

## ФИНАНСЫ / FINANCE

DOI: <https://doi.org/10.23670/IRJ.2023.129.69>

## RESEARCH ON THE ACCOUNTING PRINCIPLE INNOVATION AND APPLICATION OF DISTRIBUTED LEDGER TECHNOLOGY

Research article

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**Abstract**

Distributed ledger technology can effectively improve the problems of low efficiency and high cost in the current capital market infrastructure. It plays an important role in improving the global financial infrastructure and promoting the new financial infrastructure. Therefore, it is of great significance to accelerate the research of distributed ledger technology. Although distributed ledger technology has good application prospects in many fields, such as finance, and it is considered as a disruptive technological innovation, its basic principles originate from accounting, and it does have a certain subversive color in accounting theories. With the arrival of the era of digital economy and the increase of the management needs of accounting information users, the traditional accounting theory has certain limitations and can no longer meet the development needs of the current era, so it is necessary to innovate and improve the current accounting theory and combine it with practice. The new accounting theory proposed by the author can just support the application and development of distributed ledger technology, and this new accounting theory supporting distributed ledger technology can also be widely used in the accounting of large enterprise groups (such as large financial institutions). In view of this, this paper first analyzes the nature and characteristics of distributed ledgers and the differences and connection between distributed ledgers and blockchain, then introduces the application prospect of distributed ledger technology, thirdly expounds a new accounting theory supporting distributed ledger technology in combination with the nature and characteristics of distributed ledgers, and finally studies its application in the accounting of large enterprise groups, aiming to improve the understanding level of distributed ledgers around the world. It is believed that the distributed ledger technology will be widely accepted and known by people after being supported by the new accounting theory, and it can be developed faster and better, bringing great changes to the world in the future.

**Keywords:** distributed ledger technology, new accounting theory, application.

## ИССЛЕДОВАНИЕ ИННОВАЦИЙ ПРИНЦИПОВ БУХГАЛТЕРСКОГО УЧЕТА И ПРИМЕНЕНИЯ ТЕХНОЛОГИИ РАСПРЕДЕЛЁННОГО РЕЕСТРА

Научная статья

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**Аннотация**

Технология распределённого реестра может эффективно решить проблемы низкой эффективности и высокой стоимости существующей инфраструктуры рынка капитала. Она играет важную роль в улучшении глобальной финансовой индустрии и продвижении новой финансовой инфраструктуры. Поэтому очень важно ускорить исследования технологии распределённого реестра. Хотя она имеет хорошие перспективы применения во многих областях, например, финансовых, и считается революционной технологической инновацией, ее основные принципы берут начало в бухгалтерском учете, и она имеет определенную негативную оценку в теории бухгалтерского учета. С наступлением эры цифровой экономики и ростом управленческих потребностей пользователей бухгалтерской информации традиционная теория бухгалтерского учета имеет определенные ограничения и уже не может удовлетворить потребности развития нынешней эпохи, потому необходимы инновации и усовершенствование существующей теории и сочетание ее с практикой. Новая теория бухгалтерского учета, предложенная автором, может поддерживать применение и развитие технологии распределённого реестра, а также широко использоваться в бухгалтерском учете крупных групп предприятий (таких, как крупные финансовые учреждения). В связи с этим в данной статье анализируются природа и характеристики распределенного реестра, различия и связь между ним и блокчейном, затем описываются перспективы применения данной технологии, в-третьих, излагается новая теория бухгалтерского учета, поддерживающая технологию распределенного реестра в сочетании с её сущностью, и, наконец, исследуется ее применение в бухгалтерском учете крупных промышленных групп, с целью повышения уровня понимания распределенного реестра во всем мире. Считается, что технология распределённого реестра станет известна людям после поддержки её теорией нового бухгалтерского учета, и она сможет развиваться быстрее, принося большие изменения в мир в будущем.

