CPSC 610: Topics in Computer Science and Law

Final Project

DAO Governance: Decentralized Autonomous Organizations,

Quadratic Voting, and Liberalism

Michelle Fang

Professor Joan Feigenbaum

December 18, 2021

Table of Contents

Part I: What is a DAO?

- I. Definitions & History
- II. Governance Structure
- III. Benefits & Limitations
- IV. Current Landscape
- V. Blockchain Technology
- VI. Legal Aspects

Overview

Part II: DAOs as the Leviathan

- I. The Political Theory of Liberalism
- II. Blockchain and Trust

Part III: The Mechanism of Quadratic Voting

- I. Problem: Tyranny of the Majority
- II. Quadratic Voting as a Solution
- III. Drawbacks & Limitations
- VII. Alternative Voting Methods

Part IV: My Proposal of DAOs and QV as a Political Governance Structure

- I. Approach: The Case Against Techno-determinism
- II. Proposal
- III. Legal Challenges

Conclusion

Part I: What is a DAO?

In the society we live in today, the use case of blockchain technology has revolved around money. Bitcoin started a wave of digital assets that have shaken our imagination of financial systems; however, technologists involved in the blockchain revolution want to bring to reality a vision that operates beyond payment systems.¹ Large-scale blockchain-based ecosystems hint at a future where online groups coordinate exclusively through software. This future was brought to reality after Vitalik Buterin created the Ethereum blockchain, where one of the first projects was The DAO, the decentralized autonomous organization, or a blockchainbased cooperative that set membership rules and coordinated through code.² As the various realms of our physical lives have been digitized, perhaps society's coordination, decisionmaking, capital aggregation and deployment, can progress with blockchain technology to bring a new governance structure in this new diamond age.³

I. Definitions & History

A decentralized autonomous organization or DAO is a blockchain-based system that allows people to coordinate and self-govern through a series of smart contracts. DAOs often function as a collective that is organized around a joint mission and operates through a shared set of rules enforced on a blockchain. What makes DAOs different from traditional legal entities is that DAOs are not controlled by boards but instead are governed by democratic or participatory processes and algorithms. Members rely on smart contracts as the "primary glue" to manage

¹ Law, A. W., Clinical Professor of Law at Benjamin N. Cardozo School of. (2021). The Rise of Decentralized Autonomous Organizations: Opportunities and Challenges. Stanford Journal of Blockchain Law & Policy.

² Cryptopedia Staff. (n.d.). The DAO: What was the DAO hack? Gemini. Retrieved December 21, 2021

³ Wikimedia Foundation. (2021, November 4). *The diamond age*. Wikipedia. Retrieved December 21,

member-to-member transactions.⁴ A smart contract is a program stored on a blockchain that runs when predetermined conditions are met, which can automate the execution of rules in DAOs.⁵ At its core, a DAO is a complex set of smart contracts that mediate member interaction.

The idea of a DAO was first proposed in 2013 by Dan Larimer, a software developer who envisioned a "decentralized autonomous company" where the "source code defines the bylaws."⁶ Larimer's concept of a DAC was generalized into a DAO to incorporate non-capitalistic organizations. The first DAO, named "The DAO," was launched on April 30, 2016 on the Ethereum protocol by Christoph Jentzsch, an engineer at the Ethereum Foundation, with a token sale that distributed DAO tokens in exchange for ether (ETH).⁷ The DAO was conceptualized as a virtual venture capital firm where DAO tokens gave members the right to vote on investments using collectivized funds. Around that time, Ethereum was still in its infancy; its first cryptocurrency release, called Frontier, was released in July of 2015.⁸ The Ethereum protocol was the first blockchain structure that enabled developers to layer programs of smart contracts and decentralized applications (DApps) on top of the cryptocurrency.⁹ The DAO was seen as a revolutionary project and crowdfunded \$150 million USD worth of ether within three weeks of its token sale, but an attacker exploited a vulnerability in The DAO's code and stole \$60 million of ether.

The saga ended with the Ethereum blockchain controversially implementing a "hard fork" to restore The DAO's capital to investors. The decision to fork was controversial since

 ⁴ Law, A. W., Clinical Professor of Law at Benjamin N. Cardozo School of. (2021). The Rise of Decentralized Autonomous Organizations: Opportunities and Challenges. Stanford Journal of Blockchain Law & Policy.
 ⁵ What are smart contracts on Blockchain? IBM. (n.d.). Retrieved December 21, 2021

⁶ Larimer, D. (2013, September 7). Overpaying for security. Let's Talk Bitcoin. Retrieved December 21, 2021

⁷ Cryptopedia Staff. (n.d.). The DAO: What was the DAO hack? Gemini. Retrieved December 21, 2021

