DECENTRALIZED GOVERNANCE (DEGOV). AN EXPERIMENTAL STUDY.

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ABSTRACT

This project explores the participation of retail investors, or small cryptoasset holders, in decentralized autonomous organizations (DAOs) and how they perceive cryptoassets, primarily as a source of yield rather than a means for decentralized governance or control, affecting the exercise of governance rights. This project seeks to understand how separating cryptoasset holders' economic rights from voting rights could encourage more active involvement in the organization, thereby mitigating the collective action problem prevalent among organizations in blockchain and beyond. Through the conduction of an online experiment, this study examines assumptions related to passive investment and coordination costs among small cryptoasset holders.

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INTRODUCTION

"[Cyberspace] is an act of nature and it grows itself through our collective actions."[1] Early believers in Cypherpunk ideology envisioned the collective action *solution* as one of the many features of the burgeoning world of blockchain. Their goal was to develop a cryptographic system that leveraged private property and markets to minimize coercion while maximizing efficiency.[2] They pursued this vision through blockchain, a record-keeping system that uses cryptographic methods to register transactions.[3] However, blockchain is more than a record-keeping tool; it has also been promoted as a trustless system for electronic transactions characterized by disintermediation and decentralization.[4]

Around this ecosystem, many communities and organizations have emerged that rely on the technological benefits of disintermediation and decentralization. In the blockchain space, these organizations are known as Decentralized Autonomous Organizations (DAOs).[5] DAOs aim to operate through computer code as their primary source of governance and organization, eliminating the need for boards or intermediaries.[6] Participants

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[1] John Perry Barlow, *A Declaration of the Independence of Cyberspace*, EFF (Feb. 8, 1996), https://www.eff.org/cyberspace-independence.

[2] Decentralized organizations' governance mechanisms. Vitalik Buterin, *Moving beyond coin voting governance* (Aug. 16, 2021), https://vitalik.ca/general/2021/08/16/voting3.html.

[3] Christian Catalini & Joshua Gans, *Some Simple Economics of the Blockchain. Online appendix*, 63 COMMUN. ACM A-1 (2020). Blockchain is a species of Distributed Ledger Technologies (DLTs). A distributed ledger technology keeps track of information recorded in a public ledger using cryptographic means. A blockchain adds peer-to-peer networks and consensus mechanisms, among other economic incentives, to validate transactions (represented by a string of numbers and characters) before recording them in a virtual block (instead of book pages) visible to the network. See Christian Catalini & Joshua S. Gans, *Some simple economics of the blockchain*, 63 COMMUN. ACM 80–90 (2020); Carla L Reyes, *Moving beyond bitcoin to an endogenous theory of decentralized ledger technology regulation: An initial proposal*, 61 VILLANOVA L. REV. 191 (2016); AARON WRIGHT & PRIMAVERA DE FILIPPI, *Decentralized Blockchain Technology and The Rise of Lex Crytographia*, SSRN ELECTRONIC JOURNAL 5 (2015).

[4] Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008), https://bitcoin.org/bitcoin.pdf.; Reyes, *supra* note 3, at 196.

[5] See Vitalik Buterin, *DAOs, DACs, Das and More: An Incomplete Terminology Guide*, ETHEREUM FOUNDATION BLOG: RES. & DEV. (May 6, 2014), https://blog.ethereum.org/2014/05/06/daos-dacs-das-and-more-an-incomplete-terminology-guide/; Carla L Reyes, Nizan Geslevich Packin & Benjamin P Edwards, *Distributed Governance*, 59 WILLIAM MARY L. REV. ONLINE 1 (2017).; Cristiano Bellavitis, Christian Fisch & Paul P. Momtaz, *The rise of decentralized autonomous organizations (DAOs): a first empirical glimpse*, 25 VENTUR. CAP. 187–203 (2023).

[6] Aaron Wright, *The Rise of Decentralized Autonomous Organizations: Opportunities*

join these organizations by contributing capital or labor and, in return, receive digital assets (cryptoassets) from the DAOs.[7]

The technological elements of blockchain strongly influenced the development of DAOs and participants' adherence.[8] The emphasis on decentralization suggests that blockchain distributes control among participants, thereby eliminating the concentration of power among centralized actors. However, decentralization has not eliminated the need for governance.

For many years, the technological underpinnings of blockchain have overshadowed the need for good governance within such organizations.[9] Governance is frequently associated with intermediation and centralization, evoking the image of middlemen and centralized entities that govern institutions. Participants in the blockchain space believed intermediaries and centralized actors were deemed complicit in the financial crises of the 2000s and continue to associate these roles with poor management.[10] Consequently, blockchain participants rely heavily on technology to solve legal problems by eliminating these intermediaries and substituting them with protocols and software to improve their organizations' governance. Nevertheless, governance remains a critical issue.

Broadly speaking, governance comprises social practices and activities that develop gradually over time across organizations.[11] Governance emerges as a counterpoint to government and the concept of a unified state.

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and Challenges, 4.2 STANFORD J. BLOCKCHAIN L. POL'Y 152 (2021).

[7] PRIMAVERA DE FILIPPI & AARON WRIGHT, BLOCKCHAIN AND THE LAW 136 (2018).

[8] Participants joined DAOs because the technology's trustworthiness fosters confidence and induces reliance on the system. Primavera De Filippi, Morshed Mannan & Wessel Reijers, *Blockchain as a confidence machine: The problem of trust & challenges of governance*, 62 TECHNOL. SOC. 1, 4 (2020).

[9] A questionnaire sent to various blockchain organizations revealed that only 30% of respondents indicated that issuing cryptoassets aimed to improve governance. The majority stated that the primary purpose of issuing cryptoassets was to incentivize behavior that adds value to the project. Kevin Werbach, Primavera De Filippi, Joshua Tan & Gine Pieters, *Blockchain Governance in the Wild*, 3 CRYPTOECONOMIC SYST. 1 (2024).

[10] Andreseen and Horowitz (known as A16Z) is a leading venture capital (VC) firm that invests mainly in crypto and Web 3 startups (blockchain technologies). The firm envisions the "next generation of the internet to be: open and inclusive, participatory and well-governance, distributed and resilient, sustainable, accountable, efficient, secure, equipped to protect privacy, *designed to help individuals and communities, not middlemen, capture more of the value they create for society*." (emphasis added). MARC ANDRESEEN & BEN HOROWITZ, *How to Win the Future: An Agenda for the Third Generation of the Internet* 4–5 (2021).

[11] MARK BEVIR, GOVERNANCE. A VERY SHORT INTRODUCTION 1 (2012).

Historically, creating a new state with different hierarchies has aimed to sanitize corruption by establishing a vast bureaucratic system and fostering public reliance. Reposing trust in a state and its institutions also implies trust in the government as an administrative entity, far removed from markets and networks but also far from society.[12] This detachment from society and the nascent democracies across the globe has moved the attention from government to governance, first of corporations and then of individuals through different forms of organizations that, to some extent, affect governments and formal institutions.[13]

The contemporary trust crisis in governments and their institutions has fueled anti-government sentiment, leading communities around DAOs to embrace anarchic-technological ideas.[14] These ideas integrate fields such as cryptography, economics, political science, philosophy, and computer science, aiming to overcome (political) power and democratize access to capital.[15] Participants in DAOs have moved away from traditional markets and laws to embrace new forms of technological organizations where code is law but with limited success.[16]

The elements of trust obtained through decentralization of processes and disintermediation have not yet achieved their scope. Instead, the blockchain ecosystem has seen a progressive re-centralization/re-intermediation with

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[12] The pluralist challenges to the concept of a unified state and of governance owe their approach to the distancing of political science from historical, philosophical, and empirical or otherwise extrinsic methodologies, which transformed the science in politics into a science of politics. JOHN G. GUNNELL, BETWEEN PHILOSOPHY AND POLITICS: THE ALIENATION OF POLITICAL THEORY 143 (1986); Jens Bartelson, *Throwing the state out*, in THE CRITIQUE OF THE STATE 77–113 (2009). For a redefinition of the state tradition, see: Ellen Deborah Ellis, *The Pluralistic State*, 14 AM. POLIT. SCI. REV. 393 (1920); W. Y. Elliot, *Sovereign State or Sovereign Group*, 29 AM. POLIT. SCI. REV. 475 (1925).

[13] Mark Bevir, *Governance as Theory, Practice, and Dilemma*, in THE SAGE HANDBOOK OF GOVERNANCE 1 (2011); Robert K. Christensen & Mary Tschirhart, *Organization Theory*, in THE SAGE HANDBOOK OF GOVERNANCE 65 (2011).

[14] Timothy C. May, *The Crypto Anarchist Manifesto*, ACTIVISM.NET (Nov. 22, 1992), https://www.activism.net/cypherpunk/crypto-anarchy.html.

[15] Nakamoto, *supra* note 4.

[16] Wulf A Kaal, *DAO Fallacies-Common Myths and Uses for Decentralized Autonomous Organizations* 1–20 (2022), https://ssrn.com/abstract=4067783. The downfall of coding capital and law became evident during "The DAO hack," where billions of dollars were stolen from a DAO that claimed to be a democratic organization based on shared control and governance. The DAO ended up carrying a scarlet letter on its code, a gateway resulting in massive financial losses and highlighting the dangers of technocracy and code determinism in a probabilistic world. Katharina Pistor, *A New Code?*, in THE CODE OF CAPITAL: HOW THE LAW CREATES WEALTH AND INEQUALITY 183, 195–97 (2019).

new actors holding power.[17] Indeed, reliance on blockchain as a trustless system is akin to reliance on bureaucratic hierarchies—or, more accurately, technological hierarchies—that consequently demonstrate the challenges in achieving true decentralization and power distribution.

This shift towards centralization emphasizes the critical issues of social coordination. There is a failure to develop social practices incorporating pluralistic visions to solve dilemmas in an interconnected ecosystem.[18] There is currently no exploration of the limited shared social practices of governance around DAOs. The only sparse practices have been shaped based on immediate contingencies (or dilemmas) and are hard to replicate.[19] As a result, the approaches to governance vary widely and have different levels of sophistication, but they mainly involve voting as a means of governance.[20]

Despite the technical capabilities of accessing voting power in a decentralized manner, distributed or shared governance has not been appropriately implemented. This failed implementation has led to a significant concentration of power among centralized actors through cryptoassets imbued with governance rights (or governance tokens), such as cryptoexchanges[21] (with similar characteristics to institutional investors in the corporate world)[22] and cryptoasset holders with enhanced voting privileges, such as core developers and DAO founders[23] (akin to minority

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[17] One example of this progressive re-centralization is cryptoexchanges. These virtual trading venues offered important resources to financial projects seeking funding. Despite the peer-to-peer technology, participants were unable to distinguish between good and bad projects. In other words, the blockchain peer-to-peer ecosystem has not considered the technological means for participants to search, opening the door to re-intermediation. PAUL P. MOMTAZ, *How Efficient is Decentralized Finance (DeFi)?*, SSRN ELECTRONIC JOURNAL (2022), https://ssrn.com/abstract=4063670. The re-centralization of intermediary functions is not the only feature of financial transactions in blockchain. The broader financial ecosystem around blockchain, labeled DeFi, has consistently shown the persistence of intermediaries (such as wallet providers with banking functions), indicating that the system was never truly disintermediated. Vanessa Villanueva Collao, *The Functions of Crypto(intermediaries)* (2024).

[18] Bevir, *supra* note 13.

[19] Werbach et al., *supra* note 9.

[20] Aggelos Kiayias & Philip Lazos, *SoK: Blockchain Governance*, *in* AFT '22: PROCEEDINGS OF THE 4TH ACM CONFERENCE ON ADVANCES IN FINANCIAL TECHNOLOGIES 61–73 (2022).

[21] Gail Weinstein, Steven Lofchie & Jason Schwartz, *A Primer on DAOs*, HLS FORUM ON CORP. GOV. (Sept. 17, 2022), https://corpgov.law.harvard.edu/2022/09/17/a-primer-on-daos/. Cryptoexchanges provide a digital venue, platform, or financial market infrastructure for organizations to issue and list their customized cryptoassets, facilitating a series of transactions and generating value. Villanueva Collao, *supra* note 17.

[22] Wright, *supra* note 6.

[23] Kiayias and Lazos, *supra* note 20.

shareholders with supervoting rights),[24] and delegates. This concentration of power facilitates governance manipulation through vote buying (or bribing), where voting rights in DAOs are acquired to influence governance decisions.[25]

In the current state of this ecosystem, bribing opportunities have not widely emerged due to off-chain governance taking the decision-making process offline.[26] Offline/off-chain decision-making implies that the process does not occur in real-time, with the governing rules and results uploaded or registered online after they have already been made.[27] Nevertheless, off-chain governance also implies that a handful of people, usually founders/developer team members, make unilateral variations to fundamental rules of the organization and variations to the code.[28] These variations result from an unaudited decision-making process.[29]

There is a need for different and improved governance mechanisms among DAOs to avoid severe collapses, such as those that led to the crypto winter.[30] The use of off-chain governance has produced an offline and non-regulatory compliance process, leaving small cryptoasset holders requiring more effective control and monitoring mechanisms. Since the DAO ecosystem primarily involves off-chain relationships, these can hinder the transition to on-chain governance and coded rules, where all decisions would be visible and based on cryptoasset holders' participation.[31] Such a move

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[24] Shaanan Cohney, David Hoffman, Jeremy Skaroff & David Wishnick, *Coin-Operated Capitalism*, 119 COLUMBIA L. REV. 591, 614 (2019).

[25] *Permissionless Governance Layering: A Defence of Token Bribery*, DARCY ALLEN (Aug. 4, 2022), https://darcyallen.substack.com/p/permissionless-governance-layering.

[26] Wessel Reijers, Iris Wuisman, Primavera De Filippi, Christopher Wray, Vienna Rae-Looi, Angela Cubillos Vélez & Liav Orgad, *Now the Code Runs Itself: On-Chain and Off-Chain Governance of Blockchain Technologies*, 40 TOPOI 821–831 (2021).

[27] Werbach et al., *supra* note 9. See also, PRIMAVERA DE FILIPPI, SOFIA COSSAR, MORSHED MANNAN, KELSIE NABBEN, TARA MERK & JAMILYA KAMALOVA, *The Blockchain Governance Toolkit: A Cookbook for a Resilient and Robust Ecosystem* (2024). See *infra* Section I.B.1. Off-chain governance.

[28] Moreover, stakeholders and other centers of interest might also affect governance decisions. Werbach et al., *supra* note 9.

[29]   *Off-chain   governance*,   PCMAG.COM: ENCYCLOPEDIA, https://www.pcmag.com/encyclopedia.

[30] The FTX debacle indicated to the crypto community that not all promises made by the organizations they invest in or interact with are truthful. It also revealed that coded transactions in an open market can be less reliable than traditional capital markets. Matt Levine, *FTX Had a Death Spiral*, BLOOMBERG OPINION:MONEY STUFF (Nov. 11, 2022), https://www.bloomberg.com/opinion/articles/2022-11-09/bankman-fried-s-ftx-had-a-death-spiral-before-binance-deal.

[31] Blockchain features allow the real-time distribution of the cryptoenterprise's financial

towards on-chain governance could enable coding capital to avoid manipulative decisions and render accountable off-chain governance, restoring the image and egalitarian aims of the ecosystem.[32] Nevertheless, on-chain governance may open up a series of vote buying instances and other problems.[33] These problems are incentivized by the separation of voting rights from economic interests, a situation somewhat enabled by on-chain governance.

Progressively, it has become evident that despite the goals of decentralized governance, participants in DAOs are not interested in exercising their governance rights—essentially because the technology behind blockchain has not eradicated collective action and coordination problems. Small cryptoasset holders, therefore, often overlook their governance rights as a consequence of viewing their cryptoassets more as a tool for yield generation rather than a means of decentralized governance or control. In this scenario, is there a way to improve good governance among DAOs?

There are recent examples of collective activism in corporate governance by younger generations that offer a different perspective, illuminating a path for distributed or shared governance.[34] During the 2021 GameStop/Robinhood saga, an army of retail investors modified the accuracy of the information reflected in stock prices, uncovering issues with short-selling, collusion, and stock manipulation in modern capital markets. Their collective action harmed market integrity but showed a particularly powerful effect in corporate governance dynamics: their ability to coordinate. Drawing upon this example of investors' behavior, this study focuses on the participation of small cryptoasset holders through an online experiment to inform the analysis of how the dissociation of their rights is one form of incentivizing active participation in governance. The implications of this study highlight that mitigating the issues of on-chain governance (such as vote buying) can also profoundly impact off-chain governance and enhance good governance within DAOs.

This research makes three key contributions: First, it examines the unique

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statements. David Yermack, *Corporate governance and blockchains*, 21 REV. FINANC. 7–31 (2017).

[32] Katharina Pistor, *supra* note 16.

[33] There are also worse potential outcomes, such as financing terrorism, among other illegal activities, by manipulating votes on proposals to transfer funds to anonymous accounts.

[34] Sergio Alberto Gramitto Ricci & Christina M. Sautter, *Corporate Governance Gaming: the Collective Power of Retail Investors*, 22 NEVADA L. J. 51–98 (2021).

characteristics of DAOs, their structure, and the rights of cryptoasset holders, distinguishing them from other organizations in the fintech sector. Second, it explores governance mechanisms that elude traditional corporate analysis, offering insights into how these DAOs operate. Finally, it investigates ways to enhance governance structures within blockchain and beyond.

This paper is organized as follows: Section I explores DAOs, focusing on their structure and current governance mechanisms, distinguishing between off-chain and on-chain governance, formal and informal rules within this ecosystem, and their social practices. It also analyzes governance issues, focusing on vote buying. Section II outlines the experimental design and methods for enhancing governance by testing a hypothesis to mitigate vote buying (the disassociation of voting rights and their influence in governance) and the effect of information on governance. Section III analyzes and justifies the variables, providing a preliminary discussion on their selection. Finally, the paper concludes.

I. DAOs and the Problem of Governance

The common understanding of Decentralized Autonomous Organizations revolves around innovative approaches to implementing businesses.[35] DAOs are a new form of virtual organizational structures powered by blockchain technology that aims to enable decentralized governance and decision-making.[36] However, DAOs are used for a variety of purposes, not necessarily with an entrepreneurial scope in mind.[37] They represent a modernized conceptualization of decentralized organizations with a peculiar means to implement governance through reliance or confidence in technology rather

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[35] Prior to being referred to as DAOs by online groups, they were called DACs (Decentralized Autonomous Companies), emphasizing their entrepreneurial focus. Daniel Larimer, *DAC Revisited*, Let's Talk Bitcoin (Nov. 2, 2013). However, the term DAO was initially used to refer to multi-agent home systems interconnected via the internet. Samer Hassan & Primavera De Filippi, *Decentralized autonomous organization*, 10 Internet Policy Rev. 1–10 (2021) (citing Werner Dilger, *Decentralized autonomous organization of the intelligent home according to the principle of the immune system*, 1 *in* Proceedings of the IEEE International Conference on Systems, Man and Cybernetics 351–356 (1997)).

[36] DAOs were initially theorized as distinct from traditional business organizations. Technologists envisioned these new forms of organizations not as virtual property but as online platforms where unlimited participants could interact. Buterin, *supra* note 5. Nevertheless, the virtual property concept is constant in DAOs, often described as an "algorithmic organizational form." Kevin Werbach, The Blockchain and the New Architecture of Trust 110 (2018).

[37] Hassan and De Filippi, *supra* note 35, at 5 (exemplifying the multiple purposes of DAOs).

than trust in institutions, authorities, or traditional markets.[38]

The autonomous nature of DAOs may mislead non-tech experts into believing these organizations emerge spontaneously or are created by robots using an artificial intelligence technique. In reality, like traditional organizations, DAOs are established by founders. Founders, often developers, are responsible for setting up, coding, and managing the organization.[39] As visionaries, they drive the project forward, attract participants,[40] set strategic directions before raising capital, define the organization's purpose and scope, as well as select collaborators.[41]

Through technological means, DAOs can be collectively owned or managed by their members (participants), possibly excluding a central authority (such as the board of directors) or hierarchies.[42] DAOs allow their members/participants to raise capital, manage resources, hire people, provide services, and coordinate their activities through a set of rules embedded into the source code.[43] However, coded rules or coded laws have hindered the issues with governance. The main issues reside in the trust of technology to solve legal and idiosyncratic governance problems without appropriately acknowledging hierarchies or rules for distributed governance.[44]

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[38] Organization theory has studied various ways to implement governance across different types of organizational structures, identifying three main approaches: authority by establishing hierarchical structures, pricing mechanisms in markets, and trust through the development of networks. MARK BEVIR, A THEORY OF GOVERNANCE 7 (2013). De Filippi, Mannan, and Reijers, *supra* note 8.

[39] DAO platform services have progressively eroded the coding part. See *infra* section I.2. Capital Formation.

[40] In some instances, founders also work with catalysts, external advisors, or influencers to help promote the project and ensure alignment with trends.

