

Research on Application Hotspots of Blockchain Technology in Accounting Field

Liu Zhenqing

School of Economics and Management, Xi'an University of Posts and Telecommunications, Xi'an, China

Abstract: *Blockchain is a distributed ledger technology that has had a significant impact on various industries in the accounting field. Through the retrieval of keywords and abstracts of 862 accounting journals on CNKI, and the statistics of relevant reports on the technical services launched by accounting firms for blockchain, with the help of Echart visualization software, the hot topics of research on the impact of blockchain technology on the accounting field are determined as follows: The problems of decentralization in blockchain system, real-time audit supported by blockchain, application of smart contracts, and role change of accountants and auditors are four aspects. Based on the research on the hot topics, the paper sorts out the current problems, and puts forward relevant suggestions such as strengthening the supervision system, advocating the flat management mode, promoting the construction of continuous audit activities, and strengthening the professional talent reserve. It provides reference for accountants and auditors to study blockchain technology in the future.*

Keywords: *Blockchain technology; Accounting field; Hot topic*

1. Introduction

Blockchain technology is a kind of technology emerged with the development of computer science, which provides a platform for Bitcoin transactions.^[1] With the birth of this technology, the Internet of Things, manufacturing, supply chain, finance and other industries at home and abroad have begun to pay extensive attention to and study blockchain technology. During the two sessions of 2021, representatives also proposed that we should give full play to the characteristics of the technology, accelerate innovation in the technology industry, promote economic development and create social value. In fact, blockchain technology has a huge impact on the accounting and audit industries. The characteristics of decentralization, data sharing and tamper-proof of blockchain technology have brought a new round of opportunities and challenges to the traditional old industries of accounting and audit, and accelerated the reconstruction of the existing accounting and audit industries.^[2]

2. Research methods and data statistics

2.1 Research methods

This paper mainly adopts two research methods. The first method is to use crawler software to conduct statistical analysis on the literature on the application of blockchain in the accounting and auditing industry, mainly including articles published in journals at all levels, excluding Chinese and English extensions, aiming to understand the research status of blockchain in the accounting field through literature statistical analysis.

The second method is to select Echart visualization software, the rich interaction of software and highly defined data visualization chart, which can draw the knowledge graph of the research content and development trend of blockchain and grasp the current research direction.

2.2 Data sources

First of all, the main data of this paper comes from CNKI database of China National Knowledge Infrastructure (CNKI). The literature on the subject of blockchain is searched in the accounting and auditing industry. The categories of journals mainly include EI journal, SCI journal, Peking University

core journal, CSSCI, CSCD, etc. Secondly, China's Big Four accounting firms are selected to launch technical services for blockchain.^[3]

3. Literature research status of blockchain in the accounting field in China

In this paper, the annual publication volume of literatures on the subject of blockchain in the field of accounting, the publication situation of high-producing domestic authors, the keywords and content of literatures are analyzed and counted, and the research status of blockchain is sorted out.^[3]

3.1 Statistics of the number of publications

By retrieving CNKI database, found in the year to April 2021, in the field of accounting, eliminate repetition in the journals and the extension, subject is contained in the chain of blocks with a total of 862 papers, but most of the literature in this academic research is not deep, periodical level is not high also, this is related to the block chain technology is just emerging in recent years. Table 1 statistics the annual publications from 2016 to 2020, as shown in Table 1.

Table 1: Annual statistics of articles issued

Number of years of issue	2016	2017	2018	2019	2020
Number of articles issued	7	49	108	234	370

As seen from the above table, the research on the impact of blockchain technology on the field of accounting has entered the vision of scholars since 2016. the number of articles published in 2016 was 7, 49 in 2017, 234 in 2018, and 370 in 2019. the increasing number of literature emerged indicates that scholars gradually pay attention to the research on blockchain, marking the rapid development.