⁸ Magas, J. (2020, July 31). Five Years of Ethereum: From a teenage dream to a \$38B Blockchain. Cointelegraph. Retrieved December 21, 2021

⁹ Magas, J. (2020, July 31). Five Years of Ethereum: From a teenage dream to a \$38B Blockchain. Cointelegraph. Retrieved December 21, 2021

blockchains are designed to be immutable and censorship-resistant — forking created two competing, separate pre- and post-fork Ethereum blockchains: Ethereum Classic (ETC) and Ethereum.¹⁰ Although the first DAO ended with an infamous hack, it proved the concept of a decentralized, automatically running organization that made investment decisions democratically by giving members voting rights on projects funded by the group. Ultimately, the definition of what qualifies as a DAO is still in constant evolution. Right now, a DAO is a blockchain-based organization that consists of autonomous smart contracts and digital assets that are internet-native, facilitate economic and social interaction, and are global in reach.¹¹

II. Governance Structure

Laws are to our society as smart contract code is to DAOs—it is the supreme rule. Members that join a DAO agree to abide by the "rule of code"—the contracts form a network of immutable or hard to change rules that institute the standards of interaction in this organization. DAOs enable members to collaborate autonomously or without the need for a central authority as members transact and deliberate on decisions according to the protocol that are enforced by the blockchain. Smart contracts allow members to control the DAO's assets and observe each member's past votes and interactions. Membership to a DAO is normally obtained through purchasing a minimum threshold of the organization's tokens and comes with specific rights, such as sharing in the DAO's profits (or losses), accessing certain privileges, managing joint resources, and participating in decision-making processes.¹² The less hierarchical governance of

¹¹ Law, A. W., Clinical Professor of Law at Benjamin N. Cardozo School of. (2021). The Rise of Decentralized

¹⁰ Cryptopedia Staff. (n.d.). The DAO: What was the DAO hack? Gemini. Retrieved December 21, 2021

Autonomous Organizations: Opportunities and Challenges. Stanford Journal of Blockchain Law & Policy. ¹² Law, A. W., Clinical Professor of Law at Benjamin N. Cardozo School of. (2021). The Rise of Decentralized Autonomous Organizations: Opportunities and Challenges. Stanford Journal of Blockchain Law & Policy.

DAOs is reflected in the way DAOs are managed by group consensus. There are two primary taxonomies of DAOs:

 Participatory DAOs use smart contracts to "aggregate votes or preferences of members". Governance is organized by a vote that is measured through tokens distributed to users (in a pure democratic manner).

2) Algorithmic DAOs are a nascent organizational design that defer entirely to software or the structure of smart contracts to coordinate interactions.



Two types of DAO structures (Wright and Cardozo, 2021)

The DAO design that technologists are optimistic about is upgradeable smart contract participatory DAOs (bottom left in the chart). This type of DAO "helps soften some of the downsides that accompany more autonomous smart contracts."¹³ Smart contracts are designed to be tamper-resistant or extremely difficult to modify once deployed—potentially leading to

¹³ Law, A. W., Clinical Professor of Law at Benjamin N. Cardozo School of. (2021). The Rise of Decentralized Autonomous Organizations: Opportunities and Challenges. Stanford Journal of Blockchain Law & Policy.

regulatory challenges and difficulty to change the contract if there is a bug.¹⁴ This issue is partially mitigated if initial developers of the DAO protocol can "transfer ongoing decisionmaking to a disparate group of the software's users" which gives the members of these DAOs the ability to update the smart contract.¹⁵ Participatory DAOs with upgradeable or amendable smart contracts foreshadow a future where open source technology is managed by its token holders, which incentivizes the continued improvement of the organization's smart contracts.

III. Benefits and Limitations

There are many benefits to DAOs. First, DAOs transcend geographical and national borders and seek to "stretch across the globe, stitching together thousands" of members.¹⁶ Furthermore, DAOs present operational efficiencies compared to existing legal entities by allowing for a rapid acquisition and deployment of capital. This is made possible by DAOs implementing "low-cost and streamlined digital voting schemes" through algorithmic systems and blockchain-based voting, which allow members to cryptographically verify and publicly view and audit the vote results. In turn, by making the voting process more transparent, secure, and autonomous, participatory DAOs can reduce the chances of contested decisions and fraudulent behavior. Moreover, the digital nature of DAOs decreases both the economic and time costs of voting. Participatory DAOs also better incorporate input from a "wider group of stakeholders in a wider variety of situations and circumstances" by eliminating the need for a central manager.¹⁷ The decentralized structure of DAOs allows organizational duties to be distributed among members, which in turn creates accountability.