[41] Founders also select participants (coders) for the bounty hunt, a contest for posting the open-source project in a repository and attracting coders for code review or by hiring them as employees. Moran Ofir & Ido Sadeh, *ICO vs IPO: Empirical Findings, Information Asymmetry and the Appropriate Regulatory Framework*, 53 VAND. J. TRANSNAT'L L. 525–613 (2020). A recent trend since 2021 is to hire an auditing company for the bounty hunt process. See section on Cryptoauditors, Vanessa Villanueva Collao, The Functions of Cryptointermediaries (2024)

[42] Bellavitis, Fisch, and Momtaz, *supra* note 5, at 187; Wright, *supra* note 6.

[43] The academic literature, ranging from economics to computer science, has outlined the various purposes a DAO can achieve beyond just finance. See DE FILIPPI & WRIGHT, *supra* note 7, at 136; Wright, *supra* note 6; Youssef El Faqir, Javier Arroyo & Samer Hassan, *An overview of decentralized autonomous organizations on the blockchain*, *in* ACM INTERNATIONAL CONFERENCE PROCEEDING SERIES 1 (2020); Youssef Faqir-Rhazoui, Javier Arroyo & Samer Hassan, *A comparative analysis of the platforms for decentralized autonomous organizations in the Ethereum blockchain*, 12 J. INTERNET SERV. APPL. (2021).

[44] Primavera De Filippi, *Blockchain Technology and Decentralized Governance: The*

As a matter of fact, the success of DAOs[45] is a merit of technological hierarchies and/or technological determinism.[46] Members of DAOs advertised them as organizations with almost no organizational (bureaucracies or state-level) hierarchies built into their structure. Instead, DAOs would solely rely on blockchain and smart contracts as a deterministic source of governance. This technological determinism allows for instructions written in smart contract code to be deployed and recorded onto a blockchain.[47] Such deployment allegedly ensures the self-execution of encoded instructions (promises or rules), meaning there are no remaining/future obligations after execution as well as transparency of a public recording system.[48]

Technological determinism lies in the immutable nature of irreversible, timestamped transactions or exchanges of resources. The cryptocommunity believes these features can insulate them from hierarchies and centralized authorities.[49] This is because centralization rests on several assumptions of authoritarian power that a distributed and decentralized communication network can theoretically solve.[50] Most importantly, this technological determinism, grounded in the rule of code, fosters trust among participants

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Pitfalls of a Trustless Dream, SSRN ELECTRON. J. (2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3524352.

[45] According to Deep DAO analysts, as of July 2024, there are over 13,000 DAOs holding a combined total of approximately $25 billion in cryptoassets within their treasuries. See *Organizations*, DEEPDAO, https://deepdao.io/organizations.

[46] Modern organizational theory, following the seminal work of Max Weber, describes how organizational structures promote governance. Weber's studies emphasized central authorities and bureaucracy based on rationality, excluding an appeal to personal beliefs and laws or rules. MAX WEBER, THE THEORY OF SOCIAL AND ECONOMIC ORGANIZATION (Trans. A. M. Henderson & Talcott Parsons eds., 1947). In general, technology has not eliminated those hierarchies among DAOs and in the blockchain ecosystem. See *infra* section I.B. Governance.

[47] Kevin Werbach & Nicolas Cornell, *Contracts Ex Machina*, 67 DUKE L. J. 313 (2017); Carla L. Reyes, *Emerging Technology's Language Wars: Smart Contracts*, 2022 WISCONSIN L. REV. 85 (2022).

[48] Farshad Ghodoosi, *Contracting in the age of smart contracts*, 96 WASHINGT. L. REV. 51–92 (2021). Although legal literature often emphasizes the issues surrounding smart contracts as self-enforcing contracts, what smart contracts do is perform some functions or execute parts of an already existent legally enforceable agreement. Reyes, *supra* note 47., at 93.

[49] The entire Bitcoin system was inspired by the mission of its creator to battle the government through P2P networks. Email from Satoshi Nakamoto to the Cryptography mailing list (Nov. 6, 2008), https://satoshi.nakamotoinstitute.org/emails/cryptography/4/.

[50] Balázs Bodó, Jaya Klara Brekke & Jaap-Henk Hoepman, *Decentralisation in the blockchain space*, INTERNET POL'Y REV.: GLOSSARY OF DISTRIBUTED TECHNOL. (Nov. 25, 2020), https://policyreview.info/open-abstracts/decentralisation-blockchain-space.

by ensuring that the rules of the game remain unchanged in the future.[51] However, participants do not consider how the technology behind networks is socially constructed and that technological trustworthiness implies a level of confidence, and thus trust, in the persons creating and maintaining it.[52]

The decentralization feature of distributed network technologies like blockchain conceals the goals of distributed governance. Despite the absence of central control at the political or architectural level of the infrastructure, these technologies require some centralization at the governance level to function.[53] While the unstructured simplicity of blockchain was initially praised for enhancing coordination without vertical hierarchies and reducing the impact of individual decision-making,[54] hierarchies became necessary to solve specific technological dilemmas.[55] This reintroduced layers or technological hierarchies to address specific operative issues and implementations.

Similar to the Internet's success in initially reducing the need for intermediaries through protocol layers,[56] blockchain also aimed to mirror these layers or standard procedures that allow different nodes or peers (sets of computers) to communicate and share information across a network.[57]

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[51] De Filippi, *supra* note 44.

[52] WERBACH, *supra* note 36.; Balázs Bodó, *Mediated trust: A theoretical framework to address the trustworthiness of technological trust mediators*, 23 NEW MEDIA SOC. 2668–2690 (2021). Some commentators have distinguished trust from confidence, considering mental state, source, destination, and relationships between actors and systems. De Filippi, Mannan, and Reijers, *supra* note 8, at 2. In this sense, confidence would be tied to the reliance or expectation of the system and its actors, namely technological trustworthiness. At the same time, trust evokes a higher level of uncertainty or complexity in the system and its interpersonal relationships. However, it is crucial to observe that technological trustworthiness or confidence instills trust as both concepts are intertwined and dependent on one another.

[53] Bodó, Brekke & Hoepman, *supra* note 50.

[54] THIBAULT SCHREPEL, BLOCKCHAIN + ANTITRUST 55 (2021).

[55] The blockchain trilemma posits that decentralization, security, and scalability—the three desired qualities of blockchain—cannot coexist simultaneously; therefore, one must always be sacrificed. Vitalik Buterin, *Why sharding is great: demystifying the technical properties* (April 7, 2021), https://vitalik.ca/general/2021/04/07/sharding.html.

[56] This model has five layers that go from concrete to more abstract layers, finally grouped in a stack: *i.* physical (hardware), *ii.* link (ethernet and other protocols), *iii.* the network or internet protocol, *iv.* the transport or TCP & User Datagram protocol (UDP), and *v.* the application layer, which protocols include the HTTP (web), SMTP (email), and FTP (file transfer). The TCP/IP is not the only internet networking protocol suite, but it's often referred to as a model for other type of networking protocols. CHARLES M. KOZIEROK, THE TCP/IP GUIDE: A COMPREHENSIVE, ILLUSTRATED INTERNET PROTOCOLS REFERENCE 124 (2005).

[57] Jan L. Harrington, *Anatomy of a Network*, *in* ETHERNET NETWORKING FOR THE SMALL

Different from the Internet, which was not originally envisioned to transit money, blockchain instead had a clear vision of digital money/capita/assets transmission free from intermediaries. Each layer serves a specific function, making it easier to fix problems or update parts of the system without changing the entire network. In blockchain, each layer independently upgrades and improves the system without affecting the others but needing the below layers. These layers function as levels or segments made up of software and a hierarchy of code, which communicate with both the layers above and below them.[58] In fact, this cross-layer communication sets a standard for processing specific encoded rules.

Hence, every layer (or operative division) of blockchain was created to ease technology management. However, they reintroduced points of centralization and, thus, intermediation. Unlike governments and states, decentralization in blockchain is not decided top-down but bottom-up. Only the lower layers of the ecosystem are decentralized (no control or power over the network). However, as more layers are added to the system, the upper layers (along with the governance they oversee) become centralized.[59] As a result, this nuanced grasp of decentralization (and thus distribution) is more characteristic of some layers than others.

Centralization is not inherently negative; in fact, centralized governance systems provide several benefits. Centralized systems are easier to coordinate because information circulates among a limited number of participants, facilitating decision-making despite significant disadvantages or systemic risks. In contrast, decentralized systems often struggle with information dissemination since participants cannot efficiently internalize all the necessary data for informed decision-making. However, the benefits of decentralized systems and governance lie in the reduced risks for the entire ecosystem.[60]

OFFICE AND PROFESSIONAL HOME OFFICE 3–20 (2007).

[58]*See*,   *Layer*,   PC   MAGAZINE: ENCYCLOPEDIA, https://www.pcmag.com/encyclopedia/term/layer.

[59] SCHREPEL, *supra* note 54., at 58.

[60] Alessandra Arcuri & Giuseppe Dari-Mattiacci, *Centralization versus decentralization as a risk-return trade-off*, 53 J. L. ECON. 359–378 (2010).

Blockchain layers and DAOs

PROBLEM	SOLUTION	DESCRIPTION
Access to financial services	Aggregation LAYER 5	Combine participants' assets to facilitate profit-earning automated strategies & passive income, aggregation of information, lending money, purchasing & minting assets, & checking prices in one convenient system. E.g., Aave.
Interaction between protocols & digital assets	Application LAYER 4	User-facing decentralized applications, visually appealing and user-friendly interfaces for interactions. E.g., Decentraland DAO
Network capabilities, interoperability across systems	Protocol LAYER 3	Protocol and platform interoperability facilitates access for decentralized applications (dApps) & adds complexity, centralization points, and new actors to digital asset interactions (on-chain asset mgmt.). E.g.cryptoexchanges
Scalability	Asset LAYER 2	Transactional throughput is enhanced by faster, tailored transactions through cost-efficient off-chain methods. Issuance of digital assets. E.g., Optimistic
P2P payment systems, security & privacy	Settlement LAYER 1	Double spending problem, decentralization of processes, privacy in sending messages (value), resistant recordkeeping system. E.g., Ethereum.

*Layers in the blockchain space and the DeFi stack.[61]

Layer 1 (L1), called the settlement layer, is where transactions are validated and finalized, as in the case of Bitcoin/Ethereum. However, this layer has limitations, such as slower transaction speeds and reduced scalability. To address these issues, Layer 2 (L2) was developed. L2 works with L1 to speed up transactions and reduce costs by processing most transactions off-chain and then adding them back to the main blockchain.

Layer 3 (L3), the application layer, builds on top of L1 and L2 to enable interoperability between blockchains, allowing decentralized applications (dApps) to operate smoothly across different L1 blockchains like Bitcoin and Ethereum.[62] Each layer introduces specialized software and services, enhancing functionality while adding complexity to the system.

DeFi is built on the blockchain application layer (L3), a level of software protocols that operates independently from earlier layers, allowing promoters

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[61] The chart represents the layers in the blockchain space, with each layer operating independently from the preceding one. The darker blue layers delineate the DeFi stack, where most DAOs operate and interact.

[62] While platforms offering financial services and products operate across various blockchains, most run primarily on the Ethereum blockchain.

to create custom rules and governance models. L3 acts as the backbone of DeFi, supporting decentralized applications and enabling on-chain operations, which replace traditional intermediaries like investment managers by using automated protocols.[63]

Above L3 is the application layer (L4), which connects protocols to user-friendly interfaces, such as web or mobile apps, allowing users to interact with decentralized financial systems.[64] The aggregation layer (L5) compiles information from various platforms, enabling users to access financial services across different blockchains, similar to how broker-dealers operate in traditional finance.[65]

Although the layers and hierarchies have addressed the increasing complexity of the ecosystem with encoded rules, there is still no structured approach for distributed governance or control of organizations within this ecosystem.

DAOs often lack a precise structure and, in some cases, an initial scope/purpose. Even when they are financial in nature, their business models are often unclear. This ambiguity complicates establishing a governance structure, meaning all social organization and coordination processes among participants. The following sections outline the structure of DAOs, examine the governance methods experimented with so far, and analyze a pressing governance issue: vote buying or the exploitation of cryptoassets for governance manipulation.

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[63] Fabian Schär, *Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets*, FED. RESERV. BANK ST. LOUIS REV. 153–174 (2021).

[64] RAPHAEL AUER, BERNHARD HASLHOFER, STEFAN KITZLER, PIETRO SAGGESE & FRIEDHELM VICTOR, *The Technology of Decentralized Finance (DeFi)*, BIS WORKING PAPER (2023), https://www.bis.org/publ/work1066.htm. Their application interfaces and automated mechanisms simplify cryptoasset exchanges, both for sell-side and buy-side aggregators, while optimizing cryptoasset portfolios. Yield aggregators, in particular, enhance this process by analyzing returns across various financial services in DeFi. *What are DeFi yield aggregators, and how do they work?*, COINTELEGRAPH:LEARN, https://cointelegraph.com/learn/what-are-defi-yield-aggregators-and-how-do-they-work.

[65] Aggregators offer rewards in the form of cryptoassets created by their platform to investors who deposit their assets, often popular ones like Ether or stablecoins. In return, aggregators collect fees for their services. Daniil Ogurtsov, *Yield Aggregators Common Pitfals. Beefy Case Study*, MIXBYTES, https://mixbytes.io/blog/yield-aggregators-common-pitfalls#rec515086866.

A.   The Structure of DAOs

DAOs have been classified in different ways.[66] Some scholars characterize layer 1 blockchains, such as Ethereum and Bitcoin, as DAOs.[67] However, these layer 1 blockchains are more accurately described as decentralized networks functioning as large-scale or general-purpose infrastructures. Decentralized networks are similar to cities that provide essential infrastructure (energy, water, etc.) and governance rules for utilizing those resources. They allow smaller ecosystems, such as communities, organizations, or firms, to develop, albeit with low coordination between them.[68] Those smaller ecosystems, built around decentralized networks, are DAOs. Unlike decentralized networks, DAOs require significant organizational efforts to be established.

DAOs are constituted virtually to avoid being subject to a specific jurisdiction. DAOs thus maintain a virtual but ambiguous status by not incorporating their organizations within geopolitical boundaries.[69] They are initiated by individuals (founders) with a general vision for the organization's future. Founders usually connect with others through websites with captive designs or informal social media channels (such as Discord), where cryptocommunities gradually grow.[70]

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[66] Efforts to describe DAOs qualitatively have been made, but an accurate formulation of a DAO taxonomy is still lacking. Currently, only one empirical quantitative study of DAOs created on the Aragon platform categorizes them into seven dimensions: domain, purpose, scope, community size, voting system, amount of crypto assets (treasury), and type of crypto assets issued. Andrea Peña-Calvin et al., *A Categorization of Decentralized Autonomous Organizations: The Case of the Aragon Platform*, IEEE TRANS. COMPUT. SOC. SYST. 1–13 (2023).

[67] Layer 1 blockchains have been described as algorithmic DAOs distinguished from participatory DAOs. Wright, *supra* note 6, at 157.

[68] Denis Nazarov, Jesse Walden, Ali Yahya & Devon Zuegel, *Cryptonetworks and Cities: Analogies*, A16Z (Jul. 26, 2018), https://a16z.com/cryptonetworks-and-cities-analogies/.

[69] SAMER HASSAN, JAYA KLARA BREKKE, MARCELLA ATZORI, BALÁZS BODÓ, SARAH MEIKLEJOHN, PRIMAVERA DE FILIPPI, KATE BEECROFT. DAVID ROZAS, CHRISTIAN ORGAZ ALONSO, ELENA MARTINEZ VICENTE, GENOVEVA LOPÉZ MORALES, ABEL FIGUERAS AGUILAR, *Scanning the European Ecosystem of Distributed Ledger Technologies for Social and Public Good: What, Why, Where, How, and Ways to Move Forward* 102 (2020).

[70] It has been shown that social media channels play a fundamental role in community growth and are also correlated with the capital that DAOs can raise. José Campino, Ana Brochado & Álvaro Rosa, *Initial coin offerings (ICOs): Why do they succeed?*, 8 FINANC. INNOV. (2022), https://doi.org/10.1186/s40854-021-00317-2. Marten Risius, Christoph F. Breidbach, Mathieu Chanso, Rubne von Krannichfeldt & Felix Wortmann, *On the performance of blockchain-based token offerings*, 33 ELECTRON. MARK. 31 (2023). This trend in the use of social media has been explored also in traditional (or regulated) markets

The early development of a community prior to forming an organization is common in DAOs, as it mirrors the engagement methods similar to (securities) crowdfunding.[71] Founders structure their organization without assets and with a few controls or binding contractual promises upon investors before the actual deployment of the DAO. In this sense, DAOs are an atypical or unconventional organizational form. They could hardly be collocated within the spectrum of traditional organizational corporate structures such as dispersed and concentrated ownership[72] or even startups that use the venture capital model.[73] After founders raise capital through a low-cost funding mechanism in exchange for cryptoassets, the governance of a DAO becomes more complicated as complex relationships arise in managing the assets held in treasuries. As a result, the structure, financing methods, and ongoing evolution of DAOs influence their governance, making it more centralized and less diffuse than intended.

The following sections emphasize a common theme, further explored in the governance discussion, where the structure of DAOs gradually suppresses distributed control (allegedly granted through direct democracy) to mitigate conflicts among cryptoasset holders, founders, and insiders.

1.   The purpose of DAOs: An Attempt at Taxonomy

By blending blockchain technology and decentralized decision-making, DAOs are considered the new frontier in governance. However, despite their popularity, there is no structured approach to understanding their potential to reshape organization and governance systems. This attempt at a taxonomy seeks to provide a clearer framework for analyzing DAOs, highlighting key characteristics such as governance models, tokenomics, and the roles of

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through the use of "meme stocks." Jill E. Fisch, *Gamestop and the Reemergence of the Retail Investor*, 102 BOST. UNIV. L. REV. 1799–1860 (2022).

[71] In crowdfunding, founders create a community to raise capital, while investors benefit from direct interactions with entrepreneurs. Paul Belleflamme, Thomas Lambert & Armin Schwienbacher, *Crowdfunding: Tapping the right crowd*, 29 J. BUS. VENTUR. 585–609 (2014).

[72] Modern corporations reach economies of scale by going public or asking for public capital. Their ownership structure can vary and be dispersed by having multiple owners or concentrated ownership with controlling shareholders. This ownership structure leads to the separation of ownership and control, which is vested in management, encouraging issues related to managerialism, such as resorting to firm-specific investments that would render them indispensable or hard to be replaced within the organization. Andrei Schleifer & Robert W. Vishny, *Management Entrenchment*, 25 J. FINANC. ECON. 123 (1989).

[73] Startup financing progresses through multiple stages or rounds, each involving increasing contractual commitments and investor controls as funding advances. Gad Weiss, *A Theory of Seed Financing*, SSRN ELECTRON. J. (2023), https://ssrn.com/abstract=4668015. These elements are absent in DAOs.

participants.

To start, most DAOs offer financial services. Their development is especially owed to decentralized finance or DeFi, an ecosystem developed to enable the technological distribution of financial services. DeFi moves within unconventional corporate structures, and consequently, so do most DAOs.[74] Satellite activities surrounding these financial DAOs have been developed with the particular purpose of offering a wide range of services such as digital identities, wallet service providers, oracles, etc. DeFi is still an immature type of market, similar to early traditional markets. As DeFi evolves, some commentators have argued that this blockchain-based alternative financial system may be absorbed by traditional finance, albeit with some adjustments.[75] While most DAOs are still primarily financial in nature, not all have an economic scope, even when they hold significant amounts of cryptoassets. In fact, several types of DAOs operate without financial scope.

Nonfinancial DAOs are developed for entertainment, gaming, art, information, charitable purposes, and/or as organizations funding real-world projects and legal services, among other services.[76] Some DAOs organized as cooperatives or collectives do not provide financial services or goods or even have assets. For example, dOrg mediates between two parties to establish a future employment/contractual relationship that promotes a solidaristic approach among their members.[77]

While most DAOs function predominantly virtually, some do attempt to connect the virtual with the real world. This real-world connection is a challenge for projects that aim to develop virtual/ digital organizations with an impact in the offline world (e.g., DAOs with a charitable scope in a geographic region). Specifically, it may prove particularly problematic for

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[74] The literature on DeFi emphasizes the distinction between DeFi and Fintech. While both involve financial services, Fintech employs technology to streamline processes within traditional legal and organizational frameworks. In contrast, DeFi breaks away from conventional corporate structures and traditional markets, leveraging technology to create alternative capital markets and evade regulation. Vanessa Villanueva Collao, *Decentralization and Disintermediation in DeFi* (2024).

[75] Dirk A. Zetzsche, Douglas W. Arner & Ross P. Buckley, *Decentralized finance*, 6 J. FINANC. REGUL. 172–203 (2020).

[76] Peña-Calvin et al., *supra* note 66., at 7.

