A Study of Community-Based Ecological Governance Model of DAO Organizations

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Abstract. In the context of metaverse, blockchain technology provides new ideas for organizational governance in institutional systems. The DAO born based on blockchain is expected to become the underlying paradigm of governance within various organizations in the meta-universe. This paper analyzes the core features and connotations of the decentralized, open, automated and autonomous DAO community-based ecological governance model from blockchain technology, builds the framework of the DAO community-based ecological governance model of "co-creation + sharing + co-governance", summarizes the current dilemmas faced by the governance model, and explore solutions.

Keywords: blockchain; DAO; community-based ecological governance model

1 Introduction

Decentralized Autonomous Organization (hereinafter referred to as "DAO") is necessary as an innovative way to organize collaboration in the future metaverse.

In terms of policy, on April 20, 2020, the National Development and Reform Commission clearly included blockchain in new infrastructure and vigorously promoted blockchain applications. The most representative application of blockchain at the level of organizational governance is DAO.

In the economy, DAO, a decentralized autonomous management paradigm based on blockchain technology, brings new ideas to traditional corporate governance to adapt to the complex and changing environment and the requirements of the new generation of individuals for the organization.

On the technology side, the real implementation of the DAO concept has been made possible by the development of blockchain technology. The four features of blockchain make it the foundation of DAO governance. [1] In the future, the combination of distributed artificial intelligence and DAO can further realize the transformation from automation to intelligence.[2]

At the level of realistic demand, the emergence and development of numerous decentralized autonomous organizations have also become forceful evidence of the relevance and research value of DAO. Such as The DAO、 Uniswap DAO、 Vone DAO,et al. [3]The above examples

provide a realistic basis for the research and promotion of DAO.

As the next-generation Internet iteration direction, the productivity enhancement point of Web3.0 lies in the community-based ecological co-prosperity model (Ownership Economy)[4] , and DAO, as the core carrier of this model, is bound to become the relevant research in question. In this paper, under the background of Web3.0 and metaverse, with blockchain as the technical support and DAO as the carrier, we explore the core attributes of DAO community-based ecological governance model, construct its governance framework, analyze the development path and constraints of this governance model, and propose strategies to deal with them.

2 The technical cornerstone of DAO community-based ecological governance model: blockchain

Blockchain is decentralized, tamper-proof, traceable, multi-party maintenance and open and transparent. [5]So far, all the 3 stages of its development have commendable application evidence. The meta-universe is raging, and many realistic problems of building the meta-universe are gradually emerging. Among them, DAO, born based on blockchain, is expected to become the underlying paradigm of internal governance of various organizations in the meta-universe with its core advantages of decentralization, openness, automation and autonomy. Blockchain technology provides new ideas for the community-based ecological governance model of DAO organizations in the following aspects.

2.1 Blockchain decentralization feature reconstructs the trust mechanism

In the real world, credit-enhancing institutions create a credible transaction environment while also leading to higher transaction costs for both sides of the transaction, resulting in a waste of social resources. The peer-to-peer distributed organizational structure formed on the decentralized underlying technology of blockchain makes the blockchain public ledger transparent, which provides a strong incentive for users to behave honestly, and dishonest behavior has an extremely high cost, which drives the self-interest motive of mutually distrustful collectives, forming trust without trust and bridging the decentralized trust. [6]Blockchain distributes the power of traditional centralized authentication to each participant in a decentralized form. With the combination of underlying technologies such as competitive bookkeeping, longest chain, consensus, smart contracts and asymmetric encryption, blockchain establishes a trust mechanism that is expected to reduce the cost of trust borne by society and establish a social system of trust, security and transparency.