¹⁷ Ibid

¹⁴ Ibid

¹⁵ Ibid

¹⁶ Ibid

A barrier to the mass-adoption of DAOs as a governance structure is the cost to creation. If the cost of deploying a DAO decreases, it will have more potential to coordinate a large group of people. Moreover, another potential limitation is that DAO memberships are often transitory, in which members can join for a time period and leave due to a lack of interest or better opportunities.¹⁸ The frequent entering and exiting of members could cause decisions to be made for short term interests, which in turn could harm the well-being of the DAO. However, more specific to governance, smart contracts do not remove sociopolitical tensions and human limitations in information gathering and rationality, which both undermine the capacity of members to fully engage with the DAO's governance structure.¹⁹ Algorithmic DAOs are seen as a potential solution to the set of risks mentioned above but also can be jeopardized by bugs in the software. Ultimately, the "ideal" design of DAOs is still being explored due to the complexities of governance and decision making, in addition to a lack of legal recognition making it difficult for DAOs to interface with traditional society and regulation.

IV. Current Landscape

In the past year, DAOs made headlines as consortiums of NFT owners and crypto investors made bids for million-dollar music albums and rare, first edition Constitutions.²⁰ An NFT or non-fungible token is a digital asset that symbolizes real-world objects like art, music, or videos that are purchased and sold online with cryptocurrencies.²¹ Recently, NFTs have become more mainstream as people use them to buy artwork and rare collectibles. In late November,

¹⁸ Ibid

¹⁹ Ibid

 ²⁰ Sigalos, M. K. (2021, November 20). The crypto investors who raised \$47 million to buy a copy of the Constitution lost their bid - here's where the money goes now. CNBC. Retrieved December 21, 2021
 ²¹ Conti, R. (2021, November 30). What you need to know about non-fungible tokens (nfts). Forbes. Retrieved December 21, 2021

ConstitutionDAO announced its shutdown after raising \$47 million to bid on a rare copy of the U.S. Constitution, but lost the auction to the CEO and cofounder of Citadel Securities, one of the largest hedge funds in the world.²² The organizers decided to end the project and refund investors, but a significant portion of the transaction was spent on gas fees, which are transaction fees that individuals pay on the Ethereum network.²³ Another high-profile DAO purchase that was featured by the *New York Times* is PleasrDAO's purchase of the Wu-Tang Clan album "Once Upon a Time in Shaolin" for \$4 million.²⁴ PleasrDAO is a collective with a portfolio of rare NFT and art collectibles. After buying the music album, PleasrDAO created an NFT to formalize their ownership.

Since the first DAO in 2016, the market for these protocols has expanded drastically. Right now, there are over 100 DAOs managing over \$10 billion in assets.²⁵ The map below shows the various types of DAOs. Grant DAOs were one of the first use cases for this type of organization, and are another form of DAOs where communities donate capital that the organizations manage then choose how to allocate to various projects. For instance, MolochDAO was founded in March of 2019 to place members' ether (ETH) into a fund contributing to Ethereum projects that members vote on.²⁶

²² Hirsch, L. (2021, November 19). Ken Griffin, head of Citadel, bid highest for a copy of the Constitution. The New York Times. Retrieved December 21, 2021

²³ Kastrenakes, J. (2021, November 23). ConstitutionDAO will shut down after losing bid for Constitution. The Verge. Retrieved December 21, 2021

²⁴ Sisario, B. (2021, October 20). Meet the new owners of the Wu-tang clan's one-of-a-kind album. The New York Times. Retrieved December 21, 2021

²⁵ Coopahtroopa. (2021, November 27). Dao Landscape. Mirror. Retrieved December 21, 2021

²⁶ Peaster, W. (2019, August 19). Molochdao looks back on its rising role in Ethereum Ecosystem. Blockonomi. Retrieved December 21, 2021



Map of DAO Landscape from Twitter²⁷

V. Blockchain Technology

Definitionally, the blockchain is a data structure that is a distributed ledger where information is stored in blocks and linked to past blocks via cryptography, which gives participants read-access rights to verify transactions. Each block is transmitted to a distributed network of computers, and to ensure that data is synchronized, each blockchain requires a consensus mechanism, which preserves the sanctity of the data.²⁸ Blockchains vary in terms of rules of access and scope of distribution— "permissionless blockchains" allow everyone to join the network and write consensus data. This system is highly decentralized but operates at a reduced speed. On the other hand, "permissioned blockchains" restrict the ability to change the blockchain to "pre-approved participants who need off-network authentication and permission to

²⁷ Coopahtroopa. (2021, November 27). Dao Landscape. Mirror. Retrieved December 21, 2021

²⁸ Reinsberg, B. (2021). Fully-automated liberalism? Blockchain technology and international cooperation in an anarchic world.

write.²⁹" Similarly, blockchains can be designed with different read-restrictions. Adjusting write and read restrictions can help develop blockchain systems that solve a variety of problems.