3.2 Statistical analysis of domestic high-yield authors

The top five authors and their research topics were summarized and statistically analyzed (see Table 2). These data indicate that the research hot topics of some productive authors have penetrated into the era of blockchain 3.0, and the research topics have also penetrated into many fields, as shown in Table 2.

Table 2: Research themes of some of the country's most prolific authors

Author	Research themes
Xu Jinye	Smart contracts, digital currencies, accounting oversight
Cheng Ping	Smart Contracts, General Assembly Accounting, Supply Chain
Tang Yanjun	Big Data, Smart Contracts, Internal Audit
Yao Yi	Smart contracts, financial integration, financial shared services
Wang Yufeng	Internal audit, financial sector, real-time audit

As can be seen from Table 2, the hot topics of research on blockchain in accounting have gradually emerged, with smart contracts appearing most frequently, followed by internal audit. Further statistical analysis of the keywords and abstracts in the CNKI database will be conducted in the following section to further identify the hot topics of research.

3.3 Visual analysis of word frequency and summary of keywords

Table 3: Keyword word frequency statistics

Serial number	Word Frequency	Keywords
1	59	Big Data
2	44	Smart Contracts
3	38	Decentralisation
4	23	Artificial Intelligence
5	11	Real-time audits
6	7	Talent Development

The analysis of keywords can reflect the research hotspots in this field. Therefore, after removing

high-frequency words such as blockchain and accounting audit from the selected samples, statistical analysis was conducted on high-frequency keywords in the accounting field under blockchain technology.^[4] As some words in the obtained keywords have similar meanings, high-frequency words are merged, and the specific data are shown in Table 3.

As can be seen from Table 3, the top ranking keywords are big data, smart contracts, decentralisation, artificial intelligence, real-time auditing and talent training. All these keywords have a high frequency and a certain centrality, which can reflect to a certain extent the research hotspots of Chinese journals on the accounting and auditing industry under blockchain technology.

In order to dig more deeply into the hot topics of research on accounting and auditing under blockchain technology, the abstracts of the sample were further summarised and analysed. The abstract is equivalent to the secondary topic of a journal, and its analysis can pinpoint the hot topics of current research more precisely. In this paper, a centrality clustering map is drawn by extracting the main keywords of the abstracts, as shown in Figure 1.

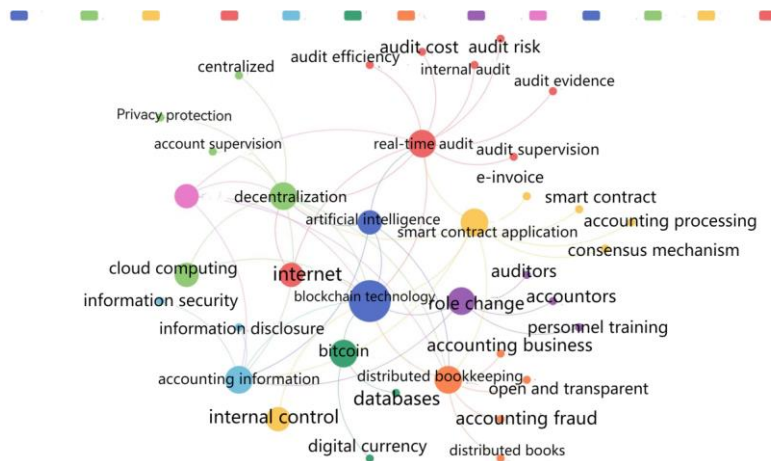


Figure 1: Summary keyword centric clustering

Knowledge mapping with the help of the metric visualisation software Echart shows that the research focuses on decentralisation issues in blockchain technology, the use of smart contracts and the use of blockchain technology for distributed bookkeeping, real-time auditing and the shift in roles that has been the subject of much research in the last two years.