**Ключевые слова:** технология распределённого реестра, новая теория бухгалтерского учета, применение.**Introduction****1.1 The nature of distributed ledgers**

Distributed ledgers, which are also known as shared ledgers, are an asset database that can be shared, replicated and synchronized among network members composed of multiple sites, different geographical locations or multiple institutions.

Distributed ledgers record transactions between network participants, such as the exchange of data or assets. Its data is not only stored in the accounting address, but also copies are stored in multiple network spaces simultaneously [1]. The assets stored in this account book can be financial, legal, physical or electronic assets. This shared ledgers reduce the time and expense costs incurred by mediating different ledgers [2].

### **1.2 The characteristics of distributed ledgers**

#### 1. Decentralization

Distributed ledgers have no central administrator or centralized data storage, and the shared and synchronized data are geographically distributed across multiple websites, countries or institutions.

#### 2. Consensus

Participants in the network restrict and negotiate the update of records in the account book according to the consensus principle. According to the consensus rules agreed in the network, the records of the account book can be updated and maintained by one, more or all participants. Any changes in the account book will be reflected in all copies in minutes or even seconds [3]. Only with the consent of most nodes can the new account page information be connected to the public account book [1].

#### 3. Openness

In a network based on distributed ledger technology, each participant can obtain a copy of the unique real ledger. The system is open to all participants.

#### 4. Independence

Distributed ledger technology adopts point-to-point direct transactions, and the clearing and settlement procedures are automatically completed by the information system, without the participation of the intermediate third-party arbitration institutions (such as financial institutions or clearing houses), without human intervention and supervision.

#### 5. Reliability

Each record in the distributed ledger has a time stamp and a unique password signature, which makes the ledger an auditable historic records of all transactions in the network.

#### 6. Security

The security and accuracy of the assets stored in this account book is to control the access rights of the account book through the use of public and private keys and signatures, so as to realize the maintenance of cryptography foundation.

### **1.3 The differences and connection between distributed ledgers and blockchain**

Blockchain is a chain-like data structure, which is a series of data blocks that are combined in chronological order by using cryptography. It is a data structure form of distributed ledgers, which is essentially a decentralized database. Blockchain is a kind of distributed ledgers, but not all distributed ledgers must use blockchain to ensure its safe and efficient realization.

### **The application prospect of distributed ledger technology**

Distributed ledger technology has broad application prospects, and it can be applied in many fields. Firstly, it has great potential application value in the field of financial asset trading, and its advantages are shown in the following aspects: first of all, distributed ledger technology can eliminate third-party intermediary links through point-to-point direct docking, complete the payment and settlement of cross-border and interbank transactions at one time by sharing ledgers, use computer codes to automatically and intelligently manage customers' assets, which simplifies the business process, shortens the transaction cycle, reduces costs and risks, and improves the operational efficiency and economic benefits of the financial system; secondly, decentralized distributed ledgers are open to everyone, only the private information of all parties is encrypted, and the information is highly transparent, anyone can view the transaction records, which is more convenient for supervision; finally, distributed ledger technology verifies the authenticity of identity and transactions through encryption technology and electronic signature, and enhances the flexibility and robustness of the system [2]. Secondly, in terms of insurance claim settlement, after the introduction of distributed ledger technology, the insurance transaction information is open and transparent, it can not be tampered with, the two sides of the transaction trust each other, the transaction cost is reduced, the regulatory department can monitor the risk more intuitively, and the intelligent contract system can also realize the automatic claim settlement of the insurance policy [4]. Thirdly, distributed ledger technology can also be applied in the field of the Internet of Things and supply chain. Through distributed ledger technology, the capital flow, logistics, invoice, order or contract and other information can be recorded and transmitted truthfully and reliably, and the openness and transparency of ledger records can be guaranteed, which improves the security of information and the efficiency of management. Fourthly, the distributed ledger technology can be applied to public management, energy, transportation and other fields closely related to people's production and life. The distributed ledger can ensure the equal status of participants, reliably record citizens' personal information, and protect the security of public data and information [5]. Fifthly, the data stored on distributed ledgers is highly reliable and tamper-proof, and it can be applied to the fields of authentication and notarization as well as digital copyright. Distributed ledger technology can prove the existence of text, video, audio and other works to ensure the authenticity and uniqueness of ownership. After the rights of the works are confirmed on the blockchain distributed ledgers, the subsequent transactions will be recorded in real time to realize the full life cycle management of digital copyright, and it can also be used as a technical guarantee in judicial forensics. The sixth, distributed ledger technology can also be used in the field of accounting and auditing. By building an accounting information platform based on distributed ledger technology, the authenticity, transparency and integrity of data can be guaranteed, and the database can be more comprehensive, real-time, traceable, anti-counterfeiting and anti-fraud functions can be realized [6]. The time stamp technology of distributed ledgers can also be applied in the field of auditing. By applying distributed ledger technology, certified public accountants can save data verification time, improve audit efficiency, reduce audit risk and expand business scope [7]. The seventh, distributed ledger technology can also be applied to social public welfare scenarios. The relevant information in the process of public welfare, such as donation projects, details of fundraising, fund flow, recipient feedback, can be stored on distributed ledgers, and can be disclosed transparently and conditionally to facilitate social supervision. In addition, the application of distributed ledger technology can also promote the integration of