2.2 Blockchain distributed system helps to establish a low-cost social consensus mechanism

In blockchain, the nodes that do not trust each other reach an agreement on the correct result by excluding the interference of malicious nodes in a short period of time through a mechanism, which is called consensus among nodes, and this mechanism is called consensus mechanism. Consensus mechanism is actually a management mechanism based on cryptographic trust, which is a higher level of trust mechanism. From practical Byzantine fault-tolerant algorithm[7] , PoW *proof-of-work* consensus mechanism[8] , PoS *proof-of-stake* consensus mechanism[9] to DPoS *delegated proof-of- stake* consensus mechanism[10] , the consensus mechanism has been continuously improved to solve the problem of distributed database consistency, and

continuously explored to avoid wasting resources such as arithmetic power and electricity while reducing latency, and to establish a lower cost and higher-level trust mechanism.

2.3 Blockchain smart contracts incubate a consensus-based paradigm of decentralized autonomous management

Relying on the technology and features of blockchain, DAO organization form encodes the management and operation rules of the organization in the form of smart contracts on the blockchain, and operates autonomously without centralized management according to the pre-set rules. This has helped shape one of the main characteristics of DAO organizations: the equality of rules.Once the system starts to operate, in principle, it does not need to be managed manually and is not affected by human factors.DAO's decentralized and autonomous mechanism of operation based on smart contracts mainly benefits from smart contracts. A smart contract is essentially a traditional contract transformed into an automatically executable program code that is consistent with it. After the contract is published on the blockchain, it is automatically executed by triggering the contract's events to complete the contract call. Smart contracts transform the "rule of man" into "rule of machine"[11] , weakening the role of hierarchy and managers, realizing the equality of rules for all participants, ensuring the standardization and objectivity of contract execution, and thus reducing transaction costs and execution costs.[12]

3 The construction of DAO community-based ecological governance model: core attributes and governance framework

3.1 DAO organization and community-based ecological governance model

There is no universally accepted clear definition of decentralized autonomous organization DAO so far. By sorting out representative DAO concepts, we grasp the connotation and core of DAO.

In 2014, Vikram Dhillon et al. proposed DAO in the blockchain context in the book *Decentralized Organizations*.[13]

In 2016, Gong Ming pointed out that a DAO is a fully automated company that anyone can join and exit at will, while equity (tokens) becomes the only currency operating in the system, allowing concepts such as revenue and profit to disappear completely, and allowing participants to profit through token (equity) appreciation as the organization's ecosystem grows.[14]

In 2017 Wikipedia gave a definition stating that a DAO is an organization embodied in open and transparent computer code that keeps records of financial transactions and procedural rules on the blockchain.[15]

In 2019, Ding Wenwen et al. proposed that DAO is to gradually encode the management and operation rules (consensus) of the organization's continuous iteration in the form of smart contracts on the blockchain, so as to make the organization realize self-operation, self-governance and self-evolution according to the pre-set rules without the intervention of a third party, and then realize the maximum effectiveness and value flow of the organization through intelligent management means and economic incentives of passwords Organizational form.[16]

2021, Hassan gives the definition of a DAO as a blockchain-based system that enables people

to coordinate and govern themselves in a decentralized system independent of central control through a set of automatically enforced rules deployed on a public blockchain.

The concrete manifestation of decentralized autonomous organization DAO theory applied in practice is the DAO community-based ecological governance model, which is a new social collaboration model and benefit distribution mechanism based on blockchain technology and DAO as the core organizational carrier.

3.2 Core attributes and elements of DAO community-based ecological governance model

3.2.1Decentralization

The decentralized property of DAO community-based ecological governance model is attributed to the technical feature of blockchain which establishing a decentralized and trusted distributed system.[17] The decentralized property of DAO community-based ecological governance model means that in this model, DAO does not have central nodes and hierarchical management structure[18] , which in practice is manifested as the absence of centralized legal entities. Further more, Participants can map all goods and services on the chain through DAO Tokens issued within the organization (i.e. Tokens, a negotiable digital asset and proof of interest[19-20]), which can be defined as needed within the DAO organization. In addition to representing entitlements, Tokens are also an important incentive in DAO governance, as obtaining a pass is an incentive in itself for those who want to participate in the community.[21]) Becoming a stakeholder and thus joining this DAO organization ecosystem is a democratic way of governance in which community members participate together. The rights and responsibilities of any member are the same. In particular, the term "equal" here refers only to equal opportunity and not "equal" in the absolute sense, i.e., DAO participants have the opportunity to become investors or contractors, and to put forward their own proposals; however, in the case of some existing DAO organizations that adopt the PoS (Proof-of-stake) consensus mechanism, for example, PoS requires voting based on the amount of equity to reach consensus, resulting in voting only reflects the will of a small number of nodes with large pass-through holdings, and cannot reflect the will of the majority of small and medium-sized nodes[22] , which cannot achieve the "same" rights in the absolute sense. Nevertheless, DAO brings significant advantages to community eco-governance,such as providing a solution to the problem of adverse selection and information asymmetry existing in the traditional section hierarchy and pyramidal management structure[23]

