Accounting Organizations and Society	6	300
Abacus-A Journal of Accounting Finance and Business Studies	5	60
Journal of Emerging Technologies in Accounting	4	105
Journal of Corporate Accounting and Finance	4	13
Accounting Review	3	81
Accounting Auditing & Accountability Journal	3	23

The topic is of great interest in historical and modern accounting research, also in the business and finance field. The observed increasing relevance in recent years is also driven by the new technologies.

Next, the top 10 authors with the most publications are listed in Table 3. We kept track of the author/s and institutional characteristics of the papers to see if any writers or institutions dominate literature, a phenomenon known

as the "Matthew or Superstar effect"t (Merton, 1968, 1988). Overall, we observe that two authors, Kuter Mikhail (9) and Gurskaya Marina (8) have the most publications (19 articles in total), followed by Goncalves Miguel (6), Antonelli Valerio (5), Sangster Alan (5) and Edwards John Richard (5). The remaining top ten authors have each written four articles. The top ten authors are responsible for 52 different publications, accounting for 22.6% of publications of our sample.

The top ten research institutions by number of publications on double-entry bookkeeping and ledgers in accounting, include the Kuban State University (Russia) with 10 papers, followed by the University of Salerno (Italy) and the University of Sydney (Australia) with 5 publications each. The other universities listed have 3-4 publications.

Finally, the top ten countries have published 178 out of 230 publications, accounting for 77.4% of total. The main contribuors are the USA (48 items), Australia (23), England (22), China (21) and Russia (17). The other countries, Italy, Spain, Slovakia, Portugal and Netherlands range from 13 to 7.

Table 3 - *The top ten authors*

AUTHOR	DOCUMENTS	CITATIONS
Kuter Mikhail	10	14
Gurskaya Marina	9	13
Goncalves Miguel	6	4
Antonelli Valerio	5	29
Sangster Alan	5	71
Edwards John Richard	5	53
Andreenkova Angelina	4	13
Musaelyan Artem	4	2
Blums Ivars	4	4
Weigand Hans	4	4

3.1. Network analysis

Network analysis categorizes bibliographical data such as co-authorship, co-word, citation, bibliographic coupling, and co-citation using a relational technique, clustering the main emergent topics. As stated in Section 2, network analysis is a more advanced approach of presenting the intellectual and social structure of the chosen literature.

3.2.1. Co-words analysis

The purpose of co-word network analysis is to determine which terms have been used frequently in our sample. This might assist in understanding what kinds of topics and issues scholars have been most interested in and their linkage directly from the content of the texts. Moreover, by comparing the network maps for different periods, the dynamics of science can be identified. The VOSviewer text-mining algorithm creates a map, with the distance between terms taken as an indication of the relatedness of the various keywords (Laudano *et al.*, 2018). The closer two or more terms appear to be related, the smaller the distance between them appears. The co-words in the articles were examined to establish term relatedness. Moreover, a cluster represents a group of well-connected words in a research area characterized by a limited connection to words in other clusters or research areas. The keywords *double entry bookkeeping* (40), *blockchain* (33), and *accounting* (30), determined the three main clusters or modules in which the connection (density of edges) is greater between the nodes of the same cluster compared to those of different clusters.

The co-words network map is shown in Figure 2. The data collection contained a total of 3362 terms. Only the terms that appeared more than five times in the data set were chosen for the network map. The map depicts the numerous keywords connected to each other by various lines, indicating keywords appeared together in the data set and the terms used the most often.

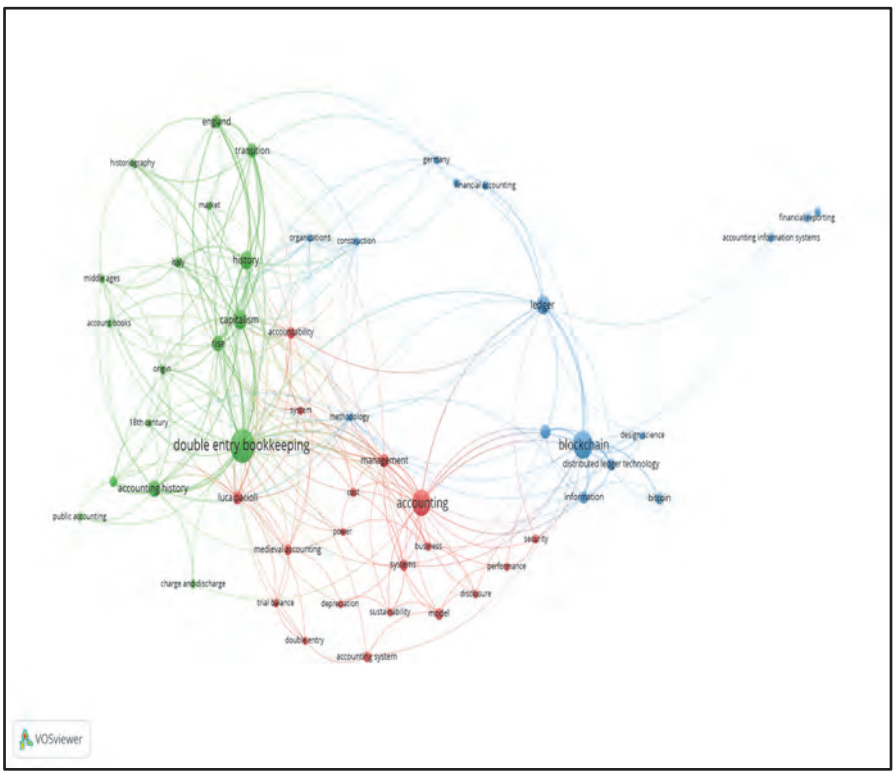
Three clusters that can be traced back to three different aspects:

1) in the green cluster, the word with the largest node is “double entry bookkeeping”. In the same cluster there are also the words “history”, “accounting history”, “capitalism” and “England”. The central theme in the domain of the first cluster is DEB with a significant percentage of 49.45%, confirming that “*in a socially constructed world in which knowledge is temporal, the task of enhancing understanding is continuous*” (Parker *et al.*, 1998, p. 374).
   Other main word are *History* and *Accounting history*, which refer to the historical development of accounting across all organizational forms while understanding the interaction of accounting and its socio-economic and political environments within historical contexts.
2) In the blue cluster, the most frequent word is “blockchain”, followed by “ledger”, “bitcoin”, “financial reporting” and “distributed ledger technology”. With a percentage of 29.67% out of the top ten, this cluster refers to a growing concern about adopting new technology for the emergent theme of *blockchain* (33 occurrences). It is worth noting that blockchain

technology, also known as distributed *ledger* (15 occurrences) technology (DLT), constitutes the most disruptive innovation in information systems in recent years (Dai and Vasarhelyi, 2017). Admittedly, this technology does have the potential to profoundly change the world of accounting and accounting research (Schmitz, Leoni, 2019, Coyne, McMickle 2017; Dai, Vasarhelyi 2017; Kokina *et al.*, 2017) and it is also considered as one of the technologies attracting the most investment today.

3) Finally, in the red cluster, the most frequent word is "accounting", followed by "management", "accountability" and "Luca Pacioli''. This cluster, with a percentage of 20.88%, focused on the words Accounting (30 occurrences) and Management (8 occurrences), both appearing in the top ten keywords, and on the words Accountability and Luca Pacioli.

Figure 2 - *Keywords network analysis map* (for greater readability, see Figure 3A in appendix - www.sidrea.it/bookkeeping-ledger-blockchain).



3.2.2. Citation analysis

Citation analysis is widely applied to track the relevance and scientific impact of previous research, also in the accounting field (Dumay, 2014; Benson *et al*., 2015; Dumay *et al*., 2018). Therefore, a high citation index on a publication usually implies that it has/had a significant impact in the field. Furthermore, citation patterns might reflect the kind of influences that research has on researchers (Feng *et al*., 2017).

Table 4 presents the top five cited articles, representing approximately 34.68% of the total citations in our sample (1689).

Table 4 - *The top five cited publications*

	title	authors	year	citations WOS	average per year WOS	citations/ tot citations of sample %
1	Accounting for rationality - double-entry bookkeeping and the rhetoric of economic rationality	Carruthers, BG; Espeland, WN	1991	262	8.45	15.51%
2	Genealogies of calculation	Miller, Peter; Napier, Christopher	1993	177	6.1	10.47%
3	Blockchain: Emergent Industry Adoption and Implications for Accounting	Kokina, Julia; Mancha, Ruben; Pachamanova, Dessislava	2017	53	10.6	3.14%
4	The Genesis of Double Entry Bookkeeping	Sangster, Alan	2016	49	8.7	2.90%
5	Can Blockchains Serve an Accounting Purpose?	Coyne, Joshua G.; McMickle, Peter L.	2017	45	9	2.66%
	Tot. citation sample (230 items)			1689		

We provide a synthetic overview of the main contents of the top five articles, (their reference to the corresponding clusters is described by the map in Figure 4A in Appendix - www.sidrea.it/bookkeeping-ledger-blockchain).

Published in 1991, “Accounting for rationality - double entry bookkeeping and the rhetoric of economic rationality”, by Carruthers and Espeland, represented in the green cluster, has had the most significant effect in the

field with a percentage of 15.51% on the total citations of our sample. The article re-considers the significance of DEB, stressing the existence of two important dimensions of accounting: the rhetorical and the technical. Accounting, as well as all communication, is intended to persuade some audience; accounts are a way to enhance the legitimacy of business results. Analysing the development of accounting, the article discusses why various audiences have found accounting persuasive and how much the technical superiority of DEB explains its diffusion.

In their work *Genealogies of calculation* (1993), Miller and Napier, represented in the red cluster, consider accounting in its attribute of changing "*in both content and form over time*" (p. 631). The authors offer quite an innovative view, emphasising the contingency of contemporary practices. The paper calls for the "*genealogies*" of calculation, focusing on the outcomes of the past, as a *historically and geographically localized result*, rather than looking at the origins of the present. A relevant aspect highlighted in the paper is *the discursive nature of calculation*, which refers to the role of language and vocabularies that from time to time give shape to practice and technologies. The authors exemplify how new frontiers of accounting (so-called genealogies of calculation) have developed: the discounted cash-flow techniques for investing decisions in the UK in the 1960s; the development of cost accounting in the late eighteen century, that led to a new way of seeing and of intervening in management practices; the notion of accounting for value added that emerged in Britain in the late 1970s, which has dramatically changed the way of disclosing and demonstrating company results to different arenas; and, in the early decades of the 20th century, the emergence of standard costing, whose roots have been traced back to Taylorism and the search for efficiency.

In the third position of the top articles of our study we find *Blockchain: Emergent Industry Adoption and Implications for Accounting*, by Kokina *et al.* (2017). The paper does not appear in the citation network analysis, as the VOSviewer software only shows the elements that are linked together. Thus, despite its relevance in terms of citations reached in a very few years, it is not strictly linked to previous accounting literature. The examination of blockchain-related practices in large accounting firms and discussion on the opportunities and limitations of the new technology in the field are presented. The authors explain how blockchain has the potential to create a new ecosystem for the handling of accounting information, improving trustiness and timeliness of information, reducing the risk of human errors in data manipulation, compared to current accounting and auditing systems.

The fourth most cited paper is *The Genesis of Double Entry Bookkeeping* by Alan Sangster (2016). This work, represented in the blue cluster, is one of the few studies identifying the historical context that enabled the emergence of DEB. Sangster provides an overview of the Italian debate by reviewing the most widely discussed archival sources, focusing on the emergence on the motivations why DEB shifted from a mechanical task to a skilled craft for the accounting profession. Moreover, the paper documents the reasons that led to the transformation of bookkeeping from the single-entry tabular system of the Knights Templar to double entry.

Finally, we find the title *Can Blockchains Serve an Accounting Purpose?* by Coyne and McMickle (2017). Similarly, to the other work on blockchain in the top five, we found no connection within the network, revealing that the current research on this new technology does not seem to be anchored to the foundation of traditional accounting theory.