business and finance, distributed ledgers are consensus, open, transparent and real-time, and the use of smart contract integration can achieve the full process control of finance over business [8].

### **The accounting principle innovation of distributed ledger technology**

First of all, from the perspective of financial accounting, blockchain is a distributed, open and decentralized large network account book. Anyone can use the same technical standards to add their own information at any time, extend the blockchain, and continue to meet the data entry needs to be brought by various needs. Generally speaking, blockchain is a way for everyone to participate in bookkeeping. The current situation is that each system records its own account book, such as Tencent's WeChat account book and Alibaba's Taobao account book. There is a database-shared account book behind all systems. Everyone in the system can have the opportunity to participate in bookkeeping. If there is any change in data within a certain period of time, the system will write the contents recorded by the fastest and best bookkeeper in this period of time into the account book, and send it to all other people in the system for backup, so that everyone in the system has a complete account book. Similarly, distributed ledgers are also bookkeeping by multiple participants, using the same standard and the same system. Because accountants usually use the company as the accounting subject to bookkeep, participants need to be likened to companies. Distributed ledgers can be seen as multiple companies reaching an agreement to use the same set of rules for bookkeeping in the same system at the same time. Its data can be updated in real time, transferred and shared with each other, and cannot be tampered with in the progress. Decentralization of distributed ledgers can also be seen as de-company. Assuming that the scenario of multiple companies bookkeeping fully meets all standards and applicable conditions of distributed ledgers, Then the accounting subject of distributed ledgers is the network of all participants – the whole system, which is also a kind of taking the specific object as the accounting subject proposed by the author (accounting has four basic assumptions: accounting subject, continuous operation, accounting period and currency measurement. Distributed ledgers only record the changed data in real time, the other three assumptions are also not necessarily satisfied except for accounting subject. Here, the author selectively studies the key basic assumption of accounting subject).

