DAO Governance: An Empirical Investigation on the Heterogeneity amongst DAO Governance Systems

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Abstract. This study delves into of decentralized autonomous organizations (DAOs), aiming to empirically determine the diversity of their governance frameworks. Through the use of semi-structured expert interviews and literature review, it comprehensively explores the nuanced facets of DAOs—decentralization, autonomous functioning, and the concept 'organization'.

Regarding decentralization, the study reveals varying degrees of deviation from the theoretical model, by exploring centralizing factors such as traditional executive structures, hierarchical arrangements, and influential mechanisms that contribute to nuanced centralization. While some centralizing mechanisms optimize decision-making efficiency, others risk undermining democratic functioning, highlighting the need for safeguards. While addressing autonomous functionality, the study advocates viewing full autonomy as an eventual goal rather than an absolute requirement, considering practical constraints like transaction costs, efficiency and off-chain asset involvement. On the organizational front, DAOs should exceed a spontaneous group of individuals, through methods like membership registration through tokens or regular meetings. Furthermore, the study proposes conceptualizing DAOs as a diverse landscape rather than a singular organizational archetype.

Keywords: DAO, Governance, Decentralization.

1 Introduction and Background

Over the past decades, technology and business have crossed paths in several ways. With blockchain technology entering the picture, the door opened for new manners of data storage, contracting and networking. It was now possible to store and record transactions on a medium that was more transparent and less susceptible to fraudulent behavior, because once something is recorded on the blockchain, it is public and difficult or even impossible to modify. This technology forms the basis of smart contracts: these are automated computer programs that are stored on a blockchain, that enable the terms of a contract to execute upon the occurrence of some event, without external intervention. Since these contracts execute themselves, they eliminate the need for a third party or human judgment in the execution phase, leading to unbreakable and unbreachable contracts. The rigid nature of these contracts does not mean that adjustment is not possible: the parties creating the contract can insert provisions that allow for the adjustments of terms by voting or through the occurrence of pre-programmed triggers [1]. If an organization goes beyond the mere use of these 'contracts' for their contracting operations, and decides to base their entire organizational structure on blockchain-based smart contracts, it can be classified as a 'decentralized autonomous organization' (i.e., a DAO). Over the past few years, DAOs have been subject to substantial growth: the number of DAOs increased from 700 organizations in May 2021, to 50960 organizations in April 2024. Furthermore, there were approximately 1.6 million holders of interest in DAOs in 2021, representing 16 billion USD

in funds, which further extended to 10.1 million holders that represent 40.4 billion USD in funds in April 2024 [2].

DAOs are – theoretically speaking - blockchain-based systems that enable people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain (smart contracts), and whose governance is decentralized (i.e., independent from central control) [3]. The smart contracts (the by-laws) replace the notary statutes in traditional organizations, so that these rules can be executed automatically, rather than through interference of a (central) management board. This implies autonomous function, because there is no intermediary required to have decisions executed. Furthermore, the feature within smart contracts that allow for adjustments thereto through member voting, allows for a further decreasing necessity of a (central) management board. This democratic process implies decentralization: every member has the right to vote for any decision made by the organization – whether based on sole membership or on the number of tokens that the member possesses - so that there is no centralized power within the network. Furthermore, the use of tokens as membership definers allows for a phenomenon called rage quitting, which means that members can step aside and leave the organization whenever they want. This contributes to downside risk protection and a feeling of individualized control over the contributions that the individual makes toward a project [4].

However, the first empirical results are showing some cracks within this picture-perfect, theoretical view of DAOs. In reality, the democratic nature of DAOs is less absolute, since members do not vote on every proposal that they can technically vote on [5]. This could diminish the idea of decentralization, and shall therefore be subject of further empirical exploration. Therefore, the aim of this article is to empirically determine the current, realistic landscape of DAOs through a set of expert interviews. The display of these results function as a starting point for a critical review of the current stance of DAOs.

2 Methodology

The methodology used for this paper constitutes of two qualitative research methodologies – expert interview-based empirical methodology and theoretical literature review. To perform an inductive analysis, the following phases have been followed [6]: (1) analyze literature on the definition; (2) conduct a first interview round and analyze the empirical data to establish within- and cross-case patterns and themes; (3) conduct a second interview-round for definition development and analyze the resulting empirical data through the establishment of within- and cross-case patterns and themes; (4) analyze and synthesize the data and compare it to literature; (5) produce conclusions and recommendations.