Blockchain technologies are in their early-stages. In November of 2008, a white paper released by Satoshi Nakamoto created the first cryptocurrency Bitcoin, which uses a public-permissionless blockchain as "a decentralized alternative to fiat money backed by central banks.³⁰" Bitcoin enabled direct instantaneous transfer of value in a fully decentralized mode, which eliminated the need for participants to trust each other or rely on a central authority. The first wave of blockchain technologies was from 2009 to 2013 and consisted mainly of other cryptocurrencies or altcoins. The second wave of blockchain innovation starting in 2014 extended the usage of this technology beyond financial systems to more complex token and agreement structures, such as DAOs.

A key aspect of public-permissioned blockchains is authentication which comes in many forms. Decentralized applications built on Ethereum, a general-purpose blockchain that can "settle any kind of digital transactions, not just cryptocurrency transfers" supports both the "proof of work" consensus mechanism and "proof-of-stake," which allows participants to "validate a proposed block with probability proportional to its staked deposit.³¹" Another consensus mechanism used by the World Bank is "proof of authority," which allows "trusted" participants to manipulate the ledgers.³²

VI. Legal Aspects

²⁹ Ibid

³⁰ Ibid

³¹ Ibid

³² Ibid

DAOs are a new form of corporate governance agreements written in coded contracts and implemented in blockchain. Due to the recency of its rise in the past five years, DAOs lack most forms of legal recognition, which can cause DAO members to be exposed to liabilities. In March of 2021, the Wyoming state Senate passed the *Decentralized Autonomous Organizations Supplement (DAO Supplement)*, which was a bill trying to layout a legal framework for this new entity that was previously not covered by any existing federal, state, and foreign law. Now in court, DAOs are categorized in three main ways: 1) Unformed DAOs are run by members in an unassociated partnership scheme; 2) Wrapped DAOs utilize a traditionally recognized legal entity with DAO features built into the governance; 3) True DAOs are organizations recognized as DAO LLCs under U.S. law.

Overview

In pursuit of principles of liberal democracy, I propose a governance system using decentralized autonomous organizations (DAOs) as the infrastructure for our liberal society and quadratic voting (QV) as a new voting system. The remainder of this paper will first discuss DAOs as a vehicle for liberalism (Part II), liberal values, and how blockchain technology creates trust. Then, the paper will critique the tyranny of the majority in democratic institutions then explain the system of quadratic voting and its limitations (Part III). Finally, I will detail my proposal of using quadratic voting in participatory DAOs with upgradeable contracts and analyze potential legal challenges (Part IV).

The focus of this paper is unique in that it departs from the mainstream discussion of DAOs as an investment or corporate structure and instead analyzes it for political governance. I synthesize the theory of DAOs as an artificial trusted entity for liberalism and practical

implementation mechanisms like quadratic voting to advocate for DAOs and QV as a structure for policy votes or political elections.

Part II: DAOs as the Leviathan

I. <u>The Political Theory of Liberalism</u>

Liberalism is a political theory positing that the government is necessary to protect individuals from being harmed by others, however, the government itself can also threaten the liberty of individuals.³³ Modern liberals believe that the core responsibility of the government is to remove obstacles (like poverty, disease, and discrimination) that hinder individuals from freedom or fully realizing their potential. Liberalism has an interesting relationship with democracy where the core of democratic philosophy is the belief that governments "derive their authority from popular election," in which liberals fear that democracy may create a tyranny of the majority. Democratic agendas satisfy majorities but liberalism focuses on protecting unpopular minorities.³⁴

Thomas Hobbes' *Leviathan* is one of the most influential pieces of modern political philosophy and key works of liberalism. Given that most of the western world has liberal democratic institutions, we live in the "shadow of the Leviathan.³⁵" Hobbes' theory rests on the premise that we exist in a state of war where a person may need things from another person to survive but both parties have no trust that the other party will hold up their end of the agreement. Thus, Hobbes advocated to give an artificial entity a monopoly on power and violence to avoid

 ³³ Encyclopædia Britannica, inc. (n.d.). Liberalism. Encyclopædia Britannica. Retrieved December 21, 2021
 ³⁴ Ibid

³⁵ Danaher, J. (2016, March 24). Blockchains and Daos as the modern leviathan. Blockchains and DAOs as the Modern Leviathan. Retrieved December 21, 2021

the "war of all against all." Trust is the reason why we need government, and a lack of trust leads to a disintegration of cooperation and society. Therefore, Hobbes proposes a "once-in-a-lifetime" agreement where individuals transfer their "natural rights and powers" to the artificial being known as the Leviathan.

