

Blockchain-based auditing, effectiveness for accounts receivables and compliance gaps towards
relevant audit standard AU-C 505

Markus G. Selg

EBU European Business University

Hitzkofer Str. 42, 72517 Sigmaringendorf, Germany

Mobile: +49 172 2198010

EBU European Business University, Rue du Château, 9516 Wiltz, Luxemburg

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Abstract

Digitalization provides challenges for audit firms to adapt automated audit and advisory services. This article deals with the suitability of blockchain technology to perform regular external audits of financial statements. The potential of the blockchain in auditing is researched by analyzing, if the balance sheet positions of accounts receivables and the blockchain technology are suitable to eliminate weaknesses of traditional substantive auditing procedures that require external confirmations. Later, it is evaluated if blockchain-based auditing complies with the GAAS standard AU-C 505 “External Confirmations” that rules manual procedures or if new audit standards have to be codified. Based on a qualitative study, the literature research findings are verified by collecting primary data through interviews. The blockchain technology is highly efficient and effective. At the same time, audit firms must refine their business models, and auditors must rethink their role in a future blockchain-based audit environment. In contrast, adequate audit standards must be codified for auditing accounts receivable.

Key words: Blockchains, Effectiveness, Technology, US GAAS

Introduction / Overview of the Research

This article evaluates, if the blockchain technology constitutes an appropriate tool for business purposes¹. Furthermore, the study is analyzing if it is able to enhance audit procedures². Special focus lies on the analysis of blockchain-based auditing towards the balance sheet position accounts receivable³. Research is performed, if blockchain-based audits are able to compensate drawbacks of traditional audit procedures, that are work and cost intensive, and not even cover all relevant accounting data⁴. A further problem is analyzing, if blockchain-based audits comply with the requirements of the General Accepted Auditing Standards (GAAS) framework⁵.

Dai and Vasarhely (2017) provided an early discussion on the blockchain technology, how it could enable a transparent verifiable accounting ecosystem under real-time conditions⁶. According to Dai and Vasarhely (2017), the blockchain technology empowers the potential to disrupt contemporary substantive auditing procedures by an automatic audit approach⁷. Bonsón and Bednárová (2019) outlined, that technological developments such as the blockchain technology have the power to change our business and social life over a time-span of decades, by providing insight into the functionality of the blockchain technology and its potential impacts on auditing and accounting⁸. The innovation of smart contracts for blockchain systems, that enable automated transactions on the blockchain, when pre-defined rules are met, are prescribed by Rozario and Thomas in the year 2019⁹. In addition to smart contracts, smart audit procedures enable automated audit procedures, that enhance the effectiveness audit procedures and their results¹⁰. External audits by blockchains aim to improve the audit quality and reliability¹¹. Vincent et al. (2020) outlined specific requirements for blockchain architecture, thus it is enabling auditors to leverage this technology to provide high quality audit and assurance services¹².

Potentials of Blockchains for Auditing

The emerging blockchain technology has the potential to disrupt and to overcome weaknesses of the traditional auditing procedures, by enabling permanent auditing procedures

¹ R Kumar, Research methodology: A step-by-step guide for beginners (2019).

² Z Barandi et al., Impact of the Blockchain Technology on the Continuous Auditing: Mediation Role of Transaction Cost Theory (2020) 206-212.

³ R Lombardi et al., The disruption of blockchain in auditing—a systematic literature review and an agenda for future research (2021).

⁴ R Lombardi et al., The disruption of blockchain in auditing—a systematic literature review and an agenda for future research (2021).

⁵ American Institute of Certified Public Accountants (AICPA), Generally Accepted Auditing Standards. AU-C Section 150 (2001)

⁶ J Dai and MA Vasarhelyi, Toward blockchain-based accounting and assurance (2017).

⁷ J Dai and MA Vasarhelyi, Toward blockchain-based accounting and assurance (2017).

⁸ E Bonsón and M Bednárová, Blockchain and its implications for accounting and auditing (2019).

⁹ AM Rozario and C Thomas, Reengineering the audit with blockchain and smart contracts (2019).

¹⁰ AM Rozario and C Thomas, Reengineering the audit with blockchain and smart contracts (2019).

¹¹ AM Rozario and C Thomas, Reengineering the audit with blockchain and smart contracts (2019).

