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„Current Trends of Blockchain in Accounting Research:
A Structured Literature Review“

Verfasst von / submitted by

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Abstract

Purpose – This Master’s thesis offers a structured literature review on the subject of using blockchain in accounting. The author summarizes the current state of the research, the focus and critique of the key research topic, and proposes research directions for the future related to blockchain in accounting.

Design/methodology/approach – This Master’s thesis is based on the structured literature review methodology (SLR) and follows all the steps as laid out by Massaro et al. (2016). The corpus of scholarly literature consists of 125 relevant academic articles that are included and ranked in the Academic Journal Guide 2021. From this, the author analyses and critiques the actual state of the academic sources related to the topic of blockchain and accounting, introduces the main insights of the literature as well as future research trends.

Findings – After analyzing abstract and conclusion parts of all 125 academic articles, the author finds the main discussed areas of blockchain in accounting to be the influence of this technology on the accounting profession; opportunities and challenges of blockchain using in accounting; regulation of blockchain technology. The blockchain technology is seen as the technology with the highest potential after the internet that brings to accounting and accountants many challenges and opportunities.

Research limitations/implications – This study is subject to certain limitations that could serve as potential direction for further research directions. The first concerns the time period of the covered studies, which ends in March 2022. The second limitation is that only articles were used that are ranked in the Academic Journal Guide 2021. As a next limitation, only articles published in English were considered. Topics around using blockchain technology in accounting that deserve more attention from researchers include new skills for accountants (so they can use and coordinate the blockchain technology in accounting environments), and potential challenges with public and private blockchain in term of access for everyone versus (in)sufficient privacy.

Originality/value - The present study gives a structured literature review around the implementation of blockchain technology in accounting and so that uniquely introduces the emerging topics and trends in its application. It also allows researchers to develop a deeper understanding of the topic and forms a basis for future research and questions related to blockchain in accounting.

Keywords – Blockchain, Accounting, Information, Technology, Research

Paper type – Research paper

Deutschsprachiges Abstract

Zweck – Diese Masterarbeit bietet eine strukturierte Literaturübersicht zum Thema der Verwendung von Blockchain im Rechnungswesen. Der Autor fasst den aktuellen Stand der Forschung, den Fokus und die Kritik des zentralen Forschungsthemas zusammen und schlägt Forschungsrichtungen für die Zukunft in Bezug auf Blockchain im Rechnungswesen vor.

Aufbau/Methodik/Ansatz – Diese Masterarbeit basiert auf der Methodik der strukturierten Literaturrecherche (SLR) und folgt allen Schritten, die von Massaro et al. (2016) dargelegt wurden. Der Korpus an wissenschaftlicher Literatur besteht aus 125 relevanten akademischen Artikeln, die im Academic Journal Guide 2021 aufgeführt und eingestuft sind. Auf dieser Grundlage analysiert und kritisiert der Autor den aktuellen Stand der akademischen Quellen zum Thema Blockchain und Rechnungswesen und stellt die wichtigsten Erkenntnisse der Literatur sowie zukünftige Forschungstrends vor.

Ergebnisse - Nach der Analyse der Zusammenfassungen und Schlussfolgerungen aller 125 akademischen Artikel stellt der Autor fest, dass die wichtigsten diskutierten Bereiche der Blockchain im Rechnungswesen der Einfluss dieser Technologie auf den Beruf des Buchhalters, die Chancen und Herausforderungen der Blockchain-Nutzung im Rechnungswesen und die Regulierung der Blockchain-Technologie sind. Die Blockchain-Technologie wird als die Technologie mit dem größten Potenzial nach dem Internet angesehen, die dem Rechnungswesen und den Buchhaltern viele Herausforderungen und Chancen bringt.

Forschungseinschränkungen/Implikationen - Diese Studie unterliegt bestimmten Einschränkungen, die als potenzielle Richtung für weitere Forschungsarbeiten dienen könnten. Die erste betrifft den Zeitraum der erfassten Studien, der im März 2022 endet. Die zweite Einschränkung ist, dass nur Artikel verwendet wurden, die im Academic Journal Guide 2021 aufgeführt sind. Eine weitere Einschränkung besteht darin, dass nur in englischer Sprache veröffentlichte Artikel berücksichtigt wurden. Zu den Themen rund um den Einsatz der Blockchain-Technologie in der Buchhaltung, die mehr Aufmerksamkeit seitens der Forscher verdienen, gehören neue Fähigkeiten für Buchhalter (damit sie die Blockchain-Technologie in Buchhaltungsumgebungen nutzen und koordinieren können) und potenzielle Herausforderungen mit öffentlichen und privaten Blockchains in Bezug auf den Zugang für jedermann und die (un)ausreichende Privatsphäre.

Originalität/Wert - Die vorliegende Studie gibt einen strukturierten Literaturüberblick über die Implementierung der Blockchain-Technologie im Rechnungswesen und stellt somit die

aufkommenden Themen und Trends in ihrer Anwendung vor. Sie ermöglicht es den Forschern auch, ein tieferes Verständnis für das Thema zu entwickeln und bildet eine Grundlage für zukünftige Forschung und Fragen im Zusammenhang mit Blockchain im Rechnungswesen.

Stichworte - Blockchain, Rechnungswesen, Information, Technologie, Forschung

Papiertyp - Forschungspapier

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Abbreviations

AJC	Academic Journal Guide
CPY	Citations per year
IIRC	International Integrated Reporting Council
K-alpha	Krippendorff's alpha
SLR	Structured Literature Review

1 Introduction

A blockchain technology, defined by many researchers as the biggest turbulence since the advent of the internet, also brings with it innovations in accounting in terms of new ways of storing and verifying financial transactions in a decentralized ledger, to be managed across a network of peer-to-peer devices. This technology has been in the center of interest in the past few years (Abdennadher et al., 2022; Garanina et al., 2021). The technology has a potential to gain more power every year and influences businesses and the organizational structure of corporations in significant ways. This influence is also felt in accounting (Abdennadher et al., 2022).

In the existing academic literature, researchers take different points of view on the implementation of blockchain technology in accounting. They tend to agree that it offers opportunities as well as challenges for accounting and the accounting profession. Most studies in this area of research deal with the benefits of blockchain technology in accounting (Yeoh, (2017); Alsaqa et al., (2019); Yermack, (2021)). In their study, Maffei et al. (2021) focus on potential concerns and doubts regarding the implementation of this technology in accounting, by comparing accounting before and after the implementation of this technology. Other researchers study the influence of blockchain technology on the job of accountants, such as potential concerns about keeping their job or challenges arising from the using of this technology in their workplace (Abdennadher et al., (2022); Ferri et al., (2020); Kend and Nguyen, (2020). Staying on top of the current research presents a challenge for researchers, since the development of blockchain technology progresses rapidly. In order to help present up to date research, the present thesis attempts a structured literature review based on the following research questions:

RQ1. *What is the current state of the research regarding blockchain technology in the accounting system?*

RQ2. *What is the focus and critique of the key research topic?*

RQ3. *What are the main trends that the research has identified, and what are the proposed research directions related to blockchain in accounting?*

Future research proposals mostly reflect the limitations that were encountered in previous research topics and studies. These could be solved by conducting future research in a specific field. Moreover, it may be beneficial if future research was conducted on the field in general, to document trends and developments as well as changes in focus or results.

The structure of this study is as follows. After this introduction follows an overview of blockchain technology in accounting. The beginning of Chapter 3 presents the structured literature review as a research design and justifies the selection of the methodology for the study. Next, the SLR method is introduced with an explanation of all its steps and their application. In Chapter 4, the search and selection of the academic literature necessary for the further analysis is conducted, in order to develop an analytical framework appropriate for blockchain technology in accounting. The results of this analysis are presented and critiqued. Chapter 5 discusses the future of blockchain technology in accounting by presenting the main trends found in the literature, and presents suggestions for future research. The last chapter provides a conclusion and the limitations of the present study.

2 Background: Blockchain in accounting

The first use of blockchain dates to the year 2009, when Satoshi Nakamoto presented the first cryptocurrency, known as Bitcoin. From the start, blockchain was used to control the digital transfer of cryptocurrencies (Alsaqa et al., 2019). Alsaqa highlighted that *“Blockchain is generally defined as an open and shared online database that generally tracks transactions and protects data from tampering”* (Alsaqa et al., 2019, p.5). The potential and advantages of blockchain in terms of storing data resulted in many experts trying to implement this technology in various areas other than cryptocurrencies, as Moll and Yigitbasioglu (2019, p. 12) confirm: *“Blockchain is a type of distributed ledger technology where multiple copies of the same ledger are shared among the members (nodes) of a large network. The technology is considered to be highly promising by many organisations.”* (Moll and Yigitbasioglu, 2019, p. 12).