3.4 Technical service statistics of the Big Four accounting firms

Table 4: Emergence of themes in Chinese CPA firms

Name	Decentralisation issues	Real-time audits	Smart Contracts	Role change
PricewaterhouseCoopers				
2016		√		
2017		√	√	
2018	√	√		
Deloitte				
2016	√		√	
2017		√		√
2018			√	
Ernst & Young				
2016		√		√
2017		√	√	
2018		√		
KPMG				
2016				
2018	√		√	√

In addition, based on professional websites and some relevant reports, a statistical categorisation of the technical services launched for blockchain by China's Big Four accounting firms PwC, Deloitte, Ernst & Young and KPMG reveals that the technical changes made for blockchain technology in recent

years revolve around the following four areas. As shown in Table 4.

PwC was the first firm to partner with blockchain technology companies, followed by Deloitte, Ernst & Young and KPMG. In line with economic development and the need to accelerate the transformation of the accounting and auditing industry, the four firms have continued to launch blockchain service technologies for the accounting sector. From the above table we can see that the four major Chinese accounting firms have started to launch technology services for one or two hot topics since 2016, and their subsequent technology research has covered all four hot topics.

Through a synthesis of the above literature statistics and a summary of the analysis of the technology services of the Big Four accounting firms around the impact of blockchain technology on the accounting and auditing industry, the hot topics of current research were identified as (1) the issue of decentralisation (2) real-time auditing (3) smart contract applications (4) the changing role of accountants and auditors.

3.5 Analysis of four hot topics based on blockchain technology

3.5.1 Issues of decentralization

Due to its distributed and decentralized nature, blockchain will bring accounting and auditing into a peer-to-peer realm without institutional intermediaries. Blockchain provides distributed data, its security, transparency, and immutability will greatly improve accounting and auditing practices, and can force auditors and accountants to make considerable changes toward more transparent behavior. Blockchain allows companies to write transactions to the blockchain, creating accounting records that cannot be changed. It is also possible to create private chains and alliance chains based on stakeholders to provide differentiated services to stakeholders based on their needs. For example, the chief financial officer and auditor have access to all accounting data, while the accounts payable clerk can only access accounting information related to accounts transactions. Of course, every coin has two sides. Because a simple record of data on a blockchain doesn't mean that a transaction took place in the real world, it just means that the transaction record was written into the blockchain, but whether it actually happened or was tampered with is unknown. As a result, companies can use blockchain to make offline payments without guaranteeing that transactions take place in the real world. However, it is an important aspect for accounting experts who can contribute by studying how to safeguard the consistency of transactions and actual payments recorded on the blockchain.

3.5.2 Real-time audit

Traditional audit work is labor intensive, at the beginning of each audit, the auditor will receive electronic and manual forms of journal, spreadsheets, documents and other documents, before the start of the audit process, auditors need to invest a lot of time to prepare data and planning the audit, at the expense of the long process efficiency and cost effectiveness. The traditional audit needs to form an audit report at the end of the reporting period to miss the relevant transaction contents of the company, while the blockchain can immediately provide verified transaction action records. Through the instant confirmation of the transaction, the blockchain realizes continuous audit, also known as "real-time audit".^[5] This is very different with traditional audit work, traditional audit is the focus of the investigation after the event happened, eliminates the traditional sampling and continuous audit concept, real-time monitoring, in block chain provides all transactions in the latest, an irreversible historical records, don't need to input and check the accounting data in multiple databases, saving time, The risk of human error is greatly reduced.

3.5.3 Smart contract application

An implicit process in accounting and auditing is the involvement of the human factor in all steps. However, as blockchain evolves, the functional imperatives of people may change. Blockchain can host not only transaction data in real time, but also programmatic versions of human actions. Using smart contracts, programs and terms needed by human beings are presented in the blockchain in the form of coding, and automatically executed when predetermined conditions are met.

