Blockchain Tokens for Enterprise Knowledge Sharing: Characteristics, Economic Ecology, and Implications

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ABSTRACT

Virtual knowledge communities have become essential platforms for enterprises to facilitate knowledge sharing. However, due to the lack of effective incentive mechanisms, the traditional virtual knowledge community is generally inefficient in attracting high-quality content and maintaining enthusiasm for users’ long-term participation. To address these problems, we theoretically explore the characteristics and economic ecology of enterprise knowledge sharing based on blockchain tokens to promote its sustained development. Specifically, we examine the application scenarios of token-economy activities through system-dynamics simulation and discuss the development status and path of the economic ecology. In addition, we studied the blockchain token-based incentive and penalty mechanisms for virtual knowledge communities to better stimulate knowledge sharing. Finally, the research method is applied to the GienTech supply chain finance community website to validate the proposed model and analysis. The findings contribute to the existing literature and point enterprises in a new direction in designing more effective incentive mechanisms to improve knowledge-sharing in virtual knowledge communities.

KEYWORDS:
Blockchain, Blockchain tokens, Economic ecology, Incentives, Enterprise knowledge sharing, Virtual knowledge community

1. INTRODUCTION

In a knowledge economy, effective knowledge sharing has become more critical than ever in the business world, and the topic of knowledge sharing has attracted the attention of numerous scholars (Al-Azad, Mohiuddin, & Su, 2022; Borodako, Berbeka, & Rudnicki, 2021; Mengesha, Watson, &
Negash, 2021; Rahman et al., 2022; Uniyal et al., 2021). Prior studies have considered internal talent cultivation or knowledge-sharing as an essential corporate strategy for improving organizational competitiveness (Hsieh et al., 2019; Li et al., 2022; Ma & Zhang, 2022; Yao et al., 2021). Specifically, they have analyzed how various stakeholders, such as government agencies and business organizations, influence knowledge-sharing processes (Kassen, 2020), explored knowledge transfer and its impact on business models (Bernardi et al., 2021), and investigated the effect of organizational and network resource heterogeneities on knowledge transfer (Dolmark et al., 2022; Zhang et al., 2021).

With the rapid development of information and network technology, virtual knowledge has become a critical platform for knowledge transfers or knowledge sharing among employees of enterprises or other organizations (Al-Hasan, Khuntia, & Yim, 2021; Ardichvili et al., 2003; Luo et al., 2021; Qi et al., 2021; Trappey, Chang, & Trappey, 2021; Wang et al., 2022). However, although participants can take non-predicate roles in the process of value co-creation and contribute to such value co-creation in organizations (Goemmar et al., 2021), the full potential of such virtual communities is yet to be realized. Prior studies show that knowledge collaboration is influenced by factors such as participants’ willingness to cooperate and knowledge attributes (Cheng & Chang, 2020). They also find that knowledge is shared more frequently during formal settings than informal settings, suggesting a lack of participant motivation to contribute knowledge in informal settings such as virtual knowledge (Weijs-Perrée et al., 2020). However, not all participants are eager to participate in knowledge internalization or sharing (Wipawayangkool & Teng, 2019). Many virtual knowledge communities fail for the insufficient engagement of participants or collaborators (Haas et al., 2021). Due to the absence of more effective incentive mechanisms, virtual knowledge typically faces low knowledge-sharing efficiency, difficulty in attracting high-quality content, and a lack of user enthusiasm for long-term participation. Hence, refining and developing knowledge-based processes is essential to lead organizations to higher innovation performances (Choi et al., 2020; Wang et al., 2022), which is the focus of our research based on blockchain technology.

The application of blockchain technology has been recently extended to many business areas, including digital finance (Liang et al., 2022; Tapscott & Tapscott, 2017), the Internet of Things (Dai, Zheng, & Zhang, 2019), intelligent manufacturing (Li et al., 2021), supply chain management (Buthelezi et al., 2022; Saberi et al., 2019; Zhang et al., 2021), digital asset trading (Chiu & Koeppl, 2019), shipping and logistics (Harshwardhan & Teoh, 2022), social crowdfunding (Nguyen et al., 2021), international trade (Toorajipour et al., 2022), green innovation (Chin et al., 2022), carbon emission trading (Al Sadawi et al., 2022), and other fields (Liang et al., 2022; Qiu, 2022), which makes blockchain an important technology in building powerful cyber countries, developing digital economies, and facilitating economic and social development. However, it remains unclear if blockchain technology can reshape human Internet activities. Notably, prior research has not shown if blockchain’s unique advantages could help improve knowledge sharing in virtual communities.

