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Exploring the Potential of DAOs: A Comprehensive Study of Decentralized Autonomous Organizations

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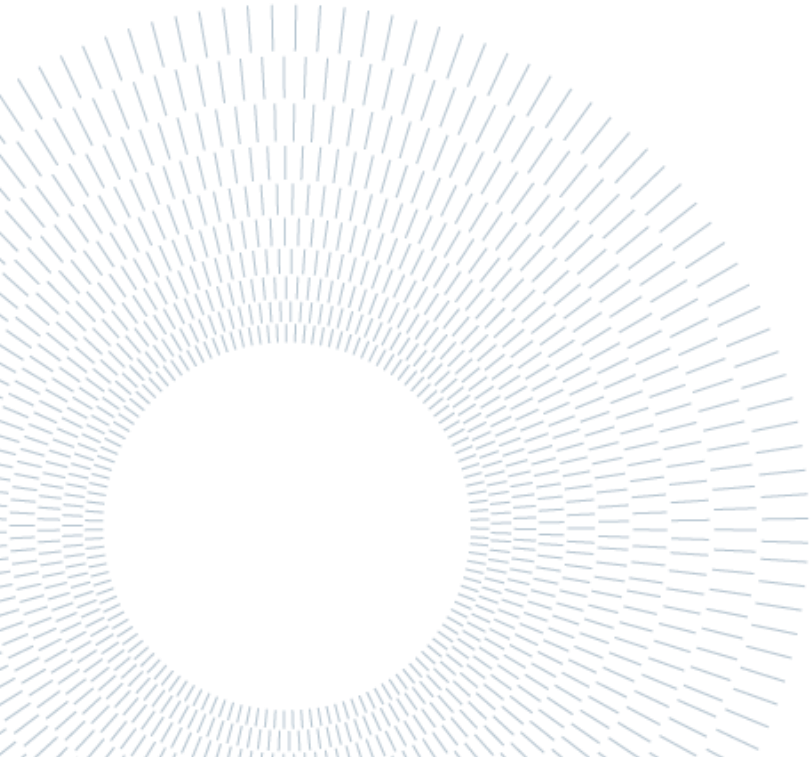
Abstract

Over the past decade, the rise of the new shape of organizations, the decentralized autonomous organizations, has been infectious and rapidly growing. This affected the ability of literature to catch up to what the industry has achieved in the same period. Studying the DAO market, its trends, along with the elements that help shape the governance model and explaining it by an organizational theory that will help measure its merits and success. This thesis is the first one to dedicate its objectives to filling the gap between the two worlds. First by painting a clear image of the market landscape of the DAO, the image that can help us understand the decisions in changing or updating an element of the DAO governance model. Second by finding the consensus of the DAO market to what these elements of the governance model could look like. And finally, by finding a concept or a theory that DAO market is using in creating or updating its governance model.

Studying the 200 most successful DAOs that capture together more than 95% of the DAO market using data collected and variables analysis, has answered the research questions. The DAO market has 12 industries where decentralized finance captures more than half of the market. It has only 4 DAOs capturing more than half of the market. Ethereum is enjoying a monopoly on the DAO market with the help of Aragon platform and the second merge of the blockchain. The market is agreeing on the following elements in the governance model: the use of sub-teams and elections by members, more than one voting stages, six types of voting systems, usage of communication tools during the voting process, the choice of operating on-chain or off-chain, identifying a path for external relationships management, relying on incentive system that balance between rewards and power dynamics, implementing accountability measures and finally adopting an emergency plan with a rapid response path. The market research also helped identify Progressive decentralization and Polycentric governance as the two most prevailing concepts applied by DAOs to update their governance model to approach more decentralization over time. These concepts are not in the DAO literature but are found in other fields or in market practices.

Keywords: DAO, Decentralized Autonomous Organization, Voting process, Governance Model, Progressive Decentralization, Polycentric Governance.



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Executive Summary

Introduction and Objectives of the Research

When blockchain technology succeeded in getting the attention of digital technologies Markets at the beginning of the last decade, a lot of applications have come out utilizing the characteristics of blockchain technology believing and building on its vision. One of these applications is Decentralized Autonomous Organizations. Starting from the Ethereum whitepaper 9 years ago where the general concept of a DAO was introduced to the world, then in 2016 when the first practical example of a DAO was tested and monitored by the world which would sadly turnout to be a failed learning experience. All this laid the groundwork for the biggest breakthrough in DAO market by the introduction of Aragon and other platforms that offered the opportunity to easily create and deploy parameterized DAOs with low cost and less time. From this moment forward the number of DAOs created in the market has increased exponentially, and the DAO market grew in under 5 years into an average value of tens of billions of dollars captured by just a handful of thousands of DAOs. This rapidly developing situation has invited a lot of experimentation and literature studies, to study and annotate concepts around the new emerging market.

