



Mohammed Bin Rashid School Of Government

POLICY BRIEF

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Summary

Blockchain technology, a distributed ledger system, has revolutionized the potential for decentralizing governance structures. By relying on collectively managed technologies to pool and share information, blockchain networks present an opportunity to govern the digital commons. This policy brief explores the application of blockchain networks to govern shared digital spaces through decentralized and scalable systems. Blockchain networks offer new possibilities regulating the digital commons, aligning with Elinor Ostrom's principles of participatory decision-making and conflict resolution.

Leveraging Blockchain Networks for Decentralized Governance of the Digital Commons

Professor Mark Esposito

Introduction

Blockchain networks can create inclusive frameworks for managing shared digital resources. These systems align with Ostrom's eight principles for commons governance, including the need for clearly defined boundaries, rules fit to local circumstances, participatory decision-making, self-monitoring, environmental monitoring, sanctions, accessible modes of conflict resolution, and rights to organize. However, despite these capabilities, blockchain networks continue to face challenges with preventing undue concentrations of power, regulating environmental impacts, and clarifying legal ambiguities.

This paper examines the current usage of blockchain networks through several case studies. These findings have been synthesized to form strategies for deploying blockchain while mitigating the risks of centralization, environmental degradation, and legal ambiguity. Eight actionable policy recommendations are provided to outline the equitable and sustainable implementation of blockchain governance systems. These include creating oversight bodies, promoting energy-efficient protocols, addressing token monopolization, and establishing DAO-specific legal frameworks.

Current Usage of Blockchain Networks

Blockchain has seen significant adoption in financial systems, where DAOs and tokenization models enable democratic resource management. For instance, MakerDAO uses governance tokens (MKR) to manage its decentralized stablecoin, DAI. Similarly, platforms like Aragon empower communities to establish self-regulating organizations. These models demonstrate blockchain's potential to decentralize decision-making and ensure transparency.

On blockchain networks, tokenization is used to determine users' rights to conditionally perform an action based on their ownership of an asset. These assets are tokens that function as transferable data elements on the blockchain. Tokenization allows for forms of decentralized governance that are unique to blockchain networks, including DAOs like MolochDAO and MakerDAO. Originally created to fund Ethereum 2.0 development, MolochDAO allows token holders to vote on grant proposals, collectively funding projects that contribute to the Ethereum ecosystem. Similarly, MakerDAO is a lending protocol and a DAO that oversees its operating protocol using the MKR governance token. Such tokens turn users into policy-makers. Holders of MKR participate in the decentralized governance of the MakerProtocol by voting on key policies to govern the network.

Along with tokenization, DAOs allow users on blockchain networks to establish a collective, decentralized decision-making process. Initially, users or community members of a blockchain network propose changes to the network's structure, operation, and strategies. Then, these proposals are refined through online discussions on the blockchain before the core team takes the proposals to on-chain voting. After token holders cast their weighted votes based on their possession of tokens, the core team implements the community-approved proposals. This collective determination of digital regulation aligns with Ostrom's principles for effectively regulating the commons. For example, the MakerDAO ecosystem allows users with tokens to actively participate in governance decisions as well as delegate their voting power to other individuals or entities, who vote on their behalf. This governance model aligns with the monitoring and regulations outlined in Ostrom's principles for efficiently sustaining the commons. with Ostrom's definition of the commons

However, the tokenization model also introduces the risk of centralization when a limited number of individuals or entities owns a comparatively large percentage of tokens. Moreover, despite blockchain networks' inclusionary, collective decision-making approach to decentralized governance, current trends suggest that blockchains are used in fewer cases as platforms for inclusion in the digital commons; rather, the vast majority of blockchain networks are being used for more exclusionary, centralizing ends. As such, DAOs must be limited to only taking initiative when users propose changes.