3.2.2 Open-ended

The openness of the organization in the DAO community-based ecological governance model is demonstrated by:

Firstly, the opening of organizational boundaries, DAO can achieve online operation and maintenance of production and management by coding the organization's charter on the chain, breaking the restriction of geographical location, and each individual has the opportunity to participate in it regardless of their geographical location.

Second, the openness and transparency of rights and obligations. The essence of blockchain is a distributed public ledger, while using timestamp technology to completely record what happened at what time on the blockchain and make it public on the blockchain. [24]

3.2.3 Automation

The tamper-evident nature of the blockchain also means that once a smart contract is on the chain, it is not allowed to be modified, so as to guarantee the authority and trustworthiness of the contract and realize the automated management in the form of "code is law"[25] . With the development of artificial intelligence technologies such as generative adversarial networks, smart contracts are expected to replace each individual node in the current DAO organization, realizing "What-If" type intelligent deduction, computational experiments and autonomous decision-making functions[26] , helping to push the DAO from automation to intelligence.

3.2.4 Autonomy

DAO operates under a standard of operation and collaboration model defined by the stakeholders. Through sufficient consultation, the rights, responsibilities and interests of all parties are clarified, and members reach a consensus to form code-definable and programmable terms and conditions. The self-governance attribute can greatly enhance the participation of community members and strengthen the vitality of the community because it takes care of the opinions of all parties, and eventually realize the incremental marginal effect of DAO[27].

3.3 Governance framework of DAO community-based ecological governance model

Co-creation (productivity), sharing (relations of production), and co-governance (superstructure) constitute the three fundamental aspects of DAO community-based ecological governance, see Figure 1.
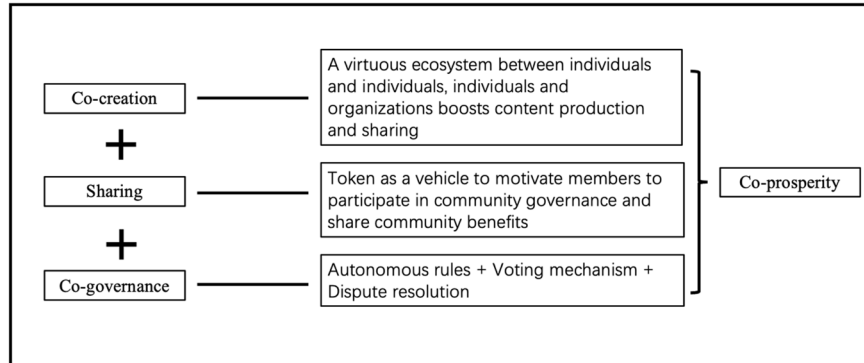

Figure 1. Governance framework of DAO community-based ecological governance model

3.3.1 Co-creation

Co-creation mainly refers to the productivity and production mode of the community, which is inseparable from the community ecology of DAO. As a decentralized organization model typically characterized by the autonomy of member groups, the community consists of a group of individuals with common interests or values, and members are free to produce and share content under the premise of maintaining consistency with the community's own concepts, guidelines and norms. In turn, the community helps members achieve some common goals or visions, which drive them to continuously contribute to the community's popularity and

prosperity. In this process, an interdependent, interactive and dynamically evolving ecosystem is formed among different members of the community.[28]A good community ecology can provide members with important social capital such as trust, reciprocity, identity, reputation, and sense of belonging[29] , and motivate them to contribute to community development. The continuous participation of members satisfies their personal functional needs[30] , and also promotes the effectiveness of DAO community-based ecological organization governance.