The paper comments on the role of blockchain in enabling successful creation of decentralized digital currency networks, which gave it the merit of becoming one of the most widely used technologies since its inception in 2008. The authors highlight the disintermediation function performed by blockchain in financial transactions and, consequently, in accounting, and conclude that blockchain is not suited "to bridge the chasm" between digital asset management and financial reporting and that further innovations are needed to validate its feasibility in accounting.

3.2.3. Bibliographic coupling analysis

Bibliographic coupling is the opposite of co-citation (which we will see in section 3.2.5). In bibliographic coupling analysis, the relatedness of items is determined in the number of references they share. Therefore, if a third publication is cited by two publications, they are considered bibliographically coupled. The goal of the analysis is to find out what is currently being researched in a field, investigating into a field's intellectual structure. According to the VOSviewer manual, each link has a strength, which is represented by a positive number value. The stronger the relationship, the higher this value. Total link strength in Table V refers to the total strength of an article's links to other items.

Gonçalves' article (2019) has the highest link strength index (418) and may provide a new direction to investigate accounting from a pedagogical point of view. Indeed, the objective of this study is to develop and explain the subject of DEB from a scientific and educational standpoint.

The second article, with a link strength of 277, is that of Antonelli and Sargiacomo (2015), focused on a key figure in the history of accounting practice, Alberto Ceccherelli, whose efforts played a pivotal role in the transmission of worldwide accounting history.

According to the third article, by Sangster (2018), Pacioli's teaching technique was influenced by Euclid, his Franciscan education, and his humanist values. He maintains that Pacioli uncovers a previously neglected simplicity in the then-unrecognized axiomatic base of DEB; these findings represent a shift in our understanding of Pacioli, his book, and double entry.

Table 5 - *The top five strength articles of bibliographic coupling analysis*

AUTHORS AND TITLE	*TOTAL LINK STRENGTH*	*DIRECTION*
Goncalves (2019), Contabilidad Por partida doble: historia, y pedagogía (CON ESPECIAL REFERENCIA A SU INSTITUCIONALIZACIÓN EN PORTUGAL, 1755-1777)	*418*	*Accounting Education*
Antonelli and Sargiacomo (2015), Alberto Ceccherelli (1885-1958): Pioneer in the history of accounting practice and leader in international dissemination	*277*	*Accounting history*
Sangster (201), Pacioli's lens: God, humanism, Euclid, and the rhetoric of double entry	*275*	*Paradigm shift on Luca Pacioli*
Dean et al. (2016), Pacioli's double entry-part of an intellectual and social movement	*258*	*Accountability and morality*
Antonelli et al. (2020), Enlisting accounting history in the contest between competing visions of accounting systems: Tommaso Zerbi and the origin of double-entry bookkeeping	*197*	*Accounting history to understand accounting systems*

In fourth place is the study by Dean *et al*. (2016) that speculates on DEB conceptual underpinning, observing that accountability and morality are frequently absent from DEB education and research. Finally, the manuscript by Antonelli *et al*. (2020) shows how accounting history research can ensure the success of specific understanding of accounting systems in the context of academic struggles, highlighting how the research is not always a value-free endeavour in the generation of new knowledge.

3.2.4. Country co-authorship analysis

In this section we carry out the examination of country co-authorship networks to determine which nations' authors have collaborated with the most

other countries' authors (Figure 5A in Appendix - www.sidrea.it/bookkeeping-ledger-blockchain shows the country co-authorship network map). The VOSviewer software revealed that authors from the United States, Russia, England, and Australia collaborated the most with authors from other nations. In addition, the software created three clusters of different colours which highlight the collaborations between countries. So, for example: we can see in the red cluster in the red cluster in the red cluster in the red cluster in the red cluster in the red cluster that the USA has collaborated more with Russia, Austria and Netherland; in the green cluster the collaborations between France, Germany, Canada and Spain; finally, in the blue cluster we find England, China, Italy, Wales and Australia.

3.2.5. Co-citations analysis

In co-citation analysis, the relatedness of items is determined based on the number of times they are cited together. The goal of co-citation analysis is to uncover a hidden pattern of author relationships based on their publications, such as identifying writers who did not collaborate actively but were mentioned by other articles at the same time, implying a common research topic (Feng *et al.*, 2017). Because early publications constitute the foundations of our research traditions, it is critical to maintain an interest in older articles as well as papers examining more modern accounting concerns. Moreover, document co-citation analysis may help identify key literature for cross-disciplinary ideas, exploring patterns in influential literature developed across different disciplines.

Table 6 shows the top ten publications. Going over these manuscripts chronologically, the first study is that of Yamey B.S. (1949) who asserts that, to varied degrees, historians have stressed the importance of systematic bookkeeping in the creation and growth of modern capitalism. Thanks to the research of Melis (1950) and de Roover (1956) we now have a better understanding of accounting. Indeed, their movement took on a universal dimension, distinct from that of a technical history, by placing the roots of double entry in the broader context of Renaissance cultural and economic regeneration. This new accounting history was sceptical of neoclassical economics-based theories of accounting's past. Although Yamey (1964) rarely emphasized theoretical arguments in his historical publications, he tended to evaluate DEB in terms of its utility for good corporate decision-making. The historical accounting studies of Yamey are varied (1964, 1975, 2005, 2006a,

2006b, 2010) but a main tendency can be recognized: He questioned whether DEB was a necessary component of the evolution of capitalism.

The book *Accounting Evolution* by Littleton (1933) represents one of the most important contributions in the field of accounting history, a "prodigious volume" (Bedford *et al*., 1975, p. 436) that has deeply influenced historians and strongly contributed to the further development of accounting. The author traced the evolution of accounting from 1300 by focusing on technique and procedures used in accounting. According to Littleton's view, accounting theory cannot be separated from practice, where practice, on the other hand, reflects theory, which finds its own embodiment in practice. Jumping from 1966 to 2007, Chiapello (2007) provided new light on the post-Sombartian argument. As is known, Sombart believed that the advent of DEB was crucial to the formation of capitalism (Sombart, 1916). This storical position substantially helped intellectuals of the time to conceptualize what they called capitalism.

