

A value-driven blockchain network: The efficacy of Ostrom’s design principles in designing a collaborative community governance model¹

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Abstract

The current structure of blockchain governance, which is predominantly reward-based, faces a myriad of challenges regarding decision-making, centralized control, lack of incentives, and an overall absence of a value-driven network. To propose a solution, the study aims to (1) explore the advantage of treating blockchain protocols as **digital commons** instead of public infrastructure and (2) introduce a value-driven blockchain governance model. Termed **collaborative community governance**, our proposed governance structure incorporates the principles of good governance while incentivizing a governor to be a “good governor”. We utilize Ostrom’s design principles (Nobel Memorial Prize in Economic Sciences, 2009) in a blockchain network to design such a governance model. We demonstrate that Ostrom’s principles can potentially introduce a stable decentralized governance mechanism that ensures fair, equitable, and voluntary participation of a governor regardless of the reward while enhancing the value of the network and the reliability of its tokenomics. We consider Ostrom’s eighth principle – “building a nested enterprise” – as the foundation for a bottom-up interconnected decentralized blockchain ecosystem that ensures the Commons governance is driven by multi-faceted community interests. Capitalizing on Ostrom’s design principle, we show that a governance protocol premised upon a set of rules (participation, enforcement, and dispute resolution) can significantly enhance the value of a blockchain network and incentivize a governor to be a good governor. We believe this will constitute one of the first practical applications of Ostrom’s design principles in blockchain’s governance protocol.

I. Research objectives: Incorporating Ostrom’s design principles into a blockchain protocol

“A self-governing institution designed according to Ostrom’s principles provides a way for its members to self-organize the management and sustainability of common-pool resources.” (Petruzzi, 2016).

Ostrom shows that commons can be managed sustainably if certain conditions are met. At the time of writing, Ostrom’s design principles have been applied mainly to common-pool physical resources. In the discourse on blockchain governance, experimental research is going on to understand the implications of blending Ostrom’s design principles to guide the governance of blockchain-based systems protocol to achieve a greater degree of decentralization. The principle of a ‘nested enterprise’ was previously used in REDD+ in designing a governance framework that linked regional and local forest conservation efforts led by forest users (Kashwan and Holahan, 2014). A nested climate accounting architecture integrating DLT, machine learning, and IoT was

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also studied to improve interoperability across accounting systems (Schletz, 2022). We propose a similar governance framework for a blockchain protocol that creates an interconnected ecosystem wherein governors are organized in bottom-up nested tiers, and their governance responsibilities are proportional to commitment and rewards.

The shift from reward-based governance to collaborative community governance supports blockchain's original promise of decentralization and community empowerment. We envision that Ostrom's design principles, once integrated into blockchain protocol, can achieve optimum decentralization while protecting community resources from any disturbance ensuing from majority control, thereby maximizing the reliability of blockchain networks. This essentially balances governors' rewards and commitment to value creation, enabling them to be informed participants in a network's necessary decision-making process.

In earlier work, Rozas et al. (2021) highlighted six blockchain affordances (tokenization, codification of trust, transparency, etc.) that support the concept of 'blockchain as the global digital commons'. In this work, we aim to analyze the advantages of treating blockchain as digital commons from two perspectives – first, to address blockchain's existing governance problems by laying out a tangible design framework in our research paper, and second, to increase the reliability of tokenomics by introducing a tiered approach to blockchain governance. Hence, our research objective is two-fold:

- A. Integrating the “good governance” principle into a blockchain protocol:** To realize the full potential of the blockchain's promises (such as decentralization, trust, confidence, and self-governance), a blockchain-based Governance model needs to incorporate the basic principles of good governance-- accountability, transparency, fairness, responsibility, and sustainability (economic, environmental and technical). We believe in a governance model that integrates accountability as its core foundation and encourages and enables governors to continue to be champions and take up more responsibilities.
- B. Establishing a tiered approach to governance:** We view Ostrom's eighth principle of 'nested enterprise' as the foundation of blockchain governance. Within a blockchain ecosystem, a nested enterprise' refers to building responsibilities among governors interconnected in tiers ('governance tiers') from bottom to top. Each level of governor will have a varying degree of stake in the ecosystem, which determines their rewards. The proposed governance structure ensures a governor's long-term commitment and skin in the game. It thus has the potential of minimizing the risks of moral hazard by requiring the willing governors to be bound by mandatory governance rules to sustainably and transparently manage the common-pool resources.