3.3.2 Sharing

If we use a cake as an analogy, co-creation is making a cake and sharing is sharing a cake. Token distribution system is used to encourage community members to participate in community governance and share community benefits by issuing Tokens to them, which are currently classified as payment, utility and asset. tool to promote the collaboration of individuals in the community ecology.[31] DAO community-based ecological organizations grant Tokens the right to income through smart contracts, and then realize the right to income through dividends and buybacks.[32]

3.3.3 Co-governance

Co-governance is to make rules together to make a bigger and better share the cake, which is manifested in DAO community-based ecological governance in the form of self-governance rules, voting mechanism, and determination of dispute resolution. In general, the rules of shared governance are made by the participants of DAO organizations in a group manner, which is a kind of democratic governance with joint participation of community members.

The effectiveness and sustainability of DAO community-based eco-organization governance depends on the power relationship between members[33] , and the autonomous rules turn "code is law" into reality, so that each DAO community operates autonomously within the framework of its own autonomous rules.

In terms of voting mechanism, the voting subject is the DAO community participants, specifically the Token holders of the DAO community, and after the DAO community organization is established, all its decisions are made by the token holders of the community.[34] The voting under the DAO community-based ecological governance model allows the organization members to participate in the group "proposal + voting "This is a form of democratic governance in which the community members participate together.[35]

In terms of dispute resolution, the way the rights credential Token is acquired and the one-pass-one-vote mechanism dictate that DAO community organizations cannot avoid disputes. From the current time, there are mainly several solutions: First, the splitDAO function, as exemplified by The DAO, allows the non-supporting party to independently split the main account and create a sub-account when the organization cannot form a collegial agreement for a proposal internally. [36]This method not only ensures the truthfulness of participants to a certain extent, but also solves the problem of "recentralization" of DAO community-based ecological organizations, fully reflecting the openness of DAO community-based ecological organizations; second, the "court agreement" of Aragon DAO as an example. "When a dispute arises, members pay a deposit to become jurors to form a court, and a majority opinion is used to make an arbitration decision within a certain period of time.

DAO community-based ecological organizations operate autonomously in a structured manner within a governance framework of co-creation, sharing and shared governance, ultimately realizing ecological co-prosperity.

4 Conclusions

The constraints of DAO community-based ecological organizations are almost all directly or indirectly related to Token, which is a credential of community members and directly affects their ability and scope to participate in community governance, thus affecting the healthy and orderly operation of the true community ecology. The risk of "recentralization" is inextricably linked to the Token voting decision-making method.

The core decision making method of DAO is voting, and the simplest voting mechanism is one pass one vote. The voting mechanism itself has many flaws, such as the aforementioned collusion of a few people in the decision making process, conflict of interest of members, corruption, and the problem of "recentralization" induced by the concentration of Tokens in the hands of a few people in the community. The DAO community has been working hard to address these issues. Therefore, revising the voting mechanism of DAO community-based ecological organizations to address such problems is the core of realizing the concept of "co-creation + sharing + co-governance + common prosperity". At present, new solutions to these problems have emerged, as shown in Table 1.

Table 1. DAO common voting mechanism[37]

Voting mechanism	Introduction	Advantages	Disadvantages	Representative Institutions
One pass, one vote (1T1V)	An improvement on one-person-one-vote, the simplest and most commonly used of the current DAO voting mechanisms	Easy to operate	Easy to create problems such as collusion of a few in the decision-making process, while triggering "re-centralization"	Common voting mechanisms for most DAOs such as The DAO, Uniswap DAO, etc.
Vote delegation/Liquid democracy	Similar to the representative system. The right to vote is delegated to a professional, but the proxy can be withdrawn or transferred at any time. and that proxy can be multi-level	Increase efficiency by delegating power to a few; increase participation of coin holders; somewhat dissipate the problem of collusion by a few	There are still problems with bribery and collusion	Aragon
Quadratic Voting (Quadrac Voting)	Individual voting subjects are allowed to vote repeatedly for the same option to express the strength of their will, but the marginal cost of voting for the same	Avoid monopolizing the discourse by giant whales; create an open culture of community participation	Increasing the voice of voting subjects while also increasing their financial burden	Gitcoin