For all these reasons, the need has increased for doing a comprehensive study of the market of DAOs, their behavior, and their trends. A newly emerged market needs to be mapped and analyzed, its shape needs to be understood and explained. A lot of controversy has happened around the DAO's governance model, with no clear theoretical explanation or framework of how to apply decentralization inside an organization, speculations and interpretations have increased. That's why this study aims to find this pattern through collecting data about the most successful DAOs in the market and analyzing how they reached and maintained this success. The study is not only analyzing the market Data and trends, but also these DAOs' choices and their evolving decisions about their governance model that influence their standing in the market and creates a gravitational center around them encouraging more others to follow their experience or sometimes "fork" it. This research has led to identifying market composition against different variables, it also identified the shape and nature of the elements that their governance model is built on. The research has also unearthed two theories for applying governance concepts in the DAO explaining the benefits and the drawbacks of them.

Literature Review

At the beginning of this thesis, a comprehensive literature review was conducted with the focused goal on defining what a decentralized autonomous organization means, and how it is different than a traditional organization. The literature came short of offering a consensus on DAO's definition, the literature only introduced different versions of the concept behind creating a DAO. From generalizing the idea to include any organization that works on pre-determined self-executing rules that are created on a decentralized technology, to going into specifics and pairing it with the use of smart contracts. Then from denying that the core definition of a DAO is building the organization on smart contracts and tokens to only recognize it as any organization built on blockchain. And lastly identifying it as an organization that offers equal authority to all its members through a flat hierarchy that gives access to all the members as they are also its shareholders.

Because of the lack of consensus on the definition of a DAO, the focus has shifted instead to define the characteristics that they all agree on in a DAO. Four vital characteristics were extracted from the literature: Decentralization meaning distributed and equal power between all members of the DAO eliminating central authority through the usage of voting processes to reach a consensus among them. Usage of public permissionless blockchain meaning reliance on blockchain technology in their infrastructure that offers public access to distributed ledger without permission to validate it. Usage of smart contracts that are digital software coded contracts with embedded fulfillment conditions that automatically trigger a decentralized financial transaction that completes the contract. Usage of tokens that are digital fungible assets, issued and created on blockchains that give financial sense to the smart contracts, a right to access or vote in a DAO, and the right to own a portion of the DAO.

With the purpose of finding how DAOs govern themselves and which elements define their model and any theory that might explain their reasoning, a literature review was conducted on any paper that studied this scope. Instead, what was found was repetitive case studies and incomplete elements of governance. Both only offered a fraction of a model or only definitions that lacked explanation of how to implement and a theory behind it. The study combined the elements from these study cases together and tried to show everything in a structured way. Finding 9 voting systems that count the members' votes differently. The choice of operating the DAO on-chain for more security and independence or off-chain for less costs and faster deployment. Classifying the tasks inside the voting process into strategic ones and operational ones. Allocating more resources for strategic tasks, more time, providing deeper information and more quorum requirements, because they need

broader support and have long-term effects. The incentive system, the basis of motivating passive members to participate in the governance process depends only on giving a financial reward to members linked to their stakes in the DAO. The only way they conduct external relationships is through delegating them through writing smart contracts with 3rd parties that will fulfill these tasks.

Methodology

In this chapter the gaps found in the literature review were reported to be fatal. The literature was adequate in definitions and vision of the DAO, but it lacked any structuring of a governance model, it also lacked any wide market analysis, and it lacked explanation of theory behind DAO governance. The methodology for the research also was laid down as data collection through specific variables identified from the gaps of the literature, these variables had only 3 collected from second hand reliable source that sums up the original data in a list, and the remaining 13 variables collected from firsthand sources that belong to each DAO's online presence information. The limit of the data was collecting as many DAOs as possible that collectively capture absolute majority of the market shares, for being successful enough to capture and maintain this percentage. Then after data collection, descriptive analysis, interpretation, and comparisons were made to report findings for each research question. And capping the chapter with the research questions which are the following:

What is the market landscape of the DAO and what are the main trends inside it? what is the consensus in the DAO market about the elements of their governance model? What is the DAO rationale and theory behind their handling of their governance model?

The research findings are divided into 3 chapters each one answers one of the research questions.