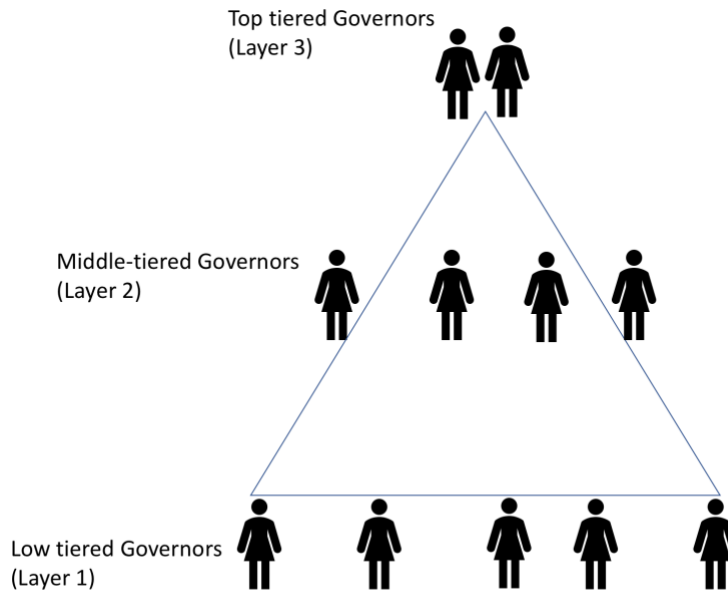


Figure 1: Nested Governance Tiers

To develop a tiered collaborative community governance framework, we use Ostrom’s principle of ‘nested enterprise’ as the foundation. We divide Ostrom’s remaining seven design principles into three main categories -- (1) participation rules; (2) enforcement and execution rules; (3) dispute resolution mechanism.

The participation rules refer to the governance rules determining the terms and conditions of being a governor. While participating as a governor is voluntary, the rules are mandatory. Therefore, if a governor is in breach of any rules, he/she should be sanctioned as per the enforcement and execution rules as agreed to by the community. Any conflict concerning a decision involving the blockchain ecosystem (such as a governor wanting to dispute the imposed sanctions) should be resolved in a prescribed manner. These rules and mechanisms, which can be agreed upon via community voting, are preconditions to building a responsible interconnected system that can govern common resources, sustainably and equitably. During the research stage, we aim to explore the avenues to be obtained to develop the set of agreed rules.

We draw on the model of a “constituent assembly” balancing the empowerment of individual decision-making with individual responsibilities, within a framework that ensures sustainability. We further propose that the governance structure includes an exit strategy for a governor if an unusual circumstance occurs and the governor is no longer capable of performing duties. An exit strategy can be, for example, transferring the committed tokens to an existing governor, as a way to prevent early liquidation.

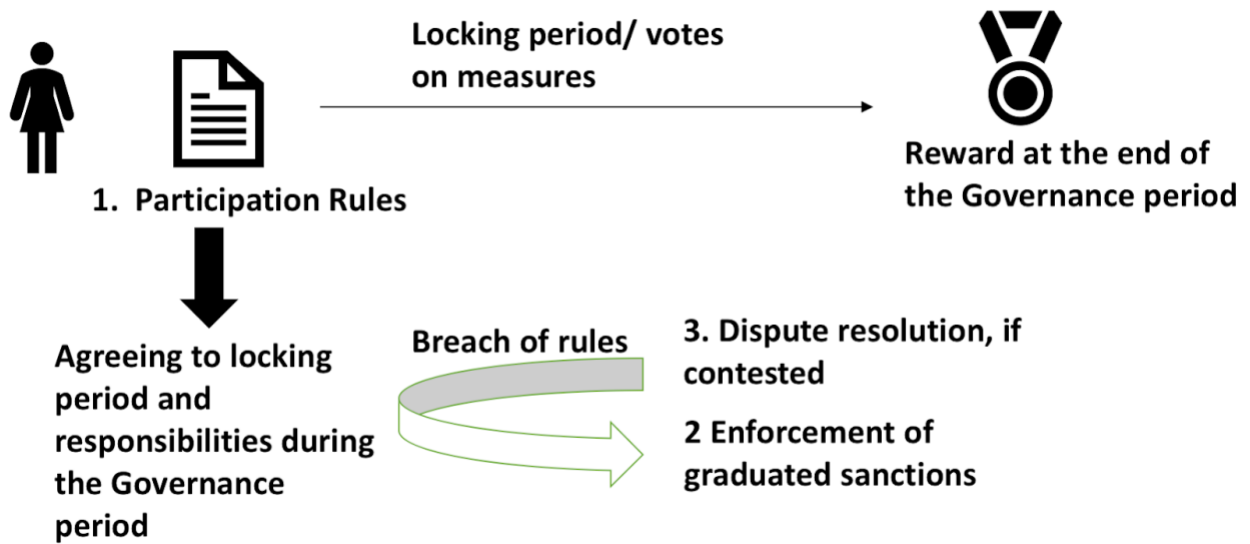


Figure 2: Applying Ostrom’s principles to blockchain governance

We further propose that the Governance structure also includes an exit strategy for a Governor in case an unusual circumstance takes place, and the Governor is no longer capable of performing the duties. An exit strategy can be in the form of transferring the committed Algos to an existing Governor (as a way to prevent early liquidation).