Nakamoto is the pseudonym under which an individual or a group of individuals, through a seminal white paper (2008) introduced a new type of digital currency: Nakamoto was the first to propose a distributed network called *Blockchain technology or Distributed Ledger*, as a platform for bitcoin transactions. This study is also the most cited one on Scholars with a total of 16.142 citations.

More recently, Sangster (2016) (previously discussed in section 3.2.2. Citation analysis) reviewed the most discussed archival documents to present an outline of the Italian debate concerning early DEB applications.

Instead, the study by Dai and Vasarhelyi (2017) (previously discussed in Section 3.2.2.) tries to provide an introductory discussion on how blockchain could enable a real-time, verifiable, and transparent accounting ecosystem. It looks into the prospective applications and uses of the technology in the accounting and auditing fields. Auditors, regulators, and technology suppliers benefit from the talks and illustrations, which make it easier to integrate blockchain into existing business procedures and support the evolution of the current audit paradigm into the next generation.

During the same year, Coyne and McMickele (2017) were included in the top ten with a study on blockchain. The aim is whether blockchain could become a more secure alternative to current accounting ledgers. The paper represents an interesting point of view regarding the implications of blockchain for accounting and auditing. After a general presentation of the conceptual problem by also highlighting cryptocurrency and smart contracts, designed to automate the execution of certain operations, the authors identified

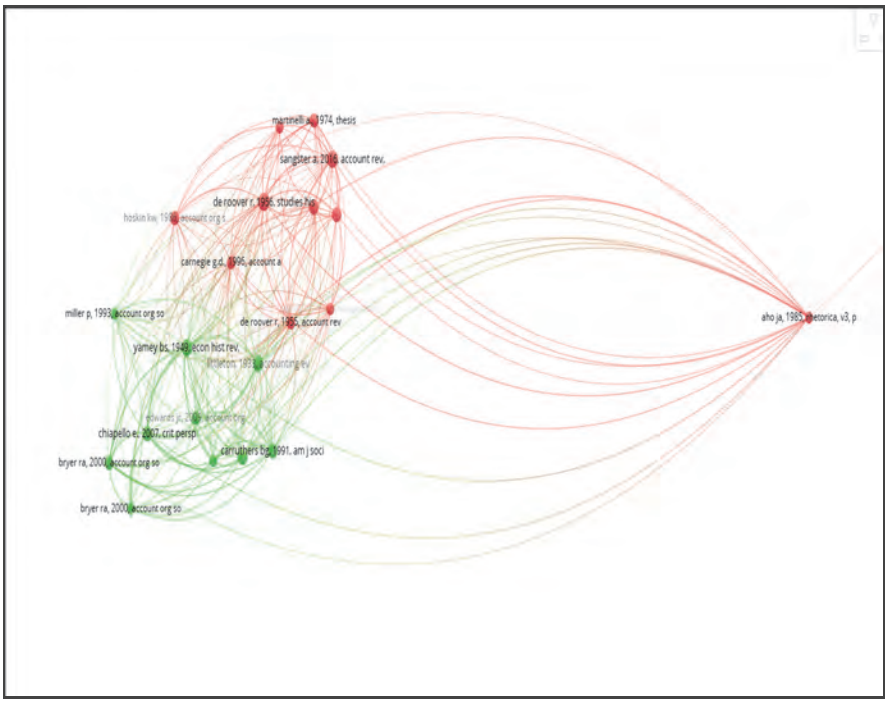
some hurdles that limit the applicability of blockchain technology to accounting.

Table 6 - *The Top ten co-citated articles*

cited reference	citations by sample items
De Roover R. (1956), *The development of accounting prior to Luca Pacioli according to the account books of medieval merchants,* Sweet & Maxwell.	18
Yamey B.S. (1949), Scientific bookkeeping and the rise of capitalism, *The Economic History Review*, 1(2/3), 99-113.	16
Sangster A. (2016), The genesis of double entry bookkeeping, *The Accounting Review*, 91(1), 299-315.	16
Dai J., Vasarhelyi M.A. (2017), Toward blockchain-based accounting and assurance. *Journal of Information Systems*, 31(3), 5-21.	16
Nakamoto S. (2008), Bitcoin: A peer-to-peer electronic cash system. *Decentralized Business Review*, 21260.	16
Littleton A.C. (1966), *Accounting evolution to 1900*. Russell & Russell, New York [1933].	14
Coyne J.G., McMickle P.L. (2017), Can blockchains serve an accounting purpose? *Journal of Emerging Technologies in Accounting*, 14(2), 101-111.	14
Melis F. (1950), *Storia della ragioneria,* Zuffi, Bologna.	13
Chiapello E. (2007), Accounting and the birth of the notion of capitalism. *Critical Perspectives on Accounting*, 18(3), 263-296.	12
Yamey B.S. (1964), Accounting and the rise of capitalism: Further notes on a theme by Sombart, *Journal of Accounting Research*, 117-136.	12

The network mapping of authors based on co-citations analysis shown in Figure 3 demonstrates there are three prominent clusters (for greater readabilityt see Figure 6A e 7A in Appendix - www.sidrea.it/bookkeeping-ledger-blockchain).

Figure 3 - *Co-citation analysis map*



What immediately catches the eye is the distance of the green and red clusters (very related to each other) from the blue cluster. Indeed, while the papers in the red and green cluster are directly attributable to DEB and ledger studies, the blue cluster refers to studies on blockchain. Once again it is highlighted that the blockchain theme is peripheral to the central theme and its relationship with the latter is weak. In particular (as shown in Figure 7A in Appendix - www.sidrea.it/bookkeeping-ledger-blockchain), the blue cluster is linked to the other clusters by Nakamoto's study (2008), the most cited paper that we have seen above being in the top ten ranking. Nakamoto advocated a decentralized solution to transactions, which led to the development of blockchains. This study is linked to the red cluster by the study of Aho (1985) on the rhetoric dimension associated with the invention of DEB. This connection explains the relevant role assigned to trustiness in the current debate of blockchain, also within accounting applications, and in the invention of the DEB, since the origins of capitalism. We find how the ledger, which also declined within the blockchain distributed version, is suitable to increase auditors' confidence (and generally of third parties), or – to use Aho's words

– the "narratio of the ledger is ideally suited to impress a sceptical audience in a favourable way" (Aho, 1985, pp. 32-33).