Prior to the emergence of blockchain, the execution of smart contracts was impossible because traditional business parties focused on independent databases. After using blockchain technology, a blockchain protocol is established through a shared database, and smart contracts are executed automatically, reducing the risk of error or manipulation, without the need for a third party intermediary. For example, if the rules of shipment and sale of goods are written into the smart contract, the system will automatically review and verify the shipment date, and then record the sales synchronously on the

blockchain.^[6] However, it is important to note in this regard that it is not possible for every transaction to be reviewed and automatically data checked by a blockchain smart contract program. Complex accounting entries, such as valuation of fair value or accounting measures such as impairment tests, require the expertise and judgment of accountants and auditors. Therefore, the future development of smart contract application is inevitably inseparable from human participation.

3.5.4 Role change

With the advent of blockchain, a large number of academic works have also made predictions for the accounting and auditing industry, and most of them include the role change of accountants and auditors. Some academics say the accounting and auditing professions are at risk from automated reconciliation, for example: the people who keep and audit the books will lose their jobs. Other academics say auditors have become obsolete and can be replaced by blockchains based on the assumption that transactions themselves can be trusted. In effect, auditors enhance trust in the companies they audit, thereby ensuring the functioning of global capital markets. And blockchain itself doesn't fully represent all the transactions that happen in the real world. Even if the transaction is recorded on the blockchain, the transaction may still be fraudulent, illegal, or unauthorized. Thus, the argument that auditors have become obsolete is overstated, given the need to detect and investigate trading errors or fraud.

In addition, companies are unlikely to store all transactions on the blockchain, and they will still rely on internal and external auditors to verify their accounts. While accountants and auditors will not be redundant, their roles will have to change as the industry moves from traditional statistical checks to artificial intelligence in the recording and reconciliation of transactions.

4. Application of blockchain technology in the field of accounting and the problems that exist

4.1 Four major accounting firms' service applications in blockchain technology

A survey of the blockchain technology services launched by China's four major certified public accounting firms in the past five years highlights that this technology is undoubtedly disruptive.^[7] PWC focuses on testing different blockchain technologies and advising clients on a variety of uses. Deloitte has been developing its own in-house blockchain services since 2014. Its best-known platform, Rubix, was created to simplify and speed up the auditing process for blockchain trading actions. Ernst & Young was a late starter in the blockchain business, but it grew quickly. In 2016, we started to cooperate with a number of Blockchain technology companies, and then launched a number of Blockchain service platforms. Among them, the EY Blockchain Analyzer pilot launched in 2018 has been widely recognized in the industry. This technology has improved the ability of in-depth review of digital currency business transactions of EY team. KPMG has launched distributed Ledger services since 2016 with the help of Microsoft to help financial services companies realize the potential of blockchain capabilities. And in 2018, it used blockchain technology to provide professional auditing for asset services platform BlockEx.

In summary, the technical services that these four firms are promoting for blockchain technology can be seen from: (1) each company acknowledges the disruptive nature of blockchain and is exploring myriad applications for the technology. (2) these companies are piloting private, public, and licensed blockchain technologies to better suit customer needs. Clearly, these pilot projects and alliances reflect the growing impact blockchain is already having on the accounting and auditing industry.

4.2 Problems with future research

Based on the above four hot topics, although the academic community has been constantly discussing, there are still some key issues that have not been solved, which should be paid great attention to in the future research.

First, the decentralization of blockchain means that no party can control the system.^[8] While this is useful to ensure security and transparency, it raises questions about how large-scale changes in procedures will be handled and who will make important ethical corrections: who should participate online? Who decides what information each participant has access to? What kind of accounting information should be recorded on the blockchain? What information should be kept private and what should be made public? Who would oversee it in a decentralized system? These questions will be the focus of future research in this field.

Second, the realization of real-time audit is based on the maturity of technology. Although continuous audit can be realized theoretically in blockchain technology, there are still some questions about the audit in the future blockchain era, such as: how to conduct continuous audit? Can continuous auditing reach its full potential if only selected transactions are recorded on the blockchain? How should auditors solve the "big data" problem and other unsolved key issues arising from continuous audit?