Experts have been selected and approached based on an analysis of the listed DAOs and their respective members/founders on Crunchbase and comparable platforms. This search has been complemented by a LinkedIn inquiry. This search resulted in a set of twelve experts, which includes nine DAO members with various internal roles – software developers, governance lead, legal officer – one member of a self-sovereign organization, one lawyer, and one independent DAO governance and coordination specialist. A more detailed description can be found in appendix 1.

The empirical data has been gathered through open-ended expert interviews. The interviews were conducted based on open-ended questions, and lasted between 30 and 60 minutes.

3 Understanding DAOs

Due to the emergent and broad nature of the concept of a 'DAO', there exists a lot of debate on what the term actually entails. Several experts desire a clear definition that can properly set legitimate DAOs apart from *scams* - or differently phrased: organizations that use the term *DAO* as a marketing tool, while not truthfully qualifying as such. This could effectuate broader societal justification and understanding, while simultaneously averting a bad reputation for DAOs. In their opinion, this necessity follows from DAOs' interrelatedness with the crypto space, which is often perceived as a highly speculative and uncertain space.

However, they also stress that the development of a definition should be approached with caution: the concept is highly emergent, hence the scope changes over time. Therefore, a frequently fetched starting point is that of its self-explanatory name, which entails the fundamental and likely enduring sub-concepts: (1) decentralization, (2) autonomous, and (3) organization. They furthermore suggest following either an explanatory or a broader, boundary-based approach. This chapter attempts to develop ideas for both approaches.

3.1 The Goal of a DAO

According to an expert, the difference between legitimate DAOs and *scams* can be found in the practical operations of the DAO in question: there should be a distinction between the use of blockchain features for subparts of the organization, such as community engagement or record-keeping purposes, and the use of the structure for the entire organization. According to the expert, this first situation does not reflect the presumed goal of a DAO, which is to optimize the organizational functioning as a whole by using blockchain to achieve decentralized and autonomous functioning. Therefore, this expert suggests that organizational-wide implications should be a criterium to identify an organization as a DAO, or that there should at least be a distinction between the two forms. Another expert extends this goal-based view by indicating that there should be a distinction between being self-sovereign and qualifying as a DAO: self-sovereign governance can still be relatively centralized, while using a DAO structure for the organization as a whole implies a focus on decentralization. This leads to the suggestion that *organizations that do not experience organizational-broad implications as a result of using the DAO structure, and/or that do not focus on decentralization and autonomous functioning should not be qualified as DAOs*.

3.2 Decentralization

The extent of decentralization explains a large chunk of the deviation between DAOs. Decentralization can be understood as a '*peer-to-peer-based decision-making process'*, e.g., a network of equals that communicate and make decisions without a (centralized) intermediary. While this implies that DAOs should have a decentralized governance process, empirical evidence indicates that this premise should be understood as relative, rather than as absolute. This was already suspected by Voshmgir [7].

Hierarchy The theoretical premise is that DAOs function without central control or hierarchy, though there are numerous examples of DAOs using governance models that lean towards a higher degree of centralization. For example, some DAOs use a governance model in which

councils can overrule community decisions on exceptional occasions (a council-system), while others use sub-DAOs that take care of specific subject matters that require more expertise. Although those sub-DAOs are installed and voted for by the entire community, and the appointed members have a short functioning period, this constitutes a form of centralization. Lastly, some DAOs use 'traditional' management titles, such as CEO and CFO, which could lead third parties to believe that these titled members have centralized power. Experts indicated numerous reasons for these relatively centralized approaches, such as the ability to overcome scaling problems, an increased efficiency of the voting process, the prevention of mistakes as a result of community decisions, and exuding legitimacy towards society and counterparties by using titles that they are familiar with.

While at the first glimpse, such centralization can be perceived as problematic, the following nuance can put the phenomenon in perspective. When having a closer look, this type of centralization is different from the centralization occurring in traditional organizations. In traditional organizations, there exists an ex-ante type of centralization, where the (centralized) board makes decisions on behalf of the organization in (almost) every instance. Generally, the shareholders can solely object or decide to provide a discharge of liability afterwards. The centralization that occurs in DAOs that use the council system, however, is arguably the opposite: ex-post centralization. The centralized 'power' to overrule decisions occurs after a decentralized community vote has taken place. Furthermore, this overruling can only go through if there is a sufficient majority within the group of councils. This comes with the advantage that the community's views will arguably be valued to a higher extent than in an ex-ante type of centralization, since the community's opinion is clearly expressed through their voting round and would only be overruled in exceptional cases. The following graph provides a visual representation of how a council-based system could be realized.