Because the main benefit of blockchain is storing and controlling data, it enables a new innovative possibility to record and verify operations that was also noticed by the researchers working in the areas of accounting and auditing. The first studies about using blockchain in the accounting environment started to appear around the year 2017, and since then the development of this technology has continued at such a rapid pace, it proves challenging for researchers to stay up to date (Moll and Yigitbasioglu, 2019). To gain insights into the topic of blockchain technology in accounting, the focus points of the literature are outlined. One of the discussed points is the impact of blockchain technology on the accounting profession and one of the reasons is that blockchain offers new opportunities for managing and presenting accounting information, thereby transforming the way companies perform their routine

accounting activities. A consequence of these changes is that the accounting profession is likely to change or even disappear in the future and so that is important to develop more insights into this topic (Abdennadher et al., (2022). The other important focus point in the literature is analyzing opportunities and challenges of blockchain in accounting. The accounting information system is specifically impacted because of its open structure, and so are the surroundings in which it works. That's why is important to keep the accounting information systems running continuously, which is analyzed if that could be achieved with blockchain technology (Alsaqa et al., 2019).

In view of this, the present thesis is based on a structured literature review and aims to offer the main trends and insights in the development and use of blockchain technology in accounting, with a view of the potential opportunities and challenges that come with it.

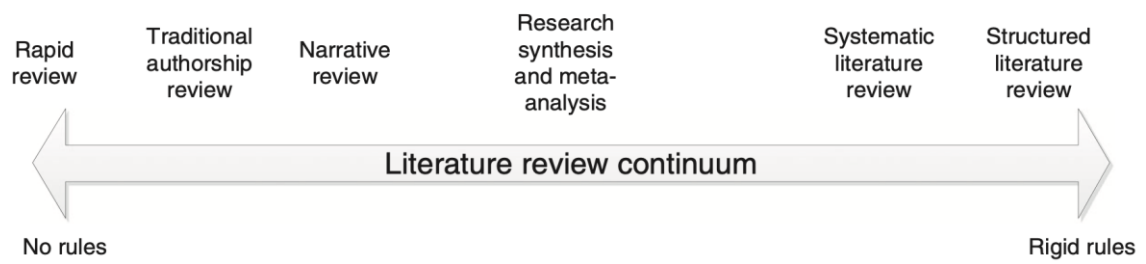
3 Methodology

The present master thesis is based on a qualitative research design, namely the Structured Literature Review (SLR). All the steps identified by Massaro et al. (2016) that comprise the structured literature review, are described in the following. Massaro et al. (2016, p. 2) defined this methodology as “a method for studying a corpus of scholarly literature, to develop insights, critical reflections, future research paths and research questions“. In the present thesis, the SLR method is used to review primarily abstracts and conclusion parts of the academic literature regarding blockchain technology in accounting, in order to develop research questions, provide insights and critiques, as well as identify areas of future research (Massaro et al., 2016).

Figure 1 shows the SLR as a method with strictly defined rules, in contrast to the method called Rapid review, where no rules apply. As a consequence of its strictly defined rules, the review procedure of SLR consists of nine distinct steps, as illustrated in Figure 2. This chapter covers the steps of the structured literature review methodology:

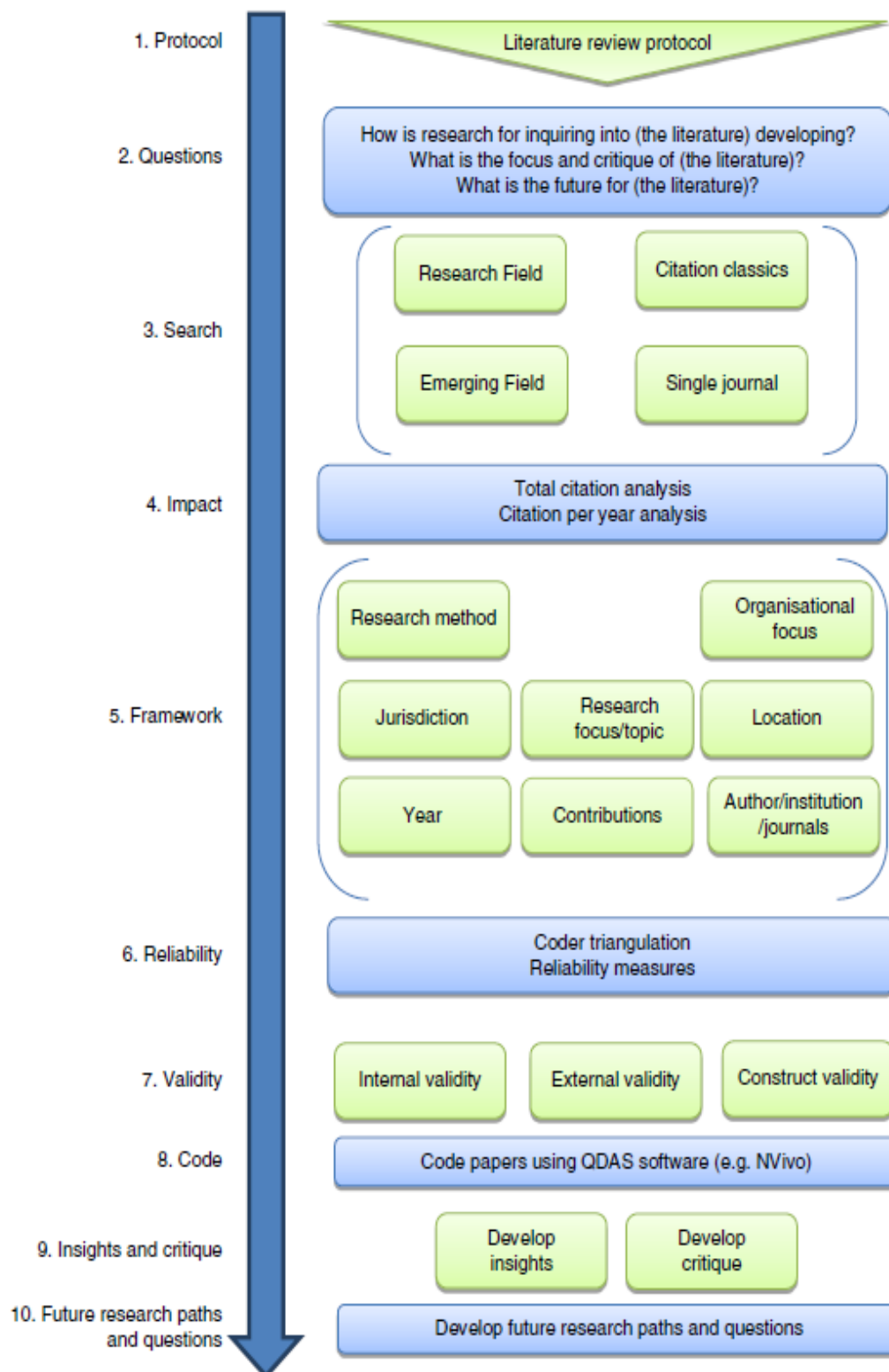
- 1) writing a literature review protocol,
- 2) developing the research questions,
- 3) carrying out a literature search strategy,
- 4) measuring article impact,
- 5) constructing an analytical framework,
- 6) as well as coding the articles for testing the reliability and validity of the sources.

Figure 1: Types of literature review



Source: Adapted from Dumay, Massaro & Guthrie, 2016

Figure 2: Structured literature review process



Source: Massaro et al., (2016)

3.1 The literature review protocol

The literature review protocol represents the first step of the SLR methodology and its main objective is to identify the frame conditions of the research (Massaro et al., 2016). The focus is only on journals that are ranked in the Academic Journal Guide 2021. For the present thesis, the following inclusion and exclusion criteria are applied to ensure that only relevant literature will be selected for the SLR.

Inclusion Criteria

The research is focused on academic papers published in journals that are included and ranked in the Academic Journal Guide 2021 (AJG). The publications should concern Business, Accounting, Management, Corporate Governance, Finance, or similar relevant fields. The collection of data includes publications from the year 2000 through the most recent articles published in 2022 anywhere in the world. Finally, the main focus is on document types such as peer-reviewed and published articles.

Exclusion Criteria:

Publications are excluded if their language is not English, or if they're inaccessible document types such as letters or position papers.

3.2 Research questions

After conducting the structured literature review in accordance with the Massaro et al. (2016) methodology as shown in Figure 1, the research questions, that are mentioned in the Section 1 Introduction, are determined.

The research pertaining to the first question offers an overview of the existing literature, with a particular emphasis on the development of blockchain technology in accounting.

The research concerning the second question highlights the main insights and critique of the literature related to this topic, whereas the answer to the third research question presents any trends the research has identified for future research.

The questions are answered after developing the analytical framework. The first research question is answered in Chapters 4.1 and 4.2, the second question will be reflected in Chapter 4.3 where the criteria obtained from the analytical framework will provide a basis for a thorough analysis of the benefits and concerns of blockchain technology in accounting. At the same time, limitations, critical points and issues will be highlighted.

3.3 The literature search and data collection

A literature search consists of selecting the relevant data sources for a literature review. To obtain the best results, a three-phase process is utilized (Massaro et al., 2016).

Phase 1. Following the criteria of the literature review protocol, academic journals are only included if they are ranked in the Academic Journal Guide 2021. Because the research primarily focuses on peer-reviewed and published articles, the database Scopus as the biggest abstract and citation database was used. At the beginning, a shortlist of the top 20 academic journals in Business, Management and Accounting is created (listed in Table 1). According to the number of citations found in Google Scholar metrics, these journals are the most cited.