Third, the application of smart contract is the basis for the implementation of blockchain technology.^[9] Although blockchain technology has been a hot topic of research in recent years, the application of smart contracts can not be ignored. Accounting researchers in the future blockchain era still have many questions to explore: What kind of information (rules, regulations, counting standards) can be encoded into smart contracts? How will the use of smart contracts affect the audit process? To what extent can smart contracts improve the efficiency of the audit process?

Fourth, the role of accountants and auditors should conform to the trend of The Times. Explore how well accountants and auditors understand technology and the skill sets required to deliver accounting and auditing services to clients using blockchain. This needs to include an extensive analysis of how blockchain technology is changing the nature of auditors' and accountants' tasks. Therefore, researchers should also address the following research questions: What knowledge do accountants and auditors need to have in order to provide blockchain-based services? How are accountants and auditors preparing for the blockchain push? How do accountants and auditors view the development of blockchain? What tasks will auditors and accountants accomplish in the future, and what tasks are likely to disappear?

5. Suggestions for the application of blockchain technology in the field of accounting

In response to the above issues, an attempt is made to make some rationalised recommendations for accounting and auditing in the future blockchain era.

5.1 The state should increase support and strengthen the establishment of the supervision system

At present, the state is not perfect in supervising this aspect of blockchain technology. With the increasing maturity of blockchain technology, the formulation of regulatory policies on the technology and the legality of blockchain technology applications should also be brought up to the process. The government should introduce relevant laws and policies, increase the publicity of blockchain technology, encourage further research and promotion of blockchain technology, break the fetters of traditional concepts, do a good job of reserving professional talents, and at the same time formulate blockchain technology norms and standards, and make a detailed division of the rights and responsibilities of various departments, so that blockchain technology can be "lawful" in the process of development and application. The law can be followed".

5.2 Generate flat management mode, improve the efficiency of enterprise financial operation

Blockchain technology helps enterprises generate a flat management model, avoiding duplication of work by various departments within the enterprise and increasing the control of financial data in a true and effective manner.^[10] The decentralised feature of blockchain is used to establish a trust mechanism, which reduces intermediaries and greatly reduces the credit cost of enterprises. For the advent of blockchain technology era, enterprises should grasp the trend of economic development, seize the opportunity, increase the investment and research on blockchain technology, actively participate in the related work, optimize the financial operation of enterprises and improve the efficiency of decision-making. In addition, enterprises should also actively introduce professional talents and employees should attend regular training to get in touch with the cutting-edge information of the industry and grasp the trend of the times.^[11]

5.3 Actively promote the construction of continuous audit activities based on blockchain technology

Continuous auditing with blockchain technology achieves an innovation of the traditional audit process. Real-time audit activities, first of all, the application environment and technical maturity of the audit unit's blockchain technology should be assessed at the early stage of preparation, and initial business activities should be carried out to understand whether the business transactions and smart

contract rules design of the audited unit and the relevant enterprises or units where transactions occur are reasonable. While the audit unit incorporates itself into the blockchain technology environment of the audited unit, it also has to reach a consensus with the audited unit on the basis of the relevant authority on rule setting. Secondly, in the process of audit implementation, consensus also needs to be reached with relevant nodes, e.g. banks, customers, etc., on the authenticity and validity of the data, using blockchain technology for bookkeeping and storage. If one party falsifies the data, the majority of honest nodes will resist the anomalous data sent by that node and actively "isolate" it based on consensus mechanisms and real-time alerts from the contract technology and publish it to each node. Finally, a consensus-based real-time report is created. Auditors can audit and validate transactions as they are recorded by the audited entity, without having to wait until the end of the period, resulting in an uninterrupted and continuous audit.^[12]