	option decreases, i.e., the n+1st vote is more costly than the nth vote			
Holographic Consensus (Holographic Consensus)	Create a prediction market parallel to the voting mechanism through the attention pass GEN, using bets to allow small groups to accurately express the popular will and ensure that the most important proposals get attention	Improves the efficiency of the governance system and provides a usable governance solution for larger DAOs	There is no way to ensure that the screened proposals are truly worthy of attention; the GEN access mechanism dictates that bettors base their judgments on whether a proposal can be passed rather than whether it should be passed	DAOstack
Conviction Voting (Conviction Voting)	A dynamic voting mechanism based on voter beliefs. When a user chooses to vote for a proposal, its voting utility increases over time, but at a decreasing rate, stopping when it reaches a maximum. Each proposal in the community generates a threshold based on the funding requested, and once the "belief" gathered by the proposal reaches the threshold, the proposal is approved and the funds are disbursed	Fundamentally change the voting form, voting is not only related to the number of votes, but also related to time; do not require users to reach a majority consensus on the same issue, give full play to the diversity of user will	Limited application scenarios, currently very suitable for budgetary decisions	1HIVE
Rage Quitting mechanism (Rage Quitting)	Commonly used in investment DAOs, members can withdraw from the DAO at any time, destroy their shares, and get back their corresponding share of the DAO's funds	Under the anger retirement mechanism, no member can control the funds of other members to protect the interests of members, improve the unity of organizational thinking and increase organizational efficiency	The "take it or leave it" approach has increased the instability of DAO organizations and platforms to some extent.	Moloch
Weighted Voting vs (Weighted Voting)	Voting power is tied to the length of time held (coin age) or locked	Make attacks infeasible by increasing their cost	To a certain extent, it hinders the circulation of passwords and	Bifros

	position, the longer the hold or locked position, the greater the voting power		reduces the rate of value flow	
Reputation-based Voting (RV)	Under this mechanism, it is reputation, not passes, that has voting power. Reputation is a non-transferable, non-circulating credit that is earned by holding or locking a pass, or by contributing to the organization. Reputation can be deducted, lapsed or destroyed	Improve the quality of voting through a rigorous approach to reputation acquisition	Cannot completely resist malicious bribery	DAOstack
Knowledge-extractable Voting	A new type of knowledge pass. Before voting, proposals are divided into different topics, corresponding to different knowledge passes, and having a certain type of knowledge pass can have more voting power in the proposals of that type of topic, the core of which is to allow experts with knowledge to have more voting power	The pass is not used for voting directly, but rather by influencing the weight of the vote, reflecting the design idea of "knowledge affects rights" and reflecting on the populism of realpolitik.	The correctness of expert judgment depends on the voting results; the reasonable setting of pass weight and other related parameters is still being explored	dit protocol

A good voting mechanism does not necessarily have to be flawless, but as long as it takes into account the interests of as many people as possible, and does its best to ensure that the decision-making process is realized in a fair and just, efficient and professional manner, and develops toward a better organizational vision, it can better achieve organizational goals and generate good externalities. The above-mentioned voting mechanism keeps correcting its own flaws, and while promoting the development of DAO community-based ecological organizations, it also provides profound inspiration to our real governance and triggers us to think about the origin of human organizational forms.

No mechanism can be perfect, as is the voting mechanism, and so is the organizational governance model. The DAO community-based ecological governance model has technical and institutional shortcomings, but we have reasons to believe that through the improvement of technology and the continuous improvement of institutional design, we will be able to make full use of its core features of decentralization, openness, automation and autonomy, and through the design of the governance structure of co-creation, sharing and co-rule, we will eventually The common goal of human beings is to achieve common prosperity.

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