¹² NE Vincent et al., Blockchain architecture: A design that helps CPA firms leverage the technology (2020).

almost in real-time based on automated tools for data analysis with direct access on all relevant data, while transactions are authorized by all nodes, are immutable and traceable¹³. Furthermore, blockchains require an appropriate architecture as amendment to existing ERP systems, that is based on a decentralized peer-to-peer network of servers, respective nodes¹⁴. By application of blockchains, accounting is enhancing to a triple accounting system, a digitally signed receipt serves as a medium to perform the mutual authorization of transactions and to verify that the transaction has been performed as specified upfront to avoid fraud on the transaction, and to reduce any redundancies in bookkeeping¹⁵. Audit procedures based on a federated blockchain with a zero-knowledge proof protocol that provide the potential to facilitate a collaborative auditing and cross-party verification, in an economic environment in which auditors take fees to compete for clients, whereby clients determine the level of misstatement in anticipation of the auditing intensity¹⁶. In a distributed ledger, these authorization and verification are fulfilled by a group of peers, whereas no central authority is required¹⁷.

Smart contracts provide the potential of replacing a trusted third-party auditor by testing autonomous approval processes¹⁸. Smart contracts depict computer codes that are stored on a blockchain with the purpose to execute transactions under pre-defined conditions, without human interventions¹⁹. Concerning accounts receivable, the smart contract provides information for the buyer, and furthermore about the quality and the location of the ordered goods²⁰. If a contract is settled, the goods are delivered, and the supplier records accounts receivable until the payment is transferred²¹. In the blockchain, the supplier and the buyer use the same base, while inefficiencies toward the reconciliation of accounts or the request for paper-based or electronic confirmations will become obsolete²². Auditing on the blockchain is performed by smart audit procedures, that are designed to perform autonomous audit activities that include autonomous tests of internal controls and performing of autonomous analytical procedures²³.

Problems and downfalls of Blockchains

A critical issue towards a wider adoption of the blockchain technology lies in the requirement of sufficient and appropriate training for auditors and their staff to enable them to

¹³ R Lombardi et al., The disruption of blockchain in auditing—a systematic literature review and an agenda for future research (2021).

¹⁴ NE Vincent et al., Blockchain architecture: A design that helps CPA firms leverage the technology (2020).

¹⁵ CW Cai, Triple - entry accounting with blockchain: How far have we come? (2021).

¹⁶ S Cao et al., Auditing and blockchains: Pricing, misstatements, and regulation (2018).

¹⁷ Deloitte An internal auditor's guide to blockchain: Blurring the line between physical and digital (2019).

¹⁸ K Fan et al., Decentralized, reliable and efficient remote outsourced data auditing scheme with blockchain smart contract for industrial IoT (2020).

¹⁹ AICPA and CPA Canada, Blockchain technology and its potential impact on the audit and assurance profession (2017).

²⁰ AM Rozario and MA Vasarhelyi, Auditing with Smart Contracts (2018).

²¹ AM Rozario and MA Vasarhelyi, Auditing with Smart Contracts (2018).

²² Deloitte, Operational finance with business blockchains (2020).

²³ AM Rozario and MA Vasarhelyi, Auditing with Smart Contracts (2018).

apply the blockchain appropriately²⁴. Further issues concern the interoperability among different blockchains, as a key feature for the functioning of the blockchain technology²⁵. In the existing blockchain systems, the need for interoperability was hardly considered by the developers²⁶. Auditing of transactions in a blockchain does not guarantee that accounting based on the blockchain assures reliable financial reporting, as agreed and verified transactions on the blockchain could be based on fraudulent agreements, misleading transactions or by omission of transactions²⁷. Thus, blockchains require effective internal controls that ensure the integrity and completeness of data²⁸. As data in the blockchain do not assure the reliability of a company's financial reporting, the effectiveness of the internal controls that are surrounding the blockchain has to be tested by auditors²⁹. The focus of auditors when auditing of accounts receivable e.g. will no longer be on testing of transactions directly, but on the testing of the internal controls to obtain the appropriate assurance, that the recorded transactions on the blockchain are reliable and accurate³⁰.

The use of blockchain technology and the emergence of new blockchain-based techniques and procedures are placing new demands on both the role and skills of CPA auditors³¹. To cope with new techniques and requirements, auditors must acquire new sets of technical and IT skills for auditing of blockchains³². CPAs must learn a technical programming language and study the main functions of a blockchain system³³. Due to the mere automated audit procedures, some substantive audit procedures towards the testing of transactions will be replaced by smart contracts³⁴.

There are many questions that arise when dealing with the blockchain auditing:

1. How must blockchain technology be implemented and designed to serve as a suitable progressive tool to perform independent and independent audits?
2. How can blockchain technology be designed to audit the balance sheet positions of accounts receivables to be more effective than traditional substantive auditing procedures, in which external confirmations become obsolete?

²⁴ E Pimentel et al., Systematizing the Challenges of Blockchain-Based Assets (2020).

²⁵ R Belchior et al., A survey on blockchain interoperability: Past, present, and future trends (2021).

²⁶ R Belchior et al., A survey on blockchain interoperability: Past, present, and future trends (2021).