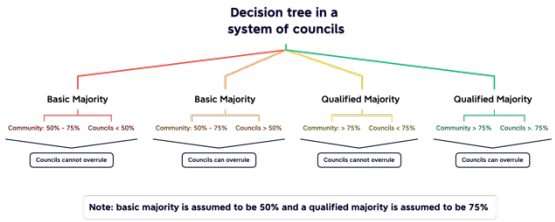

Fig. 1. Decision Tree in a System of Councils

Sub-DAOs address a different issue. These are smaller groups of community members that center around an area of expertise, such as human resources, communication services, daily protocol maintenance, decision execution or finance. Experts argue that this can improve the efficiency of the organization, as well as the activeness of the members, by allowing members that lack the necessary expertise to delegate their voting power to the members of that particular sub-DAO. Although it cannot be denied that decentralization is compromised through this system, it can form the solution to the often-observed issue of members not living up to their voting responsibilities [8]. Furthermore, sub-DAOs can put decentralization safeguards in place, which can include electing sub-DAO members through a top-DAO community vote; determining the sub-DAO's budget through a top-DAO community vote; requesting regular reports on the operations of those sub-DAOs; restricting the period of mandate to a few weeks

or months; requiring a top-DAO community vote to approve of a roadmap for every mandate period; and hold the sub-DAO accountable for following that voted-upon roadmap. Furthermore, experts argue that this does not decrease the extent of transparency and openness, since those sub-DAOs have the same characteristics as the top-DAOs. Given these safeguards, the improved efficiency, and the ability to generate a solution, it remains debatable whether the sub-DAO structure should be perceived as a harmful type of centralization: it could very well be a realistic solution to the obstacles that decentralization brings to the table.

Influential Mechanisms Another observed type of centralization is the influence of core members or core contributors. Whereas the previous types of centralization are arguably intentional, this type can be considered unintentional, being a result of either the lenience of (other) members or a mistake in the design of the voting procedure. Several experts point out that in practice, specific people within the network of a DAO can have comparably much influence on either the members' opinions or the decision-making process in itself. They describe two ways in which this can be observed. The first way comprises the situation in which a specific member has gained much trust from the community, which is arguably an informal or soft type of power. In such a case, votes will often be delegated to this member, opinions of this member are followed relatively often, and/or proposals of this member are accepted relatively easily. Delegation is only possible if the operating agreement of the DAO allows for delegation, but the other two expressions of soft influence can occur in any DAO.

The second type of influence relates to the voting system, which is a hard or formal type of power. In the basis, there are two dominant types of voting: (1) a token-weighted voting system (1 token, 1 vote), where the total amount of votes is tied to the number of tokens sold; and (2) a democratic voting system where the total amount of votes is tied to the number of members (one person, one vote). When a member has bought a substantial number of tokens in a DAO with a token-weighted system, this member can simultaneously gain substantial voting rights, obtaining relatively much power. Theoretically, such a gathering of power cannot occur in a fully democratic system (1 member, 1 vote), but experts and literature [9] indicate otherwise. If only a solid core of members votes on proposals, while the others only passively participate in the DAO by either consistently delegating their voting power to an individual in a solid core group of members or by completely refraining from voting, this core will eventually gather substantial power over the decisions made within the DAO [10]. This type of centralization should not be disregarded, because it could harm the decentralized and participatory nature of DAOs. Some DAO experts share these concerns and act on this concern by including democratic (1 person, 1 vote) voting, or consider introducing an obligation to participate in voting procedures.

Keyholder / Executor Centralization A last type of centralization is the centralized power that lies with the keyholder and the executor of community decisions. The term keyholder refers to the holder of the key that allows for changes in the underlying smart contract and/or the treasury. Several experts indicate that keyholders have specific centralized power, given their access to these generally automatized and locked protocols, and their theoretical ability to change them without a community vote. This furthermore leads to centralized power concerning the treasury, since this person can theoretically spend the treasury without community approval. This is an active risk, and diminishes the absolute meaning of decentralization. Furthermore, the executor of community decisions has centralized power by having a final say in

whether they will perform the actions necessary to obey the decisions. Even though the first intuition would be that they would have to obey the decisions, due to the threat of legal enforcement, this is not necessarily the case for every DAO. Experts indicate that there are two possible difficulties regarding legal enforcement. First, if the executor acts under a pseudonym/anonymously – something that blockchain technology allows for – it could be difficult to ever find their actual identity, let alone to sue them. Experts stress that this is the biggest pain point. Second, the uncertain legal status of DAOs that do not have a legal wrapper – there are still many DAOs facing this issue - can cause problems when initiating legal actions either as the DAO or against the DAO, wherefore a threat to sue as an incentive for obeying decisions is not always effective.

