Construction of Central European Cross-border E-commerce Ecosystem by Using the Blockchain Technology

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Abstract: For many years, EU is always the important export market and leading important source of China. China always maintain the close trading relation with EU. Central European cross-border e-commerce development is lagging, thus to construct the harmonious and unified trading ecological environment becomes the urgent demand to promote successful development of Central European cross-border e-commerce. As an advanced collaborative technology, blockchain can uses decentralization, de-trust, anti-fake traceability, consensus mechanism and smart contract to effectively overcome the bottleneck of Central European cross-border e-commerce development and lay a foundation on constructing the Central European cross-border e-commerce ecosystem, which is composed of integrated service platform system of cross-border e-commerce, credit risk management system, supply chain smart system, cross-border logistics system, and customs supervision system. In this ecosystem, the blockchain technology is located in the bottom to support five systems for collaborative operation, improve trading efficiency of blockchain and decrease the safety risk of blockchain.

1. Introduction

At present, existing problems of Chinese e-commerce platform in functions are increasingly standing out, including flooding virtual information; frequent fake commodity and food safety events, and doubt of product traceability; easy leakage of information and ticket updating of fake fans result in credit crisis. Therefore, the characteristics of blockchain will combine with each function of e-commerce in the future to create the new e-commerce mode, showing the vast prospects for development.

2. Technical analysis of constructing Central European cross-border e-commerce ecosystem based on the blockchain

2.1 Application of the blockchain

The blockchain belongs to the bottom technology of bitcoin. By analyzing its meaning, it can be observed that it is the data block formed by cryptology. The interior covers internet trading data of all bitcoins with the role of identifying true or false of data. However, this technology shows identification by comparing bitcoin.

Table 1 Comparison between the Blockchain and Bitcoin System

	Blockchain	Bitcoin
Essence	Bottom framework of value transfer	Digital currency based on cryptology
Consensus algorithm	Construction of multiple algorithms	Workload certificate(POW)
Trading times(second)	Ten thousand times or more	≤ 7 times/second
Link form	Public chain, private chain and alliance chain	Public chain

Data source: Public data and 360kr research institute

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(1) Blockchain application hierarchy

After ten years of development, the blockchain has been developed in three aspects, respectively marked as blockchain 1.0, blockchain 2.0, and blockchain 3.0 according to time occurred.

Firstly, application of blockchain 1.0 refers to programmable currency application, bitcoin, ether coin and Ripple. In early 2010, the first bitcoin stock exchange was founded. After that, the overall price of bitcoin was present in the rising tendency.

Table 2 Bitcoin Price Change Tendency

Time	Early in 2013	April 2013	November 19, 2013	Early in 2015	Early in 2016	End in 2017
Price(USD)	13	266	1242	200	400	20000

Secondly, application of the blockchain2.0 is the “smart contract”.

Thirdly, senior application stage of the blockchain is 3.0, including medical treatment. In other words, the blockchain is used to the extensive social field. This is the block communication and election.

(2) The blockchain is used to construct the supply chain financial service analysis of Central European cross-border e-commerce ecosystem. In the end of 2017, loans of Chinese banking financial institutions was up to 129 trillion RMB. The total amount of supply chain finance at that year was about 10 trillion RMB. The relative scale of supply chain finance service is relatively scale.

Table 3 Financial Loan Scale Structure of Chinese Supply Chain

Loan scale	Below 100 million	100 million—1 billion	1 billon—10 billion	More than 10 billion
Ratio	21%	39%	26%	14%

2.2 Application of the blockchain

Each block in the blockchain contains all transactions. Hundreds of transactions are stored in a block. In order to simplify and rapidly confirm the transaction position, it will verify its existence. The blockchain introduces Merkle tree to sort out all transactions.