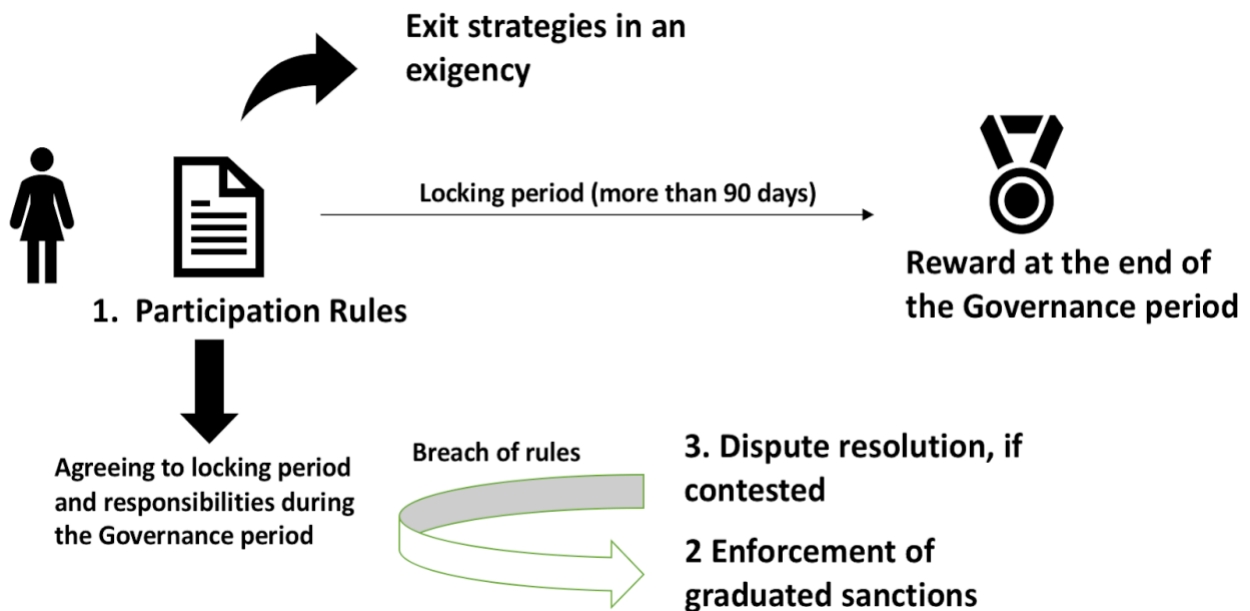


Figure 3: Exit strategy where the locking period is more than 90 days

II. Theoretical Framework

Blockchain as digital commons

We have developed a theoretical framework for our research that uses Ostrom's concept of the commons and applies it to blockchain technology. Digital commons are "a subset of the commons" that inherently apply to the resources "created and maintained online." (de Rosnay and Stalder 2020). This approach fundamentally derives from the discussion of 'common-pool resources', traditionally referring to resources shared by a group of people, such as forests. The utilization of Ostrom's concept of governing the commons in the digital world has gained significant traction due to its potential to sustainably conserve common resources while mitigating conflicting interests. Moreover, in the wake of the proliferation of advanced technologies, such as DLT, machine learning, and IoT, the concept of the digital commons is gaining an innovative dimension. The research can essentially be deployed to design the governance of other newer forms of the digital commons (such as data commons). On a broader scale, the principle of 'nested enterprise' can be deployed to enhance the trust and interoperability of digital infrastructure, which can potentially pave the way to mitigate frictions in fragmented systems. We observe that very little work has been undertaken by the research community that intersects decentralization, governor incentives, and value-creation within a blockchain network. Therefore, we envision our work garnering significant attention from academics, researchers, economists, industry leaders, and blockchain scientists.

III. Research methodology

The study takes a qualitative approach, including primary and secondary research. The primary research consists of interviews with industry leaders, blockchain scientists, and subject-matter experts to understand the current landscape of blockchain governance and identify risks and challenges. The secondary research covers a desk-based literature review. Drawing on references from original and applied cases of Ostrom's design principles, the study methodically analyses (1) the concept of 'digital commons'; (2) the potential of treating blockchain protocol as a common-pool resource; and (3) the efficacy of applying Ostrom's idea of "nested enterprise" in a blockchain ecosystem. **It applies the findings to design a tiered community-empowered collaborative governance framework.**

The study aims to reveal cutting-edge insights for blockchain technology firms to deploy as part of their protocol design and application development. Testing and validation of the concept can be conducted during the research stage and confirmed through industry partners.

The research is integral in understanding the impact of a stable decentralized governance mechanism promoting a blockchain ecosystem's value and reliability and reflecting the community-agreed rules and behavior. Our design ensures governors are a part of the decision-making process relating to the foundation's core organizational structure, economics, and future goals. Hence, this will help develop a long-term value-driven relationship between a blockchain-based network and its governors in the long run.

Our structure bridges the existing information gap (ensuing from the lack of participation in the decision-making process) between a blockchain-based organization and its governors and facilitates a common understanding. Each governor has specific commitment rules and rewards expectations from inception. This removes uncertainty and unpredictability from the governance structure. It brings governors into a decision-making framework where they are driven to create/add value to the network.

In our design, the community has equal right to participate in the governance tiers, each having the freedom to choose the level of commitment and reward voluntarily.

We anticipate the widespread application of Ostrom's design principles in responsible socioeconomic design in the near future (and as indicated in the international policy community), encompassing use cases for DAOs, Dapps, decentralized finance, payments systems, asset management, and distributed investment.

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