[77] Members of dOrg are freelancers who join the organization with their resources to find equitable working conditions to perform their services. Morshed Mannan, *The Promise and Perils of Corporate Governance-by-Design in Blockchain-Based Collectives: The Case of dOrg*, *in* CO-OPERATION AND CO-OPERATIVES IN 21ST-CENTURY EUROPE 78, 79 (2023). This collective is composed of software developers from multiple jurisdictions. See *What is dOrg?*, DORG:FAQs, https://www.dorg.tech/.

participants who are non code-literate but are attracted by a charitable cause to be informed and participate in the governance of these DAOs. Participation, then, is not strictly dependent on a collective action problem but on information asymmetries, such as a lack of understanding of how cryptocurrencies (cryptoassets with a monetary function) work, which creates an obstacle to members' willingness to create wealth. Additionally, the informal disclosure of fundamental information through social media channels, rather than solely used for marketing cryptoassets, increases the risk of making uninformed decisions and makes it difficult to distinguish sound from unreliable information.[78]

2. DAO Capital Formation

There is no single structure DAOs follow. Founders usually develop the project by themselves. In such cases, founders are also core developers or catalyst developers,[79] and post the project's source code on public repositories such as GitHub. Other times, founders use a DAO service platform ("DAO platform"), which is a blockchain technological infrastructure (dApp) that allows them to create a DAO from scratch.[80] Several platforms offer services to customize and develop these types of organizations, including implementations for governance, distribution of dividends, and proposal contribution tools.[81] This method of creating DAOs has gained popularity due to its simplicity and the support of other virtual enterprises offering services to develop, manage, and deploy these organizations on the blockchain.

A unique feature in DAOs is that their founders disclose the code source before launching the project.[82] By making the code public, the founders aim to attract participants interested in the future organization to act as (freelance) coders to help fix bugs. Other times, code disclosures attract venture capital firms before deploying the project into the blockchain.[83]

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[78] Ofir and Sadeh, *supra* note 41.

[79] Josh Lerner & Jean Tirole, *Some Simple Economics of Open Source*, 50 J. IND. ECON. 197–234 (2002).; Raina S. Haque, Rodrigo Seira Silva-Herzog, Brent A. Plummer & Nelson M. Rosario, *Blockchain Development and Fiduciary Duty*, STANFORD J. BLOCKCHAIN L. POL'Y 139–188 (2019).

[80] The most used DAO platforms used as a service for the creation of DAOs are Aragon, DAOstack, and DAOhaus. El Faqir, Arroyo, and Hassan, *supra* note 43.

[81] Peña-Calvin et al., *supra* note 66.

[82] Saman Adhami, Giancarlo Giudici & Stefano Martinazzi, *Why do businesses go crypto? An empirical analysis of initial coin offerings*, 100 J. ECON. BUS. 64, 65 (2018).

[83] INTERNATIONAL ORGANIZATION OF SECURITIES COMMISSIONS (IOSCO), *IOSCO Decentralized Finance Report* 29 (2022).

DAO founders raise money through low-cost funding mechanisms, such as initial coin offerings (ICOs) or, most frequently, initial exchange offerings (IEO) through cryptointermediaries. Through these mechanisms, they sell their cryptoassets[84] to the public in exchange for capital, including cryptocurrencies such as Bitcoin or Ether, fiat currencies, like dollars or euros, or labor.[85] These cryptoassets, also called tokens, can be tailored for various purposes including but not limited to governance (with weighted attributes), claiming financial benefits (dividends), rewarding purposes, purchasing, transferring (with or without market value), acting as vouchers, and/or providing access to a DAO service. A single cryptoasset often encapsulates multiple purposes, but the majority includes governance rights.[86] Although not all DAOs raise capital through an ICO/IEO, almost all issue a cryptoasset with governance rights.[87]

The legal nature of cryptoassets is ambiguous. US federal agencies like the SEC have consistently stated that they represent securities.[88] Due to that characterization, members would have an economic interest in the organization but lack asset partitioning or liability protection from DAO activities since most DAOs are unincorporated entities.[89] Legal scholars have theorized that cryptoassets possess a hybrid nature, resembling both bonds and equity, depending on the DAO's developmental stage.[90] Following several crypto crashes, some organizations began offering debt tokens or repurchasing tokens of failed financial DAOs, transferring them into opaque trust forms to ensure economic protection for members.[91] Different from the US regulatory approach, European regulations like MiCA aim to establish a legal framework for financial services offered by cryptointermediaries, thus

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[84] These cryptoassets, often termed native protocol tokens, are actually non-native as they "sit" on top of the underlying decentralized network infrastructure such as Ethereum or Corda. Carla L. Reyes, *Emerging Technology's Language Wars: Cryptocurrency*, 64 WILLIAM MARY L. REV. 1193, 1216 (2023).

[85] Yuliya Guseva, *A Conceptual Framework for Digital-Asset Securities: Tokens and Coins as Debt and Equity*, 80 MD. L. REV. 166, 176 (2021).

[86] Peña-Calvin et al., *supra* note 66., at 11.

[87] Mannan, *supra* note 77.

[88] In an approach defined regulation by enforcement. Carol Goforth, *Regulation by Enforcement: Problems with the SEC's Approach to Cryptoasset Regulation*, 82 MARYL. L. REV. 107 (2022). To see the current state of enforcement actions, see US Securities and Exch. Comm'n (SEC), Crypto Assets and Cyber Enforcement Actions, https://www.sec.gov/securities-topics/crypto-assets.

[89] See the next section on Legal Wrappers (I.A.3).

[90] Dirk A. Zetzsche, Ross P. Buckley, Douglass W. Arner & Linus Föhr, *The ICO Gold Rush: It's a Scam, It's a Bubble, It's a Super Challenge for Regulators*, 60 HARVARD INT. LAW J. 267 (2019). Guseva, *supra* note 85.

[91] Diane Lourdes Dick, Christopher K. Odinet & Andrea Tosato, *Debt Tokens*, SSRN ELECTRON. J. 1–56 (2024).

markets.[92] Nevertheless, there is no comprehensive regulation on cryptoassets or how to legally structure a DAO (see next section).

DAOs hold capital resources in treasuries or funds designated for managing the organization.[93] The resources in a treasury are primarily used to acquire goods and services for the organization but also to fund research and development (R&D).[94] In this sense, the initial phase of a DAO resembles the environment of many startups developed through the crowdfunding process,[95] albeit without necessarily complying with the respective regulations.[96] Treasuries can be allocated to various projects undertaken by the organization, with the spending and allocation primarily determined by the rules set forth through decisions made by participants, including stakeholders. This process may involve the establishment of a committee, voting mechanisms, proposals by elected members, and other decision-making methods for using treasuries.[97]

Some DAOs issue a fixed supply of cryptoassets during the funding development stage of ICO/IEO for several reasons, most prominently to generate scarcity. The fixed supply is decided at the creation time (generation or minting), even if they are not placed in circulation.[98] Namely, encoded rules designate the distribution, circulation, issuance, and removal of that

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[92] FILIPPO ANNUNZIATA, *An Overview of the Markets in Crypto-Assets Regulation (MiCAR)*, EBI WORKING PAPER SERIES 13 (2023), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4660379.

[93] These assets are commonly the DAO's protocol token, which might be pre-mined (similar to a pre-order), or issued after the launch. DARCY ALLEN, CHRIS BERG & AARON M. LANE, *Trust and Governance in Collective Blockchain Treasuries*, SSRN ELECTRONIC JOURNAL 2 (2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3891976.

[94] *Id.* Cryptoassets locked into a treasury are earmarked to benefit the organization or the public good.

[95] Some of these projects entered only the venture capital process, following a consolidated regulatory path and becoming absorbed into Fintech, which this paper does not analyze. Elizabeth Howcroft, *Venture capital investment in crypto pick up after long decline*, REUTERS:BUS. (May 20, 2024, 12:06 PM), https://www.reuters.com/business/venture-capital-investment-crypto-picks-up-after-long-decline-2024-05-20/.

[96] It was hypothesized that raising capital through ICOs would have better outcomes than "traditional" crowdfunding methods. Wulf Kaal, *Reputation as Capital—How Decentralized Autonomous Organizations Address Shortcomings in the Venture Capital Market*, 16 J. RISK FINANC. MANAG. 1–14 (2023).

[97] ALLEN, BERG, AND LANE, *supra* note 93.

[98] Fixed supply means that the organization had developed rules for creating a limited/restricted amount of tokens, which could be conditioned by predetermined rules, indicating a period in time in which the DAO would not issue more, capping at a specific number of tokens issued, or restoring a particular pool of tokens in their balance when certain conditions are met. Peña-Calvin et al., *supra* note 66., at 7.

supply.[99] This is consistent with corporations' issuance of a fixed amount of stock during the IPO, which customarily dilutes ownership by reducing the percentage of existing shareholders' ownership and diminishing the value of current investors' shares when new shares are issued. However, unless pre-mined (pre-issued), there is no dilution of ownership when a DAO offers cryptoassets to the public since the organization has yet to exist.[100]

With a few exceptions, cryptoassets are transferable and fungible.[101] However, most lack accurate valuation unless sold, as the only mechanism to assess their value is through secondary markets, whenever available. In the initial stages of a DAO, members found it more appealing to hold the DAO cryptoassets rather than sell them, as it represents the potential profitability of the DAO.

These passages are a crucial part of tokenomics. Just like underwriters prepare the public offering considering the optimal capital structure for the firm, structuring a cryptoassets initial offering is fundamental for its success.[102] Customarily, a firm without prior assets or operating history is challenging to assess. Within DAOs, this assessment is more complicated and riskier. This valuation issue has prompted the demand for tokenomic design consulting services offered by auditing companies (which also includes background checks for founders).[103] Nevertheless, DAOs developed through DAO platforms are unaudited, meaning the governance structures, economic incentives, and token mechanisms are not aligned.

3. Legal Structures of DAOs: A Comparative Overview of Legal Wrappers

Traditional business entities—such as partnerships, limited liability companies, and corporations—which have supported entrepreneurs are increasingly being replaced by more adaptable forms to suit the complex modern business world. The concept of the firm as a legal entity distinct from

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[99] INTERNATIONAL ORGANIZATION OF SECURITIES COMMISSIONS (IOSCO), *supra* note 83., at 5.

[100] Alexis Collomb, Primavera De Filippi & Klara Sok, *Blockchain Technology and Financial Regulation: A Risk-Based Approach to the Regulation of ICOs*, 10 EUR. J. RISK REGUL. 263–314 (2019).

[101] Guseva, *supra* note 85., at 177.

[102] Whether cryptoassets are issued through an ICO or an exchange (IEO), the consequences of proper cryptoasset valuation are evident in underpricing. Minh Anh Tran Bui, *Initial Exchange Offering and the Presence of Underpricing*, 2020, https://opus4.kobv.de/opus4-rhein-waal/frontdoor/index/index/docId/1468. See also Hugo Benedetti & Leonard Kostovetsky, *Digital Tulips? Returns to investors in initial coin offerings*, 66 J. CORP. FINANC. 1–20 (2021).

[103] Villanueva Collao, *supra* note 17.

its owners raises critical governance issues, particularly in scenarios where it operates without any owners. Several legal structures have been built around the premise of legal personhood for a firm to operate. These legal structures help deal with tax law, limited liability of their members, and several other issues of organizational forms. This trend is no exception for DAOs. Regulators worldwide aim to attract the capital held in these organizations' treasuries by competing to offer the most appealing and innovative legal structures. DAOs take advantage of these legal structures for some or all of their activities through legal wrappers, essentially wrapping a legal structure across the DAO.

The concept of legal wrappers emerged to address interactions with the non-virtual world. Not everything in blockchain is virtual; its interrelation with the real world necessitates appropriate structures, especially when activities' repercussions or their operational needs require a framework to circumscribe liability. For instance, hiring and paying employees (or, most commonly, third-party software providers) becobuterinmes complicated without a formal legal structure. The protections of business structures can shield DAO members from the imputation of a general partnership with unlimited liability arising from their operations.[104]

However, to date, there has not been a clear acceptance of DAOs as unincorporated general partnerships by default. Their classification as one would necessitate a case-by-case analysis by courts, assessing factors such as members' involvement in governance (management), the sharing of profits and losses, and contributions of money, property, or services.[105] Given the structure of DAOs, this assessment is particularly challenging. Without a line of cases evaluating DAOs as default general partnerships, most of these organizations prefer to safeguard their cryptoassets from being classified as securities, especially given the increased enforcement of US federal agencies under federal securities laws and the broad interpretation of investment

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[104] «Under the Uniform Partnership Act (UPA), a partnership is the association of two or more persons to carry on as co-owners of a business for profit, whether or not the persons intended to form a partnership.» Laila Metjahic, *Deconstructing the DAO: The need for legal recognition and the application of securities law to decentralized organizations*, 39 CARDOZO L. REV. 1533, 1579 (2018).

[105] Provided some plaintiffs are not a conflicted class by being members or "governance token holders" of the organization. Sarcuni v. bZx DAO, No. 22-618 (S.D. Cal. Mar. 27, 2023). There is only one ruling in a US federal court concerning negligence for economic losses harming "non-partners", where the court applied a six-factor test to determine the special relationship that established the duty of care. *Id*. at *8. This federal ruling is not binding to other courts.

contracts.[106]

There are four types of business/commercial structures used by DAOs enabled by regulation: limited liability companies (DAO LLC, DO LLC, or LAO), associations, foundations, and trusts. A DAO typically chooses a legal wrapper after developing it organically, applying it not to the entire organization but to a sub-DAO.[107] The legal wrapper around a sub-DAO focuses on a specific project, functioning similarly to the branches of a traditional organization.

a. DAO LLC

Modern corporate law provides liability shielding for organization members/owners by segregating the organization's assets. Doing so prioritizes the claims of the organization's creditors while preventing them from accessing the personal assets of the owners/members.[108] In theory, DAO members could register their organizations as LLCs.[109] However, traditional LLCs are not well-suited for these new organizations. This inadequacy has prompted the enactment of regulations on DAO LLCs or the evolution of LLCs, driven by industry demands for regulatory clarity in this area.[110] Some states in the US allow this organizational form,[111] which combines a

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[106] Douglas S. Eakeley & Yuliya Guseva, *Crypto-Enforcement Around the World*, 94 SOUTH. CALIF. REV. PS. 99–127 (2021) (showing the primacy of US federal agencies in the crypto-enforcement actions).

[107] Christopher J. Brummer & Rodrigo Seira, *Legal Wrappers and DAOs*, SSRN ELECTRON. J. 1, 5 (2022), https://ssrn.com/abstract=4123737.

[108] The principle behind the separate legal personhood of firms lies in the dual defensive and affirmative asset partitioning. Thus, this separation is a defensive mechanism or a twofold shield against the owners' personal liability and the firm's anticipated dissolution. Henry Hansmann & Reinier Kraakman, *The Essential Role of Organizational Law*, 110 YALE LAW J. 387, 394 (2004).

[109] Before DAOs' explosion, legal scholars described how algorithmic entities or entities without human controllers can be enacted through the existent LLC model. Shawn Bayern, Thomas Burri, Thomas D. Grant, Daniel M. Häusermann, Florian Möslein & Richard Williams, *Company Law and Autonomous Systems: A Blueprint for Lawyers, Entrepreneurs, and Regulators*, 9 HASTINGS INT. COMP. L. REV. 135 (2017). Shawn Bayern, *The implications of modern business-entity law for the regulation of autonomous systems*, 19 STANFORD TECHNOL. L. REV. 93 (2015); Lynn M LoPucki, *Algorithmic Entities*, 95 WASHINGT. UNIV. L. REV. 887–953 (2018).

[110] Unsurprisingly, Wyoming is among the first states to adopt the DAO LLC model, which was also the first state to innovate with LLCs in 1977. The 1977 statute was unsuccessful until tax benefits accompanied it following a ruling from the Internal Revenue Service. Keeping in mind this, the DAO LLC model includes tax benefits.

[111] VT. STAT. ANN. Tit. 11§4173 (2018); WYO. STAT. § 17-31-101 (2021); TENN. CODE. ANN. §§48-250-11-118 (2022); UTAH CODE ANN. § 48-5-101 (2023). Vermont was one of the first states to provide a legal wrapper to decentralized organizations labeled blockchain-based limited liability companies (BBLLCs). BBLLCs seem more aligned with layer 1

corporation's limited liability with the tax advantages of pass-through entities.[112]

DAO LLCs' registration is simple: they first must state in the articles of organization that it is a decentralized (autonomous) organization[113] and then maintain an in-state registered agent who does not need to be a member of the organization.

Without formal incorporation, these organizations are allowed to be managed in a similar way as general partnerships. They must be member-managed and cannot be manager-managed, creating issues with developing specific projects the organization will entrust to some of their members or outsiders.[114] Some statutes offer the possibility of being managed by a smart contract (and to be algorithmically managed) which would emphasize the alleged (and desired) autonomous part of DAOs. In those cases, statutes also require the disclosure of the smart contract code and the possibility of amendment or modification with relative disclosures if necessary.[115] Other types of statutory regulation require a description of the organizational purpose, an administrative member (or contact person) appointment, the degree of decentralization, and an assessment of cybersecurity risks.[116]

An aspect that distinguishes DAO LLCs from LLCs is the complete waiver of fiduciary obligations. There are no default fiduciary duties among each other member and towards the DAO.[117] The statutes have accurately specified that these duties are contractually waived and solved under contract

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organizations (as Wright defined them, algorithmic organizations rather than participatory or member-based organizations). Wright, *supra* note 6.

[112] With pass-through entities, earnings go directly to stakeholders, who owe taxes on them, thus avoiding double taxation.

[113] Some statutes require the statement of being a decentralized organization. However, none of them define a decentralized autonomous organization besides a type of "limited liability company whose articles of organization contain a statement that the company is a decentralized autonomous organization." See WYO. STAT. § 17-31-104(a).

[114] Brummer and Seira, *supra* note 98, at 11.

[115] See WYO. STAT. § 17-31-109; TENN. CODE ANN. § 48-250-104(c). None of the statutes define what it means to amend a smart contract, which likely involves modifying the code. This can occur only if the smart contract is designed with intentional gaps that allow for modifications or are incomplete, expecting outside input. However, these upgrades or amendments are often incompatible with the security measures required to operate smart contracts.

[116] VT. STAT. ANN. Tit. 11, §4173. However, these requirements primarily address blockchain layer 1 types of organizations, not necessarily DAOs.

[117] Joan MacLeod Heminway, *Tennessee's Dao Act: Positive Innovation or Fringe Legislation?*, 22 FLORIDA STATE UNIV. BUS. REV. 171, 185 (2024).

law. [118] Such statutes might crystallize a current practice and tendency in the US legal system among business entities to reduce the scope of fiduciary duties.[119]

Other statutes do not waive fiduciary duties by default. Nevertheless, unless the organization has appointed or mentioned one in its documents, implicit fiduciary duties across multiple stakeholders (developers, members, participants, and/or legal representatives) are excluded.[120] However, it must be noted that the requirements for an organizational constitution, such as consensus mechanisms and validation, might indicate that this regulation focuses more on a blockchain layer 1 type of organization than a DAO.[121]

In one particular case, waivers also extended to the right of DAO members to access information, typically the right to inspect corporate documents and financial records, as long as this information is publicly available on distributed ledger technology (DLT). However, concerns have arisen regarding how this dissemination of information can be achieved, as current state-of-the-art information posted on a DLT is encoded. This encodement implies that members need the appropriate skills to decode and assess the information.

Finally, the dissolution of a DAO LLC differs from that of a regular LLC. Statutes allow dissolution by members' agreement[122] but also when there is assessed inertia in the organization's governance, unlawful purpose, expiration, and/or event-based situation specified in the smart contract or articles of organization, or no humans in control of the organization.[123] In this sense, regulators aim to contrast machine-driven organizations by

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[118] *Id.* However, the Tennessee statute indicates a waiver of fiduciary duties while at the same time introducing an "implied contractual covenant of good faith and fair dealing," an unusual mixing of corporate duties with remedies in contract law.

[119] Julian Velasco, *The Diminishing Duty of Loyalty*, 75 WASH. LEE LAW REV. 1035–1096   (2018), https://heinonline.org/HOL/Page?handle=hein.journals/waslee75&id=1057&div=23&collection=journals.

[120] UTAH CODE ANN. § 48-5-307. The Utah Limited Liability DAO (LLD) model has been greatly influenced by the model law developed by the Coalition of Automated Legal Applications (COALA), including *verbatim* the provisions for fiduciary duties. See COALA, *Model Law For Decentralized Autonomous Organizations (DAOs)* 39 (2022), https://coala.global/daomodellaw/.

[121] VT. STAT. ANN. Tit. 11, §4173 (authority requirements), §4174 (multiple roles of members and managers; this provision allows for a BBLLC to be manager-managed).

[122] Sometimes, it is requested that the articles of dissolution be filed with the Division of Corporations and Commercial Code. UTAH CODE ANN. §48-5-108(2)(d).