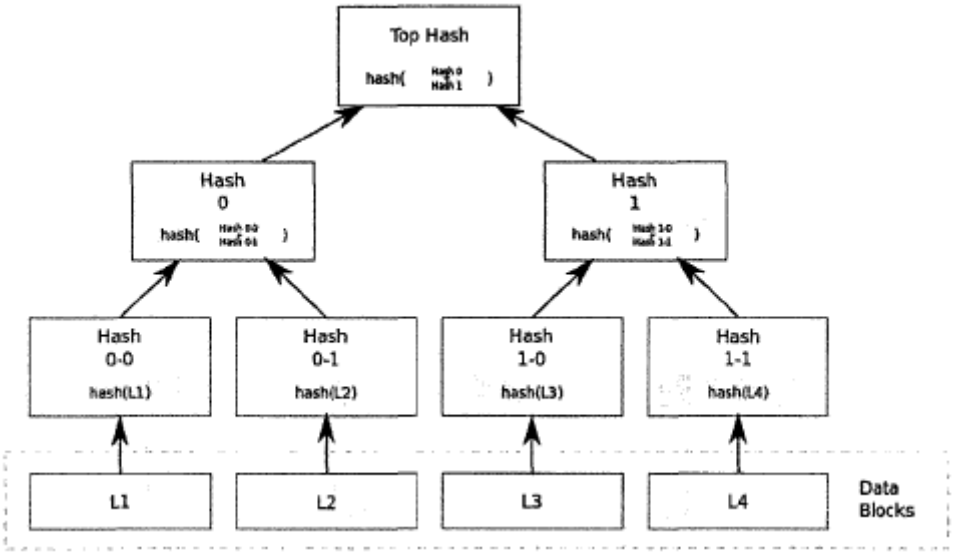

Figure 1 Merkle Tree Structure

Merkle tree is successively generated from down to up. The bottom one refers to original data of L1, L2, L3 and L4. After Hash operation, four hashes of 0-1, 0-1, 1-0 and 1-1 are generated. After two hashes in four hashes are connected in series, Hash operation is conducted again to generate Hash of the up one level. The Hash in the up one level has the same principle. After two hash values are connected in series, Hash operation generates the high-level Hash. If the odd Hash number

makes single hash fail to become unmatched series in a single hash, a hash is copied to enable hash number to be an even number.

2.3 Difference between the blockchain and traditional internet technology

By comparing with the blockchain and traditional internet technology system, the biggest difference lies in common recording of information distribution mechanism of notes in the whole network. The difference of recording way, credit source and reliability between them is stated in Table 4.

Table 4 Difference between the Blockchain and Traditional Technology

	Traditional internet technology system		Blockchain	
	Features	Centralized realization mode	Features	Non-centralized realization mode
Network framework	Centralization	Master-slave B/S network	Decentralization	P2P distributed network
Recording right and recording mode	Central node	The central node can record and maintain all interactive data	All node participation	Consensus algorithm determines recording right and commonly maintains interactive data
Trading mode	Each transaction needs the central node for confirmation	Supervision and maintenance of the central node	Point-to-point transaction	Collective supervision and verification of all nodes
Source of credit	Verification of the central node	The central node conducts credit endorsement for all nodes.	The node verifies its credit.	Asymmetric encryption technique verification and zero knowledge certificate
Trading consistency	The central node safeguards consistency of trading data	An account of the central node safeguards consistency of trading data	All nodes commonly participate in data solving	All nodes ensure trading consistency through consensus algorithm
Trading fraud or not	Possibility of fraud and counterfeit	The central node has the possibility of active fraud	Trading consistency	Distributed distribution and consensus algorithm
Information is tampered	Possibility of tampering and denying data	The central node is possible to be attacked or data are tampered	No fraud and no counterfeit	Distributed storage, chain data structure, Hash algorithm, timestamp and digital signature
Data storage reliability	Middle	The central node is used for storage of the trading information system and disaster recovery backup	No tamper and non-repudiation	Any single node has a fault or minorities of nodes have a fault. The system is normally operated. Moreover, fault node data can be recovered.
Privacy protection	Identity of trading parties has the possibility of leakage	All participation traders need to provide identity information, which is stored by the central node, resulting in privacy leakage of traders	High	All participators label in the blockchain by using ID.

The credit issue is elaborated in Table 5.