Against this backdrop, this study explores how blockchain technology can drive enterprise users to participate more actively in knowledge sharing, publish high-quality knowledge content, incentivize effective knowledge sharing through blockchain token mechanisms, and punish illegal knowledge-sharing behavior. In particular, based on the virtual knowledge of blockchain enterprises, our research analyzes the incentive and penalty mechanism of the token system in the knowledge-sharing platform and proposes a solution to better stimulate knowledge sharing in virtual knowledge. Aiming at the application of blockchain technology in virtual knowledge sharing, we significantly contribute to the existing literature. The research findings can help enterprise managers design more effective incentive mechanisms to improve the quality and efficiency of knowledge sharing in virtual communities.

The rest of the paper proceeds as follows. The following section reviews prior literature with a focus on blockchain, blockchain tokens, token economy, token ecology, and token incentives. Section 3 presents the system analysis of enterprise knowledge sharing based on blockchains. Section
4 demonstrates the system dynamics models for analyzing the influence of a token incentive and penalty mechanism on knowledge sharing. Section 5 focuses on the model analysis and results. The last section concludes the paper by summarizing the major contributions and limitations.

2. LITERATURE REVIEW

2.1 Blockchain and Blockchain Token

Blockchain technology is the core technology with the most significant potential to trigger the fifth wave of disruptive revolution (Baharmand et al., 2021; Zheng et al., 2021).

Translated as the “pass certificate” in the circle of blockchain, blockchain token is an application of blockchain technology. The token issued by the blockchain program is equivalent to the right to perform a specific operation on the network (Hou, 2018). Blockchain tokens can be categorized into native tokens and asset-backed tokens issued on the blockchain to represent some external assets. The token economy represents a promising type of blockchain application project (Zou, 2018) with four primary characteristics: reliability, privacy, liquidity, and universality (Dong & Hou, 2018). The most prominent characteristic of tokens is that they are issued directly by enterprises and set within the quota (Wen, 2018).

The token itself is not an essential element of blockchain technology, but it shines in many blockchain applications. Raskin and Yermack (2018) stated that the cryptographic digital currency based on blockchain tokens would profoundly impact the banking system. Balvers and McDonald (2021) studied the characteristics of virtual currencies and identified tokens as an ideal form of global currency. Sheng et al. (2018) stated that introducing tokens into blockchain applications could generate compelling incentives for system expansion and help redistribute user interests. Abadi and Brunnermeier (2018) used economic methods to explain that blockchain technology could better record the organizational ledger than traditional centralized technology. Kampakis (2018) concluded that blockchain technology could build an artificial economic environment where tokens could bring to the environment more possibilities through the design of incentive mechanisms to guide users to produce particular behaviors. Cong, Li, and Wang (2020) observed that tokens promoted the dealings among the dispersed users and helped them form expectations for future platform development.

The pricing of blockchain tokens is a crucial factor in encouraging the engagement of network platform entities, making it a focal point in research on token pricing. Pagnotta (2019) constructed the demand function of users for Bitcoin and the token supply function determined by miners through mining and obtains the price of Bitcoin through the balance of supply and demand. On this basis, Cong et al. (2022) further improved the platform economic model, considering the incentive effect of tokens on platform contributors and the impact on platform investment level. Fei et al. (2022) built a computational power optimization model based on blockchain. Sun et al. (2022) demonstrated that under Knight uncertainty, investors’ investment efficiency impact would have a huge impact on the blockchain token platform.

2.2 Organizations in the Blockchain Environment

Blockchain solves the “trust” problem, performs the collective coordination function, and provides a technical basis for building a form of organization rarely seen in the history of mankind. This new organizational form is called “Decentralized Autonomous Organization” (DAO, also known as “distributed Autonomous Organization”). In May 2016, members of the Ethereum community announced the birth of the first DAO (Ma et al., 2020).