²⁷ AICPA and CPA Canada, Blockchain technology and its potential impact on the audit and assurance profession (2017).

²⁸ M Liu et al., How will blockchain technology impact auditing and accounting: Permissionless versus permissioned blockchain (2019).

²⁹ M Liu et al., How will blockchain technology impact auditing and accounting: Permissionless versus permissioned blockchain (2019).

³⁰ M Liu et al., How will blockchain technology impact auditing and accounting: Permissionless versus permissioned blockchain (2019).

³¹ K Black, Perspectives. Blockchain and its potential impact on the audit profession. New challenges and opportunities for audit and assurance (2021).

³² N Farcane and D Deliu, Stakes and Challenges Regarding the Financial Auditor's Activity in the Blockchain Era (2020).

³³ N Farcane and D Deliu, Stakes and Challenges Regarding the Financial Auditor's Activity in the Blockchain Era (2020).

³⁴ K Fan et al., Decentralized, reliable and efficient remote outsourced data auditing scheme with blockchain smart contract for industrial IoT (2020).

3. Is blockchain-based auditing towards accounts receivable compliant with the codified GAAS standard AU-C 505, which regulates external confirmations?
4. Are any amendments towards AU-C 505 required?

The main research objectives³⁵ of the doctoral thesis are to determine the characteristics of the blockchain technology, to analyze the suitability and appropriateness of blockchains for auditing purposes³⁶, to verify the superiority of blockchain-based auditing of accounts receivable in contrast to manual audit procedures³⁷ and to identify the regulatory gap of the current GAAS regulation under AU-C 505 for blockchain-based audits of accounts receivable³⁸.

Theoretical Framework of Auditing and Blockchain

Auditing with blockchains is related to the topic of business and finance³⁹. The sub-topic of the research is the area of accounting. Businesses require accounting systems to collect and process the financial information of their business⁴⁰. The Generally Accepted Accounting Principles (GAAP) determine rules and regulations for financial statements⁴¹. GAAP rule the recognition and presentation of financial information⁴². Financial statements that consist of balance sheet, income statement, statement of cash flows, and statement of retained earnings are prepared quarterly or annually⁴³. To ensure the accuracy of the financial information, companies establish an internal control system to monitor accounting related processes⁴⁴. The sub-sub-topic is the area of auditing. To confirm the orderly and correctness of financial statements and the internal controls, companies engage auditors⁴⁵.

GAAS that constitute the theoretical framework of blockchain based auditing, are consisting of General Standards, Standards of Fieldwork and Standards of Reporting in the AU Section 150⁴⁶. GAAS are a set of systematic principles and guidelines, that have to be followed by

³⁵ R Kumar, *Research methodology: A step-by-step guide for beginners* (2019).

³⁶ K Black, *Perspectives. Blockchain and its potential impact on the audit profession. New challenges and opportunities for audit and assurance* (2021).

³⁷ R Lombardi et al., *The disruption of blockchain in auditing—a systematic literature review and an agenda for future research* (2021).

³⁸ American Institute of Certified Public Accountants (AICPA), *External Confirmations. AU-C Section 505* (2012).

³⁹ JR Varma, *Blockchain in finance* (2019).

⁴⁰ R Libby et al., *Financial accounting* (2014).

⁴¹ JM Flood, *Wiley Practitioner's Guide to GAAS 2021: Covering all SASs, SSAEs, SSARSs, and Interpretations* (2021).

⁴² JM Flood, *Wiley Practitioner's Guide to GAAS 2021: Covering all SASs, SSAEs, SSARSs, and Interpretations* (2021).

⁴³ CS Warren et al., *Financial accounting* (2020).

⁴⁴ K Chalmers et al., *Internal control in accounting research: A review* (2018).

⁴⁵ R Libby et al., *Financial accounting* (2014).

⁴⁶ American Institute of Certified Public Accountants (AICPA), *Generally Accepted Auditing Standards. AU-C Section 150* (2001)

auditors in general, when performing audits of financial statements⁴⁷. The framework for auditing of accounts receivables is codified under GAAS standard AU-C 505⁴⁸.

Blockchains consist of decentralized frameworks⁴⁹. They are based on a software solution that simplifies the development, provision and the support of technically complex products⁵⁰. The framework includes the infrastructure and the libraries as basis to develop the relevant application⁵¹. The network infrastructure consists of the nodes and the software that runs on them on a peer-to-peer structure⁵². The software provides functions and capabilities such as user identity, transaction details, or the consensus protocol, and controls the identity management for blockchains⁵³. The client application interacts with the infrastructure, and serves as an interface outside, and consists of the code⁵⁴, that runs a smart contract⁵⁵.