Research Findings in Market Landscape

The data found that only the 200 most successful DAOs in the market capture more than 95% of the DAO market shares. Which was enough indication of their success as they represent around 4% of the total number of DAOs created at the time of the study. Total market value at the time of the study (March of 2023) was $14.5 Billion, the study captures $13.85 Billion of that. The market is concentrated because of having only 4 DAOs capturing around 53% of its shares and all of them are operating on Ethereum blockchain.

The study identified 12 industries where Decentralized Finance captured 52% of the DAO market alone. The 12 industries can be summed up by 3 categories, a category

for 3 financial-related industries which together capture around 70% of the market value, a category for 2 industries that serves the DAO market itself "Infrastructure of DAO" and "DAO Tool" capturing together around 20% of the market value, and the third category for the remaining 7 industries that only capture around 10% of the market value.

The reason behind this composition is in the nature of the DAO market, being a nascent market compels investors to prefer short-term returns with no long-term commitments that can help test the grounds and the applications faster. This fast feedback cycle is encouraging more newcomers to head mostly to these industries as opposed to the others. For the second category they grew higher to be able to serve the first category that needs more infrastructure and more tools capabilities to fulfill their needs.

Using the average value of all industries 46.8 M$ to compare between their own average value, it can be learned that DeFi is the most competitive industry with an above average of 74.5 M$ per one DAO despite having the largest number of DAOs in all industries. The two industries of infrastructure are concentrated with only 33 DAOs it means that they require high trust and bigger investments to make value as opposed to the DeFi industry.

In the blockchain landscape Ethereum enjoys a monopoly on the DAO market with around 87% of market value. Two reasons for that, first because Aragon platform that offered fast and low-cost deployment of DAOs is operating only on Ethereum blockchain making it the heaven land for new DAOs. Second is the Ethereum merger that happened last year transforming all the blockchain into a proof of stake validation mechanism, the method that enjoys lower costs and is environmentally responsible encouraging more DAOs to adopt Ethereum. The rest of the blockchain were showing perfect competition among themselves for the remaining market share with nearly evenly split percentages.

Research Findings in Consensus in Elements of the DAO governance model

In this chapter the carefully selected variables were used to reflect the choices of the DAO market in each element affecting the governance model. Starting from the choice of on-chain or off-chain, it was found that with only 80 DAOs operating on-chain they managed to capture more than half of the market share, on top of that 16 DAOs out the top 22 that have minimum market value of 100 M$ are operating on-chain with only 6 left operate off-chain.

Moving on to the voting process, the study discovered that DAOs rely heavily (more than 90% of the market) on multiple stages in their voting process which the literature failed to report and study. With the choices in the market to be between 1

or 2 or 3 stages of voting and mapping out each choice against the choice of on/off-chain. It was discovered that DAOs using 2 stages of voting are associated with operating off-chain and DAOs using 3 stages of voting are associated with operating on-chain. The reason for this is the high cost incurred on DAOs on-chain compared to off-chain, making them in more need of testing consensus before wasting money and time and failing at the end to pass the bill.

Another thing the literature failed to capture is the communication tools used in the DAO, instead of using web3 apps for chatting, the market is found to rely heavily on two sources only. A social media app Discord, and a Governance Forum which is a website open-sourced called Discourse. The usual process stage will go like the following: First a member will propose an idea on Discord app as unofficial discussion, when they find interest in their idea, they post a proposal on the Governance Forum where are full illustration for the proposal is shown and a complete documented discussion happening in the same page that ends with a token-less vote. Second, when the proposal passes, it moves to an off-chain voting app called Snapshot where the members can vote with their tokens using one of the 6 voting systems found in the market to count the votes. The proposal at this stage is a technical draft crafted following smart contract format making it ready to deploy. When the proposal passes, if the DAO is off-chain then a team will take this draft and add it to the smart contract of the DAO ending the voting process for them at the second stage. If the DAO is on-chain a team will take the draft and attach an on-chain voting measure to it on the blockchain for a final binding vote.

Another element in the voting process is classifying the proposal from the beginning and putting different conditions to each of them. The study found that although only 37 of the DAOs classified their proposals they capture 50% of the market value together, it means that it's helping them lower costs and function faster.

As for the voting system itself, there are 6 systems only in the 200 DAOs, with Delegable Voting system chosen by 71 DAOs captured nearly 75% of the market value alone. Other findings for the delegable voting system are that against other variables it's choosing to operate on-chain, using 3 voting stages, and using both communication tools.