4. Implication and Conclusion

The study's major goal is to assist researchers and academics in comprehending the available knowledgebase of DEB and ledger in accounting research and associated fields. VOSviewer was used to perform a bibliometric study to accomplish this objective. From the existing knowledge base on the topic (230 publications), different relational techniques were used in the bibliographic analysis: co-authorship analysis, citation analysis, co-citation mapping analysis, keyword co-occurrence analysis, and bibliographic coupling analysis were all used in the relational technique for the investigations. This study is a step toward recognizing DEB and ledgers as a significant research subject both in accounting and in information systems. The networks and clusters formed, which include title, keyword, authors, citations and sources, and affiliated institutions, are based on the documents' reference lists and aid in the extraction of information on the study field. The specifics of the document aid in determining which documents/sources/authors share multiple keywords. Thematic evolution also reflects current and future research development trends.

Through the selection and content analysis of the most important manuscripts published in this research field, the current study contributes to existing research by giving information on the state of the art and identifying trends, gaps, and research possibilities. Therefore, the findings are intended to lead and stimulate research academics toward DEB and ledger as a foundation of accounting that still remains a milestone for future research development and collaboration across countries, authors, and affiliated universities.

There are several other contributions to the current study that might be highlighted.

The first contribution is based on a better understanding of the growing interest in double entry bookkeeping and ledgers in accounting, with particular focus on blockchain and its dimensions. The earliest blockchain application is linked to Bitcoin and to the introduction of cryptocurrencies as a form of digital cash enabling individuals to transmit value in a digital setting (Pimentel, Boulianne, 2020). As developed in recent years, DLT can be considered an advanced step for AIS and financial transactions models, fundamentally altering the business landscape thanks to its potential to bring trust,

transparency, and security to transactions. It also can reduce costs and encourage greater financial inclusion by efficient cross-border and remittance payments. In this context, Blockchain is a data structure used to implement DLT as a decentralized and tamperproof public ledger. In the case of the traditional system, the ledger is a permanent database or document that records each transaction that takes place during a determined period, not often guaranteeing access to different users; the new technology has shifted away from centralized information and knowledge systems toward distributed logic.

Blockchain is one of the most important and disruptive technologies currently challenging organizations, with promising spin-offs in daily operations and in the accounting profession. The Distributed Ledger allows each participant to modify the ledger's copy, updating it in real-time every time a new transaction is initiated. The strength is that each transaction across the network becomes public for any user so that they can be aware of all the transactions of any other users (Pimentel, Boulianne, 2020). It allows to update and achieve a consistent distribution of the ledger across many networks in which each participant plays a role in guaranteeing that the ledger is correctly updated (Stratopopulus, 2020). It is worth noting that despite blockchain technology being in the early stages of development, many interested parties are exploring ways to leverage it, given its vast potential. Despite being present in the cluster of the Keywords network analysis, the word financial reporting does not appear in the top ten keyword occurrences. The reason is that to study practical implications for core financial reporting functions and consequences on both auditing and accounting practices, blockchain technology is being incorporated into various financial applications and, therefore, its occurrence is evident in the keywords cluster map.

While the analysis does not include Blockchain in the search string as keywords, it ranks second in terms of frequency. This shows how Blockchain is a new technology that has the potential to revolutionize the accounting industry. Although blockchain technology was created to serve as the backbone of the Bitcoin cryptographic network, it finds application in a broad spectrum of industries. The conclusion on why accountants should worry about the blockchain is that it offers two crucial advantages for the accounting profession: transparency and immutability (Wang, Kogan, 2018). It is of great advantage for the integrity of an accounting firm that its records are easily accessible to authorized persons. Of course, there must also be rules governing how authorized entities can access financial records, and the lockout chain uses smart contracts to meet those rules (Hamilton, 2020). More on smart contracts in a snap, but the impact of such techinicalities is expected

to be relevant in accounting and auditing practices (Bonsón, Bednárová, 2019), for now, keep in mind that transparency does not mean a lack of security. Scholars believe blockchain accounting is the next step for the accounting industry (Stein Smith, 2018). Moreover, it is expected to intensify the need of a linkage between financial accounting and management accounting (Taipaleenmäki, Ikäheimo, 2018) under the lens of integrated information systems (Rom, Rhode, 2007). Generally said, digital technology in accounting and management can enhance an integrated approach to analysis on planning, information and control issues, to respond to the demands of both the academic world and company operators (Marchi, 2018). In today's business landscape, data represents an asset, as well as a fundamental element of the digital transformation of companies; new technologies make it possible to extract value from data and thus generate new business opportunities for companies. The blockchain is, therefore, in support of business processes. The blockchain, through its characteristics of immutability, transparency and traceability, contributes to the enhancement of the business processes in which it is implemented; in particular, blockchain technology enables a more efficient management of data and processes in terms of security, reliability, transparency and sharing. Therefore, one significant question is whether blockchain will prove to be a more secure accounting record than existing systems. To this aim, an exciting research perspective lies on the idea that blockchain can be better understood if set within the context of the business environment in which it operates (Alles, Gray, 2020).

Secondly, the paper aids the identification of journals that publish most of the research that falls within the defined topics. Thus, it emerges that the field's major contributions fall in accounting and business journals. Both Accounting History and De Computis-Revista Espanola De Historia de la Contabilidad journals have published nine articles, while Accounting History Review, Accounting Historians Journal, Accounting Organizations and Society, published between 8-5 publications. As shown in our analysis, the flourishing of studies on the accounting implications of blockchain technology gives a new impetus to the topic investigated, which assumes a cross-disciplinary relevance.