II. Blockchain and Trust

Blockchain technology can be used far beyond its current popular form of cryptocurrency. The distributed ledger uses a verification process that entails "cryptographic tools such as public key encryption, hash functions, and proof of work" that is performed on the network and can lock-in the transaction.³⁶ Blockchains can be used as the infrastructure for the Leviathan by enforcing agreements. Specifically, DAOs can function as the artificial entity of the Leviathan where smart contracts with conditional commitments like "I'll do X for you if you do Y for me" can be monitored and enforced on the blockchain.³⁷ The automated recording and verification process on the network can create trust in these interactions.

Specifically, DAOs can enter contractual relationships with people that allow these agents to interact with each other according to a set of predetermined, immutable or difficult to change, self-enforcing rules.³⁸ This can parallel Hobbes' theory of a once-in-a-lifetime transfer of power when coders and citizens sign onto an initial agreement as a prerequisite to the organization's formation that "will prescribe the powers and conditions that will be enforced" by the DAO.³⁹ After this agreement, the DAO becomes an independent, autonomous entity that enforces rules according to its code, which brings the benefit of transparency. One note is, while

³⁹ Ibid

³⁶ Ibid

³⁷ Ibid

³⁸ Ibid

this paper advocates for DAOs as the Leviathan, the Hobbesian artificial entity is an immense centralization of power and DAOs, by its nature, is a decentralized form of authority.

Part III: The Mechanism of Quadratic Voting

I. <u>Problem: Tyranny of the Majority</u>

Voter preferences are aggregated poorly in conventional democratic institutions. Oneperson-one-vote combined with majority rule does give everyone an equal chance to influence the outcome but "fails to give proportional weight to people whose interests in a social outcome are stronger than those of other people.⁴⁰" This gives rise to the age-old problem: tyranny of the majority. Historic solutions such as "supermajority rule, weighted voting, cumulative voting, executive discretion" have misfired by creating gridlock or corruption.⁴¹

Tyranny of the majority can seriously harm public good. In the U.S., the tyranny of the majority often leads to the systematic transfer of power and wealth because the political process is repeatedly used by a majority, such as white people, to push forward policies that benefit their group at the expense of minorities, such as immigrants of color.⁴² Moreover, majority rule can subvert democracy by excluding large minorities from participating in the process of governance. In America, the majority has attempted to and hindered minorities from political participation via gerrymandering districts, censorship, and raising costs of political

⁴⁰ Posner, E. & Weyl. G. "Voting Squared: Quadratic Voting in Democratic Politics" (Coase-Sandor Institute for Law & Economics Working Paper No. 657, 2014).

⁴¹ Ibid

⁴² Ibid

organization.⁴³ No existing voting system calibrates policy decisions based on the power afforded to minorities to the strength of their interests.⁴⁴

II. Quadratic Voting as a Solution

To address the traditional voting problem of not giving voters influence in proportion to the intensity of their preferences, I propose quadratic voting as a method to prevent the tyranny of the majority and better achieve liberal democracy.

Quadratic Voting (QV) is a voting method designed by Microsoft researcher Glen Weyl that reflects the intensity of people's preferences in collective decisions. Voters receive budgets of "voice credits" that they can allocate to different questions on the ballot to demonstrate the intensity of their conviction on that topic. Mathematically, each "voice credit" converts to "counted votes" according to a square root function. The formula is: *cost to the voter = (number of votes)*². For example, one voice credit on a policy is one vote while four credits is two votes and nine credits is three votes. A project on the ballot is approved if the votes in favor exceed the votes against. Quadratic Funding was first introduced by Gitcoin Grants which allowed community members to donate crypto to new projects to build public goods in the Ethereum ecosystem.⁴⁵ However, HackerLink was the first product that created an on-chain quadratic voting and funding mechanism that was scalable; in the past year, \$10 million dollars in cryptocurrency have been distributed to nearly 1,000 projects around the globe through Hackerlink.⁴⁶

⁴³ Ibid

⁴⁴ Ibid

⁴⁵ DoraHacks. (2021, October 23). What is quadratic voting/funding? how did we improve it? Medium.

⁴⁶ Ibid

The outcome is QV significantly alleviates the majority tyranny problem as empowering those with stronger preferences to influence the vote outcome in proportion to the strength of their beliefs. While the minority may still lose to the majority, they will rarely lose to a majority with weak preferences. Moreover, quadratic voting is incentive compatible based on the assumption that members value their voice credits or money spent to buy votes.⁴⁷ For cases where preferences are similar, the majority will prevail, but with QV, when minorities "sufficiently intense interests, they can protect their interests from majority domination.⁴⁸" Another theory why QV leads to optimal outcomes is because of market principles. Since voters are assigned a limited voting budget to allocate, the most efficient strategy is to spread the votes across multiple issues. However, a voter is able to use more votes on a topic if they feel especially strongly about that issue, which creates a preference economy.⁴⁹