Progressive, rather than absolute decentralization Decentralization is a key selling point of DAOs as a form of governance, and can be defined as a '*peer-to-peer-based decision-making process'*. However, the presented empirical results show that decentralization is not always as absolute and rigid as it is promised to be: gradations are possible. The extent thereof is not permanent in each case, as confirmed by several experts: DAOs that are still in their starting phase could decide to be more centralized at the beginning to ease the process of becoming a functional DAO, and can thereafter delegate an increasing amount of power to the community to become (more or even fully) decentralized. It would therefore be right to allow room for a certain extent of deviation, namely that of progressive decentralization: if the DAO in question shows progress in the decentralization process, and keeps full decentralization as the ultimate goal, it should still fit in. This phenomenon can also be described as progressive decentralization [11]. Therefore, a formulation such as *essentially or progressively decentralized* can be a solution to fairly extend the scope of the definition of a DAO.

3.3 The Notion of 'Autonomous': Digital / Blockchain-Based Functioning

According to an expert, autonomous functioning refers to the extent to which the operations of DAOs can function without intermediation and are driven by blockchain technology. At the first glance, this implies a fully on-chain structure, where every action is recorded on the blockchain. The upside thereto is that a fully on-chain structure provides full transparency and automatization, which is important for the members, external stakeholders and potential contracting parties in understanding and monitoring decisions, changes and transactions made within the organization. However, in reality, at least a part of the activities is still executed off-chain, meaning that these are not directly recorded on the blockchain. Experts mention that for instance, many DAOs still make use of Snapshot for voting, which is an off-chain voting tool.

A prominent reason that experts give for using off-chain tools is cost-related: when actions, such as voting, are conducted on-chain, this generally costs a fraction of your token (gas fee). Relatedly, maintaining and building on blockchain technology is expensive, and can sometimes be inefficient, as blockchain is known to sometimes be slower than off-chain registrations and transactions. Secondly, it is highly difficult to change the properties of the code afterward, so there is hesitance toward fully implementing blockchain at the beginning of a project. This holds the more for DAOs that need some fluidity due to their nature, which is the case when the operations will differ over time. A third provided reason is that on-chain transactions can only be executed for cryptocurrencies: if traditional currencies such as USD shall be used, this transaction is not solely executed on-chain. A last observative note is that some DAOs are moving their operations toward the physical world. Examples such as FriesDAO,

LinksDAO and CityDAO aim to buy physical assets and to - at least partially - operate in the physical world. Therefore, it is unrealistic for such DAOs to entirely operate on-chain, as some of their activities will likely include offline purchases or contracts.

In addition, there are notable differences between member-managed – or participatory - DAOs and fully algorithmic DAOs. While for both types, the underlying smart contract determines most of the processes, there are several nuances to be placed. An expert explains that in member-managed DAOs that use community decision-making, especially when off-chain voting is used, automatization is compromised to the extent that such off-chain voting processes take place and should then be implemented on the blockchain afterward. Furthermore, the human component is still important for on-chain voting and the execution is often still dependent on the executor. Therefore, this element can be a source of debate within member-managed DAOs. Experts nonetheless indicate that regardless of that participatory nature, it should be the DAOs' goal to strive for optimized autonomous and automized functioning. Algorithmic DAOs, on the other hand, are perceived to have the opposite starting point: while community voting can occasionally be required by the operating agreement, the starting point and main driver of the operations can be found in automated transactions. Given this context, it is relevant to allow both types of DAOs to fit within a definition thereof, regardless of their choice for a participatory or algorithmic nature.

