

Research on the Improvement of Timebank Operation Based on Blockchain Technology

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ABSTRACT

Timebank provides a resolution for mutual provision of the elderly in China. But because of the pain points such as low trust and recognition, giant room for improvement in recording veracity and difficulties in cross-regional exchange of voluntary time, which exist in the long-acting Timebank operation, we need resort to technical features of blockchain: hard to tamper, secure and reliable, collective and autonomous. Based on the blockchain technology, Alibaba had built a new pattern for creating credence. By accumulating voluntary time, depositing time in the bank, and exchanging voluntary time, the technical guarantee for the long-term operation of the time bank has been effectively improved.

Keywords: *blockchain, timebank, Alibaba, long-time operation*

1. INTRODUCTION

Originated from USA, the notion of "timebank" now is widely used in community services all over the world. The so-called timebank refers to the pension service which is based on the measurement of volunteerism time. It keeps records of the time volunteers spent in public service and participants can withdraw "public welfare time" from timebank to exchange for corresponding pension services when they are in trouble or need help at an advanced age. One outstanding feature of timebank is adopting the principle of two-way, which means it is not a charity but only acting as a go-between supply and demand. On the one hand, the timebank members can receive time and help from others. On the other hand, they also need to give time and help to others when their time permits. Timebank provides a solution for mutual assistance in Chinese pension, and the development of blockchain offers perfect technical support for timebank long-term operation.

2. THE PAIN POINTS OF MUTUAL ASSISTANCE PATTERN OF TIMEBANK

The long-term operation of traditional timebank exists three pain points: low trust and recognition, giant room for improvement in recording veracity and difficulties in cross-regional exchange of voluntary time. To solve these pain points, we not only need institutional construction, but also call for blockchain to ensure the long-term operation of timebank.

2.1. Low Trust and Recognition

The payment method of timebank is a typical extension mode which obviously contains the nature of credit product. This is the biggest characteristic of timebank and also can be the pain point of popularizing it. Due to the lack of institutional and technical guarantees, participants have some doubts about how timebank works, worrying that the public service time stored now may not be able to exchange for the service in the future and concerning the long-term viability of timebank, which all lead to low trust and recognition. In order to make better use of the "timebank" mutual pension mode to expand and socialize the familiar neighborhood mutual assistance and recruit more volunteers to provide help for the elderly in need, relevant government departments should adopt blockchain technology to solve the trust and identity problem of time bank while providing institutional guarantee [1].

2.2. Record Accuracy Needs to be Improved

The record accuracy of public benefit time is the basic guarantee to ensure the long-term operation of timebank. Measuring by the length of time, time recording in traditional timebank is in simple and extensive stage which is hard to guarantee the accuracy of service time. If the public benefit time record is not accurate, it will lead to the imbalance of timebank's income and expenses, and finally lead to the bankruptcy [2]. At the same time, due to the vast of handle agencies, mistaking or even losing the public service time record is easy to happen, or it may be maliciously tampered by others. So, how to ensure the accuracy of public benefit time record is a problem that

timebank's long-term operation must solve. Block chain's traceability and non-tamperability can effectively solve the pain point of timebank's public welfare time record accuracy [3].

2.3. Public Benefit Time is Difficult to Exchange Across Regions

The traditional mode of time bank mutual support for the aged mainly relies on the community to carry out services. But after the volunteers move to other places, it will face the problem that public benefit time cannot be stored and withdrawn. Under the social background of increasingly deepening urbanization and frequent population flow, how to realize the transregional deposit and exchange of public benefit time is also a problem that timebank must solve. And the technical support to settle that must have open, transparent and reliable accounting books. Blockchain, as a new Internet technology, is essentially a public and

distributed ledger, which could effectively verify and permanently record transactions between parties and could pave the way for cross-regional conversions.

3. TECHNICAL CHARACTERISTICS OF TIMEBANK BASED ON BLOCKCHAIN

Blockchain is a new application mode of computer technology such as distributed data storage, point-to-point transmission, consensus mechanism and encryption algorithm, which can be divided into three parts: transaction, block and chain. By virtue of the features of distributed ledger, asymmetric encryption, consensus mechanism and intelligent contract of blockchain, blockchain-based timebank has such technical features as hard to tamper, secure and reliable, collective and autonomous, which can effectively solve the pain points of timebank operation and help it achieve long-term operation [4].

Table 1 Three components of the blockchain

Number	Part	Explanation
1	Transmission	Based on cryptography principles rather than trust, The part of transmission allows both sides whoever reach a consensus to make a direct payment transaction without the participation of a third party.
2	Block	The part of block is used to record transactions and status results that occur over a period of time.
3	Chain	The part of chain is composed of blocks in series in order of occurrence and is the log record of the whole state change.

3.1. Data Cannot be Tampered with

Blockchain uses encryption technology to verify and store data and distributed consensus algorithm to add and update data. It calls for each node to participate in the verification of transactions and generating new blocks. Modifying any data requires changing all subsequent records, so it is extremely difficult to alter single-node data. With blockchain technology, everyone can access a database that records transactions. However, due to the ingenious design, combined with cryptography and consensus mechanism, the data recording mode of blockchain makes it extremely hard to change all subsequent data records in order to modify a certain data. Once the information is verified and added to the blockchain, it is stored permanently. Changes to the database on a single node are not valid unless more than 51% of the nodes in the system are controlled simultaneously. Data can not be tampered with is an important technical guarantee for the long-term operation of timebank [5].