Existing Guidelines and Policies for Blockchain Networks

The 2023 Ooki DAO ruling set a legal precedent for DAOs. District Judge William H. Orrick ruled that Ooki DAO had illegally operated a trading platform without proper registration as a futures commission merchant. After a \$643,542 fine, Ooki DAO was shut down via default judgement by the Commodity Future Trading Commission. Crucially, the ruling classified Ooki DAO as a "person" under the Commodity Exchange Act, increasing the regulatory and legal liabilities for DAOs. Further rulings in U.S. courts have created the possibility of contributors to DAOs facing personal liabilities, complicating DAOs' model of decentralized governance and increasing legal risks for DAO contributors.

DAOs are limited by the fact that most are still in their infancy, and there is a lack of tooling available for DAO development. This represents an area of development for which resources must be allocated to further investigate. Although there is currently no clear view of how a DAO designed for commons governance would operate, there have been some examples of projects who claim to rely on commons-oriented perspectives, including the Commons Stack project and the Aragon DAO platform.

Environmental concerns stem from energy-intensive consensus mechanisms, while legal uncertainties complicate DAO operations. Furthermore, blockchain initiatives in developing regions can risk perpetuating economic inequalities and exploitative practices. This policy brief investigates current applications and strategies for deploying blockchain networks to regulate digital commons effectively.

Blockchain's energy-intensive consensus mechanisms, such as Proof-of-Work (PoW), have also raised concerns about carbon emissions and resource exploitation. Case studies in Washington and New York highlight the strain on local infrastructure, as well as subsequent policies created to regulate such production.

In 2020, Chelan County, Washington became a hotspot for cryptocurrency mining due to its access to cheap hydroelectric power generated by the Columbia River. The area's historically low energy costs attracted several mining operations, but the influx of miners also generated significant environmental challenges. Mining rigs produce significant heat and require industrial-scale cooling systems to operate efficiently. The large fans used to cool these systems generated constant, high-decibel noise, disrupting the surrounding neighborhoods. Moreover, sudden demand from crypto mining operations overwhelmed the electrical grid. Mining rigs require enormous amounts of electricity to run, causing the local utility infrastructure to reach capacity. To accommodate these demands, the Chelan County Public Utility District (PUD) had to invest in grid upgrades, including installing new transformers and substations. These additional costs imposed financial burdens for the public utility.

To manage the heightened demand and offset infrastructure costs, the PUD introduced a special rate structure for cryptocurrency miners. These higher rates aimed to prevent the costs from spilling over to residential and other commercial customers. However, local residents voiced concerns that they might indirectly subsidize mining operations if rate adjustments proved inadequate to cover the actual costs incurred by infrastructure upgrades. In response to community backlash and grid concerns, Chelan County implemented temporary moratoriums on new crypto mining operations. This allowed local officials to study the long-term impacts of these activities and establish regulations to mitigate adverse effects.

Similarly, in 2020, a decommissioned coal-fired power plant in Dresden, New York was repurposed into a natural gas-powered crypto mining facility. This facility, operated by Greenidge Generation, highlighted the environmental and infrastructural challenges associated with crypto mining. Greenidge Generation converted the plant into a facility that could both produce energy and power its

cryptocurrency mining rigs. The dual-use model created additional strain on the regional energy grid, as large-scale mining operations demand a consistent and significant energy supply. The substantial power usage raised concerns about the facility's impact on energy availability for local communities and small businesses. The high energy consumption by Greenidge's mining operations raised fears of increased energy prices for local residents. While the company claimed to operate efficiently, critics argued that its heavy energy use created upward pressure on rates for the broader community. The facility drew large amounts of water from Seneca Lake for cooling, discharging heated water back into the lake. Environmental groups warned that this practice threatened local aquatic ecosystems, including fish populations and water quality.

The events in Chelan County and Dresden illustrate the unintended consequences of large-scale cryptocurrency mining. While these operations bring investment and jobs, their significant energy demands, noise pollution, and infrastructural strain often outweigh their benefits. Both communities demonstrate the importance of proactive regulation and community engagement to address the environmental, economic, and social impacts of crypto mining.