For the incentive system approach, the market had two ideas. The money approach, which is basically rebalancing the income between members, either by offering more money to small token holders or contributors that add value to the DAO works, or by implementing limits on usage of tokens. For example, preventing newly joined venture capitalists from using their tokens into manipulating the DAO by forcing everyone to stack their tokens first before voting. The other approach is the power dynamics, a new dangerous trend is found in multiple DAOs, reported

by the users themselves on their governance forum, where big token holders (they name them whales) become so big and with no restrictions they eliminate any impact by the remaining small token holders during the governance process (they name themselves Frogs or Commoners). In Wonderland DAO 5 whales were controlling every vote against the will of thousands of commoners, showing just how much influence they own through tokens in the DAO. To fix this problem, that is discouraging all members from participating again in the governance, DAOs have changed the voting system to be Delegable voting, some others changed into the Quadratic voting system.

In the external task management, the DAO market had more ideas than what the literature has reported. Instead of outsourcing them through 3rd parties smart contract agreements, some DAOs chose to do it in-house through a committee that is dedicated to this type of task only. Other DAOs have created a non-profit foundation that represents the DAO in any external relationship, broker deals on its behalf, and donate to related causes. The alternatives found are much better than the old way, it increases experience among the members, it safeguards the DAO data as they are not required to hand them over to a 3rd party to fulfill their tasks, and finally they are saving costs by doing it in-house.

The last element affecting the governance model is the emergency response and measures of accountability. The DAO market had 4 tactics for emergency response, first one: Delay to review where every proposal is automatically delayed from being implemented on smart contracts for 24 hours or 48 hours until a team inside the DAO reviews all technical details to ensure safety. The second tactic: Emergency track where there are two parallel voting processes that can happen anytime, fast tracking the emergency one with less quorum requirements. The Third tactic: Gatekeeping every proposal where any proposal that passes the voting process must be approved first by a multi-signature approval. It's a permission to modify smart contract that is given only to a handful of special members "often the founding team". The fourth tactic: Dedicated Guardians who are found in a committee (often elected) with the purpose of checking security measures and triggering emergency response when needed without requirements.

For accountability another 4 methods were found. The First is Aragon court, an impartial dispute resolver that can judge any case even from outside its DAO on one condition, if the outside DAOs paid a subscription to this service. The Second is dedicating an accountability committee. The Third is merging this responsibility with the job description of an existing higher council. The fourth is offering checks and balances among a dedicated committee, the DAO members, and the council above.

Research Findings in DAOs' New Approach to Decentralization

A theory originated from an industry veteran, Jesse Walden. Progressive decentralization is all about relinquishing power from the founding team onto the community members. The first stage (Product/market fit) is to deny decentralization in every aspect, to not create a false pretense for the members that could result in losing them in the future. Relying on the founding team only, the DAO has to be brutal and swift in decision making. Testing and jumping from one project to another will be needed until the DAO finds its product market fit. The community members are only in this stage to watch and suggest, as they are denied any tokens. For the second stage (community participation) is to build engagement and turn passive members into active ones as many as possible. The product market fit will result in adding new enthusiastic members, that's when the founding team should relinquish some powers to the community by offering them documentation and open practice that helps in transferring knowledge. While building the community active participation, the founding team has to implement an incentive system and issue token distribution and the same time. This token distribution will be limited and targeted to only people that will be useful or experts enough to the DAO at this stage. The third and final stage (Sufficient Decentralization) is all about KPIs and monitoring. The founding team will keep doing the same steps but now is monitoring the performance while issuing a complete token distribution that fits the business plan that was in place from the beginning. The end of the first stage is when network effects take place, the end of the second stage is when the community is working sufficiently without the founding team.

Another article building on this concept has been published by Harvard business school about a framework to help measure the progress in decentralization. Starting from a minimum decentralizable unit, which is a unit of management that can carry a small project in 5 levers. A core team, a technology stack, external contributors, Finance, and processes. Each of these levers range from 0 to 100 or from centralization to decentralization. And according to the DAO plan and founding team like what Walden said in the original article, the scale is divided by tasks.

The study found at least 31 DAOs are adopting this theory already or are planning to. The process in their version mostly relies on moving on from off-chain voting to on-chain voting, changing voting system from token-weighted to delegable voting system to relinquish some of the founding team's powers. Creating committees to delegate the work to. Banning voting rights on the protocol of the DAO until reaching a late phase when decentralized enough and can vote on anything.

Polycentric Governance is the second approach to decentralization. A self-governance theory that was developed in the context of public administration decades ago by Ostrom and ended with her winning a noble prize. The concept was then taken and modified to fit the corporate world. Both developments didn't put DAOs in their mind when writing this theory but to the surprise of a research, it was found to be applicable on DAOs' market where at least 23 DAOs have adopted a suitable version to them of the theory.