III. Drawbacks and Limitations

Some concerns with quadratic voting relate to issues of Sybil attacks, disproportionate influence from the wealthy, and the lack of control over what is on the ballot in the first place. First, the implementation of quadratic voting relies on secure identity verification. A Sybil Attack is where an "attacker utilizes fake or duplicate identities in order to influence outcomes," which can pose a serious problem for QV since having multiple identities leads to exponentially more voting power.⁵⁰ I believe that the on-going innovation of identity verification technology,

⁴⁷ Patty, J.W., Penn, E.M. Uncertainty, polarization, and proposal incentives under quadratic voting. *Public Choice* **172**, 109–124 (2017). https://doi.org/10.1007/s11127-017-0406-3

⁴⁸ Ibid

⁴⁹ Ibid

⁵⁰ Accelerated Capital. (2021, July 30). Daos and democracy: Voting mechanisms in Web3. Accelerated Capital. Retrieved December 21, 2021

such as the scaling of "proof of personhood" projects can be potentially applied to QV to combat this concern.

The age-old problem of the rich having more power and political influence is not resolved by a quadratic voting system so long as more votes can be bought through the governance token. QV is not a solution to society's wealth inequality but can dampen the effects of wealth because the cost of a purchased vote is quadratic. For example, a person with 100x more wealth only has 10x more influence on the vote outcome versus 100x, which diminishes the influence of wealth by 90%. Perhaps this is pessimistic but I believe wealth inequality has existed before and will persist; however, QV is a better alternative than the voting system that the status quo employs.

Another common concern of QV is that it does not decide what goes onto the ballot. When there is a "fixed number of collective decisions," QV is the optimal system; however, QV does not have a built-in mechanism for evaluating what questions make it to the ballot.⁵¹ While QV protects the minorities, it does not address the politics and power dynamics of proposing topics for the ballot. For example, a party can repeatedly propose a decision that a majority "weakly approves of" and a minority "strongly disapproves of" until the minority uses all of their voting tokens (the minority is using more tokens due to the quadratic formula). I acknowledge this is a fair concern—however, QV is not a panacea for ballot proposals but rather offers a new voting system to combat the tyranny of the majority.

IV. <u>Alternative Governance Methods</u>

⁵¹ Posner, E. & Weyl. G. "Voting Squared: Quadratic Voting in Democratic Politics" (Coase-Sandor Institute for Law & Economics Working Paper No. 657, 2014).

Aside from quadratic voting, there are a variety of DAO governance structures with innovative governance and voting mechanisms to engage members and optimize governance decision-making. Some other methods include allowing members to allocate "more weight to decisions based on how long a member supports a given proposal" as a signal of conviction and rewarding long-standing members; using prediction markets to reduce friction and stem voter apathy, or adopting a completely algorithmic governance structure instead of voting.⁵² One alternative that I found interesting is the holographic consensus (HC), a voting mechanism spearheaded by DAOstack that connects the prediction market to proposals on the ballot.⁵³ Specifically, voters can stake funds in support of or against a proposal, in which they will benefit if they predict correctly. Proposals that are predicted to pass are "boosted" which alters voting rules to decrease the barrier to passing a proposal compared to other proposals that don't have funds staked. This voting mechanism could potentially protect the ballot from "nefarious proposals" since voters have to stake funds in their predictions.⁵⁴

Part IV: Proposal of DAOs & QV for Political Governance

I. Approach: The Case Against Techno-Determinism

A critique that I have of the current blockchain and cryptocurrency space (aside from its acute lack of gender diversity) is that developers are primarily focused on monetary, investment, or corporate use cases of this technology. Even though the rise of NFT-focused DAOs that buy

⁵² Law, A. W., Clinical Professor of Law at Benjamin N. Cardozo School of. (2021). The Rise of Decentralized Autonomous Organizations: Opportunities and Challenges. Stanford Journal of Blockchain Law & Policy.

⁵³ Arsenault, E. (2020, December 15). *Voting options in Daos*. Medium.

⁵⁴ Ibid

rare collectibles seem to focus on art, it is ultimately another kind of investment in social status or what people call "clout." I hope that the potential of blockchains and DAOs can be harnessed for government and civic use cases.

However, a problem is that we most often evaluate DAOs through the lens of capitalism or techno-determinism. Market-driven values are undeniably intertwined with the fabric of our society, so it is important to build structures that reflect this reality but also guard values of democratic equality. On the other hand, techno-determinism envisions DAOs as a form of "decentralized trustlessness" and ignores the complexity of social organization by assuming that hierarchies between members during decision-making "vanish" with technological innovation.⁵⁵ I believe that techno-determinism is reductionist and disregards existing power structures, and that traditional authorities, like the U.S. government, are still necessary for democratic processes. Thus, I advocate for an approach where DAOs can support and facilitate traditional, centralized forms of governance by providing more transparent and efficient methods to achieve liberal democracy.