The theoretical framework of the dissertation consists of the blockchain as technical infrastructure and basis⁵⁶, and the GAAS standards that regulate auditing procedures under GAAS⁵⁷.

Main contributions of the research/research gaps

The value of the research is to eliminate the weakness of current audit procedures in general and in particular towards audit of accounts receivable. The purpose of the research approach is adding knowledge to the academic body, guidance for audit firms how to implement and operate blockchain-based auditing, to outline the efficiency of blockchain-based auditing towards accounts receivables for auditing firms and to provide information for standard setters concerning regulatory gaps by blockchain-based auditing. The research gap of the article refers to the lack of regulation concerning blockchain-based auditing towards accounts receivable, as the audit standard under GAAS AU-C 505 “External confirmations” that is relevant for auditing of accounts receivable, is

⁴⁷ JM Flood, Wiley Practitioner's Guide to GAAS 2021: Covering all SASs, SSAEs, SSARSs, and Interpretations (2021).

⁴⁸ JM Flood, Wiley Practitioner's Guide to GAAS 2021: Covering all SASs, SSAEs, SSARSs, and Interpretations (2021).

⁴⁹ D Puthal et al., The blockchain as a decentralized security framework [future directions] (2018), 18-21.

⁵⁰ E Tarasenko, Best blockchain frameworks you should know about (2019).

⁵¹ MT Quasim et al., Blockchain Frameworks. In Decentralised internet of things (2020) 75-89.

⁵² O Attia et al., An IoT-blockchain architecture based on hyperledger framework for health care monitoring application. In NTMS 2019-10th IFIP International Conference on New Technologies, Mobility and Security (2019) 1-5.

⁵³ M Raikwar et al., A blockchain framework for insurance processes. In 2018 9th IFIP International Conference on New Technologies, Mobility and Security (NTMS) (2018) 1-4.

⁵⁴ MT Quasim et al., Blockchain Frameworks. In Decentralised internet of things (2020) 75-89.

⁵⁵ O Attia et al., An IoT-blockchain architecture based on hyperledger framework for health care monitoring application. In NTMS 2019-10th IFIP International Conference on New Technologies, Mobility and Security (2019) 1-5.

⁵⁶ E Tarasenko, Best blockchain frameworks you should know about (2019).

⁵⁷ American Institute of Certified Public Accountants (AICPA), Generally Accepted Auditing Standards. AU-C Section 150 (2001)

concerning purely manual audit procedures^{58;59}. As a conclusion, new sets or modified audit standards are required for auditing of accounts receivable⁶⁰.

Conceptual Background of the Study / Literature Review

The positioning of the research in the field of study

Auditing with blockchains is related to the topic of business and finance⁶¹. The sub-topic of the research is the area of accounting. Businesses require accounting systems to collect and process the financial information of their business⁶². The Generally Accepted Accounting Principles (GAAP) determine rules and regulations for financial statements⁶³. GAAP rule the recognition and presentation of financial information⁶⁴. Financial statements that consist of balance sheet, income statement, statement of cash flows, and statement of retained earnings are prepared quarterly or annually⁶⁵. To ensure the accuracy of the financial information, companies establish an internal control system to monitor accounting related processes⁶⁶. The sub-sub-topic is the area of auditing. To confirm the orderly and correctness of financial statements and the internal controls, companies engage auditors⁶⁷.

Research Design and Methods / Methodology

Methodological qualitative approach

Suitable research methodologies follow the model of Saunders' research onion⁶⁸. The philosophy of the research can be based on the theory of positivism, as it enables the researcher to operate in an observable social reality in order to generate law-like generalizations and to produce unambiguous and accurate knowledge⁶⁹. The collection of data shall be performed by an induction to explore the blockchain technology as phenomenon by the identification of themes and patterns with the purpose to create a conceptual framework⁷⁰. The methodological approach may be performed as qualitative research to establish theories, search for patterns or theories out of special

⁵⁸ American Institute of Certified Public Accountants (AICPA), External Confirmations. AU-C Section 505 (2012).

⁵⁹ JM Flood, Wiley Practitioner's Guide to GAAS 2021: Covering all SASs, SSAEs, SSARSs, and Interpretations (2021).

⁶⁰ JL Alarcon and C Ng, Blockchain and the Future of Accounting (2018).

⁶¹ JR Varma, Blockchain in finance (2019).

⁶² R Libby et al., Financial accounting (2014).

⁶³ JM Flood, Wiley Practitioner's Guide to GAAS 2021: Covering all SASs, SSAEs, SSARSs, and Interpretations (2021).

⁶⁴ JM Flood, Wiley Practitioner's Guide to GAAS 2021: Covering all SASs, SSAEs, SSARSs, and Interpretations (2021).

⁶⁵ CS Warren et al., Financial accounting (2020).