The accounting subject refers to the specific object served by the accounting work, that is, the spatial scope of accounting recognition, measurement and reporting of the specific object. Under the company system, accountants always take the subject of taxation-the company as the accounting subject in their practical work, which may also be due to the need for tax declaration, but this does not always meet the needs of enterprise operation and management. The assumption that taking the company as the accounting subject has certain limitations, for example, an economic interest-related consortium may use more than one company to do business in order to achieve the purpose of reasonable tax avoidance. The financial statements of each company obtained by accounting with the company as the accounting subject reflect only the part business of the economic interest-related consortium, which is designed in advance and is not true and complete. In the face of the limitations of the accounting subject hypothesis, the emphasis on the assumption of accounting subject should be shifted from a single, tangible and stable subject in the past to the specific subject that meets the needs of accounting information users. As long as it cooperates for common economic interests, it can be regarded as the accounting subject, no matter how many departments or how many independent enterprise organizations it has. The author defines the accounting subject as the subject that provides accounting information to specific objects. This subject can be tangible and permanent, or intangible and temporary, including legal persons or enterprise groups, unincorporated entities and their special branches and departments with important characteristics within the enterprise, the economic interest-related consortium, the entire network system of distributed accounts and other hypothetical bookkeeping objects. Taking specific object as the accounting subject is flexible, and it can meet the needs of accounting information users in real time.

The basic accounting assumption is a reasonable assumption based on the accounting business, and its theoretical attribute determines its incomplete uniformity in the combination with practice. Although the accounting assumption that taking the specific object as the accounting subject has a certain degree of subversive color, it can meet the requirements of accounting assumptions by making appropriate changes when viewing the specific object as the accounting subject. For the accounting subject, taking the specific object as the accounting subject is based on the entity enterprise. The materialization under the overall intangible condition makes it have all the conditions of the accounting subject assumption, and the specific object can be regarded as the relative accounting object. Taking the specific object as the accounting subject is the expansion and extension of the spatial scope of taking a company as the accounting subject, and the inheritance, enrichment, development and improvement of the accounting subject hypothesis theory. Taking the specific object as the accounting subject meets the needs of multi-level accounting information users, accounting treatment is more real and reasonable, accounting is more accurate, accounting information is more comprehensive and complete, and it makes up for the defects of the assumption that the company is taken as the accounting subject.

Under the network environment, accounting has entered the era of computerized accounting management and information. The emergence and development of accounting computerization is also a process of breaking through traditional accounting concepts and improving existing accounting theories and methods. The network and computer system shorten the time required to prepare and submit financial information to the management. After the establishment of the accounting information processing network, the accounting subject for accounting can be determined according to the needs of the accounting information users through the accounting computerization process. Many companies in the economic interest-related consortium, trade between themselves and between them and external companies or too many participants trade with each other, which will make it difficult for the accounting subject to judge, at this time, the accounting personnel only need to input various detailed information into the computer to form a basic database. The accounting information user can automatically collect, classify and summarize relevant data and information from the basic database according to certain instructions, and obtain the required financial information from the Internet at any time or at any place, so as to collect, transform, transmit and utilize information faster and more economically, and reduce the implementation and use costs of information [9].

It can be seen from the above that the application scenario of this new accounting theory will be closer to distributed ledgers, and the basic principles of the distributed ledger also coincide with this new accounting theory. The new accounting theory proposed by the author supports and helps to prove the rationality and progressiveness of distributed ledger technology.

### **The application of the new accounting theory supporting distributed ledger technology in large enterprise groups**

One application of this new accounting theory supporting distributed ledger technology is in the accounting of large enterprise groups with the multi-divisional structure. The multi-divisional structure of the enterprise group is that the enterprise group is divided into different business divisions according to products, regions or markets (customers) and every business division is combined with the decentralization of management and independent accounting under the leadership of the group headquarters. Each business division has its own products and specific markets, and can complete all functions of a product from production to sales. Enterprise group is the advanced organizational form of modern enterprises, and the multi-divisional structure, as a high-level organizational form, has many advantages, which to a certain extent conforms to the group management of large enterprises. Adopting the multi-divisional structure and implementing independent accounting can meet the practical needs of enterprise group development and management. It can be seen from the following table what the multi-divisional structure of the enterprise group is like.