More broadly, the carbon footprint of cryptocurrency mining rivals that of entire nations, with much of the energy coming from fossil fuels. Mining operations produce e-waste from outdated hardware like ASIC units, which are discarded every 1–2 years. This waste often ends up in the Global South, exacerbating environmental degradation. Often, local communities are left to bear the brunt of these externalities, such as increased pollution, rising utility costs, and limited job creation. In order to reap the democratizing benefits of decentralized blockchain networks in the digital commons while minimizing environmental exploitation, users must have equal input in the functions of the network, as well as with external regulatory bodies.

Strategies to Deploy Blockchain Networks

Deploying blockchain networks as a mode of regulation for the digital commons requires the designing of efficient, inclusive frameworks. Blockchain networks should be equipped with token systems that balance accessibility and governance rights. Introducing non-monetary criteria for token distribution can democratize participation.

For DAOs to be effective, they must be scalable and flexible enough to accommodate diverse governance needs. Developing robust tools to simplify DAO creation and management can encourage broader adoption and participation. Features such as delegated voting allow less-active participants to voice their opinions through trusted representatives, enhancing inclusivity. Scalable DAOs also promote adaptability, ensuring that they can handle the complexities of large and growing communities while maintaining transparency and fairness.

Blockchain networks need clear legal definitions and protections to ensure compliance. Collaboration between blockchain stakeholders and regulators is critical for creating guidelines that safeguard contributors while enabling innovation. International agreements on DAO operations can standardize governance across borders, reducing the risks posed by conflicting legal systems. These frameworks should also address responsibilities, accountability, and mechanisms for resolving disputes to foster trust and stability.

Transitioning to energy-efficient consensus mechanisms, such as Proof-of-Stake (PoS), is essential to minimize blockchain's environmental footprint. PoS not only reduces energy consumption but also aligns with sustainability goals by promoting more environmental practices. By prioritizing energy efficiency, blockchain networks can balance technological innovation with environmental responsibility.

Mechanisms to prevent resource monopolization are vital for maintaining fairness in blockchain networks. Introducing caps on token ownership or redistributing governance rights ensures that no single entity wields disproportionate influence. This approach encourages diverse participation and safeguards the decentralized nature of the system. Additionally,

implementing periodic audits and transparency measures can hold stakeholders accountable and deter resource hoarding.

Blockchain projects in developing regions must prioritize ethical practices to avoid exploitation. Engaging local communities and fostering partnerships can ensure that benefits are equitably shared. Community-driven initiatives reduce the risk of financial colonialism and empower local stakeholders to take ownership of projects. Transparency and accountability in these deployments are essential to building trust and ensuring that blockchain serves as a tool for inclusive growth rather than exploitation.

Policy Recommendations

- 1. Establish Governance Oversight Bodies:** Create multi-stakeholder organizations to oversee blockchain-based governance models. These bodies should include representatives from academia, civil society, and industry to ensure balanced decision-making.
- 2. Incentivize Energy-Efficient Blockchains:** Introduce tax credits or subsidies for projects adopting sustainable protocols like PoS or innovative solutions such as carbon offsets for blockchain operations.
- 3. Enforce Anti-Monopolization:** Mandate transparency in token ownership and impose limits on individual or organizational holdings to prevent centralization.
- 4. Develop DAO-Specific Legal Frameworks:** Work with international bodies to standardize legal definitions and protections for DAOs, clarifying responsibilities and liabilities for contributors.
- 5. Promote Blockchain Education:** Fund initiatives to educate marginalized communities about blockchain technology, ensuring informed participation and reducing barriers to entry.
- 6. Regulate Crypto-Environmental Impact:** Require blockchain projects to report their energy usage and environmental footprint. Introduce penalties for non-compliance with sustainability standards.

- 7. Protect Local Economies in Developing Regions:** Implement safeguards to prevent exploitative practices by blockchain firms. Encourage partnerships with local organizations to ensure that benefits are equitably distributed.

- 8. Establish Standards for Blockchain-Based Commons:** Develop global standards for managing digital commons using blockchain, incorporating principles of transparency, inclusivity, and sustainability.

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