⁶⁶ K Chalmers et al., Internal control in accounting research: A review (2018).

⁶⁷ R Libby et al., Financial accounting (2014).

⁶⁸ M Saunders et al., Research methods for business students (2019).

⁶⁹ M Saunders et al., Research methods for business students (2019).

⁷⁰ M Saunders et al., Research methods for business students (2019).

themes or categories, and analysis of data from special themes or categories⁷¹. A qualitative research is most suitable for the research project, as it involves various approaches to investigate a specific subject, to identify relevant characteristics of this subject in order to make an objective judgment about the subject without adopting a subjective point of view of the researcher⁷². An appropriate research strategy follows an ethnography, a form of field research that seeks to learn the culture of a particular setting or environment, while it relies on researcher's observation through field work as semi-structured interviews⁷³.

Research Data

The evidence to support the findings and conclusions, as well as the need to research the problem and the literature gap may be obtained by the research of primary and secondary sources⁷⁴. The literature research can be based on a qualitative study by researching secondary data in form of articles in renowned journals that are providing an appropriate way to examine the requirement for blockchain-based audits, publications from BIG four accounting firms, audit standards and publications from standard setting bodies AICPA and Accounting Standards Board (ASB)⁷⁵. Secondary data is based on information that has been collected by other researchers and is been provided again for other researchers to make use of it⁷⁶. Secondary data is not static over time⁷⁷. Potentially, new sources are created while former common sources of content will be obsolete by time, as survey data may be outdated before it is published and available for other researchers⁷⁸. The sources for secondary data can be extracted from public available sources⁷⁹. Secondary data provides researchers with a wide range of information available to conduct their own research on primary data based on proven and reliable materials⁸⁰.

The main advantages of secondary analysis in research are the cost-effectiveness and the convenience of collecting data and information⁸¹. Secondary data from academic journals and papers are peer-reviews in general⁸². Secondary data is a valid tool to elaborate potential relationships between variables under research⁸³. The importance of secondary data is to create a context for the primary data that is collected after performing the literature research, thus, the researcher is enabled to compare the results of the own research with research results of other researchers and authors⁸⁴. Disadvantages regarding secondary data are found in a lack of

⁷¹ JW Creswell and JD Creswell, *Research design: Qualitative, quantitative, and mixed methods approaches* (2018).

⁷² R Kumar, *Research methodology: A step-by-step guide for beginners* (2019).

⁷³ M Saunders et al., *Research methods for business students* (2019).

⁷⁴ JW Creswell and JD Creswell, *Research design: Qualitative, quantitative, and mixed methods approaches* (2018).

⁷⁵ JW Creswell and JD Creswell, *Research design: Qualitative, quantitative, and mixed methods approaches* (2018).

⁷⁶ G Clark, *G. Secondary data* (2005).

⁷⁷ G Clark, *G. Secondary data* (2005).

⁷⁸ MP Johnston, M. P. *Secondary data analysis: A method of which the time has come* (2017).

⁷⁹ MP Johnston, M. P. *Secondary data analysis: A method of which the time has come* (2017).

⁸⁰ G Clark, *G. Secondary data* (2005).

⁸¹ E Smith, *Using secondary data in educational and social research* (2008).

⁸² I Bouchrika, *Primary Research vs Secondary Research: Definitions, Differences, and Examples* (2021).

⁸³ M Saunders et al., *Research methods for business students* (2019).

⁸⁴ G Clark, *G. Secondary data* (2005).

customizability and potential bias of its researchers as the data was collected with priorities of these researchers⁸⁵.

Primary data can be characterized as original data or information that is being collected directly by the researcher⁸⁶. Primary data can be collected by a direct research approach for the specific purpose to perform a particular research project⁸⁷. Primary research aims to answer questions that have not previously been answered or even asked, while the degree of originality differentiates primary research from secondary research⁸⁸. Primary data can be collected by the researcher by performing a specific plan that is based on a questionnaire with the intention to verify the statements detected from the research of secondary data⁸⁹. The procedures for collecting of primary data address the design of the questionnaire, and suitable sampling methods⁹⁰. Furthermore, the collection of primary data is related to the underlying research questions of the doctoral thesis⁹¹. The results of the literature research are evaluated with the results of interviews⁹² with an appropriate number of auditors that provide sufficient experience with IT-related audits and the impact of the blockchain technology on the audit profession and the role of the auditor.