II. <u>Proposal</u>

This proposal combines two formerly separate parts of literature to outline a form of DAO governance using quadratic voting to achieve liberal democracy. I advocate that DAOs can play the role of the Leviathan to act as the central trusted authority. To avoid the concern of members being locked in a DAO with outdated rules, I propose adopting a participatory DAO with upgradeable contracts, which allows for modifications of the protocol after voting. I believe

⁵⁵ Rozas, D., Tenorio Fornés, A., Díaz Molina, S., & Hassan, S. (2021). When Ostrom meets Blockchain: Exploring the potentials of blockchain for common governance.

that DAOs can be a vehicle to better uphold values of liberalism through its transparent and efficient structure, which can increase government accountability and credibility.

Within the DAO, I propose a governance structure where quadratic voting is implemented via a dual-structure that values members regardless of their socioeconomic status but also reflects the reality of our capitalist society and incentivizes capital pooling. This is achieved through a system where the total number of voice credits is determined by: 1) assigning a set budget of votes for each unique individual in the community that is not based on their financial ability, and 2) by allowing the payment for votes through purchasing the native DAO governance token. There will be rules for a ceiling of the maximum number of votes that can be purchased. For example, each person is given 64 voice credits by virtue of being a part of the community, which can be verified for example through their residential address, and can purchase up to 36 more credits via purchasing the DAO's token. The defined allocation of votes brings benefits of democratic equality while the option to purchase votes is constrained by the exponential cost of voting, which combats wealth inequality but also allows for external sources of capital.

A real-world example of this governance structure could be town residents voting for local officials based on the strength of their preferences. For instance, if a resident is a parent and cares about the town's education policies, they can allocate more voice credits when voting for school board members or decisions related to school-zoning. Another resident who is a retiree, perhaps cares more about safety and noise and can reflect this preference by spending more voice credits, or even purchasing some extra votes, when the ballot includes policies related to policing or the expansion of highways and businesses into the town. The implementation of quadratic voting allows each town resident's strength of preference to be incorporated in their vote.

III. Legal Challenges

A potential legal challenge to implementing DAOs in government elections or policy decisions is the lack of a "gap-filling mechanism.⁵⁶" The nascency of DAOs as a structure of governance results in smart contracts having gaps that are not covered in the rules. Traditionally, these "gaps" are filled in by law, but that does not exist for DAOs. For example, in the 2016 hack of The DAO, there were no rules for how to proceed if a hacker stole money. Consequently, Buterin's decision to hard fork and refund investors was a conflict-ridden process. It's very difficult for policies and smart contracts to anticipate every possible scenario, but the difference between DAOs and traditional entities is that laws cannot serve as a safety net that provides guidance. Using traditional legal documents to fill in the gaps within a DAO's protocol can result in translation error since U.S. law was not written for blockchain technology. This challenge is compounded by the industry's focus on financial use-cases, which causes most blockchain and DAO-related legislation to be related to securities, taxes, and anchored in American business law.

Conclusion

This paper first explains the concept of a decentralized autonomous organization (DAO), its origins and infamous hack, various governance structures achieved through smart contracts, and its benefits of transparency and limitations of cost and transiency. In the second part of the

⁵⁶ Law, A. W., Clinical Professor of Law at Benjamin N. Cardozo School of. (2021). The Rise of Decentralized Autonomous Organizations: Opportunities and Challenges. Stanford Journal of Blockchain Law & Policy.

paper, I provide a proposal to use participatory DAOs with amendable contracts as a vehicle to achieving liberalism. Moreover, I advocate for quadratic voting as a governance structure within DAOs to protects minority interests by allowing voters to reflect the strength of their preferences in their votes. The paper analyzes the problem of the tyranny of the majority, the advantages and limitations of quadratic voting, and previews alternative governance methods. Finally, I propose DAOs as a tool for political governance using quadratic voting where citizens will be given an equal number of voice credits but are also permitted to buy a limited number of extra votes. This approach faces legal challenges given the lack of gap-filling mechanisms but presents a unique potential application of DAOs and quadratic voting for political and civic use.