Table 1: Top 20 Journals in Business, Management and Accounting

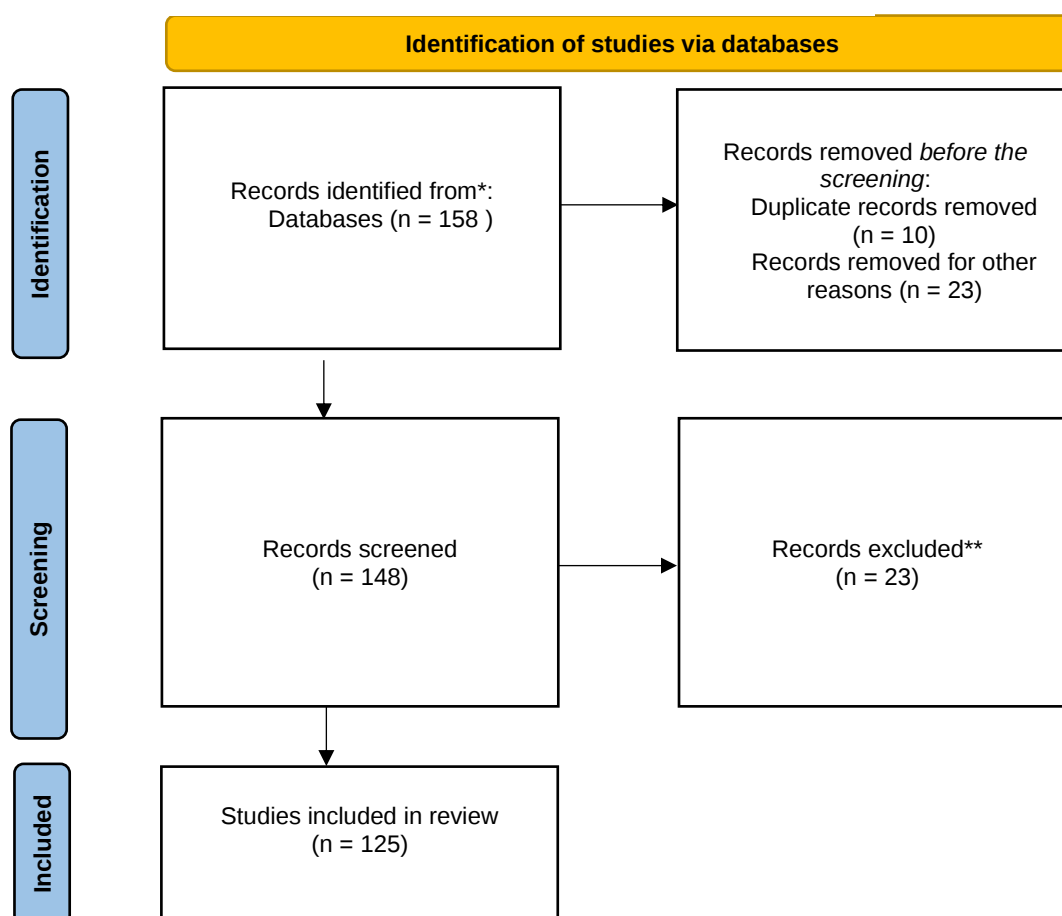
The Accounting Review
Journal of Accounting and Economics
Journal of Accounting Research
Contemporary Accounting Research
Accounting, Auditing & Accountability Journal
Review of Accounting Studies
Accounting, Organizations and Society
The British Accounting Review
Critical Perspective on Accounting
Accounting and Business Research
Auditing: A Journal of Practice & Theory
Managerial Auditing Journal
Management Accounting Research
Meditari Accountancy Research
Journal of Business Finance & Accounting
Accounting & Finance
Accounting Horizons
Journal of Accounting and Public Policy
European Accounting Review
International Tax and Public Finance

Phase 2. The searches for articles in the top 20 journals in Business, Management and Accounting are processed individually using Scopus's search engine. The following keywords

and key phrases were used, all of which relate to blockchain in accounting: “Blockchain“ OR “Accounting“ OR “Blockchain in Accounting“ with a combination of any of the keyword phrases (AND): “Smart contracts“ OR “Transfer of ownership“ OR “Reporting quality“ OR “Accounting Information System“ OR “Triple Entry Accounting“ OR “Distributed ledger“. Using these keywords, 158 articles were found.

Phase 3. After sorting the articles according to their abstracts, open access status and content, the final number of relevant articles that fulfil all the mentioned criteria (as shown in Table 2) is 125. This set of articles stands for the “corpus of scholarly literature, to develop insights, critical reflections, future research paths and research questions” (Massaro et al., 2016, p.767). Table 5 shows all the journals and the number of papers from each journal according to their Academic Journal Guide (AJG) ranking. The ranking system of journals indicates the quality of sources with the numbers 1–4*. The sources ranked with 4* are those with the highest ranking. After collecting the data sample, all of the articles were converted into a Portable Document Format (PDF) version and stored on a Google Drive with full referencing details.

Table 2: Flow diagram of the data collection



3.4 Article impact

The fourth step outlined by Massaro et al. (2016) consists of measuring the impact of all selected articles with the help of Google Scholar citations, in order to identify the most influential articles. For this purpose, the citation counts of each article were obtained using *Harzing's Publish or Perish software*. It's important to mark the date on which the Google Scholar rates were obtained, because the literature and the corresponding citations are constantly evolving. On 20 April 2022, the rates of Google Scholar citations of those 125 relevant articles were downloaded from the Google Scholar website and the citation counts used are based on this data. The Publish or Perish software provides access to data of different online databases such as Crossref, OpenAlex, Google Scholar, Scopus, and many others. Because some databases require external subscriptions or a registration and one main goal of SLR is that it should be easily replicable by third parties, the author decided to only use citations taken from Google Scholar.

The final numbers of the citation analysis are shown in Tables 3 and 4, and as Table 3 proves, the older articles have the most significant numbers of citations. One of the reasons for that is simply that they have had larger timely manner to accumulate citations than new papers. That's why Dumay et al. (2016, p. 5) highlight that "one problem with determining the impact from citations alone is that older articles can accumulate more citations" (Dumay et al., 2016, p. 5). In order to achieve balance between the articles which were recently published and those that were published some years ago and to identify the most influential papers, a second measure of article impact is used, called Citations Per Year (CPY). Table 4 illustrates the top ten academic articles according to CPY, which was automatically calculated and obtained by Harzing's Publish or Perish software. When this measure is applied, the list remains mostly the same with only a few exceptions: There are 6 articles both lists of 10 have in common (Healy & Palepu, 2001; Leuz & Verrecchia, 2000; Bushman & Smith, 2001; Hu et al., 2018; Yermack, 2021; Cong & He, 2019).

The outcomes of the citation analysis are discussed in section 4.2 and because they contribute to answer the research question about the development of the research on the topic blockchain in accounting.

Table 3: The Top 10 Total Citations

The Top 10 Total Citations					Total Citations
	Year	Author	Title	Source	
1	2001	Healy and Palepu	Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature	Journal of accounting and economics	9398
2	2000	Leuz and Verrecchia	The economic consequences of increased disclosure	Journal of Accounting research	4156
3	2001	Bushman and Smith	Financial accounting information and corporate governance	Journal of accounting and economics	3408
4	2018	Xu et al.	Industry 4.0: State of the art and future trends	International Journal of Production Research	1896
5	2010	Armstrong et al.	The role of information and financial reporting in corporate governance and debt contracting	Journal of accounting and economics	1502
6	2006	Biddle and Hilary	Accounting quality and firm-level capital investment	Accounting Review	1354
7	2021	Yermack	Corporate Governance and Blockchains	Review of Finance	904
8	2002	Debreceeny et al.	The determinants of internet financial reporting	Journal of Accounting and Public Policy	853
9	2004	Frankel and Li	Characteristics of a firm's information environment and the information asymmetry between insiders and outsiders	Journal of accounting and economics	778
10	2019	Cong and He	Blockchain Disruption and Smart Contracts	Review of Financial Studies	757

Table 4: Top 10 CPY

Top 10 CPY					CPY
	Year	Author	Title	Source	
1	2021	Yermack	Corporate Governance and Blockchains	Review of Finance	904.00
2	2018	Xu et al.	Industry 4.0: State of the art and future trends	International Journal of Production Research	474.00
3	2001	Healy et al.	Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature	Journal of Accounting and Economics	447.52
4	2000	Leuz and Verrecchia	The economic consequences of increased disclosure	Journal of Accounting Research	346.33
5	2020	Dwivedi et al.	Impact of COVID-19 pandemic on information management research	International Journal of Information Management	258.00
6	2019	Cong and He	Blockchain Disruption and Smart Contracts	Review of Financial Studies	252.33

7	2010	Beyer et al.	The financial reporting environment: Review of the recent literature	Journal of accounting and economics	206.33
8	2020	De et al.	Impact of digital surge during Covid-19 pandemic: A viewpoint on research	International Journal of Information Management	196.50
9	2001	Bushman and Smith	Financial accounting information and corporate governance	Journal of Accounting and Economics	162.29
10	2018	Gomber et al.	On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services	Journal of Management Information Systems	162.00

AJC journals rated with 4* consists of the most original and highest quality research. These journals are the best-recognized in their field, with high submission and low acceptance rates, which ensures that these papers are reliable sources of information (Sarat, 2021). Because the journal's ranking plays an important role as well, it was decided to adopt the frequency distribution of articles from the latest research *Blockchain in accounting research: current trends and emerging topics* by Dumay et al. 2021. Table 5 presents the frequency distribution of the journals that are collected for the relevant scope of research. The frequency is based on the rank each journal gets from AJG 17 in relation to the number of articles collected. Papers with a ranking of 3 have good to excellent journal metrics with a reasonable submission rate and are heavily edited. Those papers are highly regarded. Finally, the 2-rated journals publish original papers of an adequate standard and are fully peer-reviewed before being published. The leading journals in Table 5 are the *Accounting, Auditing and Accountability* journal and the *International Journal of Information Management*, both with 9 papers in this research, which represents 7,20 % of the data set. The journals have a rating of 3 and 2 respectively. Next are *Technological Forecasting and Social Change*, the *International Journal of Accounting Information Systems* and *Strategic Change*, with ratings of 3, 2, 2 respectively and a frequency distribution of 5,60 %. The scope of the research is summarized in Chapter 4.1, Table 8.