Thirdly, the paper examines the substance of the most recent, relevant articles, focusing on the countries and themes studied that appear to be more popular, as well as the directions in which investigations appear to be headed. This contribution may provide valuable information to scholars and practitioners who are exploring or planning to investigate this topic. Future research could look into the many perspectives of the DEB and ledgers for accounting destination, such as accounting in education (Goncalves, 2019),

accountability and morality (Dean *et al*., 2016) and the role of accounting history in understanding the accounting system and generating new knowledge (Antonelli *et al.* 2020).

Fourthly, the bibliometric co-citation analysis, which is a meta-analytical tool, examines how frequently one article is cited by other papers, suggesting major research streams for a topic. It allows researchers and authors to obtain a good picture of the field's structure. Indeed, the genealogical antecedents of a research field, because co-citation analysis highlights most often cited articles, can be discovered and studied through citation behaviour.

Reading through the co-citation analysis of the main connections existing among the publications involved in our sample, we can observe the significance of accounting language and method (DEB), and the evolution of ledger suitability for different purposes of business information and communication systems. The analysis uncovers patterns of research and highlights the cross-border nature of theory and practice on the subject, which involves accounting (recording rules, interpretation of data entry as associated to transactions and operations), auditing (and the need to identify the sources and nature of data, to verify the reliability of information), and accountability (in the evolution of language, discourse and interpretation of results for multiple users). Underlying the evolution (in a diachronic perspective) and the connections that link different authors and papers, the prominent role of trustiness is reaffirmed from time to time, remaining a key aspect of the rhetorical dimension of accounting language. In the perspective of management accounting, the emerging of blockchain technology opens the door to the need to reconcile the opportunity to get access to shared data and the need to protect information that are relevant for decision making in a competitive context, given that the same information are shared within the supply chain. A new research path is called to describe (perhaps) the opportunities and threats of distributed ledger and management accounting, looking for the proper use of information infrastructure of integrated information systems.

Lastly, the annual number of DEB and ledgers in accounting publications has increased dramatically over the last two decades and will continue to do so. In this field of research, the United States is the most advanced country. Australia and England have also obtained some significant research achievements and contribute to the advancement of this field of study.

Our research has some limitations, which should be considered when interpreting the findings.

To begin with, the articles are derived solely from the WoS database. The WoS database features a thorough examination of articles, ensuring that the material is of high quality, and it is frequently used in bibliometric analysis,

designed specifically for this purpose (Shen *et al.*, 2019). Nevertheless, the WoS database is constantly and dynamically updated; hence, results validity has to be temporally contextualised at the retrieval date of the publication list. Accordingly, evolution of the academic debate, observed under the lens of the bibliometric analysis conducted here, suggests some considerations on future lines of research in the field of AIS in a transdisciplinary perspective. Therefore, the following research questions arise:

Is DEB searching for new significance within the current debate on blockchain technology? Or does blockchain lie between autonomous implementation in the AIS and an attempt to be anchored in the roots of accounting?

Is the moral dimension of accounting, and the search for extensive accountability destined to improve further changes in accounting tools (as emerged in the interpretation of business results offered by value added?)

What challenges does current technology – with the ability to manage information in a distributed way, and to make use of big data – pose to the accounting profession? What about accounting studies? And what about the opportunities and threats of the implementation of the distributed ledger for the control systems?

Concluding, in our opinion, the universality of accounting language, through DEB and ledger, in its rhetorical and rational dimensions, is called upon to describe "new genealogies", by converging professional as well academic efforts in a field that can benefit widely from a transdisciplinary approach of research.

References

Aho J. (2006), *Confession and bookkeeping: The religious, moral, and rhetorical roots of modern accounting*, Suny Press, Albany, USA.

Aho J.A. (1985), Rhetoric and the invention of double entry bookkeeping, *Rhetorica*, 3(1), pp. 21-43.

Antonelli V., Sargiacomo M. (2015), Alberto Ceccherelli (1885-1958): Pioneer in the history of accounting practice and leader in international dissemination, *Accounting History Review*, 25(2), pp. 121-144.

Antonelli V., Bigoni M., D'Alessio R., Marcello R., (2020), Enlisting accounting history in the contest between competing visions of accounting systems: Tommaso Zerbi and the origin of double-entry bookkeeping, *Accounting History*, 25(4), pp. 558-579.

Antonelli V., D'Alessio R., Rossi R., Cafaro E.M. (2017), Accounting in hybrid forms of capitalist/socialist enterprises: A multiple interpretative approach to the Royal Factory of Silk of San Leucio, 1802-1826, *Accounting History*, 22(3), pp. 274-300.

Bedford N.M., Ziegler R.E. (1975), The contributions of AC Littleton to accounting thought and practice, *The Accounting Review*, 50(3), pp. 435-443.