5.4 We will strengthen the reserve of professional personnel and improve the training of technical personnel

As blockchain technology matures, the accounting and auditing industry will undergo significant changes. Work in the accounting and auditing field will become more intelligent and automated. In this context, accounting and auditing personnel need to change their functions, requiring a higher level of service, more meticulous logical thinking, stronger business communication skills, proficiency in computer operation skills and understanding of blockchain technology to meet the needs of enterprises and the development of the industry. The state should strengthen the introduction and reserve of professional and technical personnel in this area, select professionals in blockchain technology with a global perspective, build a platform for technical exchange and research, and train and drive more technical talents in this field in China. At the same time, accounting and auditing personnel should establish a sense of crisis, enhance their learning ability, enrich their knowledge base, broaden their horizons and improve their overall quality, so as to prepare for the transformation of the roles of accounting and auditing personnel.^[13]

6. Conclusions

As an emerging technology, blockchain is still in the exploration stage. Applying blockchain technology to financial systems will bring disruptive changes to the accounting and auditing industry, and as we can see from the previous analysis, the change of new technology brings both opportunities and challenges. There are still many difficult and unresolved issues in its exploration, such as technical issues, regulatory issues, efficiency issues, etc., which need to be constantly improved and refined. Therefore, companies need to implement more flexible response strategies and change their business models to better adapt to the new technological changes; accountants and auditors should further study blockchain technology, stand at the forefront of technology, better serve their clients and prepare for the future era of "self-auditing and accounting".^[14]The Institute of Certified Public Accountants, the government and other social regulators should formulate laws and regulations related to blockchain technology to regulate behaviour, ensure the legality of blockchain technology in the accounting field and promote the application of blockchain technology on the ground.^[15]

References

- [1] Pimentel Erica, Boulianne Emilio. *Blockchain in Accounting Research and Practice: Current Trends and Future Opportunities**, 2020(4):325-361.
- [2] Li Kehong. *Research on accounting model and application based on blockchain technology [J]. Finance and Accounting Monthly*, 2020(16):76-81.
- [3] Wang JL, Fan Y, Zhang F. *Research on topic discovery and evolution of blockchain literature [J]. Computer Engineering and Applications*, 2020 (20):1-8.
- [4] Cheng P., Wang L. Y. *A study on the development of blockchain technology and the dynamics of accounting applications at home and abroad [J]. Friends of Accounting*, 2020(06):143-149.
- [5] Fan B, Li Y. *Blockchain and accounting and auditing [J]. Finance and Accounting Monthly*, 2018(02):39-43.
- [6] Cheng Ping, Zhang Hongshang. *A study on accounting for sales activities based on blockchain technology [J]. Accounting Friends*, 2020 (01):152-157.
- [7] Maria Karajovic, Henry M. Kim, Marek Laskowski. *Thinking Outside the Block: Projected Phases of Blockchain Integration in the Accounting Industry*, 2019 (2). 319-330.

- [8] Jana Schmitz, Giulia Leoni. *Accounting and Auditing at the Time of Blockchain Technology: A Research Agenda*, 2019(2)331-342.
- [9] Xu Jinye. *Intelligent management accounting: the conclusion and performance of smart contracts [J]*. *Friends of Accounting*, 2020 (10):156-160.
- [10] Zhang Wanling. *Application of blockchain technology in financial accounting [J]*. *Modern Business*, 2020 (25):165-166.
- [11] He Hui. *The past life, present life and future of "blockchain+accounting"[J]*. *Friends of Accounting*, 2019 (18):155-159.
- [12] Wang Lin, Zhang Youfeng. *Research on the construction of continuous audit model based on blockchain technology [J]*. *Friends of Accounting*, 2020(19):154-160.
- [13] Tan Lilien. *Research on the impact of blockchain technology on accounting and auditing field [J]*. *Journal of Shanxi Finance and Taxation College*, 2020 (02):46-48.
- [14] Jing Zhiyong, Yin Jiajia. *Research on the application of "blockchain+accounting"-an analysis based on Deloitte Rubix platform [J]*. *Friends of Accounting*, 2020(09):149-154.
- [15] Xu Jinye, Zhu Yangyang. *Research on the impact of blockchain information technology on accounting supervision [J]*. *Accounting Friends*, 2018 (01):156-160.