Table 5: AJG Frequency distribution

Source	AJG Ranking	Number of papers	% of total in data set
Accounting Review	4*	6	4,80 %
Journal of Accounting research	4*	1	0,80 %
Journal of Accounting and Economics	4*	5	4,00 %
Review of Financial Studies	4*	3	2,40 %
Journal of Management Information Systems	4	2	1,60 %
Review of finance	4	1	0,80 %

Journal of Strategic Information Systems	4	1	0,80 %
Journal of Corporate Finance	4	1	0,80 %
Journal of Accounting and Public Policy	3	4	3,20 %
Accounting, Auditing and Accountability Journal	3	9	7,20 %
British Accounting Research	3	2	1,60 %
International Journal of Production Research	3	1	0,80 %
Information and Organization	3	1	0,80 %
Harvard Business Review	3	1	0,80 %
Information Society	3	1	0,80 %
Technological Forecasting and Social Change	3	7	5,60 %
Information and Management	3	2	1,60 %
IEEE Transactions on Engineering Management	3	2	1,60 %
Australian Accounting Review	2	5	4,00 %
Accounting and Finance	2	6	4,80 %
Journal of Accounting Education	2	1	0,80 %
Current Issues in Auditing	2	2	1,60 %
Journal of Accounting and Organizational Change	2	1	0,80 %
Journal of Organizational Change Management	2	2	1,60 %
International Journal of Information Management	2	9	7,20 %
Information Processing and Management	2	1	0,80 %
Business Horizons	2	5	4,00 %
Electronic Markets	2	1	0,80 %
Business & Information Systems Engineering	2	1	0,80 %
Journal of Cleaner Production	2	1	0,80 %
Journal of Management Control	2	1	0,80 %
Journal of Business Venturing Insights	2	1	0,80 %
International Journal of Accounting Information Systems	2	7	5,60 %
Journal of Intellectual Capital	2	1	0,80 %
International Journal of Disclosure and Governance	2	1	0,80 %
Strategic Change	2	7	5,60 %
Industrial Management and Data Systems	2	2	1,60 %
Journal of Computer Information Systems	2	1	0,80 %
Journal of Banking Regulation	2	1	0,80 %
Systems Research and Behavioral Science	2	1	0,80 %
European Management Journal	2	1	0,80 %
Australasian Accounting, Business and Finance Journal	1	1	0,80 %
Meditari Accountancy Research	1	4	3,20 %
Journal of Financial Reporting and Accounting	1	1	0,80 %
China Economic Journal	1	1	0,80 %
Intelligent Systems in Accounting, Finance and Management	1	4	3,20 %
Journal of Information systems	1	2	1,60 %
Journal of Information Technology Management	1	1	0,80 %
Journal of Financial Regulation and Compliance	1	1	0,80 %
Review of International Business and Strategy	1	1	0,80 %
Managerial Finance	1	1	0,80 %
Total		125	100 %

3.5 Analytical framework

This stage of the SLR methodology is the creation of the analytical framework for developing insights and further investigation paths in the top-level positions. The analytical framework is adopted from Dumay et al. (2016) and all 125 relevant articles are coded according to selected criteria such as jurisdiction, organizational focus, country of research, focus of literature, research method, research questions and hypothesis, and limitations. The resulting analytical framework is shown in Table 3, which comprises seven main criteria with four to eight attributes each, and helps to answer the second research question, on insights and a critique of the key research topic.

Table 6: Analytical framework

A. Jurisdiction		B. Organizational Focus	
A1 Supranational/International/Comparative - General	21	B1 Publicly listed	115
A1.1 Supranational/International/Comparative - Industry	2	B2 Private - SMEs	0
A1.2 Supranational/International/Comparative - Organizational	2	B3 Private - Others	7
A2 National - General	91	B4 Public sector	0
A2.1 National - Industry	6	B5 Not-for-profit	0
A2.2 National - Organisational	1	B6 General/Other	3
A3 One Organization	2	Total	125
Total	125		
C. Country of research		D. Focus of literature	
C1 USA/Canada	40	D1 Impact of BT or other technologies on accounting profession	7
C2 Australasia	20	D2 Opportunities and challenges of BT application	61
C3 United Kingdom	21	D3 Regulation of BT	3
C4 European Union	20	D4 Accounting information quality	4
C5 Africa	0	D5 Financial reporting	12
C6 Asia	14	D6 Theory of accounting	7
C7 Other	10	D7 Other	31
Total	125	Total	125
E. Research method		F. Research questions and hypothesis	
E1 Case study/Field study/Interviews	15	F1 Provide research questions	54
E2 Content analysis/Historical analysis/Other qualitative	57	F2 Provide hypothesis	15
E3 Survey/Questionnaire/Other empirical	28	F3 Provide research question and hypothesis	1
E4 Literature review	20	F4 Do not provide research question or hypothesis	55
E5 Other	5	Total	125

Total	125
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G. Limitations

G1 Theoretical limitations in research design	12
G2 Empirical limitations in research design	12
G3 Data or statistical limitations	14
G4 Limitation of BT technology	30
G5 Limitations not provided	57
Total	125

3.6 Developing reliability and validity

After defining the analytical framework, the next step is coding the articles, in order to determine the units of analysis identified. All 125 articles were read and coded, with a separate spreadsheet for each category of coding. Many researchers emphasize that checking the reliability and validity of a review is a necessary part of gaining insights on a topic (Creswell & Poth, 2013). Hayes and Krippendorff state that „much communication research is based on data generated by human beings asked to make some kind of judgment” (Hayes and Krippendorff, 2007, p. 77); therefore, the sources the research is based on need to be under control. To this end, scholars suggest using various reliability measures such as Cohen’s kappa, Krippendorff’s alpha and others in order to examine the reliability (Hayes & Krippendorff, 2007). Krippendorff’s alpha (K-Alpha) is also commonly used by researchers nowadays (Krippendorff, 2013). K-Alpha is measured with an online calculator called ReCal2 that was created by Deen Freelon. Krippendorff (2013) emphasizes that the resulting K-Alpha value should not be below 0.8. To calculate this value, it is necessary that two or more coders are involved in the coding process to create an agreement. However, the SLR for the present master’s thesis is performed by a single person who codes as a single coder, in which case the suggested way of coding reliably is to code more than once at different points in time. The coding process was therefore performed twice, with one month in between (April 2022 and May 2022). Based on the criteria in the analytical framework as shown in Section 3.5, where all 125 articles were coded manually, all articles in the present research are coded according to their abstracts and content in the Nvivo software. This brought up a few disagreements in each criterion, as shown in Table 7. The most disagreements concerned the criteria ‘jurisdiction’ and ‘country of the research’. In contrast, there’s only one discrepancy each for the criteria ‘research method’ and ‘limitations’. The final numbers presented in Table 7 shows

that the average K-Alpha is 0.943, which is a clear indication that the minimum score of 0.8 is fulfilled.

Table 7: K-Alpha for developing reliability

N columns:	14			
N variables:	7			
N coders per variable:	2			

Variable	N Agreements	N Disagreements	N Cases	N Decisions
A. Jurisdiction	120	5	125	250
B. Organisational focus	122	3	125	250
C. Country of research	121	4	125	250
D. Focus of literature	122	3	125	250
E. Research method	124	1	125	250
F. Research question	123	2	125	250
G. Limitations	124	1	125	250

Variable	% Agreement	K-Alpha
A. Jurisdiction	96%	0.888
B. Organisational focus	97.6%	0.842
C. Country of research	96.8%	0.96
D. Focus of literature	97.6%	0.965
E. Research method	99.2%	0.989
F. Research question	98.4%	0.974
G. Limitations	99.2%	0.989
Average for K-Alpha		0,943

To ensure, this methodology is valid, the internal and external validity features need to be checked. In order to be valid, all selected articles should properly represent the academic research field. In addition, it must be possible to generalize the results of the analysis based on the selected articles (Dumay et al., 2016). Massaro et al. (2016) explain that an internal validity test is primarily based on the time series analysis and the data display, while an external validity test provides diverse sources of evidence and further explanations.