Techniques of analysis

Literature review and semi-structured interviews are among the most commonly used forms of qualitative research⁹³. Data analysis may be performed by tools as Atlas.ti for the literature review, and by MAXQDA towards the interviews⁹⁴. Data from the literature review is analyzed by a content analysis to classify the data, whereby Atlas.ti is searching for particular texts, where the relevant topic appears⁹⁵. A suitable analysis of the interviews can be performed by a narrative analysis⁹⁶. The results of the interviews are documented, checked and analyzed and compared with the results of the literature review for verification⁹⁷. The process of data analysis towards the literature review and the interviews can be done by coding⁹⁸, while data is being extracted and sorted⁹⁹. Coding allows comparisons with other segments of data¹⁰⁰. A first-order analysis shows similarities or differences between the different aspects¹⁰¹. It serves to identify

⁸⁵ I Bouchrika, Primary Research vs Secondary Research: Definitions, Differences, and Examples (2021).

⁸⁶ S Valcheva, Primary Data VS Secondary Data (2022).

⁸⁷ S Valcheva, Primary Data VS Secondary Data (2022).

⁸⁸ I Bouchrika, Primary Research vs Secondary Research: Definitions, Differences, and Examples (2021).

⁸⁹ G Clark, G. Secondary data (2005).

⁹⁰ G Clark, G. Secondary data (2005).

⁹¹ G Clark, G. Secondary data (2005).

⁹² JW Creswell and JD Creswell, Research design: Qualitative, quantitative, and mixed methods approaches (2018).

⁹³ HK Mohajan, H. K. Qualitative research methodology in social sciences and related subjects (2018).

⁹⁴ N Kalpokas and I Radivojevic, Bridging the gap between methodology and qualitative data analysis software: A practical guide for educators and qualitative researchers (2021).

⁹⁵ R Kumar, Research methodology: A step-by-step guide for beginners (2019).

⁹⁶ M Saunders et al., Research methods for business students (2019).

⁹⁷ M Saunders et al., Research methods for business students (2019).

⁹⁸ B Smit and V Scherman, Computer-Assisted Qualitative Data Analysis Software for Scoping Reviews: A Case of ATLAS. ti (2021).

⁹⁹ S Friese, Analyzing Data. Atlasti.Com. (2022).

¹⁰⁰ S Friese, Analyzing Data. Atlasti.Com. (2022).

¹⁰¹ DA Gioia et al., Seeking qualitative rigor in inductive research: Notes on the Gioia methodology (2013).

patterns in the data to clarify the research questions and the reviewed literature¹⁰². Similarities between data are identified by second-order themes¹⁰³. Finally, different motivational drivers are grouped into aggregated dimensions¹⁰⁴.

Discussion

Key findings

The introduction of blockchain technology in the audit area leads to increased efficiency during the audit process, as the existing information has a higher degree of verifiability due to the blockchain-specific controls and mechanisms¹⁰⁵. Another advantage of the blockchain is the reduction of the audit risk¹⁰⁶. Transactions are continuously recorded in the blockchain¹⁰⁷. A complete audit trail and a history of articles for these transactions can be generated from this¹⁰⁸. Documents can even be shared and made available among related parties for cross-validation¹⁰⁹. The greatest advantage of blockchain technology lies in the establishment of smart contracts¹¹⁰. Smart contracts are computer codes stored in the blockchain that carry out predefined actions under certain conditions and criteria¹¹¹. By applying smart contracts, manual tasks can be automated, which can result in an improvement in the speed, accuracy and cost efficiency of accounting-relevant transactions in accounting but also and can serve in auditing as a basis for smart audit procedures or the independent analysis of audit evidence¹¹². With smart audit procedures, fictitious, unauthorized or incorrect sales contracts can be distinguished from actual sales contracts¹¹³. Since transactions in the blockchain are recorded automatically, encrypted and unchangeable, it is already expected that they will become the source of truth or auditing and accounting purposes¹¹⁴.

Traditional audits do not carry out a full audit but pursue a risk-oriented audit approach based on a selected random sample, where such an audit approach can only offer sufficient certainty, but not an absolute guarantee¹¹⁵. In the blockchain system are the above problems and risks solved¹¹⁶.

¹⁰² HK Mohajan, H. K. Qualitative research methodology in social sciences and related subjects (2018).

¹⁰³ J Löher, MATCHING FOUNDERS AND FUNDERS IN EQUITY CROWDFUNDING (2019).

¹⁰⁴ J Löher, MATCHING FOUNDERS AND FUNDERS IN EQUITY CROWDFUNDING (2019).

¹⁰⁵ D Bonyuet, Overview and impact of blockchain on auditing (2020).

¹⁰⁶ C Cheng and Q Huang, Exploration on the Application of Blockchain Audit (2019).

¹⁰⁷ D Bonyuet, Overview and impact of blockchain on auditing (2020).

¹⁰⁸ D Bonyuet, Overview and impact of blockchain on auditing (2020).

¹⁰⁹ J Dai and MA Vasarhelyi, Toward blockchain-based accounting and assurance (2017).