Benson K., Clarkson P.M., Smith T., Tutticci I. (2015), A review of accounting research in the Asia Pacific region, *Australian Journal of Management*, 40(1), pp. 36-88.
Bonsón E., Bednárová M. (2019), Blockchain and its implications for accounting and auditing, *Meditari Accountancy Research*, 27(5), pp. 725-740.
Brennan N.M., Subramaniam N., Van Staden C.J. (2019), Corporate governance implications of disruptive technology: An overview, *The British Accounting Review*, 51(6), pp.1-15.
Bryer R.A. (1993), Double-Entry Bookkeeping and the Birth of Capitalism: Accounting for the Commercial Revolution in Medieval Northern Italy, *Critical Perspectives on Accounting*, 4(2), pp. 13-140. Doi:10.1006/cpac.1993.1008.
Cai C.W. (2021), Triplee-entry accounting with blockchain: How far have we come?, *Accounting & Finance*, 61(1), pp. 71-93.
Carnegie G.D. (2014), The present and future of accounting history, *Accounting, Auditing & Accountability Journal*, 47(1), 89-95.
Carruthers B.G., Espeland W.N. (1991), Accounting for rationality: Double-entry bookkeeping and the rhetoric of economic rationality, *American Journal Of Sociology*, 97(1), pp. 31-69.
Chiapello E. (2007), Accounting and the birth of the notion of capitalism, *Critical Perspectives on Accounting*, 18(3), pp. 263-296.
Chiu V., Liu Q., Muehlmann B., Baldwin A.A. (2019), A bibliometric analysis of accounting information systems journals and their emerging technologies contributions, *International Journal of Accounting Information Systems*, 32, pp. 24-43.
Coyne J.G., McMickle P.L. (2017), Can blockchains serve an accounting purpose?, *Journal of Emerging Technologies in Accounting*, 14(2), pp. 101-111.
Dai J., Vasarhelyi M.A. (2017), Toward blockchain-based accounting and assurance, *Journal of Information Systems*, 31(3), pp. 5-21.
De Roover R. (1956), *The development of accounting prior to Luca Pacioli according to the account books of medieval merchants*, Sweet & Maxwell, Mytholmroyd, UK.
Dean G., Clarke F., Capalbo F. (2016), Pacioli's double entry – part of an intellectual and social movement, *Accounting History Review*, 26(1), pp. 5-24.
Doni F. (2007), *La teoria personalistica del conto. Aspetti evolutivi ed approfondimenti critici*, Giuffrè, Milano.
Dumay J. (2014), Reflections on interdisciplinary accounting research: the state of the art of intellectual capital, *Accounting, Auditing & Accountability Journal*, 27(8), pp. 1257-1264. Doi: 10.1108/AAAJ-05-2014-1714.
Dumay J., De Villiers C., Guthrie J., Hsiao P.C. (2018), Thirty years of Accounting, Auditing and Accountability Journal: A critical study of the journal's most cited articles, *Accounting, Auditing & Accountability Journal*, 31(5), pp. 1510-1541.
Dupont Q. (2017), Blockchain identities: Notational technologies for control and management of abstracted entities, *Metaphilosophy*, 48(5), pp. 634-653.
Farajnezhad M., Suresh A., Ramakrishnan L. (2020), A Bibliometric Research of Economic Study in World and Malaysia Perspective based on Web of Science Core Collection, *Journal of Environmental Treatment Techniques*, 8(1), pp. 521-534.
Feng Y., Zhu Q., Lai K.H. (2017), Corporate social responsibility for supply chain management: A literature review and bibliometric analysis, *Journal of Cleaner Production*, 158, pp. 296-307.
Funnell W. (2001), Distortions of history, accounting and the paradox of Werner Sombart, *Abacus*, 37(1), pp. 55-78.
Goldberg L., Leech, S. (2001), *A journey into accounting thought*, Routledge. London, UK.

Gonçalves M. (2019), Contabilidade por partidas dobradas: história, importância e pedagogia, *De Computis: Revista Española de Historia de la Contabilidad*, 16(2), pp. 69-142.
Hamilton M. (2020), Blockchain distributed ledger technology: An introduction and focus on smart contracts, *Journal of Corporate Accounting & Finance*, 31(2), pp. 7-12.
Hopwood A.G. (1976), Editorial, *Accounting, Organizations and Society*, 1(1), pp. 1-4.
Hopwood A.G., Miller P. (1994), *Accounting as Social and Institutional Practice*, Cambridge University Press, UK.
Kokina J., Mancha R., Pachamanova D. (2017), Blockchain: Emergent industry adoption and implications for accounting, *Journal of Emerging Technologies in Accounting*, 14(2), pp. 91-100.
Korom P. (2019), A bibliometric visualization of the economics and sociology of wealth inequality: a world apart?, *Scientometrics*, 118(3), pp. 849-868.
Kuhn T.S. (1970), *The Structure of Scientific Revolutions*, International Encyclopedia of Unified Science, 2nd enlarged edition, University of Chicago Press, USA.
Laudano M.C., Marzi G., Caputo A. (2018), A decade of the International Journal of Entrepreneurship and Small Business: a bibliometric analysis, *International Journal of Entrepreneurship and Small Business*, 33(2), pp.289-314.
Littleton A.C. (1927), The antecedents of double-entry, *The Accounting Review*, 2(2), pp. 140-149.
Littleton A.C. (1933; 1966), *Accounting evolution to 1900*, American Institute Publishing, New York.
Littleton A.C. (1928), The evolution of the journal entry, *The Accounting Review*, 3(4), pp. 383-396.
Lombardi R., Trequattrini R., Schimperna F., Cano-Rubio M. (2021), The Impact of Smart Technologies on theManagement and Strategic Control: A Structured Literature Review, *Management Control*, 1, pp.11-30. Doi:10.3280/MACO2021-001-S1002.
Maffei M., Casciello R., Meucci F. (2021), Blockchain technology: uninvestigated issues emerging from an integrated view within accounting and auditing practices, *Journal of Organizational Change Management*, 34(2), pp.462-476.
Mancini D. (2018), Evoluzione e prospettive dei sistemi di informazione e di controllo, *Management Control*, n. 2, pp. 5-14. Doi: 10.3280/MACO2018-SU2001.
Marchi L. (2011), Integrazione pubblico-privato su metodologie e strumenti di controllo gestionale, *Management Control*, n. 2, pp. 5-8. Doi: 10.3280/MACO2011-002001.
Marchi L. (2018), Quale metodologia di ricerca sulle tematiche di Management Control?, *Management Control*, 2 , pp. 5-10. Doi: 10.3280/MACO2018-002001.
Marrone M., Hazelton J. (2019), The disruptive and transformative potential of new technologies for accounting, accountants and accountability: A review of current literature and call for further research, *Meditari Accountancy Research*, 27(5), pp. 677-694.
Melis F. (1950), *Storia della regioneria*, Zuffi, Bologna.
Merton R.K. (1968), The Matthew effect in science: The reward and communication systems of science are considered, *Science*, 159(3810), pp. 56-63.
Merton R.K. (1988), The Matthew effect in science, II: Cumulative advantage and the symbolism of intellectual property, isis, 79(4), pp. 606-623.
Miller P., Napier C. (1993), Genealogies of calculation, *Accounting, Organizations and Society*, 18(7-8), pp. 631-647.
Miller P., O'leary T. (1994), Accounting, "economic citizenship" and the spatial reordering of manufacture, *Accounting, Organizations and Society*, 19(1), pp. 15-43.

Milne M., Guthrie J., Parker L. (2008), Into the light and engagement: two decades of interdisciplinary perspectives on accounting, auditing and accountability research, *Accounting, Auditing & Accountability Journal*, 21(2), pp. 117.128.