References

Accelerated Capital. (2021, July 30). Daos and democracy: Voting mechanisms in Web3 . Accelerated Capital. Retrieved December 21, 2021, from https://acceleratedcapital.substack.com/p/daos-and-democracy-voting-mechanisms

Arsenault, E. (2020, December 15). Voting options in Daos. Medium. Retrieved December 21,

2021, from https://medium.com/daostack/voting-options-in-daos-b86e5c69a3e3

Conti, R. (2021, November 30). What you need to know about non-fungible tokens (nfts). Forbes. Retrieved December 21, 2021, from https://www.forbes.com/advisor/investing/nft-non-fungible-token/

Coopahtroopa. (2021, November 27). Dao Landscape. Mirror. Retrieved December 21, 2021, from <u>https://coopahtroopa.mirror.xyz/ EDyn4cs9tDoOxNGZLfKL7JjLo5rGkkEfRa_a-6VEWw</u>

- Cryptopedia Staff. (n.d.). The DAO: What was the DAO hack? Gemini. Retrieved December 21, 2021, from <u>https://www.gemini.com/cryptopedia/the-dao-hack-makerdao#section-what-is-a-dao</u>
- Danaher, J. (2016, March 24). Blockchains and Daos as the modern leviathan. Blockchains and DAOs as the Modern Leviathan. Retrieved December 21, 2021, from <u>https://philosophicaldisquisitions.blogspot.com/2016/03/blockchains-and-daos-as-</u> <u>modern-</u> <u>leviathan.html#:~:text=In%201651%2C%20Thomas%20Hobbes%20published%20Levia</u> <u>than.&text=For%20by%20Art%20is%20created,whose%20protection%20it%20was</u>

<u>%20intended</u>.

DoraHacks. (2021, October 23). What is quadratic voting/funding? how did we improve

it? Medium. Retrieved December 21, 2021, from <u>https://hidorahacks.medium.com/what-</u> is-quadratic-voting-funding-how-did-we-improve-it-70989e813cf9

Encyclopædia Britannica, inc. (n.d.). Liberalism. Encyclopædia Britannica. Retrieved December

21, 2021, from https://www.britannica.com/topic/liberalism

- Hirsch, L. (2021, November 19). Ken Griffin, head of Citadel, bid highest for a copy of the Constitution. The New York Times. Retrieved December 21, 2021, from https://www.nytimes.com/2021/11/19/business/ken-griffin-constitution.html
- Kastrenakes, J. (2021, November 23). Constitutiondao will shut down after losing bid for Constitution. The Verge. Retrieved December 21, 2021, from <u>https://www.theverge.com/2021/11/23/22799192/constitutiondao-shutting-down-lost-auct</u>

ion-refunds

Larimer, D. (2013, September 7). Overpaying for security. Let's Talk Bitcoin. Retrieved December 21, 2021, from

https://letstalkbitcoin.com/is-bitcoin-overpaying-for-false-security

Law, A. W., Clinical Professor of Law at Benjamin N. Cardozo School of. (2021). The Rise of Decentralized Autonomous Organizations: Opportunities and Challenges. Stanford Journal of Blockchain Law & Policy. Retrieved from

https://stanford-jblp.pubpub.org/pub/rise-of-daos

Magas, J. (2020, July 31). Five Years of Ethereum: From a teenage dream to a \$38B Blockchain. Cointelegraph. Retrieved December 21, 2021, from https://cointelegraph.com/news/five-years-of-ethereum-from-a-teenage-dream-to-a-38bblockchain

- Patty, J.W., Penn, E.M. Uncertainty, polarization, and proposal incentives under quadratic voting. *Public Choice* **172**, 109–124 (2017). https://doi.org/10.1007/s11127-017-0406-3
- Peaster, W. (2019, August 19). Molochdao looks back on its rising role in Ethereum Ecosystem. Blockonomi. Retrieved December 21, 2021, from https://blockonomi.com/molochdao-rising-role-ethereum/
- Posner, E. & Weyl. G. "Voting Squared: Quadratic Voting in Democratic Politics" (Coase-Sandor Institute for Law & Economics Working Paper No. 657, 2014).
- Reinsberg, B. (2021). Fully-automated liberalism? Blockchain technology and international cooperation in an anarchic world. International Theory, 13(2), 287-313. doi:10.1017/S1752971920000305
- Rozas, D., Tenorio Fornés, A., Díaz Molina, S., & Hassan, S. (2021). When Ostrom meets
 Blockchain: Exploring the potentials of blockchain for common governance. Sage Open 11 (1), pp. 1-14. DOI: 10.1177/21582440211002526.
- Sigalos, M. K. (2021, November 20). The crypto investors who raised \$47 million to buy a copy of the Constitution lost their bid here's where the money goes now. CNBC. Retrieved December 21, 2021, from

https://www.cnbc.com/2021/11/18/constitutiondao-crypto-investors-lose-bid-to-buy-cons titution-copy.html

Sisario, B. (2021, October 20). Meet the new owners of the Wu-tang clan's one-of-a-kind album. The New York Times. Retrieved December 21, 2021, from https://www.nytimes.com/2021/10/20/arts/music/wu-tang-clan-once-upon-a-time-in-

shaolin.html

Wikimedia Foundation. (2021, November 4). The diamond age. Wikipedia. Retrieved December

21, 2021, from https://en.wikipedia.org/wiki/The_Diamond_Age