¹¹⁰ D Bonyuet, Overview and impact of blockchain on auditing (2020).

¹¹¹ I Bouchrika, Primary Research vs Secondary Research: Definitions, Differences, and Examples (2021).

¹¹² D Bonyuet, Overview and impact of blockchain on auditing (2020).

¹¹³ AM Rozario and MA Vasarhelyi, Auditing with Smart Contracts (2018).

¹¹⁴ D Appelbaum and S Smith, Blockchain basics and hands-on guidance (2018).

¹¹⁵ C Cheng and Q Huang, Exploration on the Application of Blockchain Audit (2019).

¹¹⁶ C Cheng and Q Huang, Exploration on the Application of Blockchain Audit (2019).

As data in the blockchain do not assure the reliability of a company's financial reporting, the effectiveness of the internal controls that are surrounding the blockchain has to be tested by auditors¹¹⁷. When auditors examine a specific blockchain, they have to consider the blockchain code quality, any protocol changes, and the power allocation among the blockchain peers¹¹⁸. The focus of auditors when auditing of accounts receivable e.g. will no longer be on the testing of transactions directly, but on the testing of the internal controls to obtain the appropriate assurance, that the recorded transactions on the blockchain are reliable and accurate¹¹⁹. While previously the occurrence of a transaction had to be confirmed, no further evidence of the nature of such a transaction would be required once it was added to the blockchain network¹²⁰. Obtaining external confirmations is no longer required in the blockchain system, which is all financial information has been verified by other nodes, and the data is verifiable and irreversibly stored in the blockchain¹²¹.

Auditors can fully trust the financial data of the blockchain, thereby reduce many unnecessary auditing procedures and shorten the audit time, which significantly reduces the personnel costs and the resources that are required to check the reliability of the financial information¹²².

Main propositions supported by the literature

Below is an overview on the main propositions of the literature review:

1. Blockchains improve traditional audit procedures¹²³.
2. Unless a majority of the users of the blockchain collude, transactions are basically immutable¹²⁴.
3. Auditors require effective and reliable tools that offer the necessary and expected level of security in the course of their audit activities¹²⁵.
4. The blockchain technology offers a more transparent and safer way to operate the companies' business data¹²⁶.
5. Risks of incorrect financial data are significantly reduced, as incorrectly entered data will not be approved by other nodes¹²⁷.

¹¹⁷ M Liu et al., How will blockchain technology impact auditing and accounting: Permissionless versus permissioned blockchain (2019).

¹¹⁸ M Liu et al., How will blockchain technology impact auditing and accounting: Permissionless versus permissioned blockchain (2019).

¹¹⁹ M Liu et al., How will blockchain technology impact auditing and accounting: Permissionless versus permissioned blockchain (2019).

¹²⁰ D Bonyuet, Overview and impact of blockchain on auditing (2020).

¹²¹ C Cheng and Q Huang, Exploration on the Application of Blockchain Audit (2019).

¹²² C Cheng and Q Huang, Exploration on the Application of Blockchain Audit (2019).

¹²³ NE Vincent et al., Blockchain architecture: A design that helps CPA firms leverage the technology (2020).

¹²⁴ R Lombardi et al., The disruption of blockchain in auditing—a systematic literature review and an agenda for future research (2021).

¹²⁵ D Bonyuet, Overview and impact of blockchain on auditing (2020).

¹²⁶ S Demirkan et al., Blockchain technology in the future of business cyber security and accounting (2020).

¹²⁷ C Cheng and Q Huang, Exploration on the Application of Blockchain Audit (2019).

6. Blockchains lead to an increased audit efficiency, as information has a higher degree of verifiability due to the specific controls and mechanisms¹²⁸.
7. The greatest advantage of blockchain technology lies in the establishment of smart contracts¹²⁹.
8. Obtaining external confirmations for audits of accounts receivable is obsolete in blockchains, as all financial information has been verified by other nodes, and data is verifiable and irreversibly stored in the blockchain¹³⁰.

Place of the study within the context of previous studies

This article provides an exploratory research on the suitability of the blockchain technology as an appropriate tool¹³¹, the higher effectiveness for auditing of accounts receivable in contrast to traditional substantive procedures¹³², the compliance gap of blockchain-based audits with the codified GAAS and in particular audit standard AU-C 505¹³³, and the future role of the auditor¹³⁴. The study is based on a literature review¹³⁵. By collecting of data and information the current status of the blockchain technology in the area of auditing is presented within the doctoral thesis. Furthermore, the research shows the superiority of automated blockchain-based auditing on the balance sheet position accounts receivable¹³⁶. The study identified a literature gap towards GAAS standard AU-C 505, when auditing accounts receivable with blockchains¹³⁷.