Table 1 - The simple list of enterprise groups with the multi-divisional structure

DOI: <https://doi.org/10.23670/IRJ.2023.129.69.1>

The company	The business unit	The business unit	The business unit
A	AX	AY	AZ
B	BX	BY	BZ
C	CX	CY	CZ
The business division	X	Y	Z

*Note: own development*

In order to calculate the financial status and operating conditions of each business division, this new accounting theory supporting distributed ledger technology can be applied to conduct independent accounting for each business division. It is worth noting that in the process of accounting, taking the specific object as the accounting subject, the business unit of each company can be used as the accounting subject (separate accounting before consolidated financial statements), such as the business unit AX; each company can also be regarded as the accounting subject (the business unit can be regarded as the department of the company through auxiliary accounting), such as the company A; and even each business division can be considered as the accounting subject (the corresponding business units of all companies are summarized together), such as the business division X, its operation is very flexible. It proved theoretically and practically that this new accounting theory supporting distributed ledger technology is reasonable and feasible in the accounting of large enterprise groups with the multi-divisional structure, and it can conduct accounting more clearly, conveniently and accurately and meet the needs of enterprise groups to adopt multi-divisional structure for independent accounting, and what is more advanced is that the data demand dimension can be converted in real time to meet the multi-level data needs at the same time by setting up an accounting information platform and inputting multi-dimension data in the basic database of accounting information system and setting the formula of taking number in report form, thus realizing the "integrated" accounting mode across legal entities, promoting the deep integration of business and finance, greatly facilitating its operation and management [10]. Assuming that the basic database of the accounting information system in this scenario is regarded as the network system of distributed ledgers, the business unit is regarded as a node or a block, the authority setting of each business unit assumes that it meets the encryption requirements of the blockchain, and that it is also decentralized (de-company or de-organization), the data can be updated, transmitted, shared in real time, and cannot be tampered with, and it fully meets all technical requirements of distributed ledgers, so it is completely the application of distributed ledger technology. Distributed ledger technology only records data, such as the record of each transaction in the bank statement in accounting, while this accounting system can not only record data, but also process and sort the recorded data. Similarly, large financial institutions are also a kind of enterprise groups, which can be divided into several business divisions according to the nature of revenue or other perspectives, which is in line with the multi-divisional structure, of course, this new accounting theory supporting distributed ledger technology can also be applied to the accounting and other aspects of large financial institutions.

### **Conclusion**

The distributed ledger is essentially a database that can be shared, replicated and synchronized among network members of multiple sites, different geographical locations or multiple institutions, it has the characteristics of decentralization, consensus, openness, independence, reliability and security. Blockchain is a data structure form of distributed ledgers and it is essentially a decentralized database. It is a kind of distributed ledgers, but distributed ledgers are not necessarily realized by blockchain. The application prospect of distributed ledger technology is broad, it can be applied in many fields, such as financial asset transaction, insurance claim settlement, Internet of Things, supply chain, public management, energy, transportation, certification and notarization, digital copyright, accounting, audit, social public welfare, and it can promote the integration of business and finance. The new accounting theory proposed by the author supports and helps to prove the rationality and progressiveness of distributed ledger technology. Taking the specific object as the accounting subject is the supplement and

improvement to the accounting basic assumption theory of taking the company as the accounting subject, and there is no conflict between them. Accounting is a discipline that closely combines theory with practice and keeps pace with the times, so accounting theories need to be combined with practice, and should be constantly innovated and developed. The new accounting theory supporting distributed ledgers can be applied to the accounting of large enterprise groups with the multi-divisional structure. Assuming that it fully meets all technical requirements of distributed ledger, so it is completely the application of distributed ledger technology. Similarly, large financial institutions are also one of the large enterprise groups with the multi-divisional structure, of course, this new accounting theory supporting distributed ledgers can also be applied to the accounting and other aspects of large financial institutions.

### Конфликт интересов

Не указан.

### Рецензия

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### Conflict of Interest

None declared.

### Review

All articles are peer-reviewed. But the reviewer or the author of the article chose not to publish a review of this article in the public domain. The review can be provided to the competent authorities upon request.

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