While “centralization” is the primary characteristic of traditional enterprise organizations, blockchain technology changes this structure: all stakeholders are regarded as a community and can negotiate with each other (Zachariadis, Hileman, & Scott, 2019). Through a certain algorithm, they can use smart contracts to divide rights and obligations. While smart contracts are used to enforce the DAO rules, tokens are used to provide incentives to stakeholders (Shermin, 2017).
With blockchain technology, the activities of all stakeholders are open, transparent, and effectively regulated. Each community member receives the token reward automatically determined by a consensus algorithm and the corresponding smart contract (Lee, 2019). Token reconstructs the relationships among owners, employees, consumers, and enterprises to enable everyone to work together for a common goal.

### 2.3 Token Economy and Token Economics

With growing awareness of blockchain technology, scholars have proposed the concepts of token economy and token economics (Kagel, 1972; Kazdin, 1982; Lee, 2019; Sunyaev et al., 2021). Token economy refers to the cryptocurrency-based system, which creates and strengthens good behaviors in the blockchain ecology (ur Rehman et al., 2019).

The whole process of the token economy includes the production, consumption, investment, and exchange of blockchain tokens (Au & Power, 2018). Within the token community, intermediate links and transaction costs disappear, and large-scale, low-cost, and efficient collaboration among members (or stakeholders) is realized (Sunyaev et al., 2021).

Token economics refers to the incentive mechanism that encourages miners to provide better services on the Internet. The new economic form transforms the existing business logic and changes the way of value creation (Barreiro-Gomez & Tembine, 2019). Token economics includes two crucial parts—value and incentive—as shown in Figure 1.

This paper considers the token economy preferable based on the principle of applied behavior analysis and emphasizes using positive incentives to induce people’s change to target behaviors (Hackenberg, 2018).

### 2.4 Token Incentive

Tokens carrying value can only play an incentive role if they keep appreciating (Kim et al., 2021). Token reward incentives are designed to encourage “miners” to do better jobs and to foster healthier community development. With the token economy growing in scale, the token’s market price gradually rises to attract more participants.

A commonly-used token quantity-regulation mechanism is the Burn Model, in which a portion of the tokens will be recovered and destroyed, and the remaining tokens will appreciate under the law of supply and demand (Kazdin, 2012). The number of tokens can be calculated based on the profit-sharing of the whole ecology. Such operations must be executed in a decentralized manner to avoid intermediate manipulation and fraud. For the sake of fairness and transparency, the recycled

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**Figure 1. Token economics**
token is sent to a place that can only take in the token but cannot transfer it out, and each member of the ecosystem can easily query it.

2.5 Token Ecology

Blockchain can help turn the Internet into a value-based Internet. Figure 2 shows how the blockchain token can perform the functions of price discovery and value creation. When blockchain tokens are endowed with values in specific applications, price discovery is completed through investors’ trading behaviors on the trading platform.

The scale of token ecology is a critical factor in the token economy (Liu et al., 2019). Below a threshold, the population eventually dies. If the threshold is reached or exceeded, one can prosper (i.e., the Allee effect). Clustering is conducive to the growth and survival of the population, but over-sparisty and overcrowding may prevent the growth of the population and have a negative effect on reproduction, leading to extinction. There are many models of token ecology, such as currency, traceability, points, mining machines, assets, data, content, service, fans, and storage.

Some models have great application potential. For example, the asset model includes both the digitalization of the physical asset on the chain and the digitalization of the non-physical asset on the chain (Harish et al., 2021). The data model is to capitalize on data and monetize personal data through data tokens. The service model is to facilitate intelligent matchmaking and smart contracts between service demanders and service providers, realizing a decentralized economy ecology with its own incentive mechanisms (Leng et al., 2019).

Although there have been many studies on blockchain technology and its applications, no prior study has applied blockchain token technology to knowledge sharing in virtual knowledge communities. This paper fills that gap.