Conclusion

Traditional substantive auditing procedures and the classic role of the auditor are being critically questioned in this doctoral thesis¹³⁸. The focus of the doctoral thesis is on blockchain-related audits in regard to the balance sheet position accounts receivables, as it provides the disruptive potential to eliminate weaknesses of traditional substantive audit procedures¹³⁹. The blockchain technology allows a timely examination of potential errors within accounting entries and the automation of the transaction verification by using data from business partners¹⁴⁰. Whereby smart contracts encoded with accounting and business rules could improve the controls towards

¹²⁸ D Bonyuet, Overview and impact of blockchain on auditing (2020).

¹²⁹ D Bonyuet, Overview and impact of blockchain on auditing (2020).

¹³⁰ C Cheng and Q Huang, Exploration on the Application of Blockchain Audit (2019).

¹³¹ R Lombardi et al., The disruption of blockchain in auditing—a systematic literature review and an agenda for future research (2021).

¹³² Deloitte, Operational finance with business blockchains (2020).

¹³³ American Institute of Certified Public Accountants (AICPA), External Confirmations. AU-C Section 505 (2012).

¹³⁴ K Black, Perspectives. Blockchain and its potential impact on the audit profession. New challenges and opportunities for audit and assurance (2021).

¹³⁵ R Kumar, Research methodology: A step-by-step guide for beginners (2019).

¹³⁶ Y Wang and A Kogan, Designing confidentiality-preserving Blockchain-based transaction process (2018).

¹³⁷ American Institute of Certified Public Accountants (AICPA), External Confirmations. AU-C Section 505 (2012).

¹³⁸ M Risius and K Spohrer, A blockchain research framework: what we (don't) know, where we go from here, and how we will get there (2017).

¹³⁹ M Risius and K Spohrer, A blockchain research framework: what we (don't) know, where we go from here, and how we will get there (2017).

¹⁴⁰ J Dai and MA Vasarhelyi, Toward blockchain-based accounting and assurance (2017).

the recording process¹⁴¹. As a conclusion on audits of accounts receivable, balance confirmations when auditing accounts receivables could be no longer necessary within a blockchain system¹⁴². Furthermore, with the permissioned blockchain, access to data can be restricted for different parties' respective roles¹⁴³. Triple-entry account systems through blockchain it can be programmed to follow accounting standards and regulations automatically using smart contracts and could even automate tax filings through continuous updates¹⁴⁴. To qualify as a valid tool in the context of auditing financial statements, the blockchain technology must comply with accounting requirements of the IFRS as comparability, relevance, reliability, understandability, timeliness, and true and fair view regarding accrual accounting and revenue recognition for accounts receivables¹⁴⁵. To be carried out orderly, the blockchain technology furthermore has to comply with relevant IT Governance frameworks¹⁴⁶.

The blockchain technology that is based on a distributed database and several nodes provides several promising features as immutability of transactions, traceability, transparency, and security by rules and controls¹⁴⁷. Nowadays it is still unclear what impact the blockchain Technology will have on the audit profession, but the effects can be expected to be rather significant¹⁴⁸.

Potential of future research

Future areas for research can be focusing on all the potential applications of the blockchain technology in the areas of auditing and accounting¹⁴⁹. Further aspects of research may focus on the technology by establishing of an adequate architecture¹⁵⁰. Concerning the complex requirements for auditors and the audit profession, the requirements for standard setter to codify new sets of audit standards and guidelines have to be analyzed in-depth¹⁵¹.

¹⁴¹ J Dai and MA Vasarhelyi, Toward blockchain-based accounting and assurance (2017).

¹⁴² J Dai and MA Vasarhelyi, Toward blockchain-based accounting and assurance (2017).

¹⁴³ J Dai and MA Vasarhelyi, Toward blockchain-based accounting and assurance (2017).

¹⁴⁴ J Dai and MA Vasarhelyi, Toward blockchain-based accounting and assurance (2017).

¹⁴⁵ H Zülch, International Financial Reporting Standards (IFRS) 2020 (2020).

¹⁴⁶ NE Vincent et al., Blockchain architecture: A design that helps CPA firms leverage the technology (2020).

¹⁴⁷ MP Gauthier and N Brender, N. "How do the current auditing standards fit the emergent use of blockchain?" (2021).

¹⁴⁸ MP Gauthier and N Brender, N. "How do the current auditing standards fit the emergent use of blockchain?" (2021).

¹⁴⁹ R Lombardi et al., The disruption of blockchain in auditing—a systematic literature review and an agenda for future research (2021).

¹⁵⁰ J Dai and MA Vasarhelyi, Toward blockchain-based accounting and assurance (2017).

¹⁵¹ MP Gauthier and N Brender, N. "How do the current auditing standards fit the emergent use of blockchain?" (2021).

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