The theory's framework that was adjusted for corporate world is as the following: Identifying multiple centers' boundaries in the organization where each center has a complete authority. Each center is defined based on geography or project assignment or area of expertise. Implementing rules that govern inter-center relations and center management that can be used to hold them accountable. Dedicate a separate budget and means for each center. Employ checks and balances between centers in any direct in the organization accompanied by a dispute resolving path. Replicate the same structure as many times as needed in a repetitive environment then nest them under a collective governance structure.

Examples of this theory in real world are the U.S. constitution, employing checks and balance between institutions of the United States, from the federal government and nesting the same system replicating it into each state of the 50 states with each center and collective centers having their separate budgets. The same goes for the European Union governance system starting from the European court, parliament, council of ministers and then nesting the same structure into every European country with their own courts, parliament chambers and cabinet of ministers.

The examples of DAOs in the study are the following: electing dedicated specialized committees by the community members that take decisions without needing to pass by the community every time. Each committee has its own budget that helps it in managing their decisions. Creating an accountability committee holding them up to the standards and rules. Other DAOs have created Sub-DAOs under them that work autonomously and get elected every cycle.

It can be summarized as PD is enabling passiveness and volunteering governance, it relies heavily on incentive system to cross the barrier of passiveness of the community into the badly needed activeness of the community members to fix problems and steer the wheel. After a while this centerless community will be forced to normally create caucuses inside of it (like party alliances in a congress) but these caucuses will not be held accountable, will not have checks and balances between each other and/or between them & founding team/sub-teams.

On the other hand, PG is forcing members to abandon this passiveness problem and destroying the basis of passive governance. Through creating autonomous multiple centers with separate rules and budgets, PG is engaging the members in the organization's governance, making the incentive system a plus not a necessity. All the while also keeping the separation of powers among its centers.

Conclusion and Recommendations

This study laid the groundwork for the first time in DAO market to completely measure and monitor the progress of the DAOs. using market metrics and classifications, using the elements that help shape the DAO governance model was all the beginning to catch up with market dynamics and fast evolution. The study is limited by time that is the nature of this industry, however the core principles laid out here in every research question are the basis for any future research testing these theories and finding its standing over time.

Recommendations of this study are to use the elements of DAO governance model to measure their evolution over time and the interpretations here about who is more successful and sustainable than the other. Another is to use the two theories of approaching decentralization "Progressive Decentralization" & "Polycentric Governance" as they are found in the DAO market and pit them against each other to see how they are performing and achieving this vision over time.

1 Literature Review & Research Background

In this chapter a deep dive into research background, definitions, and characteristics of a decentralized autonomous organization (DAO) as was obtained and reviewed in the existing literature.

1.1. What is a DAO?

Starting from 2014 in the reveal of the Ethereum white paper. Vitalik Buterin moved the definition and focus of DAO from merely a crypto-utilized dividend transaction of existing corporations to a new form of organization that makes its decisions through a digitalized voting procedure by participation of all its members. This procedure and other operations and relations are governed and executed in a decentralized manner through software code using smart contracts. (Buterin, 2014)

This was an important evolution of the DAO concept, because it expanded its vision from a narrow digital financial application to a new approach of corporate governance.

Some years later the vision turned into action and more detailed examples of what could happen started to shape up and reach a stable status. Using these examples of startups trying to achieve this vision, researchers tried to define DAO and determine what works for it and what doesn't.

A very general definition would be that it is an organization that runs self-governance through pre-determined self-executing rules all the while using a technology that is characterized as decentralized (Hassan & de Filippi, 2021). Others dived deep in details as they said it should use smart contracts to function, determine its rules, and even evolve (Chohan, 2017). Smart contracts are digital software coded contracts with embedded self-execution conditions that can't be hindered, modified, or nullified which in turn protect them from central authority (Rikken et al., 2021).

Another approach is to consider a DAO a multitude of a single unit of smart contract where they work together coherently (A. Wright & de Filippi, 2015). The consensus to define a DAO as a blockchain-native organization (Bellavitis et al., 2022) is because of the characteristics that comes with this technology that are sought after in a DAO Mainly decentralization and transparency. So, it is not about using smart contracts and tokens (or cryptocurrency) that defines a DAO, it is about using blockchain technology for its characteristics and whichever tools associated with this technology to deliver these specific characteristics to a DAO. (A. Wright, 2020)

In a DAO all members should be equal in authority to guarantee a flat hierarchy. Each member owns a fraction of shares in the organization expanding the circle of shareholders into the organization's members themselves. In this it revolutionizes the ordinary corporate theory that considers an organization member in the same category as suppliers, distributors, or the surrounding community as stakeholders benefiting indirectly from its success instead of a shareholder owning part of it. Which in turn incentives its members to achieve their common goal (el Faqir et al., 2020; Morrison et al., 2020; Zwitter & Hazenberg, 2020).