[123] WYO. STAT. §17-31114; TENN. CODE ANN. §48-250-113 (Vermont statute does not provide for rules on dissolution).

encouraging human participation within DAOs, similarly reflected in the governance provisions. In one case, this unlawful purpose can be detected *ex-officio* by the Secretary of State*,* which is an event that would be challenging to assess.[124]

As a legal wrapper, the DAO LLC has been deemed a failed experiment.[125] Wyoming has an estimated 800 organizations registered with DAO in their name (so allegedly taking advantage of a DAO LLC form),[126] which is low compared to the more than 13,000 outstanding DAOs and 50,896 aggregated governances (DAOs and sub-DAOs) reported by DeepDAO. This result demonstrates that the DAO LLC model does not support the goals of the cryptocommunity where these organizations emerge. It only provides a temporary solution grounded on economic theory to address agency issues by following a structure that separates ownership and control. Statutes requiring the form of an alternative LLC may not be an effective option, as these organizational structures are typically beneficial for entities with few equity investors or closely held firms. In contrast, members of a DAO LLC have already raised capital through the ICO/IEO process by offering cryptoassets to the public to develop the DAO. They are, therefore, economically similar to public companies but are substantially at the early developmental stages of a startup, lacking the guidance of venture capitalists. More successful legal entity forms are trusts and foundations.

b. Trust

A singular form DAOs have for dividing and managing projects (creating sub-DAOs) is establishing a trust.[127] Originating from English common law, the trust is an institution that provides a structure where the settlor (or grantor) passes property in trust (trust fund) to a trustee (conferring legal title), who holds this property for the benefit of beneficiaries (holding equitable title).[128] The English trust model has a particularity, beyond being a product of common law, of having origins in the courts of equity and thus grounded in equitable principles. These principles revolve around fiduciary duties of a

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[124] TENN. CODE ANN. §48-250-113(a)(5).

[125] Taras Zharun, *Wyoming LLC as a DAO Legal Wrapper: What You Need to Know*, LEGAL NODES (Jan. 26, 2024), https://legalnodes.com/article/wyoming-dao-llc.

[126] See DEEPDAO, *Organizations*, https://deepdao.io/organizations.

[127] I am indebted to David Gogel for sharing the trust structure of the sub-DAOs of dYdXDAO.

[128] There are several iterations of the "conventional trust model," which do not need a settlor or beneficiaries. MAURIZIO LUPOI, TRUSTS. A COMPARATIVE STUDY 1–3 (2000). For simplicity, I will refer only to the conventional model and add variations related to a specific jurisdiction.

different and more stringent kind than corporate fiduciary duties.

The main distinction, however, when dealing with the trust structure is that, unlike corporations, a trust is not a legal entity but composed of legal relationships.[129] These relationships establish enforceable duties and rights among the trust parties. Because it is a confidential arrangement, the trust (fund) cannot be registered as a legal entity; rather, the trustee registers the relationship.[130]

The trust structure has predominantly been utilized for estate planning in common law jurisdictions, with some variations in civil law systems.[131] DAOs have adopted trust law to manage their cryptoassets within treasuries, often separating each project into sub-DAOs.[132]

The main trust law used for sub-DAOs is the Guernsey Law.[133] This offshore trust legislation includes several variations to the traditional trust model, which is more convenient for early-stage types of organizations. For example, a trust under Guernsey law is enforced by courts when the trustee holds assets or is vested in assets for the benefit of beneficiaries (either existing or not) for several purposes and for an indefinite period (a purpose trust).[134] The appearance of the settlor as a party in the trust instrument is unnecessary; it is enough for the trustee to sign a written declaration. The settlor requirement would be challenging for DAOs, which allegedly do not have a hierarchical structure with agents making decisions.[135] There is also no requirement for the trust to have a specific purpose to be valid (unlike English trust law, which requires a purpose; otherwise, it would be considered a sham), and it does not expire or require renewal. These additional features make trust vehicles more appealing than the DAO LLC model.

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[129] Paolo Panico, *Private foundations, trusts and the liability of service providers*, 16 TRUSTS & TRS. 396–404 (2010).

[130] D. Hayton, *Foundations and trusts contrasted*, 17 TRUSTS & TRS. 462–469 (2011).

[131] These variations were mostly introduced by the Hague Convention. See Convention of 1 July 1985 on the Law Applicable to Trusts and on their Recognition. Maurizio Lupoi, *Il Trust nell'ordinamento giuridico italiano dopo la Convenzione dell'Aja del 10 luglio 1985*, VITA NOTARILE 966 (1992).

[132] dYdX has divided its projects into multiple sub-DAOs, and one of them uses the trust form. See *Operations subDAO Structure and People*, DYDX OPERATIONS, https://www.dydxopsdao.com/about.

[133] The Trusts (Guernsey) Law 2007.

[134] *Id.*

[135] See *dYdX Operations Trust – Trust Instrument*, DYDX OPERATIONS, https://www.dydxopsdao.com/about.

Moreover, according to the fundamental principle of trust law, trust assets are segregated, meaning the trustee's personal creditors do not attach. This is meaningful for DAOs since cryptoassets held in treasuries can be earmarked in a trust sub-DAO for different purposes, enabling transparency within the community and tying some assets for tax payments and reporting obligations.[136] This device allows trustees to govern the trust with more flexibility and fewer requirements than a DAO LLC without fearing the trust fund's depredation. Members of a sub-DAO must rely on the trustee's operations with limited control or recourse. Indeed, members of the organization (or, in DAO jargon, the community) can vote and make proposals for the use of the trust fund but are not the beneficiaries of the trust instrument.

The special regulation of Guernsey law, influenced by international financial centers, permits a trust structure for non-charitable purposes. It offers tax benefits without requiring beneficiaries. While beneficiaries' rights are typically extensive, allowing them to hold the trustee accountable, Guernsey law replaces this power or control over the role of an enforcer in the absence of beneficiaries.[137]

According to this structure, sub-DAOs are managed under a Guernsey Trust by administrators (trustees, which could also be legal entities), while enforcers oversee the operations of trustees. In the English trust model, trustees owe a duty to account to beneficiaries; in their absence, there must be someone to hold the trustee accountable.[138] The duty to account gives rise to the beneficiaries' right to information, and Guernsey trust law shifts this right to the enforcer.[139] Although the classic trust structure raises questions about whether a trust can exist without beneficiaries, the enforcer's powers remain fiduciary.[140]

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[136] Brummer and Seira, *supra* note 107.

[137] M. Guthrie & C. Moore, *Guernsey: Who owes what and to whom: the roles and duties of trustees, protectors, and enforcers compared to those of councillors and guardians in respect of Guernsey law trusts and foundations*, 21 TRUSTS & TRS. 645, 647 (2015).

[138] *Id.* at 648.

[139] Matthew Guthrie, *Guernsey: Beneficiaries' rights to information: a comparison between trusts and foundations in Guernsey*, 20 TRUSTS & TRS. 573, 575 (2014).

[140] Brummer and Seira, *supra* note 107. Other offshore trust alternatives are under the STAR Trust in the Cayman Islands, where beneficiaries are denied enforcing the trust. A fundamental requirement for the validity of a non-charitable purpose trust is the presence of an enforcer, someone who can advance the purpose of the trust. With the appointment of an enforcer and the irrelevance of beneficiaries, the Cayman Trust shifts from the beneficiary principle (identification of beneficiaries as a synonym of purpose) to the enforceability of the trust, proper of the contractarian basis of US trust law. Paolo Panico, *Private foundations*

An additional divergence from the English model appears around the trustee's personal liability. Generally, trustees who deal with third parties in performing their fiduciary duties incur personal liability for their obligations.[141] The self-discipline arising from the threat of personal liability is erased in the Guernsey legislation, shifting the burden of proof to the trustee creditors.[142] This provision creates a problem of visibility of the trustee's competencies and power with third parties. Trustee liability is significant for third parties interacting with the trustee. People frequently believe they are dealing with a trust, when in reality, they are dealing with the trustee. Foundations and their incorporated nature are thus more suitable solutions for addressing trust problems with third parties. Consequently, many jurisdictions have enacted private foundations legislation as a new creature of statute grounded on civil law tradition.[143]

The trust structure must be considered when implementing a trust, together with the number of trustees and enforcers required for managing sub-DAO treasuries under Guernsey law.[144] This reification of the trust structure acquiring features of corporate entities and treating the trust as a legal person is consistent with the US experience of business trust (or statutory trust) since the twentieth century.[145] The business trust, particularly in Delaware, deviates significantly from the traditional English model and highlights the contractarian basis of US trust law.[146] Business trusts have been used by holding entities to bypass certain corporate law constraints,[147] including the elimination of fiduciary duties as a default rule through contract law. Some commentators have advocated incorporating DAOs and blockchain structures into business trust to create governance mechanisms based on private ordering, but these efforts have largely been unsuccessful.[148]

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and trusts: just the same but different?, 22 TRUSTS & TRS. 132, 136 (2016). [Hereinafter private foundations and trusts].

[141] Paolo Panico, *Trustee Liability to Third Parties*, *in* INTERNATIONAL TRUST LAWS 375 (2nd ed. 2017). [Hereinafter trustee liability]

[142] Section 42 of the Trusts (Guernsey) Law 2007. Trustee's personal liability stops when the trustee discloses information about their role or when third parties interacting with the trustee are aware of the trustee's capacity. Panico, *supra* note 129. However, the indemnity for fulfilling the trustee role obtained from the trust fund can be accessed by trust creditors through subrogation. Panico, *supra* note 141. (trustee liability).

[143] Panico, *supra* note 140. (private foundations and trusts).

[144] dYdX Operations purpose trust instrument indicates three trustees (one of them an LLC) and one enforcer. See *dYdX Operations Trust – Trust Instrument*, *supra* note 134.

[145] Panico, *supra* note 140. (private foundations and trusts).

[146] John H. Langbein, *The Contractarian Basis of the Law of Trusts*, 105 YALE L. J. 625 (1995).

[147] Delaware Code, Title 12, §§ 3801–3826.

[148] Carla L. Reyes, *If Rockefeller were a coder*, 87 GEORGE WASHINGTON LAW REV.

However, the US business trust model has proven a poor option considering the tax benefits from offshore trusts with more flexible requirements for DAOs and sub-DAOs.

The trust model is a viable solution when the DAO has enough organizational structure and organizational semblance. Foundations, in particular, tend to function more effectively as legal wrappers during the initial stages of sub-DAOs or DAOs.

c.   (Private) Foundations

Foundations have emerged to manage some philanthropic mechanisms through incorporation. They have mainly been used to solve management problems that occurred when using trusts for charitable purposes. Indeed, the institution of foundations has been influenced by trusts. Similar to trusts, foundations have traditionally focused on the beneficiary's role. Nevertheless, foundations are distinct from the equitable structure of trusts.[149] Initially, foundations were structured to ensure asset protection by ascertaining the owner of the property when it had been abandoned by all of its prior owners and holders.[150] Throughout the 2000s, foundations evolved from their charitable origin into a device for estate planning.[151] Thus, the focus on the beneficiary has faded away.[152]

Private purpose foundations are a more effective alternative to private purpose trusts. As statutory products, foundations perform a similar function

373–429 (2019).

[149] Paolo Panico, *Private purpose foundations: from a classic "beneficiary principle" to modern legislative creativity?*, 19 TRUSTS & TRS. 542, 543 (2013). [Hereinafter private purpose foundations].

[150] Robert Feenstra, *Foundations in Continental Law since the 12th Century: The Legal Person Concept and Trust-like Devices*, *in* ITINERA FIDUCIAE. TRUST AND TREUHAND IN HISTORICAL PERSPECTIVE 305, 310-11 (Richard Helmholz & Reinhard Zimmermann eds., 1998). The first indication of the separate legal structure of foundations arose in 1144 during a dispute over the ownership of a monastery abandoned by all its monks, emphasizing the fiction of the property being possessed by the walls of the monastery, with rights exercised through the clerks as *procuratores*. *Id.* at 312.

[151] Panico, *supra* note 140. (private foundations and trusts). Private foundations lie in three models: the family foundation (German tradition), the Dutch foundation (stitching), and the common law foundation.

[152] Panico, *supra* note 149. (private purpose foundations). The classic model of private foundations from civil law jurisdictions exists in Liechtenstein, Panama, and Austria. Courts enforce beneficiary rights in all these jurisdictions and reject the self-serving purposes of private foundations. *Id.* at 546. The policy behind this is that self-standing properties are effectively removed from the economy and not intended to benefit a specified group of humans, a similar position concerning non-charitable purpose trust.

to trusts but are not governed by equity rules. Foundations acquire legal personality, and consequently are treated as separate legal entities through the unilateral declaration of the founder[153] or by being registered in a public register of the chosen jurisdiction with some bare information required by regulation.[154]

Liechtenstein is an example of the classic model of foundations with a tripartite scheme influenced by the trust structure: foundation participants/founders, foundation officers, and beneficiaries. Only the founder can allocate assets and decide on their purpose and the beneficiaries.[155] Differing from the trust model, the flexibility of foundations allows the restriction or denial of beneficiaries' rights but also the designation of the founder as a beneficiary.[156] As a result, founders possess and retain strong powers upon the foundation.[157]

Other models have diverged from the classic private foundation structure, particularly through legislative experiments in common law offshore jurisdictions. There is frequently no mention of the beneficiary, meaning no players have a quasi-proprietary equitable interest in the foundation assets. Besides being separate legal entities, private foundations have a corporate nature. They are governed by councilors (or directors). However, their operations are outside the scope of equitable jurisdiction over fiduciary offices.[158]

DAOs often prefer to use foundations for high-profile projects incorporated in jurisdictions with a light regulatory touch. The prominent use of foundations by DAOs resides in the lack of assets necessary to form a foundation. Although a minimum amount of capital is required, it can be constituted with virtually no assets.[159] Many early-stage DAO projects, likely

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[153] Panico, *supra* note 140., at 134 (private foundations and trusts)

[154] Hayton, *supra* note 130., at 465. In some jurisdictions, such as Jersey, foundations must undergo a formal incorporation process to acquire the status of a separate legal entity–registration with a registrar and a certificate of good standing of the foundation (or proof of existence and legal capacity). Additional requirements include the legal person qualified for incorporation, such as a licensed corporate structure and trust service provider. Paolo Panico, *Founder's powers in civil law and common law private foundations*, 17 TRUSTS & TRS. 470–478 (2011).

[155] Panico, *supra* note 140., at 133 (private foundations and trusts).

[156] *Id.* The Dutch model, or stitching, emphasizes less on the founder's powers and more on beneficiaries' rights.

[157] Panico, *supra* note 129. (private foundations, trusts and the liability of service providers)

[158] Panico, *supra* note 140., at 137 (private foundations and trusts).

[159] Hayton, *supra* note 130.

but not exclusively before the ICO/IEO launch, opt for this organizational structure.

Switzerland is a jurisdiction where some sub-DAOs have been incorporated.[160] Foundations in Switzerland are under the oversight of the Supervisory Authority of Foundations (SAF). SAF approves foundation documents and amendments as well as major organizational events, such as mergers or dissolutions. The SAF oversight has raised some criticism for their intrusion into foundations' governance, defaulting the Swiss foundation's popularity. Sub-DAOs often use the non-profit foundation form for specific projects focused on research and development or implementing their technical infrastructure.[161] Recently, other jurisdictions, particularly offshore financial centers, have offered attractive for-profit foundation forms that go beyond mere tax benefits.[162]

The governance of private-purpose foundations is complicated and raises several issues. Detaching from the classical foundation structure, private foundations in offshore common law jurisdictions view beneficiaries as objects of the powers of appointment; as objects and not subjects, they have little or no information rights.[163] Consequently, officers' and councilors' duties are of a contractual nature. For example, officers have the duty to act in good faith and exercise the care, diligence, and skills of a reasonable, prudent person. This implies that, with duties remaining of a contractual nature, foundation officers are not personally liable for the obligations they undertake in the exercise of their function. These duties usually stand unless there is a found breach or fraud, but neither of them triggers fiduciary duties in corporate or, even harder, in trust law. Nevertheless, statutory provisions

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[160] Among the earlier sub-DAOs registered in Switzerland is the Ethereum Foundation. However, the Swiss practice and acceptance of sub-DAOs registering foundations have helped their dissemination. See *dYdX Foundation*, https://www.dydx.foundation/ecosystem.

[161] See *About dYdX Foundation*, https://www.dydx.foundation/about. "The dYdX Foundation is an independent not-for-profit foundation headquartered in Zug, Switzerland. dYdX Foundation's purpose is to support the current implementation and any future implementations of the dYdX protocol and to foster community-driven growth in the dYdX ecosystem." The non-profit aspect has also driven novel regulation in US states conferring non-profit status to decentralized unincorporated associations. Jesse Hamilton, *Wyoming Grants DAOs New Legal Structure*, Coindesk (Mar. 8, 2024), https://www.coindesk.com/policy/2024/03/08/wyoming-grants-daos-new-legal-structure/.

[162] Brummer and Seira, *supra* note 107., at 18.

[163] Jurisdictions such as Guernsey require a foundation to have a guardian or protector whenever there are no beneficiaries or are disenfranchised (beneficiaries with no vested interests). However, Guernsey law circumscribed the function of the guardian, excluding the beneficiary principle of trust law into private foundations. Foundations (Guernsey) Law, 2012, section 10(1)). Panico, *supra* note 149., at 548 (private purpose foundations).

of the *ultra vires* doctrine coupled with the registration of the foundation as a legal entity offer more protection concerning third parties.[164]

For DAOs, failing to mention beneficiaries and equitable interests in the foundation assets is sought to enable the organization's smooth operations, which might be particularly important in the early stages. Furthermore, incorporating the foundation as a legal entity helps sub-DAOs enter into contracts with third parties. This transparency ensures that service providers, such as developer companies or freelance developers engaged during bounty bug programs or other reward systems, know they are contracting with a foundation representative.

d. Benefit corporations

Lately, DAOs have also experimented with US types of organizations such as the Benefit Corporation (B-corp) or for-profit corporations certified for their social impact, signifying that their ethical, social, and environmental practices meet the standards laid down by B Lab–a non-profit group based in Pennsylvania.[165] Maryland pioneered this movement in 2010 by creating the B-Corporation structure distinct from the standard corporate form designed to serve the public good. These organizations engage in activities that promote human health, preserve the environment, and support other social causes. As a result, this certification implies that B-Corporations, as specified in their formative documents, require fiduciaries to consider the impact of their decisions on various non-shareholder constituencies.

The establishment of B-Corporations marked a significant shift from traditional corporate forms since the emphasis became a commitment to public benefit over mere profit maximization. This shift aligns with some of the DAOs' willingness to move outside the scope of financial DAOs and embrace a new organizational form dedicated to their community and the improvement of governance mechanisms.[166] Nevertheless, before DAOs, the B-corp model has largely been used by consumer brands. This trend raises

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[164] Panico, *supra* note 129., at 400. (private foundations, trusts and the liability of service providers).

[165] This certification implies that B-Corporations, as specified in their formative documents, require fiduciaries to consider the impact of their decisions on various non-shareholder constituencies. ALAN R. PALMITER, SUSTAINABLE CORPORATIONS 333 (2023).

[166] See *dYdX Trading–A Public Benefit Corporation*, https://dydx.exchange/blog/public-benefit-corporation. ("dYdX Trading has officially updated its charter to become a Public Benefit Corporation. In addition to all of our work on the v4 open source code, this further establishes our commitment to aligning with the builders, traders, and stakeholders in the web3 community.")

questions about the motivations for seeking such certification in the corporate world as well as in the DAO world. The predominance of consumer brands might indicate these certifications are used as a marketing strategy moreso than aligning their mission and purpose for social impact and, thus, their commitment.[167]

This brief overview of legal wrappers is intended to identify the structures that affect DAO governance. All these organizational forms in which sub-DAOs operate create conflicts in terms of transparency concerning the members of the community and, more specifically, with respect to the use of the funds allocated in treasuries and their (conflicted) relationship with service providers.

The following sections unwrap the governance of DAOs.

B. *Decentralized Governance*

Governance in DAOs (and, broadly speaking, blockchain organizations) has been compared to those of firms and nations. Some crypto-enthusiasts parallel DAOs to supranational jurisdictions with digital sovereignty, wherein such digital sovereignty supersedes national or terrestrial jurisdictions.[168] Nevertheless, the organizational structure and interactions of the different actors within DAO governance demonstrate a different organizational model without rigid hierarchies comprised of informal relationships, networks, and techno-determinism. This section explores the governance approach of DAOs by deviating from traditional corporate literature since these entities are not conventional firms.

For many, DAOs represent the crystallization of the theoretical framework known as the *nexus of contracts* that considers a firm as a series of contractual relationships.[169] The contractarian approach places excessive

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[167] Shannon Emmerson, *How B Corps and Purpose-Led Brands are Changing Marketing*, FORGE & SPARK (Mar. 18, 2024), https://forgeandspark.com/how-b-corps-and-purpose-led-brands-are-changing-marketing/.

[168] Aaron Wright & Primavera De Filippi, *Decentralized Blockchain Technology and The Rise of Lex Cryptographia*, SSRN ELECTRON. J. 1–58 (2015); ARVIND NARAYANAN ET AL., BITCOIN AND CRYPTOCURRENCY TECHNOLOGIES (2016). But see Kevin Werbach, *Trust, but Verify: Why the Blockchain Needs the Law*, 33 BERKELEY TECHNOL. L. J. 487, 540–24 (2018). (describing how the cryptocommunity used John Perry Barlow's ideas to nurture the evolution of a digital system created on blockchain and how the history of digital systems have been attracted by the law, eradicating the State from digital systems has not yet occurred).