3.2. Data is Secure and Reliable

Blockchain system uses distributed check computation and storage and there is no centralised hardware or management structure. The contents written into blocks will be copied to each node and each node has the latest full copy of the database. All record information is overt so everyone can query block data through the public interface. Every transaction in the blockchain is immobilized into block data through chain storage, and all transaction records in all blocks are processed by superposition HASH summary through cryptography algorithm to ensure that any transaction history is traceable. Because no single institution or individual can control the global data, and shutdown any node will not affect the overall operation of the system, such a decentralized network will greatly improve the security and reliability of data [6].

3.3. Data is Collective and Autonomous

Blockchain is characterized by autonomy, and its core is that all currently participating nodes are maintained by all participants in a reciprocal way. Blockchain adopts consensus-based specifications and protocols, and

exchanges between nodes follow fixed algorithms such as a set of open and transparent algorithms. Data interaction doesn't need to be trusted [7]. The program rules in the blockchain will judge automatically whether the actions are effective or not. The consensus mechanism of blockchain has the characteristics of "minority subordinating to majority" and "equality for everyone". Among them, "minority subordinating to majority" does not completely refer to the number of nodes, but to the computing power, the number of stock equity or other characteristic quantities that can be compared by computers. "Equality for everyone" means that when the node meets the conditions, all nodes have the right to give priority to delivering the consensus result, and may eventually become the final consensus result after being directly identified by other nodes.

4. THE LONG-TERM OPERATION MODE OF ALIBABA TIMEBANK

Alibaba and Haoji technology, based on blockchain technology to build timebank product solutions. They use blockchain as a new model to create trust to perfectly solve many pain points in the operation of timebank faced. In 2019, Alibaba public welfare foundation signed timebank cooperation memorandum with relevant government departments of Hangzhou and Nanjing to promote and improve the mutual assistance service of timebank for the aged [8].

4.1. Accumulate Public Benefit Time

The "public benefit time" here refers to the unified value quantification standard of the love donation, step donation, tree planting and other public benefit behaviors of users recorded on the Internet by Alibaba using big data. Public benefit time exchange adopts "721" exchange mode:

Table2 "721" exchange mode

1	70 percent of the time	Depositing in timebank which is redeemable for future services required by oneself, parents, children or people who donated.
2	20 percent of the time	Converted into equivalent of food, oil, eggs, clothing and other material goods as indirect transportation costs subsidies
3	10 percent of the time	Converted into cash bonus, each hour is valued at 12 yuan, which is used as direct transportation costs subsidies

Instead of depositing all public welfare time into the timebank, the "721" exchange model converts 30% of public welfare time into material objects or cash rewards, which is conducive to volunteers' sustainable participation in volunteer activities and the sustainable development of timebank. Using the "721" exchange model is equivalent to driving 100 percent of the service at 30 percent of the cost which means that the cost government assumed is only 30 percent, including 20 percent of material object exchange and 10 percent cash subsidies. This exchange model plays an important role in easing the social burden, improving the multilevel and sustainable social security systems and promoting traditional Chinese virtues.

4.2. Deposit into Timebank

Blockchain technology plays a crucial role in the stage of depositing public benefit time into timebank. Due to the long cycle of time storage and exchange in the traditional technology mode and the large number of handling institutions, it is easy to make mistakes or even loss in the recording process. Besides, after the volunteers moved away from the local area, how to transfer and exchange data in different places is also a problem. After the application of Alipay blockchain technology, the storage

and exchange of "time" can be ensured to be open and transparent, not tamper-proof, permanently preserved and lifelong traceable. So volunteers can store their "time wealth" without worrying about the possibility that it might not be redeemable in the future because of modification, loss, or unclear confirmation. Alibaba has also incorporated caring funds, charitable enterprises and insurance institutions into its operating systems to ensure the continuous and long-term operation of the timebank.

4.3. Exchange Public Benefit Time

Public welfare time can not only be reserved for themselves at old age, but also be provided to parents for service exchange, passed on as assets to descendants, and donated to lonely elderly people in need. Data on each node of blockchain is consistent in real time, which naturally solves cross-community, cross-institution, cross-country and other connectivity issues. This design also makes it possible for data to circulate freely and save cost while satisfying the high security privacy protection. The time saved by volunteers after giving others service can not only be transferred and exchanged nationwide, but also be spread among generations, transferring, inheriting and donating public welfare time for posterity. Compared with similar regional services in many communities and

institutions, the timebank product takes Alipay, which has a big number of users and transactions, as the entrance and platform. Elderly people and pension institutions can post demand on the platform, then volunteers receive orders and provide services. Under the help of smart contract account system of blockchain, it enables automatic cumulative withdrawal calculation of different proportional values, efficient circulation, real-time account reconciliation, and universal deposit and exchange, which maximizes its value so that the elderly care services can cover the whole society. At the same time, relying on Ant Credit score, user portrait, AI intelligent recommendation analysis and other technologies, to ensure the integrity of public welfare, but also continue to optimize and improve the volunteers' service quality [9].

5. CONCLUSION

As China enters the aging society, the number of "empty nesters" keeps increasing, and their living conditions have drawn great attention from the whole society. The elderly care service has gradually become a social problem. In the 13th five-year plan for the development of national undertakings for the aged and the construction of the old-age care system in China, it is proposed to promote mutual old-age care services. The blockchain-based timebank can make full use of the advantages of blockchain and achieve the long-term operation of the timebank, which is conducive to better combining pension services with voluntary services and forming a new pattern of smart and universal development of social mutual pension.

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