Ownership of a fraction of shares is realized through owning a digital currency type called a token. This token could be DAO-native so it is only spent and earned inside this specific DAO, or it could be multi-DAO token where it takes its value from the public blockchain cryptocurrencies and can be spent inside multiple DAOs. The ownership of DAO tokens not only entail shares in a DAO but also voting rights of the holders on governance issues or decisions related to the organization goals. It also represents the financial structure upon which smart contracts will operate inside a DAO (the operating costs, the rewards, projects valuations, …) (Barinov et al., 2019; Braun et al., 2022; Mini & Gregory, 2021; Rikken et al., 2019; Wang et al., 2019; Zhao et al., 2022).

As we can see from all previous definition arguments, the literature is nearly in consensus on only features of a DAO and not in consensus on one paragraph definition of it. Based on this situation it will be more beneficial to talk deeply about those characteristics.

1.2. DAO Characteristics

In this subsection, I will state and analyze each characteristic separately. This will come in handy before talking in detail about DAO governance to understand how these elements influence the dynamics of governance and whether they contribute to decentralization vision.

1.2.1. Decentralization

Let's first define briefly what a decentralized organization means. Referencing JP Vergne in his paper talking about the difference between decentralized vs. distributed organizations. Decentralization is the distribution of powers among the members with no central hierarchical authority. After many concepts and comparisons in the paper, decentralization vision in a DAO fits the specific definition of "a decentralized-distributed organization" where it means that members don't need to report back or be referred to a central person or group, they report to each other and communicate on the same level of authority. It also means that every one of these members is a decision maker and their "one" vote helps decide the future of the organization (Vergne, 2020).

At first this vision was translated into a belief that the technology alone used in a DAO application, if characterized as decentralized, consequently makes the whole DAO decentralized too. This technology being blockchain which uses a distributed ledger for financial transactions that depend on consensus mechanisms and public access to the ledger with no central authority controlling or changing the rules. Of course, this worked for a while for DAO applications as long as they were dependent on financial dealings only, but the moment they experienced managerial and contractual problems they found themselves in the middle of a shadow centralized system. That's because the decentralization concept was only established on the infrastructure layer of the application and missing on the governance layer (Hassan & de Filippi, 2021).

So, for a DAO to be decentralized, it must get rid of any central authority in it. That would mean that all members will decide together the fate of the organization or the rules or simply any operational decision needed to be taken care of. This process is called voting, voting from all members based on information available and experience embedded (Rikken et al., 2021; Wang et al., 2019).This voting process has different types and rules in multiple DAOs, but I will talk in detail about this later in the next section of DAO governance.

Based on the above, that would result in a theoretical elimination of agency costs that is part of any corporate governance in the traditional governance theory.

Agency costs are the ones coming from having a central authority (CEO or Board of directors) making decisions on behalf of shareholders to expand the company business or profits. The problem here is that while they are doing this, they also have an opportunity to increase their personal profit on the back of the company's future, for example expanding the business overseas to fulfill their desire of personal accomplishment even though the company doesn't need it or lack the market capabilities for it. But in a DAO, shareholders are the members who vote for decisions to steer the company's future. In short, the principals and agents are the same people inside a DAO (Bellavitis et al., 2022; Hüllmann, 2018).

1.2.2. Public Permissionless blockchain

Being built in its core on blockchain technology in the infrastructure layer, a DAO has to have similar characteristics to the technology itself (Boss, 2022). Using a distributed ledger technology for all dealings, communications, decisions, and transactions that is accessible for every user, in other words a public blockchain (Bellavitis et al., 2022; Boss, 2022; Hou et al., 2021; Maggiolino & Zoboli, 2021; Rikken et al., 2021; A. Wright & de Filippi, 2015). Even the code source and software built upon is open source. This improves a key characteristic, being transparent about everything that is going on in the organization not only in the present but also documented later for history referral. As a consequence of transparency, trust increases among members and around the circle of influence (external relationships) of a DAO during its deals with other parties. Trust is a necessity in DAOs on a higher level than traditional organizations, but why is that? Let's see:

- One of the main characteristics that comes with blockchain tech is anonymity of users. All DAO members don't get their identity revealed in the distributed ledger or any form of documentation, instead blockchain uses a pseudo-anonymous tech, in which a user is given a unique ID (contains letters and numbers and so on...) it is also a consistent ID that can't be changed by the user which will partially define all their actions in the ledger without revealing their true identity or personal information.
- DAOs vision requires it to be without limits of access to their members, which translates in the crucial feature of being on a permissionless platform. The permission here refers to minimizing access and privileges inside a DAO to only verified and approved members for example: access to the distributed ledger, the right to join the organization, the right to vote, the right to participate in the validation process of the ledger etc. (Rikken et al., 2019)

Based on those two points it is clear why trust is a necessity in a DAO. On top of that, a blockchain has the core features of functioning on distributed ledger that is immutable and append-only That's why A DAO must be running on a public

permissionless platform to face the necessity of trust problem with an outcome of trustless organization model.

A last note about this characteristic to talk about. Some DAO papers have come out to suggest a permissioned platform-based DAO as a legit idea. There's contradiction here between this idea and DAO's purpose because it results in the need of having a central authority to verify or approve a member identity or even modify and tweak records inside a DAO(Braun et al., 2022), it also discriminates between permissioned and permissionless members if it was a mixed system. When you give access and privileges to some members rather than the others that is basically a central committee indirectly influencing the organization decisions. Or to put it in different terms: this will be the same as using IT in governance of an organization without actually adopting decentralized governance, it will be the same as digital transformation IT projects that don't actually affects the organization governance and hierarchy but only affects its operations, financial and technology management (Rikken et al., 2019; Rychkova et al., 2013).

1.2.3. Smart Contracts

A smart contract is a digital contract built on a software language ex. Solidity, Yul, and JavaScript. But specifically, Solidity is the most popular because of its association with the biggest platform for DAOs, Ethereum. The contract specifies the conditions and the outcome of a task or a financial transaction. They contain governance rules and voting procedures rules of a DAO too (Rikken et al., 2021; Wang et al., 2019). They are known for being "autonomous" in their execution once the conditions written were met, meaning that any payment as a result of a smart contract can't be stopped. A typical smart contract sometimes holds balance of tokens too to decide the path of spending those tokens (digital currency) based on conditions met or rules agreed upon through a DAO voting process.

But why does a DAO need smart contracts to function? Is it a cool plus feature that is not vital? Well, it is a cool feature, but it is very vital in a DAO. Recalling a previous paragraph about the decentralization characteristics we established the fact that a DAO is a decentralized-distributed organization. So, you have every member as a decision maker and they have no one to report to, how can you work this out? According to (Vergne, 2020) a De-Di organization needs a predefined non-controversial protocol that governs everyone, or in better terms: they need a clear path to reach consensus on their organization decisions. A smart contract is exactly what they need, it standardizes every decision process, and it self-executes also increasing trustless status and ensuring non-hierarchical authority to every member. In short it is a vital tool to manage the distributed power in a decentralized organization.

In the beginning of launching DAO's vision in the Ethereum white paper and what followed by Vitalik Buterin conferences and public talks of what could be an ideal peak development in the future of a DAO, a complete autonomous organization built by humans but operated and enhanced by a full capable AI. The AI job would be to analyze and include rules in smart contracts to ensure the minimum costs / errors possible in a DAO's work, but the final decision would have to go back to humans. Now, this will lead (still as a huge theoretical hypothesis) to minimizing transaction costs in an organization because this will help make the contracts as complete as possible with every likely condition of failure or disagreement-fix included by said AI.(Bellavitis et al., 2022; Nabben, 2021; Siliämaa, 2020; S. A. Wright, 2021)

But according to other papers, it will almost never happen like that, at least soon. Let's see why. Transaction costs include also moral hazard and adverse selection(Boss, 2022). While adverse selection affects the external marketplace, where a DAO could operate, it also affects the DAO itself, because at some point this AI would need information from this external market to conjure up outcomes or conditions of the smart contract, so it will use human generated bigdata, so it will be affected by this information asymmetry too. As for moral hazard, it will happen when a DAO chooses a contractor or a third party to execute its projects without collateral damage as a risk mitigator or without signal for morality just as much as it happens to a traditional organization. The only way the AI could help reduce these two costs is by having access to a huge library of bigdata and market statistics and at the same time having a fully developed AI algorithm of finding patterns that exclude bias and false data, only then it could help avoid those two costs, which will take a lot of years.