[169] Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial*

emphasis on contracts, including implied terms and gap fillers, which courts are expected to supplement over time—an assumption that has been progressively eroded.[170] However, participation in DAOs spans a wide spectrum of contractual and non-contractual relationships. These relationships could be understood as a nexus of data or an exchange of information. Yet, there is no basis to believe that synallagmatic promises occur. Cryptoasset holders often find fulfillment in being part of a community or supporting a specific project, creating value beyond economic terms and solely seeking profits.[171] In reality, most relationships around DAOs and their participants/members are socio-technical relationships.

The perspective on governance concerning DAOs has frequently carried out the same conceptual analysis of the separation of ownership and control.[172] Relationships established by code would likely mitigate principal-

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Behavior, Agency Costs and Ownership Structure, 3 J. FINANC. ECON. 305–360 (1976).

[170] Contractarian scholars argue that transaction terms are negotiated between a principal (shareholder) and an agent (manager), often assuming the efficiency and optimality of corporate governance structures. FRANK H. EASTERBROOK AND DANIEL R. FISCHEL, THE ECONOMIC STRUCTURE OF CORPORATE LAW 34-35 (1991). This extreme perspective has gradually faced criticism for its reductionist approach to the complexity of agency relationships within a corporation. Robert C. Clark, *Agency Costs v Fiduciary Duties*, *in* PRINCIPALS AND AGENTS: THE STRUCTURE OF BUSINESS 55 (J. W. PRATT & R. J. ZECKHAUSER EDS.,1985). Nevertheless, critics from both market realists employing empirical methods and stakeholder theorists expanding the contractual relationships within organizations still preserved the fundamental contractual framework: efficiency. HENRY HANSMANN, THE OWNERSHIP OF ENTERPRISE (2000); Margaret M. Blair & Lynn A. Stout, *A Team Production Theory of Corporate Law*, 85 VA. L. REV. 247–328 (1999). However, building on the law and economics approach, more sophisticated perspectives have emerged regarding when legal systems may evolve towards greater efficiency. ROBERT D. COOTER & THOMAS ULEN, LAW & ECONOMICS 419-55 (6th ed. 2016). From a different perspective, fiduciary scholars provide a different study of corporate relationships, exploring fiduciary duties not as a contractual term or default rule but under trust law, equity, or philosophical justifications. See FIDUCIARY OBLIGATIONS IN BUSINESS (A. B. LABY & J. HALE RUSSELL, 2021); Michele Graziadei, *Virtue and Utility. Fiduciary Law in Civil Law and Common Law Jurisdictions*, 235 *in* PHILOSOPHICAL FOUNDATIONS OF FIDUCIARY LAW 287–301 (Andrew S. Gold & Paul B. Miller eds., 2014) (examining how fiduciary law evolved to adapt to the rise of a market society). Likewise, institutional scholars have contributed to a more nuanced discussion of corporate problems. See Simon Deakin, *The Corporation as Commons: Rethinking Property Rights, Governance and Sustainability in the Business Enterprise*, 37 QUEEN'S L. J. 339–381 (2012); for a more recent critique, David Gibbs-Kneller, David Gindis & Derek Whayman, *Not by Contract Alone: The Contractarian Theory of the Corporation and the Paradox of Implied Terms*, 23 EUR. BUS. ORGAN. L. REV. 573–601 (2022).

[171] Mannan, *supra* note 77.; Werbach et al., *supra* note 9.

[172] The seminal work of Adolf Berle and Gardiner Means, "The Modern Corporation and Private Property," argues for the need to separate ownership and control in a system where dispersed shareholders own the firm, but the control is concentrated upon managers.

agent problems by eliminating agent conflicts, opportunism, and self-dealing type of behavior.[173] Agency costs, however, are not the only costs affecting a firm. Principal costs associated with the firm's owners also contribute, stemming not only from conflicts among them and with management but also from their potential lack of competence as business entrepreneurs.[174] Governance structures often emerge from the balance of control between agents and principals. Such balance is especially important in the startup and fintech world, where limiting principal costs—which tend to be higher than agent costs—is prioritized.[175] This dynamic is partially reflected in DAOs, where limiting the rights of dispersed cryptoasset holders by circumscribing fiduciary duties can be explained through the principal costs theory.[176] Founders who have a deep understanding of the project and possess key knowledge of its goals and daily operations tend to exert greater control.[177] Nevertheless, even this insightful explanation does not fully capture the complexities of DAOs as an unconventional organizational structure.

In fact, the prevailing assumption among legal scholars is that law is pervasive and that organizations only evolve around the law and legal mechanisms. However, empirical studies have shown how social norms, informal institutions, and culture have shaped organizations and influenced governance mechanisms despite the legal apparatus intended to govern them.[178] The original assumption of legal omnipresence thus does not hold

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ADOLF A. BERLE & GARDINER C. MEANS, THE MODERN CORPORATION AND PRIVATE PROPERTY (REV. ED., 1967).

[173] It has been theorized that a governance structure aiming at the reduction of transaction costs leads to the emergence of formal structures designed to minimize contracting under conditions of uncertainty and opportunism. OLIVER E. WILLIAMSON, THE MECHANISMS OF GOVERNANCE 12 (1996). However, these formal structures are not quite visible among DAOs.

[174] Zohar Goshen & Richard Squire, *Principal costs: A new theory for corporate law and governance*, 117 COLUMBIA L. REV. 767–830 (2017) (explaining that the firm's optimal governance structure reflects the reduction of both agent and principal costs).

[175] Weiss, *supra* note 73.

[176] See *supra* section on the structure of DAOs. The control cost analysis reflects not only conflict costs on agents (such as shirking, entrenchment, self-dealing, and options backdating) but also competence costs (such as lack of expertise, poor emotional control, overconfidence, and optimism bias). Likewise, principal costs have this dual type of costs: conflict costs (such as collective-action problems, rational apathy, and empty voting) and competence costs (such as coordination problems, duplicative efforts, and inadequate information). Goshen and Squire, *supra* note 174., at 795.

[177] Zohar Goshen & Assaf Hamdani, *Corporate Control and Idiosyncratic Vision*, YALE L. J. 560–617 (2016).

[178] From a socio-legal perspective see Stewart Macaulay, *Non-Contractual Relations in Business: A Preliminary Study*, 28 AM. SOCIOL. REV. 55–67 (1963) (finding that contract law is often ignored in business transactions); Robert C. Ellickson, *Of Coase and Cattle:*

because people do not constantly think about the law when organizing their activities but resort to it when there is a problem.

The corporate governance approach falls short of offering guidance when no board of directors exists, as DAOs operate without a formal structure that includes a monitoring agent. In a traditional corporate structure, legislative reforms have pursued a balance between deference to board decisions through the business judgment rule (in its different iterations) and control over the board through different means, such as a structure that encourages disclosures, rules, and liability. Reforms targeting that constituency are ineffective in this new governance model. How can an organization enhance good governance in the absence of a board of directors or supportive legislation? There is no straightforward answer to that question, but the ultimate goal of improving good governance must depart from the blockchain ecosystem's strategies.

DAOs promise a world of autonomous systems where distributed governance is achievable through techno-determinism, albeit these systems have not yet reached a truly ownerless type of organization.[179] Like business entities, DAOs cannot be entirely separated from their members.[180] Their

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Dispute Resolution among Neighbors in Shasta County, 38 STANFORD L. REV. 623 (1986) (examining the practices of cattle ranches in Shasta County for harms done by the cattle and that ranchers conformed their behavior not to the law but to the social norm of neighborliness); from a behavioral analysis perspective Cass R. Sunstein, *Social Norms and Social Roles*, 96 COLUMBIA L. REV. 903 (1996); from an institutional economics and institutional studies perspective see DOUGLAS C. NORTH, INSTITUTIONS, INSTITUTIONAL CHANGE AND ECONOMIC PERFORMANCE (1990) and Douglass C. North, *Institutions*, 5 J. ECON. PERSPECT. 97–112 (1991) (exploring the existence of formal and informal institutions); Stefan Voigt, *Determinants of social norms I - the role of geography*, 20 J. INSTITUTIONAL ECON. 1–19 (2024) (discussing the geographic factors, such as land or weather of specific regions, that play a causal role in generating social norms); Guido Tabellini, *Culture and Institutions: Economic Development in the Regions of Europe*, 8 J. EUR. ECON. ASSOC. 677–716 (2010) (establishing not only that "culture matters" but how culture affects the economic development of institutions and organizations).

[179] In the Tornado Cash example, the mixer (or the software/protocol) that allows the transactions is autonomous, but the Tornado Cash DAO, the community behind Tornado Cash treasuries, is not. In fact, in 2023, the Tornado Cash DAO was subject to an attack for siphoning resources through a malicious proposal hiding the code function and giving the attacker multiple fake votes. Maya Dotan et al., *The Vulnerable Nature of Decentralized Governance in DeFi*, DEFI 2023 - PROC. 2023 WORK. DECENTRALIZED FINANC. SECUR. 25, 29 (2023).

[180] Similar to corporations, extending artificial rights to autonomous systems is feasible. However, DAOs will predominantly remain organizations that connect dispersed members. For personless corporation analysis, *see* Carla L. Reyes, *Autonomous Corporate Personhood*, 96 WASHINGT. L. REV. 1453–1510 (2021). (explaining how artificial personhood is possible and needs to be assessed through a systems lens beyond traditional

organizational realities differ greatly according to the characteristics of the individuals involved, especially those who exert governance or power over the organization, determining issues with on-chain governance.

Blockchain tells a story of socio-technical relationships that escape the overarching scope of legal/formal institutions, in which core developers can design alternative organizations with the potential to be autonomous and collide with the law.[181] Still, even when the activities around them are punishable or punished, the law is sometimes ineffective, allowing these organizations to evolve in a state of *alegality*.[182] However, this *alegality* does not translate into a bare or unstructured system.[183]

Effective governance among DAOs largely hinges on the development of the blockchain ecosystem, which is driven primarily by networks rather than markets.[184] Network theorists have emphasized how individuals associated with a network create and recreate these organizations, tracing a path for policymaking and noting how organizational changes are always exogenous to the network.[185] However, participants in blockchain do not merely follow the rules dictated by the code. Participants respond to external pressures and take the lead in modifying their initial beliefs and desires (an endogenous

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corporate law). *Contra* Elizabeth Pollman, *Reconceiving Corporate Personhood*, 2011 UTAH L. REV. 1629 (2011) (arguing that there is no possibility of having an autonomous corporation without human involvement).

[181] An example is Tornado Cash, a mixer (or tumbler) operating through smart contracts that break the link of transactions, tracing, and correspondence of addresses of senders and receivers, thus enabling anonymous exchanges. Matthias Nadler & Fabian Schär, *Tornado Cash and Blockchain Privacy: A Primer for Economists and Policymakers*, 105 FED. RESERV. BANK ST. LOUIS REV. 122–136 (2023). This mechanism has allowed money laundering transactions across jurisdictions by obscuring the source of illicit funds and prompting actions against the founders, developers, and the organization despite the fact that the mixer was operating independently after the final developer had left. PRIMAVERA DE FILIPPI, WESSEL REIJERS & MORSHED MANNAN, BLOCKCHAIN GOVERNANCE 141 (2024).

[182] U.S. Treasury's Office of Foreign Assets Control (OFAC), Press Release, U.S. Treasury Sanctions Notorious Virtual Currency Mixer Tornado Cash, Aug. 8, 2022, https://home.treasury.gov/news/press-releases/jy0916. Despite sanctions from OFAC, the arrest and conviction of a developer for money laundering in the Netherlands, and the removal of websites and repositories associated with Tornado Cash, the mixer continues to operate, as no one can halt its transaction processing. Zoltan Vardai, *Tornado Cash developer guilty of money laundering*, COINTELEGRAPH (May 14, 2024), https://cointelegraph.com/news/tornado-cash-developer-guilty.

[183] Primavera De Filippi, Morshed Mannan & Wessel Reijers, *The alegality of blockchain technology*, 41 POLICY SOC. 358–372 (2022).

[184] Because DAOs operate and are dependent on a network infrastructure. See section I.A. The Structure of DAOs.

[185] Following a path in their interactions individuals R. A.W. Rhodes & David Marsh, *New directions in the study of policy networks*, 21 EUR. J. POLIT. RES. 181–205 (1992).

change).[186] This change in beliefs makes participants (such as miners) override the immutability and irreversibility characteristics of blockchain by modifying the state of the chain (registration of information) and the ability to take over an organization through a fork (changing the set of rules governing a specific blockchain protocol). Likewise, political economy theory suggests that the community behind decentralized networks can hardly be explained under economics or market-driven approaches, as markets heavily rely on regulation and competition.[187]

Even if networks facilitate participation through equal access to resources (the goal of blockchain and decentralized finance), in reality, there is always a leading role from specific actors based on offline and informal relationships. Since no hierarchies, authorities, or courts enforce contracts (in some cases, there are no even contracts), the lack of access to equal resources facilitates opportunistic behavior, challenging to monitor or reduce even through the aims of liquid democracy. In the DAO governance system, opportunistic behavior translates into vote buying or governance manipulation through the concentration of voting power and, thus, access to those resources.

Although DAOs do not possess consolidated governance practices, two types of governance have emerged in blockchain: off-chain and on-chain governance. Although off-chain governance is not exclusively associated with DAOs and is often connected to blockchain organizations in general, exploring off-chain governance provides valuable insights into the relationships and distinctive issues affecting DAO governance.[188] This includes understanding not only how off-chain governance influences on-chain governance but also how on-chain governance can, in turn, positively impact off-chain governance. The following sections highlight the distinctions between these two types and the realities participants face as they navigate the intersections of both governance models, the issues both governance mechanisms attract, and the extreme circumstances that on-chain governance has brought.

1. Off-chain governance

The community around blockchain has developed a network infrastructure of consensus algorithms, coded rules, alternative voting

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[186] BEVIR, *supra* note 38., at 30.

[187] Jaya Klara Brekke, *Hacker-engineers and Their Economies: The Political Economy of Decentralised Networks and 'Cryptoeconomics'*, 26 NEW POLIT. ECON. 646–659 (2021).

[188] Werbach et al., *supra* note 9. (distinguishing between off-chain governance from on-chain or DAO governance).

systems, and an entire digital financial system. All these attributes give the impression that the rule of code, or rules defined or enforced by technology, governs blockchain and the organizations that have flourished on top of it.[189]

However, not all the interactions in blockchain are dictated by code. Blockchain operates fundamentally through networks, positioning its governance within the spectrum between markets and hierarchies. As a hybrid type of organizational model, networks comprise multiple actors that are formally independent but rely on one another for key resources.[190] Blockchain networks involve stakeholders such as developers, validators,[191] users, and legal entities (business structures) engaging in processes like voting, community discussions, and decision-making outside of the chain or offline.[192]

Off-chain governance, therefore, refers to the organizational processes and rules—or, more accurately, social norms—that exist outside the blockchain protocol.[193] These processes are neither automatically enforced nor recorded by the blockchain infrastructure.[194] Off-chain governance encompasses the procedures through which developers and validators at the

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[189] This model of regulation through technological means, popularized as *Lex Informatica* or *Code is Law*, started during the 90s' when the internet became mainstream. See Joel R Reidenberg, *Lex Informatica: The Formulation of Information Policy Rules Through Technology*, 76 TEX. L. REV. 553 (1998); LAWRENCE LESSIG, CODE AND OTHER LAWS OF CYBERSPACE 3 (1999). With the advent of blockchain, several scholars have borrowed and expanded these concepts, applying them to the blockchain ecosystem. Wright and De Filippi, *supra* note 158 (coining the term *lex cryptographia* for encoded rules on blockchain); Thibault Schrepel, *Anarchy, State, and Blockchain Utopia: Rule of Law vs. Lex Cryptographia*, *in* GENERAL PRINCIPLES AND DIGITALISATION 367–383 (2020) (making a critique of the optimistic view of encoded rules and how it collides with fundamental rights); Primavera De Filippi & Samer Hassan, *Blockchain Technology as a Regulatory Technology: From Code is Law to Law is Code*, 21 first Monday (2016), https://firstmonday.org/ojs/index.php/fm/article/view/7113/5657 (explaining how blockchain and its coded rules can be a catalyst for legal enforcement); Primavera De Filippi, Morshed Mannan & Wessel Reijers, *Blockchain Technology and the Rule of Code: Regulation via Governance*, SSRN ELECTRON. J. (2022), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4292265 (advocating for governance models within blockchain organizations).

[190] BEVIR, *supra* note 11, at 26.

[191] Validators are block producers, those who decide the legitimacy of blockchain transactions through consensus mechanisms in exchange for a fee (in proof-of-work consensus, validators are also known as miners).

[192] Werbach et al., *supra* note 9, at 15.

[193] PRIMAVERA DE FILIPPI & GREG MCMULLEN, *Governance of blockchain systems: Governance of and by Distributed Infrastructure*, BLOCKCHAIN RESEARCH INSTITUTE AND COALA 4, 18, 20 (2019).

[194] Reijers et al., *supra* note 26, at 1-2.

base layer (L1) propose, create, and implement software changes as well as all offline processes that can directly or indirectly impact DAOs.

Without rigid hierarchies, the governance *of* the technology is more informal, unstructured, and difficult to enforce since there are no central authorities to resolve disputes among stakeholders.[195] This flexibility, however, allows the system to adapt to changing circumstances. In this way, off-chain governance complements on-chain governance by creating a dynamic environment of interdependent connections that foster mutual collaboration to maintain the system.

Within DAOs, off-chain governance intersects with both founders and cryptoasset holders, influencing their interactions and decisions.[196] To exemplify, the blockchain literature highlights that a founder, initially acting as a catalyst developer, would gradually step away from that role. They would shift their focus from programming to leadership and eventually become a bystander of the organization, ideally once it achieves decentralized governance.[197] Nevertheless, founders frequently remain within the organization without stepping down from their controlling/governing roles.[198] Such roles enable them to establish an internal hierarchy for decision-making,[199] broadening the circle of insiders within the organization while also creating connections with participants across various levels of the blockchain ecosystem.

Off-chain governance demonstrates that besides relationships embedded into code, there is a specific social fabric of interpersonal relationships with different centers of interest at different levels.[200] These centers of interest usually gravitate toward the base layer, or "cities," which provide essential infrastructure and governance rules for resource utilization. Key stakeholders in these centers include validators, core developers, charismatic leaders, and business structures.[201] Beyond the base layer or within the "firms," these centers of interest interact, both directly and indirectly, with DAOs and their

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[195] DE FILIPPI AND MCMULLEN, *supra* note 193.

[196] Darcy Allen & Chris Berg, *Blockchain Governance: What We Can Learn from the Economics of Corporate Governance*, 3 J. BR. BLOCKCHAIN ASSOC. 1–10 (2020).

[197] Haque et al., *supra* note 79., at 153.

[198] De Filippi, *supra* note 44.

[199] Kiayias and Lazos, *supra* note 20.

[200] Martin Kilduff & Wenpin Tsai, *Is There Social Network Theory? A Critical Examination of Theoretical Foundations*, *in* SOCIAL NETWORKS AND ORGANIZATIONS 35 (2011).

[201] See *supra* section I.A. Structure of DAOs.

actors/participants (such as founders, cryptoasset holders, etc.).

The socio-technical relationships surrounding off-chain governance can be both formal and informal. Formal relationships are, in turn, legal or coded-based. On the one hand, formal legal relationships imply interaction with governments and regulators, such as when the organization adopts traditional business structures from a specific jurisdiction (i.e., legal wrappers).[202] In turn, those running the legal wrapper for a blockchain organization or DAO-specific project might eventually interact off-chain with founders, users, or leaders—adding a layer of legitimacy. On the other hand, formal code-based relationships often reflect consolidated social practices or norms, such as consensus mechanisms or the appointment of delegates within DAOs. These formal relationships initially require off-chain agreements, which can be registered on-chain over time.

Informal relationships instead flourish between leaders and validators or core developers at the base layer. In DAOs, informal relationships allow for off-chain interaction among insiders, such as founders, between leaders and cryptoasset holders with governance rights, and between community developers and users.[203] Moreover, these informal relationships foster cooperation for mutual advantage and facilitate future exchanges.[204] Coordination of these groups sometimes appears off-chain through mailing lists, GitHub, Discord channels, social media such as X or Reddit, and in-person meet-ups.

The intersection of formal and informal relationships highlights the impact of off-chain governance on on-chain governance, not necessarily through voting validation but through consent for the use of resources. However, the strength and influence of these mutual relationships have not yet been explored. Among DAOs, these informal and formal relationships have not enhanced good governance. They have more frequently created conflicts. For example, the relationship between DAO founders and third-party software service providers is primarily informal, often influenced by

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[202] Customarily, blockchain organizations (base layer, L1) adopt the foundation model for some of their operations and goals. Instead, DAOs adopt other forms, such as the trust, foundation, or DAO LLC model. See *supra* section I.A.3. Legal Structures on DAOs: An Overview of Legal Wrappers. The formal-legal relationships also include the sub-DAO hiring employees and engaging with third-party service providers.