Figure 2. Price discovery and value creation functions of blockchain tokens
3. SYSTEM ANALYSIS OF ENTERPRISE KNOWLEDGE-SHARING BASED ON BLOCKCHAIN

3.1 Introduction of Token Mechanism

Blockchain technology is regarded as a solution to reconstruct the lousy order and ecology of various industries of enterprises. The “decentralized” technology features of blockchain realize “technology re-empowerment,” and users, after “equal rights,” can construct a “free market” of content production and communication. The “immutable” technical features of blockchain promote the awe and self-discipline of content producers, forming a technology-driven ethical constraint on the network. The token incentive mechanism of blockchain technology, as distinct from the social incentive mechanism of the Internet, is the continuous driving force that motivates content production on the platform. The introduction of blockchain technology into the token mechanism needs to pay attention to two aspects: on the one hand, there are transaction behaviors on the existing virtual knowledge platform; on the other hand, there are constraints such as insufficient incentives, lack of transaction costs, and inconvenient payment and realization in knowledge sharing (Zou, 2018).

A token incentive mechanism is designed to increase the possibility of certain behaviors in behavioral economics. Certain behaviors will trigger the generation of tokens and thus motivate different agents to become possible (Kampakis, 2018). For example, on Baidu Wenku’s knowledge-sharing platform, users can obtain credits by publishing original articles and browsing literature published by others. Such incentive mechanisms can guide users to form collective behaviors.

The motivational effect of tokens can be seen in Bitcoin’s design. The goal of the research and development of the Bitcoin network is to establish a peer-to-peer payment network in the Internet transaction utterly independent of third-party financial institutions, avoid all arbitration disputes, and decentralized, automatic award issuance (Nakamoto, 2008). In any other network node, any behavior beneficial to the network node can get incentives of Bitcoin. Of course, if there are violations, they will also be punished so that a user participation incentive and punishment system can be established.

The promoters of enterprise knowledge-sharing can formulate a set of incentive and punishment mechanisms according to the platform’s characteristics and business needs so that all users can participate in knowledge-sharing activities together to maintain the token economy’s sustainability. For active participants, token-based incentive systems not only eliminate central authority but also ensure security and transparency, whereas passive participants will pay the price for their improper knowledge dissemination. Blockchain applications with tokens will eventually complete market economic activities in a decentralized, self-organizing environment, creating a consensus-based, win-win, sustainable ecology.

Figure 3 compares the traditional virtual shared knowledge with the shared knowledge of the blockchain token mechanism.

The traditional virtual knowledge community lacks effective incentive mechanisms. Generally, it motivates participants by utilizing points, medals, and credit systems to divide users into various recognition groups. Even if most users participate in knowledge-sharing activities, they do not receive tangible or substantial benefits.

The introduction of blockchain tokens helps establish a trust mechanism among different parties involved. It also reduces the non-technical organizational costs and value-transmission costs. Each node can access all transaction information in the database and see the behavior of all enterprise users. At the same time, enterprise users will consciously regulate their online behaviors to maintain positive self-images.

The essence of the token mechanism is a deliberately arranged reward system. As long as the user completes the preset target behavior, the corresponding token reward can be obtained according to preset rules. Unlike the general point awards, blockchain technology enables people to form a consensus in which the token has the value attribute and circulation attribute to allow them rights to access functions in the enterprise community platform and its surrounding ecology. The token value
is given by the secondary (the exchange) market, the token holders maintain the token price, and all users in the enterprise community contribute to the ecosystem.

The incentive system promotes more purposeful and valuable engagement by properly setting up tokens, resulting in more high-quality content. Tokens can either be used to reward knowledge production, encouraging users to post content, or knowledge discovery, encouraging users to vote for content. Therefore, the blockchain token becomes an effective incentive for knowledge sharing in the enterprise virtual knowledge community. At the same time, users who publish information illegally will be punished. The token punishment mechanism will reduce the amount of online knowledge published illegally, and a good Internet economic ecology will be formed (see Figure 4).
3.2 System Structure and Indicators

The unique incentive mechanism, punishment mechanism, and organizational structure of virtual knowledge sharing based on blockchain token mechanism determine the characteristics of enterprise users that can be attracted and the level of knowledge sharing.

Enterprise users have different knowledge structures. The essence of virtual knowledge is that enterprise users with different knowledge structures provide different knowledge contents. Ideally, enterprise knowledge sharing should enable users to effectively create, acquire, and organize knowledge and establish and strengthen an organizational culture conducive to generating, transferring, and using knowledge. Table 1 summarizes the indicators of the various virtual knowledge-sharing subsystems based on blockchain tokens.