The internal validity testing is supported by a chronological sequence analysis, which plays a supportive role in the testing. According to Serenko & Dumay, the period of time needs to be chosen depending on the field of study. As mentioned in Chapter 3.1, the timeframe of the years 2000-2022 was chosen to observe the developments and gain insights on the implementation of blockchain in accounting. Although the blockchain was developed in 2011 and the very first academic articles regarding blockchain in accounting appeared in the year

2015, a few academic articles before the year 2010 are also taken into consideration because they provide insights into the development of accounting practices.

Considering the external validity, only journals that are ranked in the AJG 2021 are used, which ensures an internationally proven quality of the sources. Similarly, the articles' impact for the analysis in Chapter 3.4 is measured by the total number of citations as well as the citations per year. Finally, the abstracts of the articles are checked to ensure they are relevant for the review. As shown in the flow diagram in Table 2, some of the articles were excluded because they either aren't relevant to this research or don't fulfil other inclusion criteria.

3.7 Coding

In this chapter, the Nvivo software for coding the articles is applied and they are recorded in an Excel spreadsheet, using the same criteria as in the analytical framework. Because the coding is provided by only a single coder, as mentioned in Chapter 3.6, the process is reviewed one month later by manually coding with the Nvivo software, based on the criteria from the analytical framework. Through this process, an additional criterion was added, called "limitations", based on new insights after coding and reading the articles again.

The Nvivo software is also used to code the most frequent keywords that appear in this research. The results from the keywords coding reveal that the most frequent keywords are blockchain, accounting, information, technology and research.

4 Results

After collecting and analyzing all 125 academic articles, the first research question, RQ1., could be answered: *What is the current state of the research regarding blockchain technology in the accounting system?* The answer is provided and discussed in Chapter 4.1., whereas Chapter 4.2. outlines the development of this topic in the literature.

The second research question, RQ2.: *What is the focus and critique of the key research topic?* is discussed according to the analytical framework in Chapter 4.3, with the main focus on the researched academic articles.

4.1 Articles over time

In this chapter, the important data gained from 125 relevant articles is sorted into the so-called “panel data” of the articles. The criteria used are publication year, AJG ranking and subject area, as shown in Table 6, and help to provide insights into the current state and development of the research. As shown in the panel “Date by publication year” in Table 8, most of the articles in the subject area of Business, Management and Accounting were published in 2019, 2020 and 2021, which indicates a strong interest in the potential of using this innovative technology in the accounting. From this, we can predict a likely increase of publications in the following years, considering especially that 7 academic articles have already been published in the first four months of 2022.

As shown by the panel data in Table 8, the majority of the publications is ranked 3 and 2. To be exact, 59 publications have the ranking number 2 and 29 publications are ranked with 3. The ratings 3 and 2 indicate that these journals have good to excellent journal metrics with a reasonable submission rate, and that they are heavily peer-review, as described in Chapter 3.4

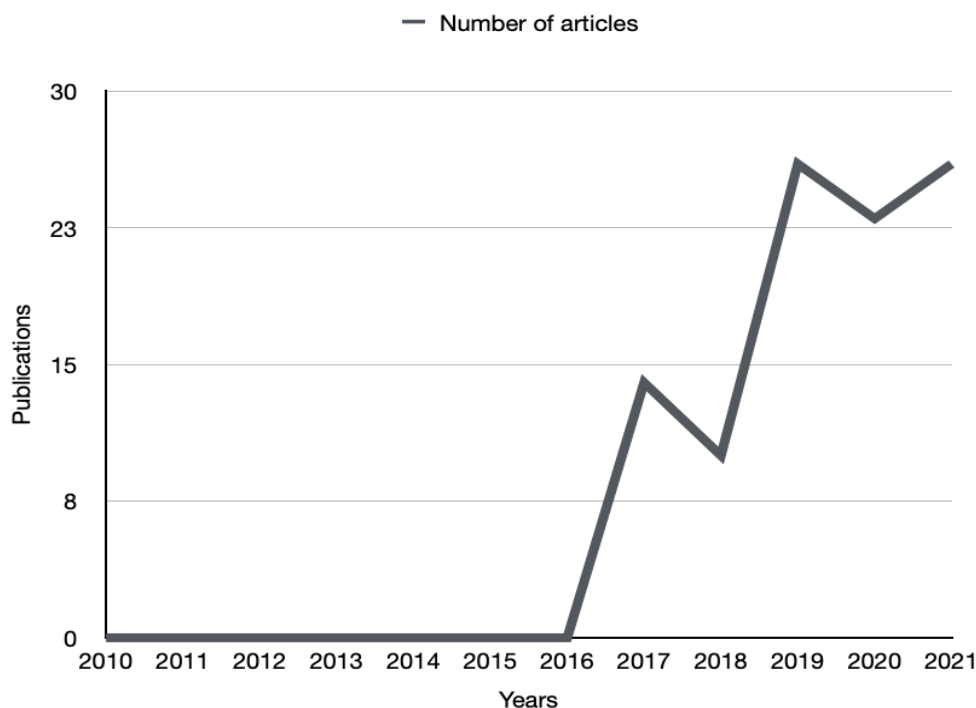
Table 8: Panel data of articles

Panel A: by publication year	Panel B: by AJG ranking	Panel C: by subject area
2022: 7	4*: 15	Business, Management and Accounting: 122
2021: 26	4: 5	Economic, Econometrics and Finance: 62
2020: 23	3: 29	Decision Sciences: 29
2019: 26	2: 59	Computer Science: 25
2018: 10	1: 17	Social Science: 21
2017: 14		
2016: 1		
2015: 1		
2014: 1		
2013: 1		
2012: 1		
2010: 4		
2008: 1		
2006: 1		
2005: 1		
2004: 1		
2002: 1		
2001: 2		
2000: 3		

However, to answer the research question “*How is the research regarding blockchain in accounting developing*” with any certainty, a graph called ‘Publication trend’ is used, which

shows the volume of published articles on this topic in the time period from the year 2010 through 2021 (Figure 3). It is significant to notice that, as mentioned in the introduction, blockchain was introduced over ten years ago through a decentralized system, which is why the axis ‘Years’ on the graph in Figure 3 begins in the year 2010. The first published articles mentioned in the panel data in Table 8, around the years 2000 and 2010, concern the impact of technological change on the accounting system in general (Leuz and Verrecchia, 2000; Bushman and Smith, 2001; Frankel and Li, 2004; Taipaleenmäki and Ikäheimo, 2013; and others). However, the first papers about the possible implications of blockchain for accounting began to appear around 2017 (Chiu and Koepl, 2017; Arnaboldi et al., 2017; Iansiti and Lakhani, 2017; Chang et al., 2017; Risius and Spohrer, 2017; O’Leary, 2017 and others). Since 2017, as is shown in the graph in Figure 3, there has been a significant increase in the volume of articles which continues annually through the year 2021. The highest number of articles was published in the years 2019 and 2021. 2022 is not included in the graph because it is not over yet at the time of writing, although Table 8 shows that seven articles have already been published by March 2022. Given all these facts, it could be concluded that interest in the application of blockchain technology in the accounting system has increased over the past few years and it may be assumed that this field will see the volume of articles affiliated to the topic of blockchain in accounting continue to increase in the future.

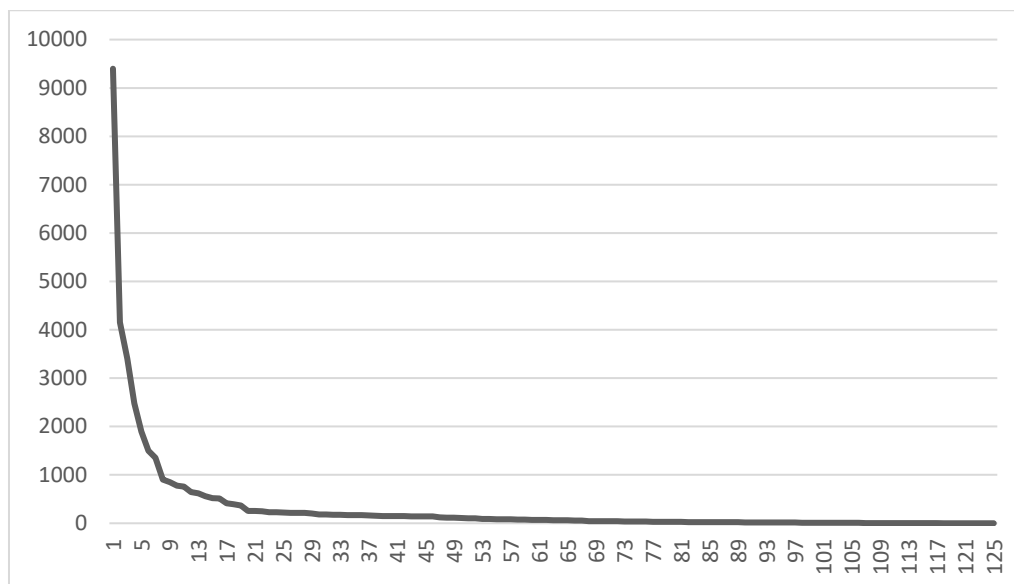
Figure 3: Publication trend



4.2 Citation analysis: measuring articles impact

According to Dumay et al. (2018), an important factor when determining the influence of an academic article is the number of total citations and citations per year (CPY). Figure 4 shows the citation decay, demonstrating that most of the citations concern a relatively small number out of the 125 articles. As these results show, Healy & Palepu receive most of the citations, 9398 in total, and Leuz & Verrecchia are a close second with 4156 citations. Four further articles (Bushman & Smith, 2001; Xu et al., 2018; Armstrong et al., 2010; Biddle & Hilary, 2006) have received over 1000 citations.