[203] Online communities are not necessarily users or cryptoasset holders but followers of specific projects that aggregate through GitHub or Discord channels. In this sense, the online community around a DAO might be greater than their actual cryptoasset holders.

[204] These exchanges are fundamental for knowledge creation that might enhance information among DAO members. Kilduff and Tsai, *supra* note 190, at 33.

personal connections and friendships. These factors play a significant role in hiring decisions and determining compensation, which, when the relationship becomes formal, tend to be considerably higher than market rates.[205]

Provided that some conflicts still persist, there is some norm of reciprocity among the members of DAOs who are willing to offer aid for different purposes, not only for extracting a price. Techno-determinism ultimately plays little or no role.[206] Most demonstrations of reciprocity result from informal relationships and the level of trust that maintains a system of mutual cooperation and beneficial links and exchanges. The key concept in off-chain governance is that informal relationships are based on trust—not on the technology but among actors/participants. Over time, these participants build trust through cooperation, forming long-term relationships that establish them as repeat players.[207] As repeat players, these actors governing off-chain will conform to emerging or new social norms to be considered part of a network or organization.

As the blockchain ecosystem becomes increasingly interconnected, dependent, and complex, both blockchain and the overarching structure of DAOs grow progressively more rigid. This growing rigidity makes it difficult to promote change or to re-direct these organizations, as they require consent from all participants.[208] The limited coordination and control among participants makes joining a decentralized decision-making system an arduous task, leading to the fragmentation of the ecosystem, as seen to some extent in Decentralized Finance (DeFi).

The aspirational liquid democracy of the cryptocommunity, allowing for coordination without any vertical hierarchy, has also introduced

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[205] The rates could increase three times more than the average market price for the same services. Information from interviews with multiple stakeholders during the DAO Events at the London School of Economics (LSE), June 2024.

[206] DONALD CHISHOLM, COORDINATION WITHOUT HIERARCHY: INFORMAL STRUCTURES IN MULTIORGANIZATIONAL SYSTEMS 114 (1989).

[207] Socio-legal studies have shown how people conform to a (legal or alternative) system depending on whether they deal with it infrequently or frequently. Marc Galanter, *Why the "Haves" Come out Ahead: Speculations on the Limits of Legal Change*, 9 L. & SOC. REV. 95–160 (1974).

[208] It has been argued that networks facilitate the flow of information, but it is unlikely that all participants in a network receive information equally. In decentralized decision-making systems, some individuals may have access to specific information that others lack. Conversely, in a fully centralized system, decision-making can be delayed as the central authority takes time to process and digest all the information. Arcuri and Dari-Mattiacci, *supra* note 60. DAOs operate within this spectrum of imperfect information and partial centralization.

accountability issues due to the lack of a central authority.[209] Furthermore, decentralization and lack of accountability or enforcement mechanisms have triggered the creation of smaller control groups that organize off-chain and operate on-chain (whales). Factionalism and vested interests have paved the way for the re-introduction of hierarchies and charismatic leaders in off-chain governance, such as Vitalik Buterin,[210] co-founder of Ethereum, which, in spite of having no direct hierarchical role, has a strong influence in the ecosystem of blockchain and DAOs.[211] Buterin is seen as a revolutionary, or moreso, an authority capable of promoting change.[212]

The issues with off-chain governance could allegedly be addressed through on-chain governance, in which all the decision-making processes are visible and recorded in real-time. However, on-chain governance also brings issues connected to the tyranny of the majority, a fake majority, since the concentration of power and vote-buying issues make it more appropriate to term it the tyranny of the few.[213]

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[209] SCHREPEL, *supra* note 54., at 52.

[210] Buterin, a Canadian programmer and prominent figure in the blockchain ecosystem, possesses a charisma that captivates audiences, making them likely to invest in his ideas as soon as he takes the stage. His profound influence comes not only from his being a speaker but also from his prolific blog pointing out new issues in blockchain in general, which has also inspired this research. See Vitalik Buterin's website, https://vitalik.eth.limo/; Blockchain Summit 2022: Empowering You to Manage Disruption, Gies College of Business, University of Illinois at Urbana-Champaign, https://giesbusiness.illinois.edu/blockchainsummit-2022; Buterin, *supra* 2.

[211] BEVIR, *supra* note 11, at 30 (illustrating how factionalism and vested interests in networks highlight the benefits of hierarchies).

[212] WEBER, *supra* note 46., at 328. Buterin is an example of charismatic authority, which, as defined by Weber, serves to foster trust. «In the case of charismatic authority, it is the charismatically qualified leader as such who is obeyed by virtue of personal trust in him and his revelation, his heroism or his exemplary qualities so far as they fall within the scope of the individual's belief in his charisma.» *Id.*

[213] SCHREPEL, *supra* note 54., at 52. The tyranny of the few, in contrast to the tyranny of the majority, makes these governance conditions even more intolerable.
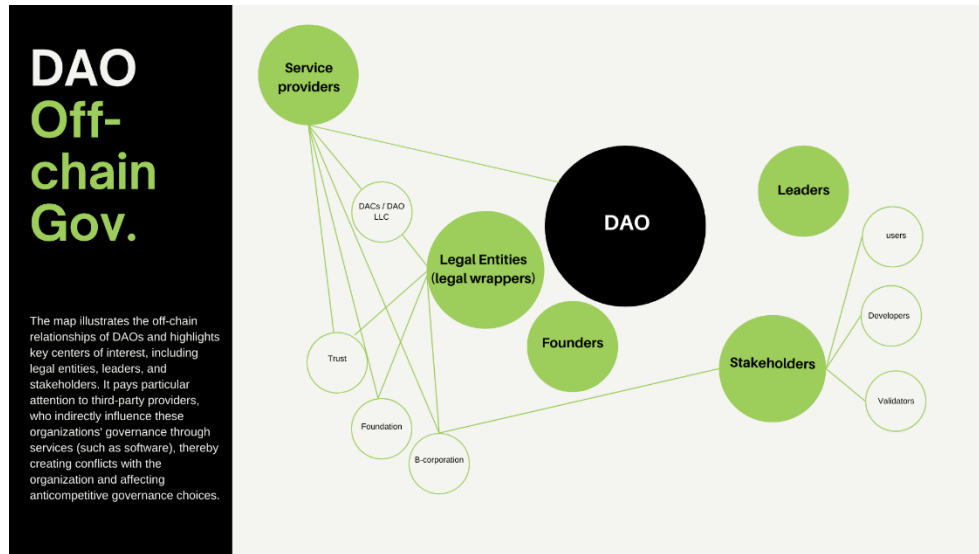
*DAOs off-chain governance. The centers of interest. This infographic is an extension of the ideas presented in *Blockchain in the Wild* (Werbach et al., 2024).

2.   On-chain governance

While off-chain governance deals with the governance *of* the technology, on-chain governance deals with the governance *by* the technology.[214] On-chain governance refers to those rules and decision-making processes encoded and registered directly into the technological infrastructure of a blockchain system.[215]

DAO governance is often associated with on-chain governance, as participants choose to join and be governed by a technological organization or a "firm" with predetermined encoded rules and voting mechanisms.[216] Unlike firms, members of DAOs vote on issues that exceed the issues shareholders usually vote on. For example, shareholders typically can only vote on the modification of ordinary bylaws. DAO members, by contrast, can directly vote on the organization's fundamental or constitutional documents.[217] These documents would equate to articles of incorporation

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[214] DE FILIPPI AND MCMULLEN, *supra* note 193., at 17. DE FILIPPI, REIJERS & MANNAN, *supra* note 171, at 10.

[215] Reijers et al., *supra* note 26., at 822; DE FILIPPI AND MCMULLEN, *supra* note 193., at 32; Taner Dursun & Burak Berk Üstündağ, *A novel framework for policy based on-chain governance of blockchain networks*, 58 INF. PROCESS. MANAG. 3 (2021).

[216] Werbach et al., *supra* note 9, at 22.

[217] Shareholder meetings are customarily called by management for ordinary or extraordinary matters. See MATHIAS M. SIEMS, CONVERGENCE IN SHAREHOLDER LAW 91-94 (2008). Among DAOs, meetings are neither called by founders or insiders nor by cryptoasset

relating to the organization's purpose without the board's recommendation (and proposal) for such changes.

Techno-determinism plays a fundamental role in on-chain governance. This type of governance is more formal and stricter but also predictable and efficient than off-chain governance.[218] Since all the details of the governance process are stored on-chain, this type of governance is more transparent and auditable.[219] Theoretically, such encoded rules should allow for more inclusivity and accessibility for those who are non-code literate and lack economic power through a democratic voting process.[220]

In on-chain governance, voting decisions result in the governance of resources within a DAO. Typically, DAOs start as organizations without a specific purpose or with flexible objectives. As DAOs evolve, resources are allocated to specific causes determined by participants' decisions over treasuries, with a more consequential decision-making process uncommon to traditional corporate structures.[221] Management of treasuries goes through online voting. On-chain governance has innovated in the development of different (and uncommon) voting mechanisms, such as voting schemes based on prediction markets (Knowledge-Extractable Voting and Holographic Voting)[222] and asymmetric voting weights (Quadratic Voting).[223] Celebrated

holders. In fact, there is no feedback to founders about the expectations of cryptoasset holders.

[218] DE FILIPPI AND MCMULLEN, *supra* note 193., at 18; Werbach et al., *supra* note 9, at 19.

[219] Yermack, *supra* note 31.

[220] Dursun and Üstündağ, *supra* note 215., at 3.

[221] ALLEN, BERG, AND LANE, *supra* note 93.

[222] Knowledge voting allocates more weight or voting power to experts or experienced members. Yixuan Fan et al., *Insight Into Voting in DAOs: Conceptual Analysis and a Proposal for Evaluation Framework*, 38 IEEE NETW. 92–99 (2024)., at 98-99. ("Holographic consensus associates each proposal with a prediction market and introduces a betting token GEN […] members can bet on proposals they think will pass or fail by up staking or down staking GENs."). Youssef Faqir-Rhazoui, Javier Arroyo & Samer Hassan, *A Scalable Voting System Validation Holographic Consensus in DAOstack*, in PROCEEDINGS OF THE 54TH HAWAII INTERNATIONAL CONFERENCE ON SYSTEM SCIENCES 5557 (2021).

[223] Quadratic voting is based on democratic political studies, offering a system that allows individuals to cast votes while expressing the intensity of their preferences (known as the Vickrey-Clarke-Groves mechanism). William Vickrey, *Counterspeculation, Auctions, and Competitive Sealed Tenders*, 16 J FIN 8, 14–27 (1961); Edward H. Clarke, *Multipart Pricing of Public Goods*, 11 PUB CHOICE 17, 22–26 (1971); Theodore Groves, *Incentives in Teams*, 41 ECONOMETRICA 617, 622–29 (1973). From economics and democratic politics, this model has made its way into corporate governance and, finally, into blockchain. Eric A. Posner & E. Glen Weyl, *Quadratic Voting as Efficient Corporate Governance*, 81 UNIV. CHICAGO L. REV. 251–272 (2014). In this system, investors can purchase votes, with the cost of each vote increasing quadratically based on the number of votes bought, thereby

initially with utmost enthusiasm among the cryptocommunity, quadratic voting—a mechanism capable of reflecting the intensity of people's preferences in collective decisions—has eventually yielded to liquid voting/democracy as the main voting system utilized by DAOs.

Liquid democracy is a voting system characterized by proxy representation, voluntary delegation, and direct online deliberation as a form of governance.[224] Originating in online communities, liquid democracy combines elements of direct and representative democracy. It gained traction within the cryptocommunity as it was supported by Ethereum—the foundational infrastructure from which most DAOs depend for their functionality.[225]

The use of liquid democracy in on-chain governance translates into proposals directly made by their members or by delegation.[226] In fact, liquid democracy allows cryptoasset holders to delegate their votes to a representative (proxy or delegate) for any possible governance matter without being tied to a specific delegate.[227] Voters can revoke their delegation at any time,[228] but hypothetically, delegates must act in "the best interest of" their constituents—an unenforceable duty with specific nuances.[229]

While on-chain governance offers some benefits, it faces coordination problems, barriers to participation, and security risks. The voting process

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incorporating the intensity of preferences into the voting process. For example, one vote equates to the price of one token, 2 votes require 4 tokens, etc. Steven P. Lalley & E. Glen Weyl, *Quadratic Voting: How Mechanism Design Can Radicalize Democracy*, 108 AEA PAP. PROC. 33–37 (2018).

[224] Liquid democracy was a concept originally developed after the Internet explosion of the 2000s, but it acquired significant interest among online communities due to the Pirate Party Germany (Piratenpartei Deutschland) in the 2010s, a movement and political party of the information society fighting for freedom and rights over the net. Chiara Valsangiacomo, *Clarifying and Defining the Concept of Liquid Democracy*, 28 SWISS POLIT. SCI. REV. 61–80 (2022).

[225] Ethereum, *Ethereum Whitepaper*, ETHERUM.ORG 1–36, https://ethereum.org/en/whitepaper/.

[226] ALLEN, BERG, AND LANE, *supra* note 93., at 12; Fan et al., *supra* note 222., at 98; ROBIN FRITSCH, MARINO MÜLLER & ROGER WATTENHOFER, *Analyzing Voting Power in Decentralized Governance: Who controls DAOs?* 3 (2022), https://arxiv.org/abs/2204.01176; Bellavitis, Fisch, and Momtaz, *supra* note 5, at 190.

[227] FRITSCH, MÜLLER, AND WATTENHOFER, *supra* note 226., at 2; Fan et al., *supra* note 222., at 98.

[228] Nathan Tse, *Decentralised Autonomous Organisations and the Corporate Form*, 51 VICTORIA UNIV. WELLINGT. L. REV. 313, 332 (2020).

[229] ELLEN NAUDTS, *The future of DAOs in finance* 32 (2022); Faqir-Rhazoui, Arroyo, and Hassan, *supra* note 222.

could be time-consuming, leading to issues with voters' apathy and potential governance attacks by actors with disproportionate voting power.[230] The nature of delegates is often unclear, and acting in voters' best interests does not immediately ensure accountability.[231] Delegates are most often selected because they are expert members, thus improving the quality of decisions.[232] Delegates become experts when they are active members of the organization and sometimes when they have stakes in it. Therefore, it is probable that these experts are mostly insiders to the DAO organization since they are usually considered better informed and engaged on specific issues. Although the power is distributed across delegates, the result of liquid democracy could not be dissimilar to voting systems where voting power is concentrated in a small number of elected representatives.[233] The small number of influential delegates can often sway the outcome without direct control from voters, particularly as these systems become more complex.[234]

The ideal principle for accessing on-chain governance was originally one-person, one-vote, following the egalitarian nature of networks. Nevertheless, this idealization of an egalitarian society lessened as it became more convenient for the voting system to be one-token, one-vote.[235] As a result, this change in direction created a system where the concentration of voting rights is the norm. Voters' names are concealed through cryptographic means and are not disclosed or known by others, not even by founders. A single person or entity can have multiple "addresses" corresponding to a specific amount of governance tokens from where to vote.[236]

The state of voting in DAOs evidences valid concerns of emerging plutocratic systems, wherein power is concentrated in the hands of large

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[230] Particularly when using quadratic voting mechanisms. Bellavitis, Fisch, and Momtaz, *supra* note 5, at 189. See section I.C. Vote Buying: The Problem in DAO Governance.

[231] Tse, *supra* note 228.

[232] Valsangiacomo, *supra* note 214, at 69. Expertise is well-desired among founders and insiders of DAOs. See interviews, *supra* note 195.

[233] WULF KAAL & JOSH BYKOWSKI, *Decentralized Autonomous Organizations (DAO) A Market Meta-Analysis*, 143 (2023). For blockchain organizations and variations to liquid democracy, see ALLEN, BERG, AND LANE, *supra* note 84, at 12 (describing a more adequate representation system adopted by Cardano).

[234] Tse, *supra* note 218, at 332 (examining the new agency issues that would emerge once the systems grow in complexity).

[235] Rainer Feichtinger, Robin Fritsch, Yann Vonlanthen & Roger Wattenhofer, *The Hidden Shortcomings of (D)AOs – An Empirical Study of On-Chain Governance*, 13953 LNCS FINANC. CRYPTOGR. DATA SECUR. 2023 INT. WORK. 165, 167 (2024).

[236] Andrea Peña-Calvin, Javier Arroyo, Andrew Schwartz & Samer Hassan, *Concentration of Power and Participation in Online Governance: the Ecosystem of Decentralized Autonomous Organizations*, *in* WWW 2024 COMPANION - COMPANION PROCEEDINGS OF THE ACM WEB CONFERENCE 927–930 (2024).

cryptoasset holders rather than a network that fosters an egalitarian system, the initial goal of the cryptocommunity.[237] More troubling, on-chain governance can remove checks and balances that exist in off-chain governance mechanisms (consensus mechanisms where there is a specific quorum). Additionally, there are especially risks of manipulation by vested interests.[238] On-chain governance alone cannot solve all these governance challenges, as it is difficult for a system of fully coded rules to adapt in a changing, constantly evolving scenario.

Moreover, on-chain governance can have the effect of decreasing participation due to the lack of understanding of governance issues also by large cryptoasset holders.[239] This lack of involvement in governance decisions stems from the motivations for joining the organization. When joining in the initial stages, large cryptoasset holders may not fully engage in governance decisions because they are just willing to be part of the organization.[240] In this sense, large cryptoasset holders do not necessarily accumulate power to exert control over a DAO. A comprehensive approach to governance may require a blend of on-chain and off-chain mechanisms, with continuous checks and balances in place. This would help mitigate the challenges inherent in both systems, allowing each to complement and address the limitations of the other.[241]

III. DAOs, Decentralized Governance, and Vote Buying. An Experimental Study

A. *Vote Buying: The Problem in DAO Governance*

The typical view of participants or contributors in organizations seeking public capital often identifies them as shareholders. However, since DAOs

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[237] Reijers et al., *supra* note 26, at 828.

[238] Kevin Werbach, *The Siren Song: Algorithmic Governance by Blockchain*, *in* After the Digital Tornado: Networks, Algorithms, Humanity 215, 233 (2020).

[239] *Id.*

[240] Some empirical studies of DAO voting systems have pointed out that powerness of voters does not necessarily correspond to manipulation, as some voters with a major concentration of voting power rarely have participated in governance (for example in the BarnBridge and Decentraland communities). Andrea Peña-Calvin, *Categorization and governance analysis of blockchain-based communities: the case of Decentralized Autonomous Organizations in the Aragon platform*, at 55, N. 10, 2022, https://docta.ucm.es/entities/publication/867a4e57-646c-41d3-9a32-34bec4175eac. (Master thesis in Spanish).

[241] Carla L Reyes, *(Un)corporate Crypto-Governance*, 88 Fordham L. Rev. 1875–1922, 1889 (2018); Allen and Berg, *supra* note 186, at 7.

are rarely seen as traditional corporate structures, their participants are not easily classified as shareholders. The hybrid nature of cryptoassets, with no clear residual interests or an easy assessment of their value,[242] makes DAOs and blockchain participants less similar to traditional shareholders and more akin to members of an organization.[243]

While DAO members have developed social practices for distinction from real-world organizations, they have not developed shared social practices for governance.[244] Their activities are not based on any specific abstract model but typically involve both off-chain and on-chain interactions, combining elements of hierarchies, networks, and markets.[245] Indeed, the problem in DAO governance is more of a wicked problem: hard to explain but easy to spot, in which different interactions between markets (propelled by DeFi platforms), voting systems, community members' engagement, and hierarchical positions might play a role in finding a *resolution*.[246] One resolution to this wicked problem of DAO governance could be mitigating

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[242] Jensen and Meckling, *supra* note 169. Valuing crypto assets is challenging since they often lack a secondary market and a set price, especially when distributed to new members via airdrop to reward their loyalty.

[243] In the US, the concept of organizational members originated from the seminal work of Margaret Blair and Lynn Stout, who proposed that every constituency within an organization, especially in publicly traded companies, is connected through a mediating hierarchy that balances the various interests involved. Blair and Stout, *supra* note 170. See also Mathias M. Siems, *With Great Power Comes Great Responsibility: Ideal and Real Types of Shareholders*, 12 *in* SHAREHOLDERS' DUTIES 69, 71 (Hanne S. Birkmose ed., 2017). (exploring various types of ideal shareholders, the association-member perspective is prevalent in Germany).

[244] These social practices also include the development of a specific language and labels such as *ape ape* (ingenuous buyer, interpreted as an outsider not part of the community) or *degen* (expert or in DeFi, a participant that engages in very speculative strategies in crypto). See r/CryptoCurrency, *Crypto Slang Terms: Become A Degen And Join Us*, REDDIT, https://www.reddit.com/r/CryptoCurrency/comments/11tzuzu/crypto_slang_terms_become _a_degen_and_join_us/.

[245] BEVIR, *supra* note 11, at 35.