Naciti V., Cesaroni F., Pulejo L. (2022), Corporate governance and sustainability: a review of the existing literature, *Journal of Management and Governance*, 26, pp. 55-74.

Nakamoto S. (2008), Bitcoin: a peer-to-peer electronic cash system. Decentralized Business Review, 21260. https://www.debr.io/article/21260-bitcoin-a-peer-to-peer-electronic-cash-system

Napier C.J. (2001), Accounting history and accounting progress, *Accounting History*, 6(2), pp. 7-31.

Pacioli L. (1494), Particularis de Computis et Scripturis, in S*umma de Arithmetica Geometria Proportioni et Proportionalita*, ff. 197v-210v, Paganino de Paganini, Venezia.

Parker L. (2015), Accounting historiography: looking back to the future, *Meditari Accountancy Research*, 23(2), pp. 142-157.

Parker L., Guthrie J., Gray R. (1998), Accounting and management research: passwords from the gatekeepers, *Accounting, Auditing & Accountability Journal*, 11(4), pp. 371-406.

Pimentel E., Boulianne E. (2020), Blockchain in Accounting Research and Practice: Current Trends and Future Opportunities, *Accounting Perspectives*, 19(4), pp. 325-361.

Riccaboni A., Giovannoni E., Giorgi A., Moscadelli S. (2006), Accounting and power: evidence from the fourteenth century, *Accounting History*, 11(1), pp. 41-62.

Rom A., Rohde C. (2007), Management accounting and integrated information systems: A literature review, *International Journal of Accounting Information Systems*, 8, pp. 40-68.

Sangster A. (2016), The genesis of double entry bookkeeping, *The Accounting Review*, 91(1), pp. 299-315.

Sangster A. (2018), Pacioli's lens: God, humanism, Euclid, and the rhetoric of double entry, *The Accounting Review*, 93(2), pp. 299-314

Schmitz J., Leoni G. (2019), Accounting and auditing at the time of blockchain technology: a research agenda, *Australian Accounting Review*, 29(2), pp. 331-342.

Shen L., Wang S., Dai W., Zhang Z. (2019), Detecting the interdisciplinary nature and topic hotspots of robotics in surgery: social network analysis and bibliometric study, *Journal of Medical Internet Research*, 21(3), pp.1-17.

Søgaard J.S. (2021), A blockchain-enabled platform for VAT settlement, *International Journal of Accounting Information Systems*, 40, pp.1-18.

Soll J. (2014), *The reckoning: Financial accountability and the rise and fall of nations*, Basic Books, New York.

Sombart W. (1915), *The quintessence of capitalism: a study of the history and psychology of the modern business man*, T.F. Unwin, ltd. UK.

Sombart W. (1916), *Der moderne Kapitalismus: Historisch-systematische Darstellung des gesamten Wirtschaftslebens von seinen Anfaengen bis zur Gegenwart*, Duncker and Humblot, Berlin.

Stein Smith S. (2018), Implications of next step blockchain applications for accounting and legal practitioners: A case study, *Australasian Accounting, Business and Finance Journal*, 12(4), pp. 77-90.

Stratopoulos T. (2020), Blockchain foundational knowledge for accounting students, *working progress*.

Taipaleenmäki J., Ikäheimo S. (2018), On the convergence of management accounting and financial accounting, the role of information technology in accounting change, *International Journal of Accounting Information Systems*, 4, pp. 321-348.

Tranfield D., Denyer D., Smart P. (2003), Towards a methodology for developing evidence-informed management knowledge by means of systematic review, *British Journal of Management*, 14(3), pp. 207-222.
Valentinetti D., Flores F. (2021), Internet of Things: emerging impacts on digital reporting, *Journal of Business Research*, 131, pp. 549-562.
Van Eck N.J., Waltman L. (2017), Citation-based clustering of publications using CitNetExplorer and VOSviewer, *Scientometrics*, 111(2), pp. 1053-1070.
Walker S.P. (2016), Revisiting the roles of accounting in society, *Accounting, Organizations and Society*, 49, pp. 41-50.
Waltman L., Van Eck N.J., Noyons E.C. (2010), A unified approach to mapping and clustering of bibliometric networks, *Journal of Informetrics*, 4(4), pp. 629-635.
Wang Y., Kogan A. (2018), Designing confidentiality-preserving Blockchain-based transaction processing systems, *International Journal of Accounting Information Systems*, 30, pp. 1-18.
Winjum J.O. (1970), *The Role of Accounting in the Economic Development of England: 1500 to 1750*, University of Illinois at Urbana-Champaign.
Yamey B.S. (1949), Notes on the origin of double-entry bookkeeping, *The Accounting Review*, 22(3), pp. 263-272.
Yamey B.S. (1964), Accounting and the Rise of Capitalism: Further Notes on a Theme by Sombart, *Journal of Accounting Research*, 2(2), p. 117. Doi:10.2307/2489995.
Yamey B.S. (1975), Notes on double entry bookkeeping and economic progress, *Journal of European Economic History*, 4(3), pp. 717-723.
Yamey B.S. (2005), The historical significance of double-entry bookkeeping: Some non-Sombartian claims, *Accounting, Business & Financial History*, 15(1), pp. 77-88.
Yamey B.S. (2006a), Pacioli's De Scripturis in the context of the spread of double entry bookkeeping, *De Computis Revista Española de Historia de la Contabilidad*, 1(1), pp. 142-154.
Yamey B.S. (2006b), Duplicate accounting records: historical notes, *Accounting, Business & Financial History*, 16(3), pp. 447-455.
Yamey B.S. (2010), The market for Luca Pacioli's summa de arithmetica: Some comments, *The Accounting Historians Journal*, 37(2), pp. 145-154.
Zainuldin M.H., Lui T.K. (2021), A bibliometric nalysis of CSR in the banking industry: a decade study based on Scopus scientific mapping, *International Journal of Bank Marketing*, Vol. ahead-of-print No. ahead-of-print. Doi: 10.1108/IJBM-04-2020-0178.