Table 5 Technical Features of the Blockchain and Credit Problems to Be Solved

Technical features	Influence on the information stream	Solutions
Hash and block	Single information flow; real, irreversible, non-tempering and improvement on transparency	The problem of tampering information is solved. It is convenient for tracing the commodities and services.
Mining and workload certificate mechanism	All nodes are ensured to have the recording right; the system is decentralized to enhance the entire reliability	
Public key code system and digital signature	Privacy and safety of information transportation are ensured.	Information safety and payment risk are solved.

2.4 Decentralized P2P credit model based on the blockchain

(1) If we change the one-time game into repeated game to explain an honest problem. Repeated game has multiple time stages, which bring the different utility. Therefore, profits in the future time stage should be discounted to the current days. 6 is set up as the discount factor, thus a participator determines to "keep a promise". The total profits in all stages are:

$$\lim_{n\to\infty}\left\{\frac{1}{2}(U-C)+\frac{1}{2}(U-C)\times(1+\delta)^{-1}+\frac{1}{2}(U-C)\times(1+\delta)^{-2}+....\right\}=\frac{1}{2}(U-C)\times\frac{1+\delta}{\delta}$$

Earnings when the participator determines not to keep a promise are shown as follows:

$$U-\frac{C}{2}=\frac{1}{2}(2U-C)$$

As $\frac{1}{2}(2U-C)<\frac{1}{2}(U-C)\times\frac{1+\delta}{\delta}$, we get $\delta<\frac{u}{c}$. Therefore, earnings of not keeping the promise are less than earnings of keeping the promise, thus the participator will determine to keep a promise; as $\delta>1+\frac{u}{c}$, the participator will determine not to keep a promise.

From the perspective of the system structure, the current P2P network loan is not the real P2P network application mode, but it still belongs to the C/S network application mode. Each P2P network loan system(as shown in Figure 2(a)) will have a decentralized network platform. The individual should conduct loan credit transaction through this platform, while real P2P credit system(as shown in Figure 2(a)) is the non-centralized trading platform, but only has the equal user end application.

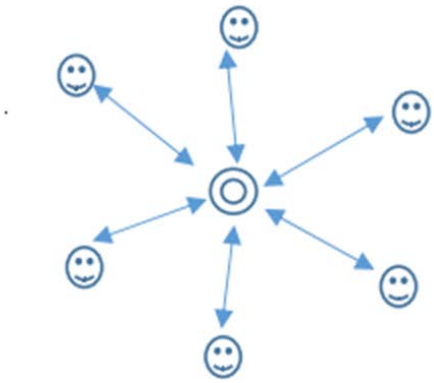

Figure 2(a) P2P Network Loan System Structure

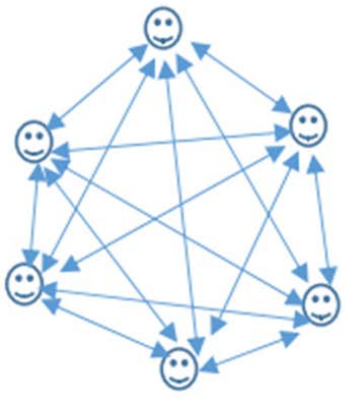

Figure 2(b) P2P Credit System Structure

3. Conclusions

At present, some functions in Chinese e-commerce platform are increasingly standing out. The blockchain that is very popular in recent years is considered as the most effective coping means by experts and scholars. The blockchain is the chain structure connected by data blocks as chronological order. It is the decentralized database formed by encryption algorithm, P2P document transportation, and consensus mechanism, showing new data recording, transmission, storage, and presentation mode. It is used as the backstage support technology to inject new vitality to traditional e-commerce. The blockchain e-commerce platform has several advantages. Firstly, the new block will be promoted in strict accordance with the linear chronological order. Information and trading recording stored on the chain are shared to all nodes. Secondly, the decentralized system has no need for the third-party intermediary or credit institution for endorsement, so as to promote the participators to reach the consensus at low costs. Thirdly, data can be fully disclosed. Any conduct of cheating the system will be restrained by other nodes, while it has no need for support of the authority.

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