[246] The term "wicked problem" was established in modern organizational theory by Rittel and Webber for complex problems in a governing system, identifying that, unlike natural sciences, there are no perfect or unique solutions for governance, and social problems are never solved but resolved every time. Horst W.J. Rittel & Melvin M. Webber, *Dilemmas in a General Theory of Planning Published by : Springer*, 4 POLICY SCI. 155, 160 (1973). Jeffrey Conklin has defined the characteristics of wicked problems including six specific traits: *i.* it is not understood until the formulation of a [re]solution; *ii.* they have no stopping rule; *iii.* [re]solutions are not right or wrong; *iv.* every problem is essentially novel and unique; *v.* [re]solutions might involve a 'one shot operation'; *vi.* they have no given alternative [re]solutions. Jeff Conklin, *Wicked Problems and Social Complexity*, *in* DIALOGUE MAPPING: BUILDING SHARED UNDERSTANDING OF WICKED PROBLEMS 8 (2006).

the issues of vote buying or coin buying.

1. Voting

Members of DAOs vote using governance tokens, which are cryptoassets specifically designed to grant voting rights. Participation in a DAO through governance tokens is usually universal—every governance token holder has a right to vote according to the number of cryptoassets with governance rights they possess.[247] Typically, token distribution is first allocated to founders (obtained by acquired rights)[248] and then issued to employees and small holders through the ICO (carrying both economic and governance rights). The remaining tokens are then distributed to the community, often as a reward for contributions or loyalty (a class with at least cryptoassets with governance rights).[249] Governance tokens in DAOs are sometimes restricted, requiring members to deposit them to vote. However, most DAOs return these tokens after voting, with forfeiture being rare.[250]

Direct participation in democratic governance has proved to be an unsuccessful experiment within the cryptocommunity, thereby changing the direction of governance in DAOs from pure liquid democracy to delegative democracy.[251] This shift derives from known coordination and collective-action problems,[252] particularly due to fragmentation forces.[253] Members are

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[247] Peña-Calvin et al., *supra* note 236. Voting participation in DAOs is not uniform. Governance tokens can restrict voting access through code, dividing voters into universal participants, where all token holders can vote on any proposal, and restricted participants, where voting rights are subject to specific conditions.

[248] Once the organization has been deployed on-chain. Peña-Calvin et al., *supra* note 66.

[249] For instance, some stakeholders receive governance tokens through airdrop methods for their loyalty to the organization. Airdrop is a procedure for free token distribution among members of the community. This method allows the DAO to develop a database of "trusted" members for different purposes, such as future compliance with KYC and AML regulations. CAROL GOFORTH & YULIYA GUSEVA, REGULATION OF CRYPTOASSETS 761 (2ND ED. 2022).

[250] An empirical study on DAOs using the Aragon platform found that 75% of participation is open to all members, with no cases of token forfeiture. Peña-Calvin et al., *supra* note 66., at 7.

[251]   BRYAN   FORD,   *Delegative   Democracy*   (2002), https://infoscience.epfl.ch/entities/publication/d5cb1470-86cd-413e-9109-d5f7eccb953d.

[252] Problems extensively studied in the corporate scholarship. BERLE AND MEANS, *supra* 171, at 85; HENRY HANSMANN, THE OWNERSHIP OF ENTERPRISE 44 (1996); Deborah J. Lucas & Robert L. McDonald, *Shareholder Heterogeneity, Adverse Selection, and Payout Policy*, 33 J. FINANC. QUANT. ANAL. 233 (1998); Ronald J Gilson & Jeffrey N Gordon, *The Agency Costs of Capitalism: Activist Investors and the Revaluation of Governance Rights*, 113 COLUMBIA L. REV. 863 (2013).

[253] Members of these organizations hold governance tokens, varying from two-digit to more than 10,000 registered members/holders. However, on average, an active DAO has around 500 members.

not a homogeneous category but include employees, founders, developers, and a diversified base of cryptoasset holders.[254] Each group tends to pursue radically diverging interests[255] and/or possess a different understanding of organizational problems.[256] Consequently, DAOs attempted to use an alternative voting system of proxy voting through delegates. Delegates are individuals or entities entrusted with voting power from cryptoasset holders[257] and are responsible for voting on proposals on behalf of the members who have delegated that authority to them.[258]

In such scenarios, the mediating hierarchy is different from corporate law analysis, wherein it is not management but, instead, delegates who create a bridge between founders/insiders and cryptoasset holders. Under this hierarchy, members of the organization who are all cryptoasset holders would be considered citizens but not parliamentarians.[259] Unlike citizens in traditional voting processes, these members have greater voting power according to the number of governance tokens they hold. True parliamentarians are instead the delegates who can use their delegated voting power to vote on governance proposals.

The differences from traditional business structures continue throughout the voting process. Members do not call meetings but interact through online forums over social media. Moreover, each and every member can start a proposal for a vote.[260] Proposals are communicated through designated channels (Discord), typically controlled by central parties. Rather than calling a traditional general meeting, these means of communication are meant to signify membership in a community that can freely interact with

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[254] All of these members hold cryptoassets with governance rights. The diversified base of crypto asset holders arises from members joining the organization through the ICO/IEO process, while others receive them in other capacities which evidence a direct connection to the organization—whether as employees or developers under contract—or are involved in running it, such as founders and other insiders.

[255] It becomes challenging to label members as owners, as most cryptoasset holders, for example, have very limited control over DAOs.

[256] Conklin, *supra* note 246. In this sense, members can be aware of a specific problem but have different ways to address it.

[257] DE FILIPPI ET AL., *supra* note 27., at 21.

[258] There are two types of delegates "single holder" (receiving 50% of their voting power from a single member) and "community" (receiving voting power from multiple members). FRITSCH, MÜLLER, AND WATTENHOFER, *supra* note 226., at 12; Feichtinger et al., *supra* note 235., at 171.

[259] Siems, *supra* note 242, at 72.

[260] Unlike DAOs, where meetings are non-existent, in corporations, only management (board) is entitled to call ordinary and special meetings. Only the Model Business Corporation Act at §7.02(a)(2) empowers shareholders of at least 10% of voting power to call a special meeting. STEPHEN M. BAINBRIDGE, CORPORATE LAW 290 (4th ed., 2020).

founders/insiders and from which insiders can receive feedback from the operations.[261] The resulting decisions are then implemented either on-chain (if possible) or off-chain, frequently involving external participants such as developers or founders.[262]

Dispersed membership reflects the size of the organization's capital resources—the larger the DAO in terms of members, the more resources and the need for voting on proposals.[263] The impact of the one-token, one-vote system on governance has been paramount, to the point that the larger the size of voters, the fewer proposals at a ballot a DAO ultimately has.[264] As a result, larger DAOs tend to see lower participation rates in governance proposals.[265] This suggests that as DAOs grow in size, coordination challenges arise, leading to fewer active voters.[266] A highly diversified voter base results in information asymmetry and increased information costs. Effective governance requires members to actively collaborate within the organization by drafting proposals, providing feedback, and dedicating time to knowledge-sharing with others. This process can ultimately favor insiders and those code-literate. This scenario has triggered the role of delegates, which ultimately allowed the transferability of governance tokens ownership.

Members transfer their voting power to delegates who are experts or trusted activists of the community. Delegates provide specialized decision-making compared to direct voting and are seen as trusted advisors.[267] They start the process of collecting votes by being activists within the community and engaging with founders and insiders through social media platforms. Once designated, members transfer the ownership of their governance tokens to delegates' wallets. Members generally leave the voting decision entirely to

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[261] For example, Uniswap provides an embedded platform to publicly test the "will to make changes to the status quo" or to test whether proposals would succeed. These kinds of *referendums* are called temperature checks. See *Temperature Check – Uniswap Governance*, https://gov.uniswap.org/c/temperature-check/9.

[262] INTERNATIONAL ORGANIZATION OF SECURITIES COMMISSIONS (IOSCO), *supra* note 83., 25.

[263] Peña-Calvin et al., *supra* note 236.

[264] *Id.* at 930.

[265] In most large DAOs (with over 1,000 active voters), the organization operates as an oligarchy, plutocracy, or timocracy, with fifty percent of voting power concentrated in just one percent or fewer of cryptoasset holders. Tom Barbereau, Reilly Smethurst, Orestis Papageorgious, Johannes Sedlmeir & Gilbert Fridgen, *Decentralised finance's timocratic governance: The distribution and exercise of tokenised voting rights*, 73 TECHNOL. SOC. 1 (2023).

[266] Peña-Calvin et al., *supra* note 236. In larger DAOs, members, on average, vote on only thirty percent of proposals. Combined with the reduced number of proposals in these large DAOs, governance tends to be dominated by large cryptoasset holders.

[267] This role has been compared to that of fund managers. Tse, *supra* note 228., at 332.

the delegates' discretion. As per representation, delegates are considered more representative if they receive a larger share of governance tokens from varied members.[268]

Nevertheless, the distribution of voting power among delegates is highly unequal.[269] There is a small number of delegates holding a majority of the voting power in most DAOs.[270] Delegates are often controlled by large cryptoasset holders, namely members with massive voting power, who delegate most of their voting power to a single delegate address.[271] Generally, delegates with more voting power tend to be more active, although there are exceptions when they do not exercise their full potential voting power.[272] These exceptions point to the problem of voting rights transferability, particularly when large delegates choose not to exercise their voting power.[273]

When only a small fraction of a limited number of delegates cast votes on proposals, it suggests transferring voting rights to a third party through vote buying. In other words, outside cases of missing casting votes accidentally or when no voting is a choice (might signal some response by not voting), both delegates might have been given economic incentives for not intentionally voting. This meta-delegation initially intended to shift voting power to more specialized delegates,[274] but it may instead be driven by the pursuit of economic gain.[275] Liquid democracy, transformed into delegated democracy, envisioned these "trusted advisors" as delegates who would actually choose their votes in their areas of expertise.[276] Nevertheless, the motivations of delegates to collect votes might also conceal extrinsic factors that attract delegation, not necessarily to improve good governance but to manipulate votes by not fully representing the interests of the delegators by voting in a

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[268] This is the case of community delegates. Feichtinger et al., *supra* note 235., at 171.

[269] FRITSCH, MÜLLER, AND WATTENHOFER, *supra* note 226.

[270] *Id.*

[271] Feichtinger et al., *supra* note 225, at 172.

[272] Delegates with more governance tokens on their addresses tend to vote more often, suggesting they proactively participate in governance, a form of delegate activism in collecting votes. FRITSCH, MÜLLER, AND WATTENHOFER, *supra* note 226.

[273] Tse, *supra* note 228., at 333; Feichtinger et al., *supra* note 225, at 170-71 (observing that less than ten addresses can control the governance system among twenty DAOs).

[274] Valsangiacomo, *supra* note 224., at 70 (citing Bryan Ford, *Delegative Democracy*, BFORD (Oct. 21, 2002), https://bford.info/deleg/deleg.pdf, unpublished manuscript).

[275] Shunya Tamai & Shoji Kasahara, *DAO voting mechanism resistant to whale and collusion problems*, 7 FRONT. BLOCKCHAIN 1, 3 (2024).

[276] Jan Behrens, *The Origins of Liquid Democaracy*, 2017 LIQ. DEMOCR. J. 7–17 (2017), https://liquid-democracy-journal.org/issue/5/The_Liquid_Democracy_Journal-Issue005-02-The_Origins_of_Liquid_Democracy.html.

certain way (through bribing) or not voting at all.[277]

2. Vote buying

DAO members can vote, rent, aggregate, and delegate governance tokens through Decentralized Finance (DeFi) coordination platforms.[278] These platforms' business model provides liquidity to cryptoasset holders, conferring them a monetary incentive to give away their votes—through vote buying. Vote buying can occur both positively and negatively—either by bribing individuals or delegates to vote a certain way or by paying delegates not to vote at all.[279] The platform aggregator collects governance tokens (used for voting on the decentralized organizations' matters) and offers in exchange a DeFi platform token (a voucher with a future date for redeeming their governance tokens) and also a reward to cryptoasset holders/members.[280]

Vote buying is a significant concern in DAOs because it allows individuals or groups with intense preferences to exert disproportionate influence in governance, even if they do not have a significant economic stake.[281] Individuals might be concerned about the expenses related to the transfer of ownership in delegation and uninterested in voting. When lacking interest or motivation in engaging with governance matters and promoting effective governance practices, delegates and members resort to

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[277] Tse, *supra* note 228., at 332-33.

[278] These types of platforms have incentivized the fight for liquidity of cryptoassets imbued with governance rights, known as the "Curve Wars". Nat Eliason, *Field Guide to the Curve Wars: DeFi's Fight for Liquidity*, EVERY (Feb. 4, 2022), https://every.to/almanack/curve-wars.

[279] As Buterin pointed out, vote buying has reduced DAOs into a tragedy of commons. «What [members] *do* know is that a vote where people vote based on their honest internal feelings works reasonably well, but a vote where voters can freely buy and sell their votes works terribly. This is because vote selling has a tragedy-of-the-commons: each voter only gains a small portion of the benefit from voting correctly, but would gain the full bribe if they vote the way the briber wants, and so the required bribe to lure each individual voter is far smaller than the bribe that would actually compensate the population for the costs of whatever policy the briber wants. Hence, votes where vote selling is permitted quickly collapse into plutocracy.» See Vitalik Buterin, *Coordination: Good and Bad*, VITALIK BUTERIN WEBSITE (Sept. 11, 2020), https://vitalik.eth.limo/general/2020/09/11/coordination.html.

[280] LD Capital, *Inside the Curve Wars: DeFi Bribes*, HACKERMOON (Feb. 25, 2022), https://hackernoon.com/inside-the-curve-wars-defi-bribes.

[281] The ability to delegate voting power can introduce additional costs and complexities, such as the overhead of tracking transfers and updating delegate voting power. These hidden costs might outweigh the benefits of delegation. Feichtinger et al., *supra* note 225, at 178.

decentralized lending platforms, short selling on their governance tokens.[282]

This separation of voting rights from equity interests is not new within the corporate context, and it is known in different forms, one of which is empty voting. In empty voting, a shareholder buys a put option to sell their shares, retaining voting rights while hedging away some of its economic interests.[283] This practice is considered one of the investors' conflict costs, particularly in a dispersed investor base.[284] Although vote buying can take various forms, DeFi platforms offer an inverse mechanism, a monetary exchange for a temporary divestiture of members' voting rights and/or influence over voting rights.[285]

Like in corporate organizations, vote buying in DAOs arises from coordination problems of a dispersed membership. The fungibility and transferability of governance tokens make vote buying easier, as they can be unbundled from the underlying economic interest,[286] allowing voters to pursue their own interests rather than being aligned with the DAO.[287]

This problem, at the heart of blockchain maximalists, has seen some avenues for resolution through mechanisms such as *slashing* of governance tokens in the case of malicious behavior.[288] However, assessing such

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[282] They receive an economic incentive from collateralized debt markets, which enable borrowers to use their cryptoassets for lending operations. Lenders deposit cryptoassets into the lending pool, while borrowers overcollateralize the amount they borrow. In this process, borrowers also function as lenders whenever their collateral is made available for lending by the pool. Vanessa Villanueva Collao, *DeFi: A Framework of the Automated Financial System*, 26 TULANE J. TECHNOL. INTELLECT. PROP. 75, 103 (2024).

[283] Henry T. C. Hu & Bernard Black, *Empty Voting and Hidden (Morphable) Ownership : Taxonomy, Implications, and Reforms*, 61 BUS. LAWYER 1011–1070 (2006).

[284] Goshen and Squire, *supra* note 174., at 795.

[285] It also differs from hidden ownership, where the cryptoasset holder retains economic rights but lacks voting rights and does not appear as a registered holder on-chain. JEFF STRNAD, *Economic DAO Governance: A Contestable Control Approach* 7 (2024), arxiv:2403.16980v3.

[286] KAAL AND BYKOWSKI, *supra* note 233., at 13.

[287] Claude Humbel, *Decentralized Finance: A new frontier of global financial markets regulation*, GESKR SCHWEIZERISCHE ZEITSCHRIFT FÜR GESELLSCHAFTS- UND KAP. SOWIE UMSTRUKTURIERUNGEN [SWISS J. CORP. CAP. MARK. L. RESTRUCTURING] 9, 17 (2022).

[288] Tse, *supra* note 228. Recent experience with governance and voting mechanisms has led some DAOs to explore locking and depositing assets to add weight to their votes. Vote weight depends on the number of deposited/locked governance tokens for a specific proposal, influencing the cost of that vote exercise. To prevent baseless proposals and malicious attacks, some DAOs have experimented with adding a cost to voting to ensure the seriousness of both the proposal and the vote itself. Although this approach could be valid, it might have a counterproductive effect: voters risk losing the entire cryptoasset, including both governance and economic rights. Consequently, only those with excess voting power

behavior is complex, as the network operates within a system of both on-chain activities and off-chain interactions, including hierarchies and deals outside the purview of the DAO's on-chain governance framework.

While a legal solution would entail the restriction of vote buying, more nuanced mechanisms such as quadratic voting might be a better option since it measures the intensity of voters' preferences, as those who care more about an issue can spend more to have their voice heard.[289] Nevertheless, this approach circles back to the original problem: the extrinsic motivation to vote, driven not by improving DAO's good governance but by personal interests tied to the specific issue being voted on and/or the economic interest of transferring voting rights.

Understanding the social norms of the cryptocommunity, such as why some large cryptoasset holders do not exercise their votes even when having strong voting power (besides economic incentives), is one of the clues for searching for a resolution to the vote buying problem. The primary motivation of the cryptocommunity and most DAO members, especially in the early stages, is to create a network system driven by interactions that integrate governance both of the technology and by the technology. They exchange fiat money for cryptoassets that may hold no immediate value and often lack a market price after the DAO goes live, driven by the expectations of what the technology could fulfill in the future and trust in founders and other charismatic leaders of the cryptocommunity.

Furthermore, these and other issues connected to voters' apathy reflect a deeper problem in DAO governance: developers have created a community guided by technology but without technological means to search. Search, expressed in ample terms, extends from finding a counterparty to finding information for voting. Most DAOs lack the implementation of shared governance practices through prime communication means, a paradox considering that they could leverage the technology for this purpose.

In fact, voters' apathy should be considered a combination of concentration of voting power, off-chain interactions (and lack of accountability), and information asymmetries. Information asymmetries distinguish outsiders to the DAO from insiders and among members, dividing those external to the developers' world (and non-code literates) using

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could afford to vote, marginalizing smallholders.

[289] Posner and Weyl, *supra* note 223., at 268; Nicola Dimitri, *Quadratic Voting in Blockchain Governance*, 13 INFORMATION 1–16 (2022).

language that tends to exclude others.

There are still avenues to be explored to resolve or reduce the risks of vote buying. One particularly draws inspiration from corporate governance examples: the GameStop saga. During the saga, a group of small (or nonprofessional) investors from the r/WallStreetBets community coordinated to buy the struggling video game retailer (GameStop) shares.[290] GameStop's stock price was very low due to hedge funds betting against the company and wishing for its (natural) decline. Small investors coordinated through the Robinhood app (a commission-free trading app), popular among tech-savvy investors from two specific generations: Millennials and Gen Z.[291] These tech-savvy investors leveraged social media, online forums (such as Reddit), and gaming dynamics to coordinate through trading activities and challenge Wall Street players.[292]

In spite of the market manipulation and volatility concerns of "meme stocks," the GameStop saga sparked discussions on the future of small investors' influence in corporate governance and their collective power.[293] Similar parallels can be drawn between DAO members.

The first consideration is the generational overlap between DAO participants and retail investors in meme stocks. This connection is evident in the similar language used by DAO members and retail investors on the r/wallstreetbets Reddit thread.[294] Terms such as "apes" or "degenerates" are part of their jargon, which could even suggest that one community (either traders on the Robinhood app or DAO members) has influenced another or that both groups are even the same.[295]

Second, coordination has long been recognized as a challenge in DAOs

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[290] Allan M. Malz, *The GameStop Episode: What Happened and What Does It Mean?*, 41 CATO J. 529–550 (2021). See r/wallstreetbets, REDDIT, https://www.reddit.com/r/wallstreetbets/.

[291] Gramitto Ricci and Sautter, *supra* note 34, at 71.

[292] Sergio Alberto Gramitto Ricci & Christina M. Sautter, *Wireless Investors & Apathy Obsolescence*, 100 WASHINGT. UNIV. L. REV. 1653, 1666 (2023).

[293] Fisch, *supra* note 70. Indeed, it has been argued that small (retail) investors may seek to use their collective power to influence companies and pursue environmental, social, and governance (ESG) goals, rather than just focusing on maximizing economic returns. Ricci Gramitto and Sautter, *supra* note 34, at 54.

[294] Gramitto Ricci and Sautter, *supra* note 34, at 59.