The enterprise user subsystem includes all the foundations of the blockchain and platform for virtual knowledge sharing. The leading indicators include the number of newly registered enterprise users, the number of enterprise visits, the number of enterprise knowledge discoverers, the number of enterprise knowledge producers, and the number of transformation knowledge discoverers, and the number of transformation knowledge producers.

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Table 1. Enterprise Knowledge sharing token mechanism index system based on blockchain

<table>
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<tr>
<th>Indicators of measurement</th>
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<tr>
<td><strong>Blockchain-based enterprise knowledge-sharing token mechanism</strong></td>
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<td><strong>Knowledge sharing subsystem</strong></td>
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<td><strong>Token subsystem</strong></td>
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Figure 4. Virtual knowledge token ecosystem based on blockchain technology
Knowledge sharing subsystem affects the development of knowledge sharing platform through the quantity and quality of knowledge-sharing.

The token subsystem composed of token reward and token punishment embodies the social and economic value of enterprise virtual knowledge sharing. It mainly includes the total number of blocks, total number of tokens, annual inflation rate, token price, knowledge-sharing incentive, and knowledge-sharing penalty. The annual inflation rate mentioned in this article is based on the Creative Commons token issuance rate, as opposed to the currency circulation inflation rate.

3.3 Subsystem Relationship Analysis

There are correlations and interactions among virtual knowledge-sharing subsystems based on the blockchain token mechanism. (see Figure 5).

The foundation of the knowledge-sharing subsystem and the token subsystem is the enterprise user subsystem. For virtual knowledge sharing based on blockchain tokens, the active activities of enterprise users generate intellectual property benefits, which are rewarded through the token mechanism of blockchain. Corporate users whose school-level activities have a negative impact are penalized through the blockchain’s token mechanism. This dual mechanism of incentive and punishment directly affects the subsystem of knowledge sharing and the subsystem of tokens. The reward and punishment mechanism set by the knowledge-sharing subsystem for knowledge quality, knowledge usefulness, knowledge legitimacy, etc., effectively attracts new enterprise users while retaining many original enterprise users. As the key incentive mechanism and normative mechanism of a virtual knowledge-sharing platform, the token subsystem has mobilized the subjective initiative of enterprise users to share knowledge results and actively innovate.

4. SYSTEM MODEL CONSTRUCTION

4.1 Relevant Assumptions

To facilitate modeling and effectively analyze the impact of the token incentive mechanism and penalty mechanism on enterprise knowledge sharing, we make the following assumptions:

Assumption 1: The number of enterprise users of the knowledge-sharing platform refers to the registered effective enterprise users, excluding inactive users who have not participated in knowledge-sharing for more than one year and other users of the sharing platform.
Assumption 2: Enterprise users are divided into knowledge innovators, knowledge forwarders, and knowledge surfers, and their numbers are increasing gradually.

Assumption 3: Three different types of enterprise knowledge contributors can be transformed into each other, and the number of enterprise users remains the same. The new enterprise users are newly registered enterprise users, which represents an absolute increase in the number of knowledge users on the knowledge-sharing platform.

Assumption 4: The development of enterprise virtual knowledge-sharing platforms is relatively stable. Enterprise users of the Shared Knowledge platform maintain good expectations for the future price of tokens. Token prices will only fluctuate within a reasonable range determined by supply and demand.

Assumption 5: Enterprise users’ participation in knowledge creation and knowledge forwarding is influenced by various incentive factors and restricted by various punishment mechanisms. In addition to the external incentive and punishment mechanism, corporate users are affected by internal motivations such as personal interests and reputation. But according to the principle of system dynamics modeling, intrinsic motivation does not change with the change of time or other variables.

**4.2 Causal Analysis of System Dynamics**

Many factors affect enterprise users’ willingness to share knowledge, such as enterprise users’ subsystems, knowledge-sharing rules, token incentive rules, token punishment rules, and so on.

In the token subsystem, the price of the token can be determined based on the quality of knowledge published by the knowledge-sharers. The total number of tokens depends on the number of tokens, the price change of the token, and the rate at which the token is issued. According to the rules of the smart contract in the blockchain, the enterprise presets the amount of the token based on the price of the token, the current supply and demand of the token, the number of tokens blocked by the platform, and the number of tokens withdrawn by the platform due to penalties. Figure 6 shows how rewards and punishments for knowledge-sharing work.