In conclusion, the focus should lie on the goal, rather than on the absoluteness of the concept of 'autonomous functioning'. A progressive element, as with decentralization, is desired by many experts. They state that even though most DAOs do not fully rely on blockchain from the beginning for cost-related or efficiency-related reasons, the goal should always be to work towards full autonomous functioning. An expert also proposed the requirement of the autonomous (blockchain-based) software being the ultimate form of governance for the DAO: rather than it merely governing one aspect of the DAO, it should be used for the entire decision-making chain, and for the practical execution. Therefore, the best way to describe 'autonomous' is as follows: '*the community governing itself by progressively relying on rules that are rooted in blockchain technology.'*

3.4 Notion of Organization

The last element in the self-explanatory name of the DAO is 'organization'. As all experts agree upon, this element does not cause much debate: it can be understood as the requirement that the DAO should have somewhat of a structure. This does not necessarily imply a specific (legal) form, but it mostly focuses on whether the DAO in question is more than just a spontaneous group of individuals. This can easily be achieved by, for instance, having regular meetings or the use of tokens to register members. This view is in line with the actual meaning of the word organization (Cambridge Dictionary): '*a group of people who work together in an organized way for a shared purpose*'.

3.5 Alternative Differentiations

Experts state that besides focusing on the core characteristics, it is also relevant to evaluate other types of differentiations, as there are many different types of DAOs. Even though the overarching name 'DAO' implies a specific corporate form, this is not the case in practice. The World Economic Forum has tried to categorize DAOs into 9 different categories:

Functional, Governance, Task, Investment, Philanthropic, Special Purpose Acquisition DAO, Production, Community, and Flashmob [12]. Other operation-based categorizations can be found on websites such as DAO central [13], which comprise categories such as investment, service, collector, product, social, protocol, grants, special-purpose, education, media, impact and decentralized science.

Furthermore, DAOs move more often toward the traditional world. Some DAOs, such as CityDAO, LinksDAO and FriesDAO, are striving to interact with real-world assets. Another way of perceiving 'moving to the traditional world', is by analyzing DAOs in the context of the traditional corporate forms. Worker collectives, for instance, act in a way that is similar to general partnerships, while investment DAOs are acting in a way that is similar to LLCs or joint-stock companies. Some DAOs are moving more towards fundraising or collecting, and act like foundations, especially when they are ad hoc DAOs. Associations could be found in the social DAOs, which have a shared (social) goal and usually don't have a profit aim.

4 Final Thoughts and Discussion

The empirical results show that DAOs differ in a variety of manners. DAOs prove to have different degrees of decentralization, due to factors such as traditional executive structures, hierarchical arrangements, and influential mechanisms that contribute to nuanced centralization. While some centralizing mechanisms optimize decision-making efficiency, others risk undermining democratic functioning, highlighting the need for safeguards. Regarding their autonomous functioning, deviation exists due to factors such as transaction costs, efficiency, and off-chain asset involvement. This holds the more, when taking into account the difference between algorithmic and participatory DAOs. This, as well as the fact that DAOs would more accurately represent a landscape, rather than a single form of organization, complicates the development of a definition. Nevertheless, an attempt shall be made through the use of three different approaches. The first approach is to remain close to the self-explanatory name of DAOs, by using the elements 'decentralized', 'autonomous' and 'organization'. When taking this line, the recommended definition is as follows: *'a group of people who work together in an organized way for a shared purpose (i.e., organization) that uses a progressively peer-to-peer based decision-making process (i.e., decentralization), that governs itself by progressively relying on rules that are rooted in blockchain-technology (i.e., autonomous).* The second approach is to create a negatively formulated definition. This means that rather than attaching specific characteristics to DAOs, the focus should be on what characteristics DAOs do not possess. This can significantly broaden the scope of the definition and increase its future-proofness. Recommendations as to the boundaries include that of '*organizations that do not experience organizational-broad implications as a result of using the DAO structure, and/or that do not focus on decentralization should not be qualified as DAOs', 'organizations that lack full central control', and 'organizations that do not progressively rely on blockchain'.* The third approach is to use a category-wise taxonomy of DAOs, since DAOs may better be qualified as a landscape, rather than as one specific organizational form. To further validate the results found in this paper, and to overcome the scale limitation of this paper, a large-scale study must be conducted on the decentralization and autonomous functioning of various DAOs. This is still an open research area.

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Appendix 1

Table 1. Overview of DAO experts.

Expert	Example
1	Co-founder of a DAO, former consultant
2	DAO member and ambassador
3	Software developer and DAO member
4	Lawyer that specializes in blockchain
5	Co-founder of a DAO
6	Blockchain tool designer and DAO member
7	DAO advisor in the field of governance and business development
8	Core contributor of a self-sovereign organization, software engineer

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9	Co-founder of a DAO
10	Co-founder of a DAO
11	Chief legal officer of a DAO
12	DAO governance and coordination specialist/advisor