Figure 4: Citation decay



The results of the citation analysis, as shown in Chapter 3.4 (Tables 7 and 8), indicate that there are six articles common to both rankings, namely Healy et al., 2001; Leuz et al., 2000; Bushman et al., 2001; Xu et al., 2018; Yermack, 2021; Cong et al., 2019. However, measuring the CPY in Chapter 3.4 (Table 8) shows that there are more recently published articles which are ranked.

This contribute to the fact, that the interest in the using of blockchain in accounting is strong.

4.3 Insights and critique

In reference to the second research question, this chapter provides insights and a critique of the key research topic, blockchain in accounting. According to selected criteria in the

analytical framework from Chapter 3.5, the author looks at *jurisdiction, organizational focus, country of research, focus of literature, research method, research question and hypothesis, and limitations*. However, the primary focus is the criterion called *focus of literature*, in other words the main areas of the literature, which are *impact of blockchain technology on accounting profession, opportunities and challenges of blockchain in accounting and regulation of blockchain technology*.

4.3.1 Jurisdiction

For the first criterion, on a *Supranational/International/Comparative – General* level (A1), 21 studies are analyzed, most of which mainly focus on the relationship between innovative technologies such as blockchain and the accounting environment (Mancini et al., 2021). Some also examine the key regulatory institutions which influence blockchain in the European Union and the USA (Yeoh, 2017). The study conducted by Liang et al. (2021) on a *Supranational/International/Comparative – Industry* level (A1.1) shows a more technological view by examining the driving factors for the adoption of blockchain technology across businesses, which are for example, industry competition, government support and consumer readiness. On a *Supranational/International/Comparative – Organisational* level (A1.2), the study by Brennan et al. (2019) reviews the main advantages of technology such as blockchain and how it can contribute to more innovative and sustainable corporate governance and accounting systems. However, most of the study authors focus their research on a *National – General* level (A2). They mainly examine the potential application of blockchain technology in accounting, such as distributed ledgers and smart contracts (Cong and He, 2019), or features and challenges the blockchain technology brings with it, for example the higher efficiency in terms of recording transactions via blockchain, or dealing with security issues since blockchain technology is introduced as a quiet new technological innovation in the accounting environment (Iansiti and Lakhani, 2017). Another study on the *National – Industry* level (A2.2) also analyzes the opportunities and strengths of introducing blockchain, such as the ways in which this technology can be used to create new business models, by reducing costs as well as time (Weiking et al., 2020). On the other hand, an article with a *National – Organizational* scope (A2.2) seeks to determine in what ways organizations should deal with technological changes and adopt new innovative technologies (Tudor et al., 2021). Finally, there is also a study concerned with the influence of blockchain on financial services on the level of *One Organization* (A3). Here, the researchers also discuss the barriers

to adopting the blockchain technology in the financial industry, as well as ethical issues associated with using it (Chang et al., 2020).

4.3.2 Organisational focus

The second criterion is *Organizational focus (B)*, which includes six attributes: *Publicly listed*, *Private – SMEs*, *Private – Others*, *Public sector*, *Not-for-profit*, *General/Other*. The organization form which most frequently is the subject for this type of research is *publicly listed* companies (B1), with 115 studies. Only 7 papers are concerned with *Private – SMEs* (B2) and finally 3 papers deal with organizations in the *General/Other* (B6) category. This confirms the IIRC's statement that "the framework is written primarily in the context of private sector, for-profit companies of any size but it can also be applied, adapted as necessary, by public sector and not-for-profit organizations" (IIRC, 2013, p. 4). The not-for-profit organizations are not considered in the present thesis, and neither is the public sector, due to their underrepresentation in the literature.

4.3.3 Country of research

In accordance with Dumay et al. (2018), the country of research was added as the criterion C, meaning the first author's country based on the university as represented by six main categories: *USA/Canada*, *Australasia* (including Australia and New Zealand), *United Kingdom*, *European Union*, *Africa and Asia*. One last attribute is marked as *Other* and stands for countries that don't match any of the previously named categories, for example Saudi Arabia. The results show that the *USA/Canada* (C1) are represented with the highest number, 40 studies. Interestingly, the results from the citation analysis in Chapter 3.4 (Table 3) which show the Top 10 articles according to their citations, also show that all of these articles except one (Debreceeny et al., 2002) originate in the USA/Canada. One reason for this could be that the USA and Canada are much larger than for example the European Union or the United Kingdom, and so that could also have better access to the necessary data. Chapter 3.4 (Table 4) shows the Top 10 articles by citations per year (CPY), where the recently published articles have an equal chance to get a higher ranking, and indeed this list shows one article from Asia (De et al., 2020) as well as one from the United Kingdom (Dwivedi et al., 2020) and finally one from the European Union (Gomber et al., 2018). The articles by authors based in the USA/Canada as well as from other countries focus on the benefits and concerns of blockchain technology in accounting (Carrasco and Romi, 2021; Sheldon, 2018; Dai and Vasarhelyi,

2017), but also on the theory of accounting (Gietzmann and Grossetti, 2021) and the history of double entry accounting (Sangster, 2016), in order to provide a better overview of the topic as a whole. To understand the application of blockchain in accounting and what potential benefits it could bring or what specific area in accounting could be impacted by blockchain, the topic of financial reporting has been explored (Brooke et al., 2020), as well as general factors of improving accounting information quality (Biddle and Hilary, 2006) and eliminating information asymmetry (Akins et al., 2012). With regards to this criterion, most of the research comes from *Australasia* (C2) and the *European Union* (C4) with 20 studies each, as well as the *United Kingdom* (C3) with 21 papers. On the other hand, no papers have originated in *Africa* (C5) out of all 125 articles, and *Asia* (C6) only contributes 14 papers. One example that doesn't match any of the above-mentioned attributes and is therefore in the *Other* (C7) category, is an article written by Alsaqa et al. (2019) from Iraq, which analyzes the possibility of employing the blockchain technology in an accounting system and at the same time explores the potential impact of this technology on accounting. Another study's authors are based in Saudi Arabia, also represented by the category *Other* (C7). This article (Al-Htaybat et al., 2019) examines the implementation of new technologies in accounting as a potential path to sustainable development.

4.3.4 Focus of the literature

This chapter outlines the focus points of the literature primarily to gain insights into the topic of blockchain technology in accounting. These focus points are also important as a starting point for further investigations related to the topic. After analyzing the 125 articles which form the basis of the present research, this criterion is divided into seven main attributes which describe the literature's main focus areas, namely *Impact of blockchain technology on the accounting profession* (D1), *Opportunities and challenges of blockchain technology application in accounting* (D2), *Regulation of blockchain technology* (D3), *Accounting information quality* (D4), *Financial reporting* (D5), *Theory of accounting* (D6), *Other* (D7). The last attribute comprises all articles whose criteria don't match the first six attributes. The focus points of the studies are categorized as follows.

Impact of blockchain technology on accounting profession

6 articles deal with the influence of blockchain technology on the accountants. As an example, the most recently published article, by Abdennadher et al. (2022), explores the impact of this technology on the accountants and services in the United Arab Emirates (UAE).

The authors explain that blockchain is in the early stages of its development and call it the most significant disruptive technology after the internet, resulting in challenges as well as opportunities for the accounting profession and services. One of the reasons is that blockchain offers new opportunities for managing and presenting accounting information, thereby transforming the way companies perform their routine accounting activities. A consequence of these changes is that the accounting profession is likely to change or even disappear in the future. The analysis clearly shows that blockchain technology brings with it both benefits and risks to the accounting and auditing professions. One of the resulting benefits for accountants is the area of recording financial transactions, because the blockchain works as an open ledger system that makes transactions more effective and secure and could therefore be used by accountants as a tool for the authentication of transactions. Another benefit of blockchain for an accountant's work is the inability to change an already stored date in the ledger, which eliminates the need for reviewing results. Blockchain can serve as a new tool for eliminating fraudulent transactions, so that the accountant can concentrate on internal accounting activities. If any of the already booked transactions need to be changed, the accountant can create another block with a date field in the system, showing that the older transaction was wrong. What is also worth mentioning is that the blockchain technology offers to accountants well-structured financial data in a sample format. On the other hand, it completely replaces the existing evidence with paper-based documents with a system of no paper records as evidence. The result is that the only proof is the blockchain technology itself. The accounting records will be saved, but accountants will only control and compare the process of coding and mapping, or similar. With the implementation of this technology, there is also no need for the resort that controls the third party: "You can verify data recorded without having to refer back to third party, most of the data stored are time sampled (chronological order). Hence, the transactions made on the ledger can be tracked to the data or point of origin" (Internal auditor, Government, Energy sector). The innovative changes require skills and knowledge about the blockchain technology, which could pose a risk and concern for accountants who don't have this type of knowledge and whose work may become more challenging. Their jobs may even be redundant in the future (Adennadher et al., 2022). However, according to Garanina et al. (2021) – cited as an example of the findings from many studies - the role of accountants will not be fully replaced in the future; instead, it'll be changed into a "judgement role" that includes, for example, deciding which amortization and depreciation methods should be used or for how many years PPE would be depreciated. The general impact of blockchain

technology on accountants is dependent on its evolution, as Marrone and Hazelton point out (2019, p. 685):

“The disruptive potential of accounting technologies can only be fully realized with a similarly profound revolution in accounting thinking. Without an accompanying mental revolution new technologies may result in incremental as opposed to step change.” (Marrone and Hazelton, 2019, p.685).