Corporate users’ willingness to participate in knowledge generation is not only affected by external stimuli but also by internal personal factors, such as social reputation and corporate social

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Figure 6. Knowledge-sharing rewards and punishments work
background. Knowledge innovators and knowledge forwarders in the subsystem of enterprise users can also be transformed. Figure 7 shows the knowledge production analysis.

### 4.3 System Flow Diagram and Analysis of Main Variables
The feedback structure of the above variable system is quantitatively analyzed by a system flow diagram (see Figure 8).

#### Figure 7. Number of knowledge producers

#### Figure 8. Flow chart of virtual knowledge sharing incentive and punishment mechanism system based on blockchain token
The state variables in the system flow chart include the number of enterprise visits on the knowledge-sharing platform, the number of knowledge-sharing innovations, the number of knowledge-sharing forwarding, the total amount of tokens, etc.

The flowrate variable represents the change in the number of enterprises on the knowledge-sharing platform within one year, including the number of knowledge innovations, the number of knowledge transformations, the number of knowledge forwarding, the number of new enterprise usage, the number of token subsystem blocks, etc.

Auxiliary variables are intermediate variables representing the decision-making process and intermediate links describing the decision-making process, including new business user registration rate, power coefficient of business user type conversion, power coefficient of knowledge discovery, power coefficient of knowledge production, quality of knowledge sharing release, annual inflation rate, token price, etc.

Constants represent local goals or criteria in the system, including motivators in the knowledge subsystem of the firm, such as reputation, social connections, altruism, and personal attitudes. Other constants include block production rate in the token subsystem, token allocation, etc.

5. MODEL ANALYSIS AND DISCUSSION

5.1 Model Analysis and Discussion

In the above model, in each block of the knowledge-sharing platform, the token is the incentive that promotes positive collaboration between the stakeholders of the enterprise. The greater the contribution of enterprises participating in knowledge sharing to the platform, the more innovative the knowledge they publish and the more tokens they will get. Otherwise, they will be punished by the platform. As the social acceptance of a knowledge-sharing platform increases, the value of the platform token will also experience a premium. This is an ideal token economy ecosystem where the social and economic value of blockchain tokens will increase if they are combined with positive economic behavior.

Thus, we can design a public chain of knowledge production and knowledge sharing in which business participants can contribute knowledge, comment on each other’s posted instructions, and learn from each other. Participants in the knowledge-sharing event will receive tokens. However, if knowledge contributors infringe on others’ intellectual property or trade secrets, they will lose some of their tokens and even the right to participate, thus degrading the social reputation of the company.

In this study, the knowledge platform can be an organic system to generate enterprise value. Enterprise participants earn tokens by contributing original knowledge or forwarding knowledge and then using the tokens they receive to exchange or learn new knowledge. As a medium for knowledge transfer or knowledge transfer between participating enterprises, the price of tokens is determined by market supply and demand. This is neither a philanthropic system nor a bare-bones system of labor relations like Bitcoin. Tokens can be used as vouchers to obtain consensus, so that token holder can form a community of interests and achieve win-win cooperation.

In this system, the token acts as a reward and punishment vehicle to measure and promote the contribution of enterprise participants. Such incentive and punishment mechanisms will stimulate and enhance users’ enthusiasm to continue to participate in virtual knowledge sharing, reduce the release and dissemination of wrong information, and contribute to the formation of a healthy social ecology based on blockchain.

5.2 Model Validation and Simulation Analysis

GienTech website serves as a platform offering financial services to enterprises, financial institutions, and social groups. Since its establishment in 1995, the company has been actively involved in supply chain finance services starting from 2001. The primary objective of user information exchange on...
this website is to share high-quality information with enterprise users, aiming to minimize instances of duplicate or illicit pledges of movable property in supply chain finance. To ensure the security and immutability of various financial information, the website adopted blockchain technology from 2012 onwards. Considering the specific community development scenario, the simulation is set to the year 2010, with a time cycle of 15 years and a step length of 0.08. The simulation is conducted using the Vensim PLE software.