[295] Compare *Dissecting the Unique Lingo and Terminology Used in the Subreddit r/Wallstreetbets*, WALLSTREETBETS SHOP (Aug. 30, 2020), https://www.wallstreetbets.shop/blogs/news/dissectingtheuniquelingoandterminologyusedi nthesubredditrwallstreetbets with r/CryptoCurrency, *supra* note 234.

and blockchain organizations,[296] with various experiments to fight against vote buying over the years without significant success.[297] Third, GameStop and blockchain coordination experiments could offer insights into improving governance through a platform that enhances member engagement and empowerment in governance. This approach and understanding of the DAO social fabric would provide a more democratized means of enhancing governance decisions while promoting financial/governance/voting literacy and education.[298] Extensive research in behavioral studies and psychology has shown that investors are irrational and subject to biases, such as framing, anchoring, and overconfidence,[299] and that access to information might improve financial literacy and impact investing behavior. However, little attention has been given to how educational factors influence participation in governance.

Fourth, the primary objective of experimental research is to counter-vote buying and incentivize voting by addressing these challenges effectively. This requires a comprehensive approach that integrates governance, finance, markets, and networks. A key starting point is decoupling the economic and voting rights of cryptoassets while implementing safeguards, with delegation practices also requiring attention. As systems transition from off-chain to on-chain, the risks of vote buying and bribery will increase, necessitating

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[296] See Buterin, *supra* note 278.

[297] The Ethereum Foundation has conducted experiments with generic tokens called "donuts," where users could comment on the token's attributes (voting, economic, and other rights to be incorporated) and upvote responses that provided valuable insights. Vitalik Buterin, *On Collusion*, VITALIK BUTERIN WEBSITE (April 03, 2019), https://vitalik.eth.limo/general/2019/04/03/collusion.html.

[298] Sergio Alberto Gramitto Ricci & Christina M. Sautter, *The Educated Retail Investor: A Response to "Regulating Democratized Investing"*, OHIO STATE L. J. ONLINE 205–217 (2022); Concerns on retail investors' speculative trading and gamification (or even "democratization of financial addition") rather than pursuing conventional investment objectives advocate for more regulation over these platforms instead of more empowerment over retailers. Abraham J B Cable, *Regulating Democratized Investing*, 83 OHIO STATE L. J. 671 (2022). Against this regulatory approach for potential clashes with First Amendment rights and protected speech, see Kyle Langvardt & James Fallows Tierney, *On "Confetti Regulation": The Wrong Way to Regulate Gamified Investing*, YALE L. J. FORUM 717–741 (2022).

[299] See Sun Weixiang et al., *An empirical assessment of financial literacy and behavioral biases on investment decision: Fresh evidence from small investor perception*, 13 FRONT. PSYCHOL. 1–18 (2022); INVESTOR BEHAVIOR: THE PSYCHOLOGY OF FINANCIAL PLANNING AND INVESTING (H. KENT BAKER & VICTOR RICCIARDI EDS., 2014); Thomas Ulen, *Behavioral law and economics*, 21 SUPREME COURT ECON. REV. 5–42 (2013); B M Barber & T Odean, *Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment*, 116 Q. J. ECON. 261–292 (2001).

proactive solutions to mitigate these vulnerabilities.

An experiment to understand which dynamics in an alternative organizational model emerge would be beneficial to explore the strengths and weaknesses of DeGov also in terms of future legal compliance, accountability, and adaptability.

B. Experimental Design

The world of decentralized autonomous organizations (DAOs) vastly occurs in the shadow of the regulatory system. This has raised concerns regarding the transparency of the organization's activities and the lack of publicly available, first-hand information regarding their organizational structures. The above-outlined DAO structure and governance processes inform the research question of whether splitting economic rights from voting rights makes any difference in incentivizing members' participation.

This first step, however, would confirm the presence of vote-buying mechanisms, with the initial hypothesis seemingly affirmed. However, it does not clarify when the decoupling of economic and voting rights impacts voting and governance or what would happen if these rights were not separated in cryptoassets. Since the motivation for being a cryptoasset holder or DAO member is not always driven solely by economic gain—some members value simply being part of the organization—separating these rights may not necessarily affect governance but could be influenced by other factors. It is possible that early supporters or true believers in the initial DAO project (before raising capital) may feel excluded during the DAO's development and the formation of governance practices. This is especially true for dispersed members who are likely not code-literate or lack the expertise, time, or engagement to stay updated with governance processes. However, this does not mean they will engage in vote buying. They could merely remain passive.

Furthermore, as elucidated during the voting and vote buying section, the proposals up for a vote would allegedly be more successful if there is collaboration and shared knowledge among their members. If information (financial or technical literacy) affects voting, then an additional question would be whether and how information affects governance.

The experimental design focuses on two key areas of inquiry: *i.* the impact of decoupling economic and voting rights of cryptoassets and *ii.* the influence of information on governance.

i.   The impact of decoupling economic from voting rights – the first hypothesis is whether the separation of voting rights from economic rights has any effect on governance, understanding governance by active participation through voting, and engaging with participants. One way for participants to understand that these rights are detangled is by testing the loss aversion theory (endowment effect), where having something tangible or possessing a physical item is perceived as more valuable, leading to greater care and attention, which in turn would encourage voting. However, due to ethical constraints, it was not possible to test the challenges to the theory and further generalizability outside the lab/online experiment, as it was impossible to contact participants to explore the exchange paradigm.

Half of the participants were randomly assigned (experimental group) two physical items (a voting card and a voucher or credit card) representing the cryptoasset rights. Participants received detailed but concise descriptions of how every item is related to their governance and economic rights.

The other half of the participants (the control group) will be randomly assigned a PDF representing a cryptoasset with both rights incorporated (voting and economic rights) and a brief description.

By comparing the frequency of voting on proposals, it becomes possible to isolate this division of rights and test how bribing or vote buying opportunities affect their ability to vote.

ii.   The influence of information on governance – the second hypothesis is whether information about governance affects voting. Half of the participants in the experimental group were randomly assigned to receive information about their voting rights in lay terms. They will also receive additional information about the corresponding proposals for a vote in plain English by email. This group received information about the outcome of the poll as soon as the vote was cast.

The other half of the participants in the control group would receive meager information about their voting rights. They would not receive information about the outcome of the poll.

The comparison between the two groups will isolate and measure the impact of information on voting. In addition, it will also show when there is an interest in acquiring information from participants who receive little informational input.

Table 1. Explanation of groups

	Decoupling economic from voting rights	Influence of information on governance
Control group	Only PDF with voting and economic rights	Proposal for vote accessible to everyone. Sometimes, the information will regard only technical information
Experimental group	Physical items: • Numbered voting card • Numbered electronic card	Proposal: • Additional information and charts in plain English • Information regarding the proposal and how their votes impact governance

1. Methods

The experiment was performed with PhD and Master students at the EUI and lasted 20 days. The recruitment process considered participants from two types of generations: Millennials and GenZers, through a survey on Qualtrics. The recruitment survey asked for information regarding their age range, ethnic/racial background (defined in the survey), and emails through a survey on Qualtrics. Furthermore, participants were asked whether they were investors in traditional companies, their prior experience with crypto, social media use frequency, and instant messaging platforms (such as Discord). After a screening process of all applications, there were selected 25 participants.

Each participant received a ticket to enter the final raffle for a €50 Amazon gift card, held at the end of the experiment. They were assured of equal chances to win, regardless of their level of participation, engagement with polls, or interactions on the Discord platform. However, participants who engaged in bribing opportunities could earn an additional ticket, increasing their chances in the raffle.

Participants were informed that they were members of the Democratic DAO (DemoDAO) and were assigned both voting and economic rights. Half of the participants (experimental group) received materials (physical assets), i.e.: a voting card and a credit card, signaling both types of rights with brief information. The other half just received the virtual asset posted on their accounts (control group). Furthermore, participants were also divided into two groups (A and B) and randomly assigned to one of the groups that received more information (A – experimental group) than the other (B – control group).

All of the participants received an email from DemoDAO asking them to join the organization, namely, to register on a private website (democraticdao.io) purposely created for the experiment and the Discord channel (DemoDAO Discord). Once participants entered the website, they were assigned one virtual cryptoasset visible on the platform (i.e., Balance: 1 coin).

The DemoDAO website mirrored a DAO with infographics about the organization and the team, a white paper with technical information, the mission and vision of the organization, the governance process, and plug-ins linking participants to the voting space.

A separate Discord channel was created, inviting participants to join to receive updated information about the organization. Periodically, through the Discord channel, participants were asked for input through a temperature check of uploaded proposals. The input was only based on an immediate response with an emoji (thumbs up or down). The channel will also act as a reminder of the upcoming vote deadline. Participants could comment on the channel established for communication and information exchange.

There were 5 proposals touching on different organizational aspects. All polls were based on real scenarios of proposals from DAOs. They were requested to vote every 3/4 days. The decision-making process was enhanced with input and facilitated by gaming mechanisms to encourage voting action, including simple delegation and exchanging delegation for additional coins (bribing).

These are the explanatory variables of DeGov (decentralized governance):

$$voting = \alpha + \beta gender + \beta age + \beta delegation + \beta race + \beta information + \beta RepAssets + \varepsilon$$

$$voting = \alpha + \beta gender + \beta race + \beta bribing + \beta age + \beta information + \beta RepAssets + \varepsilon$$

Table 4. Explanation of Variable Coding

Variable name	Details	Type of Variable
Gender	Division of three macro-gender categories	Categorical Variable 0–Other 1–Male 2–Female
Age	Two generations of digital natives, divided into two sections each: older and younger Millenials, older and younger GenZs	Categorical Variable 1981-1986 1987-1996 1997-2005 2006-2010
Bribing	Introduction of bribing opportunities for delegation of voting (an additional chance to win in a final raffle)	Binary Variable 0-No 1-Yes
Race	Mere physical appearance without connection to ethnic background.	Binary Variable 0-White 1-Non-White
Information	Receiving more detailed information about proposals	Binary Variable 0-No 1-Yes
Delegation	Delegating votes to a representative (delegate)	Binary Variable 0-No 1-Yes
Representation of assets	Receiving physical assets v virtual assets | nested with separated v combined rights	Binary Variable 0-No 1-Yes

Polls

#1 – Topic adoption of the DemoDAO Constitution

The first poll regarded the adoption of a DemoDAO constitution,

including specific principles of governance, such as the scope of the organization, governance process, good faith of members, decentralization of decision-making processes, vote delegation, and transparency.

In order to test both lines of investigation in this poll, it was developed a nested factorial design, with 3 factors.

Representation of Assets	Decoupling of Rights	Type of Information Provided
Physical Assets	Separated Rights	Brief
Physical Assets	Separated Rights	Detailed
Virtual Assets	Combined Rights	Brief
Virtual Assets	Combined Rights	Detailed

Design Breakdown

1. Factor #1 (Representation of Assets): 2 levels (Physical Assets vs. Virtual Assets).
2. Factor #2 (Decoupling of Rights): Nested within Factor #1 (no independent variation).
3. Factor #3 (Type of Information Provided): 2 levels (Brief vs. Detailed).

In this design, Factor #2 (Decoupling of Rights) is nested within Factor #1 (Representation of Assets). This nesting means:

- Physical Assets are always paired with Separated Rights.
- Virtual Assets are always paired with Combined Rights.

The voting process included a 2x2 factorial design:

- 2 levels for Factor #1 (Representation of Assets).
- 2 levels for Factor #3 (Type of Information Provided).

In all poll designs, Factor#2 (Decoupling of Rights) is nested and thus does not independently add another dimension.

#2 – Proposal to establish a fund for European Protection Against Russian Nuclear War

This poll introduces the delegation method. Participants were given the opportunity to delegate to a dRep (an insider/representative) to cast their

votes.

In order to test both lines of investigation in this poll, it was developed a nested factorial design, with 4 factors.

Representation of Assets	Decoupling of Rights	Type of Information Provided	Delegation
Physical Assets	Separated Rights	Brief	Delegated Vote
Physical Assets	Separated Rights	Brief	Not Delegated Vote
Physical Assets	Separated Rights	Detailed	Delegated Vote
Physical Assets	Separated Rights	Detailed	Not Delegated Vote
Virtual Assets	Combined Rights	Brief	Delegated Vote
Virtual Assets	Combined Rights	Brief	Not Delegated Vote
Virtual Assets	Combined Rights	Detailed	Delegated Vote
Virtual Assets	Combined Rights	Detailed	Not Delegated Vote

Design Breakdown:

1. Factor #1 (Representation of Assets): 2 levels (Physical Assets vs. Virtual Assets).
2. Factor #2 (Decoupling of Rights): Nested within Factor #1.
3. Factor #3 (Type of Information Provided): 2 levels (Brief vs. Detailed).
4. Factor #4 (Delegation): 2 levels (Delegated Vote vs. Not Delegated Vote).

Factor #2 (Decoupling of Rights) is nested within Factor #1 (Representation of Assets). This means:

- Physical Assets are always paired with Separated Rights.
- Virtual Assets are always paired with Combined Rights.

This results in a 2x2x2 factorial design (8 combinations):

- 2 levels for Factor #1 (Representation of Assets).
- 2 levels for Factor #3 (Type of Information Provided).
- 2 levels for Factor #4 (Delegation – without additional incentives).

#3 – (Technical Upgrade), DemoDAO recognition of Scroll's Mainnet Deployment as Official Deployment

This poll included a gaming mechanism introducing a bribe, an economic compensation in exchange for their voting rights. Every participant will receive a ticket (coin or cryptoasset) to access the final raffle after the experiment ends. Participants who engage in bribing opportunities, namely, transferring their voting rights to a "briber," receive an additional coin posted on their account on the democraticdao.io website. (This increases their chances of being selected for the final raffle).

In this poll, the nested design involved 4 factors.

Representation of Assets	Decoupling of Rights	Type of Information Provided	Bribing Opportunity
Physical Assets	Separated Rights	Brief	Transferable Coins
Physical Assets	Separated Rights	Brief	Not Transferable Coins
Physical Assets	Separated Rights	Detailed	Transferable Coins
Physical Assets	Separated Rights	Detailed	Not Transferable Coins
Virtual Assets	Combined Rights	Brief	Transferable Coins
Virtual Assets	Combined Rights	Brief	Not Transferable Coins
Virtual Assets	Combined Rights	Detailed	Transferable Coins
Virtual Assets	Combined Rights	Detailed	Not Transferable Coins

Design Breakdown:

1. **Factor #1 (Representation of Assets)**: 2 levels (Physical vs. Virtual).
2. **Factor #2 (Decoupling of Rights)**: Nested within Factor #1 (does not add new combinations).
3. **Factor #3 (Type of Information Provided)**: 2 levels (Brief vs. Detailed).
4. **Factor #4 (Bribing Opportunity)**: 2 levels (Transferable vs. Not Transferable).

Factor #2 (Decoupling of Rights) is nested within Factor #1 (Representation of Assets). This means:

- **Physical Assets** are always paired with **Separated Rights**.
- **Virtual Assets** are always paired with **Combined Rights**.

The design is a 2x2x2 factorial design:

- 2 levels for Factor #1 (Representation of Assets).
- 2 levels for Factor #3 (Type of Information Provided).
- 2 levels for Factor #4 (Bribing Opportunity).

Factors #3 and #4 remain fully crossed.

#4 – Sponsor dAGI Hack hackathon in January 2025

Devoting funds to sponsor the best projects for their protocol.

The design involved 4 factors:

Representation of Assets	Decoupling of Rights	Type of Information Provided	Bribing Opportunity
Physical Assets	Separated Rights	Brief	Not Transferable Coins
Physical Assets	Separated Rights	Detailed	Transferable Coins
Virtual Assets	Combined Rights	Brief	Not Transferable Coins
Virtual Assets	Combined Rights	Detailed	Transferable Coins

This specific setup is best described as a 2x2 nested factorial design with nested factors. (Only one group (A) was allowed to engage in bribing):

- **Factor #1 (Representation of Assets)**: 2 levels (Physical vs. Virtual).
- **Factor #3 (Type of Information Provided)**: 2 levels (Brief vs. Detailed).
- **Factor #2 (Decoupling of Rights)** is nested within Factor #1.

- **Factor #4 (Bribing Opportunity)** is nested within Factor #3.

#5 – Proposal to Enhance the Delegation System for Better Representation

Only Group B was allowed to engage in bribing and delegating.

Representation of Assets	Decoupling of Rights	Type of Information Provided	Bribing Opportunity
Physical Assets	Separated Rights	Brief	Transferable Coins
Physical Assets	Separated Rights	Detailed	Not Transferable Coins
Virtual Assets	Combined Rights	Brief	Transferable Coins
Virtual Assets	Combined Rights	Detailed	Not Transferable Coins

This results in a 2x2 nested factorial design:

- **Factor #1 (Representation of Assets)**: 2 levels (Physical Assets vs. Virtual Assets).
- **Factor #3 (Type of Information Provided)**: 2 levels (Brief vs. Detailed Information).
- **Factor #2 (Decoupling of Rights)** is nested within Factor #1.
- **Factor #4 (Bribing Opportunity)** is nested within Factor #3.

2. Expected Outcomes

The anticipated outcome of this study hinges on the premise that separating economic interests from voting rights and informing participants about their governance capabilities would markedly influence voting behavior and, consequently, the governance structure. In this sense, I expect participants who have been assigned disjunctive rights in physical form to care more about both voting and the economic stakes (such as when transferring assets to another account). Considering the demographics of the Institute, it is expected to have most participants within the Gen Z generation.

Furthermore, those who receive less information are expected to be more encouraged to delegate voting and be tempted by bribes. Particularly, during

the introduction of the vote-buying gaming mechanism, I expect participants from Group B (brief information – control group) to transfer their voting rights on technical matters and to be less likely to transfer their voting rights on social causes. Likewise, I expect participants in the experimental group, Group A (detail information – experimental group), to engage less in bribing opportunities.

Considering demographics, I expect that Gen Z participants will interact with less difficulty, coordinate, and be able to provide valuable feedback on issues of activism regarding pro-social behavior (funding humanitarian causes or ESG issues), which would not necessarily enhance the quality of governance but would foster a spirit of camaraderie and sense of belonging for shared causes.

I expect participants to coordinate less on technical matters such as protocol improvement or constitution creation. A distinction might appear from those in the experimental group receiving brief information in plain English, which would lessen the technical information, making it more accessible, better interpreted, and encourage more participation in voting. Participants will be interested in fostering good governance by voting on issues they understand, and they will not invest time in reading complex documents or those full of jargon. In this regard, I also expect those holding lay information to share knowledge over the Discord platform when issues about voting are debated by exchanging points of view about governance. I might also expect at least one participant to ask for the outcome of the ballot (information about outcomes will be shared only with those of the experimental group receiving additional information in plain English).

Finally, I also expect women to be less interested in governance in general, and in particular, I expect them to transfer their governance rights. Moreover, I expect participants from minorities not to engage in activism during the experiment but to remain bystanders in the organization.

3. Preliminary Results

(This section is underdeveloped, insights will be provided during the presentation)

III. Frameworks for Modelling Governance

Frameworks for Modeling Governance in decentralized autonomous organizations (DAOs) refer to structured approaches that outline how to create, implement, and evolve governance practices. In a DAO, governance typically revolves around mechanisms for decision-making, such as voting, proposal creation, and delegation of authority, often mediated by smart contracts. A comprehensive framework for DAO governance must address several key aspects: the distribution of voting power (such as one-token-one-vote systems or delegated voting), the separation (or integration) of economic and governance rights in cryptoassets, information as a source for good internal governance, and its potential for transparency, accountability, and inclusivity.

Scholars are particularly interested in how these frameworks navigate regulatory challenges, protect minority (or small) cryptoasset holders, and avoid conflicts of interest like vote buying. Effective governance frameworks must also accommodate the unique decentralized nature of DAOs, ensuring alignment between participants' incentives and organizational objectives. These frameworks help DAOs maintain operational efficiency and fairness while balancing the complexities of on-chain and off-chain interactions, member engagement, and evolving regulatory expectations.

This research has looked into several largely ignored or mildly explored variables to draw a comprehensive framework. More specifically, the separation of rights and their incorporation into relatable, tangible assets rather than abstract and/or entirely digital assets, coupled with targeted information, can unmask these organizations' idealistic and ethereal conception for a more concrete perception. These variables also relate to members of a specific generation, or digital natives, who use technology in unique ways to share information and can collectively shape an organization's future, having grown up in a culture of collaboration and sharing.

Conclusion

This paper has outlined the legal and social contours of decentralized autonomous organizations. How they are structured, the emerging social fabric, mainly off-chain/offline, and its impact on-chain governance. Furthermore, even if on-chain governance could be advocated to suppress some off-chain governance challenges, it also implies opening up to new

challenges dealing with increasing vote buying and voters' apathy. The interaction of different actors, on-chain and off-chain, suggests an approach to governance that comprehends markets, hierarchies, and networks since the issues in governance in DAOs are interrelated across these spheres and are constantly evolving.

The findings from this research endeavor will contribute valuable insights to the evolving discourse on blockchain governance, informing policymakers, legal practitioners, and blockchain enthusiasts alike. The empirical evidence gathered will facilitate a nuanced understanding of the challenges posed by decentralized governance, offering a foundation for the development of legal frameworks that foster innovation while ensuring compliance and accountability within the blockchain ecosystem.

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