Opportunities and challenges of blockchain application in accounting

The attribute *Opportunities and challenges of blockchain application in accounting* (D2) contributes to the research with 61 academic articles, the highest number of all the attributes. Most of these articles are written from the point of view of a company intending to use blockchain technology to increase their efficiency. As an example, research conducted by Alsaqa et al. (2019) shows the influence of blockchain technology on accounting information systems and the most important opportunities and challenges that this technology brings to accounting. The accounting information system is specifically impacted because of its open structure and so are the surroundings in which it works. That's why it's important to keep the accounting information systems running continuously, which can be achieved with blockchain technology. It also brings new innovative ways of storing, recording and processing accounting data. The study conducted by Maffei et al. (2021) shows that implementing this technology is an opportunity because of the transparency and constancy of the transactions which are controlled and which requires cryptographic code to ensure the reliability of the records. The implementation of blockchain changes the system of double-entry accounting to triple-entry accounting, where each transaction consists of the debit side, the credit side and a third entry, a cryptographic signature to prove that the transaction is valid. In the triple-entry system, blockchain acts as an intermediary that is neutral and contributes to secure accounting with a minimum of fraudulent transactions. It provides the opportunity to record financial transactions between two participants, for example bank payments or deposits. The whole process doesn't just depend on the cryptographic key, but also on control activities and the management required from accountants. Despite the fact that the accountants must control the blockchain-based transactions, it saves them time compared to traditional redundant daily recording. Therefore, blockchain provides the opportunity to replace time-consuming manual accounting with completely computer-automatized accounting, which protects the accounting environment primarily against human mistakes. As Dai and Vasarhelyi (2017) state, the key accountant's work changes from preparing financial statements to proving blockchain-based

transactions. The blockchain platform also offers the opportunity to trade with assets or properties through so-called smart contracts that identify the frame conditions and rules of the trade and create an independence from the main authorities, such as governance. The smart contracts can't be modified after they are published on the platform, which contributes to the security of the transactions and helps protect against manipulation (Carrasco and Romi, 2021).

Maffei et al. (2021) concentrate primarily on the risks and potential problems of implementing blockchain technology in accounting. The implementation of blockchain technology in accounting incurs high costs for the business, which is however necessary for coding automatic registrations in the system. On the other hand, it ensures savings in the long run. Because the accountants oversee the blockchain-based records, they need to first understand how the blockchain technology functions. This may present a challenge they need to face if they wish to keep their jobs (Maffei et al., 2021). This is also confirmed by Dai and Vasarhelyi (2017), who emphasize the technological complexity and financial investment around blockchain. Since businesses evolve over time, another necessary step is to keep the blockchain-based system updated, which might present a challenge, unlike pre-blockchain accounting systems which didn't require repeated updates. Garanina et al. (2021) highlight the challenge presented by context because the blockchain platform is open, which may cause disadvantages especially for small companies, since their results in financial statements may be not so attractive as by large companies.

Regulation of blockchain technology

Despite the fact that only 3 articles were found which deal with the regulation of blockchain technology and cryptoassets (Yeoh, 2017; Shermin, 2017; Zachariadis et al., 2019), the attribute *Regulation of blockchain technology* is likely to gain much attention in the future, primarily because of the critical issues and the fact that it could bring a potential disruption by reducing bureaucracy. The blockchain has been referred to as “money without banks, companies without managers, countries without politicians” (Shermin, 2017, p. 499). This might raise questions about the regulation of this technology, for example regarding transparency, privacy, security and how regulations could solve this issue. In more general terms, the question is how disruptive technologies such as blockchain can be regulated at all (Zachariadis et al., 2019). Garanina et al. (2021) review the current literature on this topic and confirm critical issues such as the “classification of cryptoassets in accounting” or the “regulation of potential money laundering via blockchain”. A further need for regulation of

the blockchain is explained in the study by Zachariadis et al. (2019), because of public blockchain's openness and lack of privacy as well as its accessibility to everyone because the public blockchain is defined by the possibility for everyone to access the platform in comparison to private blockchain, which prevents free access the platform. This issue could be solved by a tokenized design which would ensure privacy and prevent illicit activities. However, the control of the platform is not obligatory, which increases the risks in case the principle of immutability is broken. Besides, the regulation of public blockchain platforms is done on a separated basis, which causes additional issues because of the "lack of a central entity with formal responsibility over the system" (Zachariadis et al., 2019, p.19). For these reasons, the public blockchain is not suitable for accounting purposes. Instead, the private blockchain should be used, which prevents free access to the platform, which has been already mentioned in this subsection. The suggestions for further research in this area are discussed in Chapter 5.

4.3.5 Research method

Considering the next criterion, *Research method* (E), the authors of the articles in question use different research designs (qualitative and quantitative) or combine several types of methods. Therefore, this criterion is divided into 5 main attributes: *Case study/Field study/Interviews*, *Content analysis/Historical analysis/Other qualitative*, *Survey/Questionnaire/Other empirical*, *Literature review*, *Other*. The most applied method is the qualitative analysis (E2), with 57 papers. In second place are empirical studies (E3), with 28 papers, followed by literature reviews (E4) in third place, with 20 contributions. An example of a literature review is the research by Garanina et al. (2021), titled "Blockchain in accounting research: current trends and emerging topics" (Garanina et al., 2021, p.1), which explores the blockchain technology in accounting and offers an overview of the current literature on the topic. Helliard et al. (2020) contribute to the attribute case studies and interviews (E1) with a research divided into two parts. The first part describes interviews conducted in 2016 about the challenges and driving factors of blockchain technology, and the second part explores a case study about the blockchain used in the Italian wine industry.

4.3.6 Research questions and hypothesis

The criterion *Research questions and hypothesis* may be considered, not only for developing insights of the topic, but also together with the next criterion, *Limitations* (G), to try and answer the last research question about the propositions for future research and the limitations that could be relevant for them. This criterion is divided into the following attributes: *Provide research questions* (F1), *Provide hypothesis* (F2), *Provide research questions and hypothesis* (F3) and *Do not provide research questions or hypothesis* (F4). 55 of these articles don't provide either research questions or a hypothesis (F4). An example is a case study by Gaur (2020) concerning the challenges in relation to blockchain technology. In the other 54 papers in this category, research questions are developed (F1). One example, Dai and Vasarhelyi (2017), explore the following research question: “*What markets could receive the most benefits from the adoption of the blockchain-based accounting information system?*” (Dai and Vasarhelyi, 2017, p. 18) 15 academic papers contribute a hypothesis (F2) (e.g.: Akyildirim et al., 2020) and 1 provides both research questions and hypothesis (F3) (Masli et al., 2010). As this criterion helps to answer the third research question, it will also be discussed in Chapter 5.

4.3.7 Limitations

The last criterion, *Limitations* (G), is used to find the critique points of the topic in the literature and to help create suggestions for future research. It will be discussed in more detail in Chapter 5. After analyzing the articles, the following attributes are defined: *Theoretical limitations in research design* (G1), *Empirical limitations in research design* (G2), *Data or statistical limitations* (G3), *Limitations of blockchain technology* (G4) and *Limitations not provided* (G5). As shown in the results in the analytical framework in Chapter 3.5 (Table 5), there are 12 academic papers with theoretical limitations in research. An example is a study conducted by Sargent (2021) who highlights theoretical limitations (G1). Several other theoretical limitations are pointed out by Sangster (2016), who concentrates mainly on the development of double entry bookkeeping, rather than details about its use. Empirical limitations in research design (G2) are found in 12 academic articles, most of which concern the lack of insights into the practical employment of technology in accounting systems or the relationship between human and technology (Al-Htaybat et al., 2019). On the other side, 14 studies introduce data or statistical limitations in their research (G3), such as Perdana et al.

(2021). They use only sample data in their study, which means that the research is based only on the specified time period (2010 to 2018). Moreover, the data only contain English language popular news, whereas future authors could concentrate on other regions such as South Korea or China. There may also be other data limitations, as described by Biddle and Hilary (2006), that influence the results of the research, such as comparing only two countries in their cross-country study about blockchain technology.