In this study, we utilized the simulation capability of Vensim PLE to model the incentive mechanism of the virtual knowledge community’s knowledge-sharing token on the community blockchain. By conducting simulations, we obtained graphical representations of key variables within the related subsystems.

The simulation results from the enterprise user subsystem indicate that the user growth pattern within the financial community follows an “S” curve. Currently, the system is in its initial life cycle stage. However, with the influence of economic conditions and international financial policies, the financial community is expected to experience steady and rapid growth in the future. Both enterprise knowledge discoverers and sharers are projected to increase gradually, resulting in a significant increase in the number of tokens generated.

Figure 9. Website homepage

Figure 10. The number of tokens generated
rise in the number of new users. The simulation incorporates token incentives, wherein enterprise knowledge sharers actively contribute and share relevant information on the platform when an adequate number of tokens are available. Conversely, when tokens become scarce and economic incentives are insufficient, enterprise knowledge sharers may exhibit reduced activity in sharing relevant information on the platform.

In the initial stage, the community undergoes rapid development. During this phase, the token incentives quickly stimulate the enthusiasm of enterprise users to engage in voting, while the incentive for excellent content significantly enhances the quality of knowledge sharing within the community. In the middle period, the economic incentives within the knowledge-sharing incentive pool experience a notable decline. In both the early and middle periods, the quantity of knowledge sharing exhibits a clear inverse impact on its quality, resulting in a decline. However, in the middle to late period, the quality begins to rise again. Towards the end of this period, with the economic incentive pool maintaining a relatively stable size, the quality level of knowledge sharing gradually improves, and the community enters a favorable stage of sustained quantity growth and steady enhancement in the quality of knowledge sharing.

6. CONCLUSION

In a knowledge-based economy, the collective assets of corporate knowledge, skills, and expertise become more important than ever in business practice and success (Law, Lau, & Ip, 2021; Liu & Li, 2022). Most businesses have created virtual knowledge communities or platforms for business partners and internal employees to share ideas, knowledge, and expertise (Leung, Cho, & Wu, 2021; Wang, Chang, & Horvath, 2021; Zhang & Srite, 2021). However, these virtual knowledge-sharing platforms often have problems such as low knowledge-sharing efficiency, lack of quality content identification and promotion measures, and low long-term participation enthusiasm of users. The effectiveness of traditional incentives seems limited.

Inspired by the application of blockchain technology in other fields, this study proposes a theoretical system model of virtual knowledge sharing based on blockchain tokens. In the proposed model, incentives and penalties based on blockchain-based tokens play a central role. Aiming at the problems faced by the existing knowledge-sharing platform, this model puts forward a reasonable and practical solution that can restrain knowledge publishers.
The contribution of this research is manifold. First, it extends the application of blockchain technology to the field of virtual knowledge sharing, opening another window to the huge potential of blockchain technology.

Second, the theoretical development and model presented in this study enrich the existing literature on blockchain technology and its applications and virtual knowledge sharing.

Thirdly, through the simulation of enterprise knowledge-sharing behavior under the combined action of incentive and punishment mechanism, it is found that the reward of knowledge sharing and knowledge discovery token can improve the knowledge-sharing level of the virtual knowledge community. The punishment mechanism forms conscious constraints on the enterprise knowledge sharers from two aspects: internal constraints (corporate reputation, etc.) and external token penalties. Introducing blockchain tokens into the knowledge-sharing incentive and punishment mechanism provides a new and practical solution to the problems faced by enterprises’ traditional virtual knowledge platforms.

Therefore, we recommend that business managers consider integrating blockchain token mechanisms into their virtual knowledge platforms. By doing so, it can not only motivate more partner enterprises to participate in knowledge sharing and encourage participants to contribute knowledge and expertise to the enterprise knowledge system but also motivate them to contribute high-quality knowledge content to the system. In addition, because of the tangible value built into the token, continuous active participation in knowledge sharing on the enterprise platform can be expected and achieved, thus gaining lasting enthusiasm for platform participation in the enterprise.

While this paper provides only a theoretical foundation, we suggest that further studies be conducted on enterprises that may actually integrate blockchain tokens into the incentive mechanisms of their virtual knowledge to investigate the magnitude of improvement in knowledge sharing.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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REFERENCE