Concerning critique of the key research topic in the relevant literature and so that the last part of the research question, the criterion *Limitations of blockchain technology* (G4) is added. Abdennadher et al. (2022) explore limitations and negative consequences of using blockchain technology in accounting, such as low flexibility and the inability to correct mistakes, which also confirms the auditor's statement: "Based on my knowledge, it is very difficult (if not impossible) to manipulate a blockchain transaction due to the decentralized approach of recording the transactions in different ledgers". In other words, the data added to the decentralized system can't be changed anymore. On the one hand, this means it's impossible to correct mistakes in the stored data, but on the other hand, this system prevents potential fraud. The other limitation that Abdennadher et al. (2022) describe in their study is the complexity of the decentralized system due to the verification system which blockchain technology brings with it. This means that every transaction requires a digital signature, which ensures a high security level but may slow down the system. In contrast, centralized systems boast faster performance but have lower security because there's no need to verify transactions. Another limitation is the high energy consumption which is associated with using blockchain technology.

Most of the studies fit the last criterion, with a total number of 57, showing no limitations in their research (G5) (Beatty et al., 2010; Gaur, 2020; Walsh et al., 2021).

5 Directions for future research

This chapter provides the answer to the last research question, RQ3: *What are the main trends that the research has identified, and what are the proposed research directions related to blockchain in accounting?* The main trends in the literature from Chapters 4.3.4 and 4.3.7 will be summarized with reference to the most cited articles, in order to determine recommendations for future research on this topic.

5.1 Impact of the blockchain technology on the accounting profession

The influence of this technology on the accountants is discussed in Chapter 4.3.4, with a particular emphasis on the benefits of implementing blockchain technology in accounting, for example the way of gathering data and how exactly this will optimize accountants' practices to ensure efficiency for companies. As mentioned in Chapter 4.3.4, Abdennadher et al. (2022) contribute to this topic with the one of the most recently published studies. Through their qualitative research, they offer a view from the accountants' and auditors' perspective on implementing blockchain technology in accounting after the government in the UAE agreed on a radical change: They concluded to convert one half of the government operations into a blockchain-based system by 2021. The study shows limitations that could be helpful to keep in mind with regards to future research. One of these limitations is that the research is based in the UAE and therefore only takes into consideration the results from this country. Besides, the study is based on a qualitative research design, so the resulting data can't be generalized. As a possible future research topic and a way to gain insights that can be generalized, a comparison with other countries could be attempted through a survey or questionnaire about companies' experiences with blockchain application in accounting or auditing (Abdennadher et al., 2022).

As mentioned in Chapter 4.3.4, the implementation of blockchain technology for accountants may be challenging, which causes concerns. A study conducted by Kend and Nguyen (2020) presents results from their empirical research, in which they questioned accountants and auditors about the impact of using the blockchain in the accounting profession in Australia. The expectations of the answers were positive but interestingly, skepticism dominates on the side of the participants, with many of them saying they were "confused" about the explanation for the potential of blockchain technology application in their profession and further influences of this technology. A major limitation that results from this study is therefore the insufficient clarification to accountants and auditors about the blockchain technology. Based on this, recommendations for future research include expanding the survey to countries other than Australia, and most importantly, to provide to future participants adequate information so that they clearly understand the benefits and risks of blockchain application in the accounting and auditing sphere. This will more likely lead to objective results.

Next to the influence of the technology on accountants Moll and Yigitbasioglu highlight the so-called "transactional reporting" as a suggestion for future research. It allows stakeholders, investors and regulatory bodies to see the financial results of the company, by having full or

partial access to the blockchain platform. The access level should depend on the personal need, which could lead to discrepancies in accounting rules and standards, so it deserves attention. Moll and Yigitbasioglu (2019) argue that blockchain is at an early stage of its development and further investigations regarding its implementation in accounting are needed.

5.2 Opportunities and challenges of blockchain application in accounting

According to the citations per year index (CPY) mentioned in Chapter 3.4, Yermack's study (2021) has the highest number of citations and presents the potential influence of blockchain technology on corporate governance, calling it a system in accounting that controls and directs businesses. This topic seems to be very relevant for future research because the implementation of blockchain in corporate governance may influence holders and directors of publicly held firms in significant ways or even replace the existing system. The study provides the point of view of investors and corporate managers and discusses internal affairs of governance that may be influenced by this technology. Yermack (2021) also states that blockchains „offer a new way of creating exchanging, and tracking the ownership of financial assets on a peer-to-peer basis. Major stock exchanges are exploring the use of blockchains to register and trade shares of stock issues by corporations.” (Yermack, 2021, p. 1). For companies, this could mean a new way of listing, trading and voting for their shares, as well as advantages for stockholders in the shape of lower trading costs, increasing the speed of the process of ownership, precise recording and transparent processes. Since this topic is represented by only one study, it deserves more attention in the future.

Alsaqa et al. (2019) present the barriers to the implementation of blockchain technology in companies, such as the openness of the blockchain platform and the resulting lack of privacy. However, they also highlight the inability of blockchain to verify financial operations to 100 %, so that accountants will always be responsible for controlling transactions and eliminating accounting mistakes, which in the end makes blockchain a technology that is dependent on accountants' work. Future research should concentrate on ways to reduce the potential barriers, challenges and limitations of blockchain technology in accounting, rather than only describing them, and most importantly, it should focus on finding ways to create a self-managed tool with this technology (Alsaqa et al., 2019).

One study concerned with finding potential solutions to challenges connected with the implementation of blockchain technology in accounting, was conducted by Wang and Kogan

(2018). They underline that privacy and security should not be risks or barriers to the technology, they should instead be key to its successful adaptation. To overcome the problems with the openness of blockchain based systems and prevent access to the history of transactions, the authors suggest introducing encryption to the technology. This means that the history of all operations could only be viewed by authorized users. However, this solution also poses new challenges, as Wang and Kogan point out: “How can the public verify or confirm a transaction if the transaction details are unknown?” Therefore, privacy and security challenges should be a focus of future research.

5.3 Regulation of blockchain technology

Contributing to the successful further development should be the focus of further research on the regulation of blockchain technology. There are many questions that need to be answered, primarily regarding the way disruptive technologies such as blockchain could be regulated and how to create a legal structure for accounting and for valuing cryptoassets. The regulation of blockchain technology and cryptoassets seems to be a relatively unexplored topic that deserves more attention in the future. This further research could also investigate whether blockchain technology will impact - or already has impacted - the timeliness of disclosure in positive ways. Generally, the focus of further studies on regulation could contribute to alleviating the concerns and doubts about using these technologies, because according to Garanina et al. (2021), especially a legal structure and centralized regulation system would help with the successful development of blockchain technology.

6 Conclusion

The main goal of the present thesis was to identify the key insights on the topic of blockchain application in the accounting environment as discussed in academic literature. The literature review methodology helped to provide answers to the three main research questions through the analysis of 125 academic articles on this topic. By following the strictly defined principles of the structured literature review methodology, which consists of pre-defined steps described by Massaro et al. (2016), an overview of the current state of the development of blockchain technology in accounting was provided. The main insights into the current literature were presented and discussed.

The answer to the first research question, *What is the current state of the research regarding blockchain technology in the accounting system?*, necessitated an analysis of academic articles with a strong focus on the application of blockchain technology in accounting. The sheer volume of articles related to this topic can be expected to increase further in the future.

Investigating the second research question, *What is the focus and critique of the key research topic?*, showed that the most discussed areas of blockchain application in accounting are the impact of the blockchain technology on the accounting profession, the opportunities and challenges associated with it, as well as the regulation of blockchain technology.

Research related to the third question, *What are the main trends that the research has identified, and what are the proposed research directions related to blockchain in accounting?*, identified possible paths for further research. Analyzing the relevant literature showed that accountants and auditors have insufficient information about the blockchain, so one of the proposed research directions is to expand the survey about the application of blockchain to more countries and to provide future participants with adequate information so that they clearly understand the benefits and risks of blockchain application in the accounting and auditing sphere. In relevant literature are presented the barriers to the implementation of blockchain technology in companies, such as the openness of the blockchain and the resulting lack of privacy. The literature highlights the inability of blockchain to verify financial operations to 100 %, so that accountants will always be responsible for controlling transactions and eliminating accounting mistakes, which in the end makes blockchain a technology that is dependent on accountants' work. Future research should concentrate on ways to reduce the potential barriers, challenges and limitations of blockchain technology in accounting, rather than only describing them, and most importantly, it should focus on findings ways to create a self-managed tool with this technology.

The final proposed direction is the regulation of blockchain technology and crypto assets that may contribute to the reduction of doubts and concerns about implementing blockchain in accounting and to its successful development.

6.1 Limitations

In the present paper, a few limitations apply. The first concerns the time period of the covered studies, which ends in March 2022 and could serve as potential direction for further research to extend this period. The second limitation is that only articles were used that are ranked in the Academic Journal Guide 2021. This establishes other possibilities for future research, which could broaden the pool of literature to include academic magazines or library books on the topic. As a next limitation, only articles published in English were considered. Future studies could potentially include articles published in foreign languages such as German, which may increase the number of relevant articles. Finally, the literature review methodology that according to Massaro et al. (2019) provides a valid outcome only at the time of the analysis, may be seen as another limitation of this study, because it is only relevant at a certain point in time.

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