For the third type of transaction costs, incomplete contract costs, it consists of 3 things the cost of writing (commissioning) the cost of enforcing and the cost of foreseeing every possible outcome and including it in the contract. For the writing one, it is easy to minimize by AI and by an open-source software language. Foreseeing cost, it can theoretically be solved by an advanced AI of statistical analysis capabilities and access to a huge library of bigdata. But for the enforcing costs, it remains hugely dependent on human actions and judgement as it only uses concepts and rules written by humans themselves. It can never be replaced by a non-sentinel AI. (Davidson et al., 2016)

On top of all that, current DAOs only rely now on machine learning software languages and algorithms which are not yet a fully developed AI. The implication of this point is that the same contract is still written by humans from top to bottom. Which in return means it is still incomplete by a large margin(Hüllmann, 2018), thus

it is a digital contract not a smart contract yet. At this level of development, they are considered automatic contracts, as they are automatic in operating only based on pre-defined models and rules written by humans in full scale. This was addressed in an IEEE article (Ding et al., 2021) called parallel governance for DAOs. It has a good approach to solve this problem of smart contracts. They created an algorithm. Its sole purpose is to learn from past mistakes and outcomes and self-correct the smart contract inside a DAO. So, it is a smart contract helping smart contracts to reach enough AI level of intelligence to actually overcome some of the transaction costs.

1.2.4. Tokens

A DAO token is a digital fungible asset that is issued and created on a blockchain that can be used as a digital currency for smart contracts payments, a right/access to vote and operate in a DAO, or an ownership right (security) of a digital entity.

One of the biggest benefits of having a DAO tokenized as a core characteristic, is that it helps in data documentation, financial infrastructure, and ledger decentralization as it is created, pegged, and manipulated by blockchain technology only. Another benefit to working with tokens, the characteristic of being interoperable between different blockchain-based organizations(Bellavitis et al., 2022; Davidson et al., 2016). For example, many decentralized projects are translated in the real world into multiple DAOs to fulfill one project objective together, one for handling the token value, one for smart contracts development and another for handling external contracts. To be able to deal with all of them at the same time, an interoperable token used in all of them is very vital. Not to mention very low in costs, as any other alternative would require paying royalties or gas money for multiple issuers, multiple infrastructure to deal with them, and lastly multiple expertise to handle each of them.

At first a DAO would issue an ICO (initial coin offering) similar in purpose to what a traditional startup would do with an IPO(Bellavitis et al., 2022; Santos, 2018). Offering ownership rights and future dividends in a DAO. It is also a currency for voting rights and that not always comes with a membership token, some DAOs after ICOs would charge (usually more than the price of ICO, to give advantage to people who bought in during the ICO) for a membership of their organization without the right to vote included. So typically, you would have to buy governance tokens to gain the right to vote and participate in the procedures and discussions on top of buying membership tokens.

A token also gives purpose and functionality to a smart contract inside a DAO, as it translates the financial needs, transactions, and endowments. Through a smart contract managed by a balance of tokens, a DAO can pay third parties to fulfill the DAO's missions and projects. It can also help the DAO pay its members their income or in other terms, it can be used as incentive tool for members participation and organization expansion. Reward active members with profit payments after successful projects, or even assign direct promotions to task-handling members in a DAO.(Rikken et al., 2021; Wang et al., 2019)

A token can be native to a DAO, which means it is created from scratch by this DAO or non-native token which borrows another blockchain-based organization's token and adopts it in the DAO smart contracts. A token can be pegged to a fiat money or physical asset (Euro, US Dollar, etc…) in this case it is named a stable coin. It can be linked to another blockchain cryptocurrency, or lastly be manipulated through smart contracts to the desired level of value that a DAO's members want. This manipulation usually happens through taking inflation rates or other interest/financial rates as reference for valuing the DAO token.(Boss, 2022).

1.3. DAO Governance

As was established before in characteristics chapter the base unit of DAO governance is a smart contract that contains rules and triggers to execute an agreed upon situation by the members. If someone used this to study the whole governance, they will find it to be simple in its idea but very complex in its execution as it lacks a comprehensive model to deal with all governance expectations on its own. It also lacks a supporting governance theory to fortify its values whenever there's modifications or expansion to this base unit.

This prompts the need to study the core elements affecting the governance, these elements shape the choices and dynamics inside a DAO. It is also vital to test the application of these elements against the DAO vision and values, otherwise they would be manipulated and tweaked to fulfill a faction's selfish ambitions.

Although these elements are scattered throughout the literature without a clear repetitive pattern, I try as much as possible to give coherence between them to help draw a complete picture of a whole governance pattern of all interactions and decisions possible in one governance model.

1.3.1. On-chain or Off-chain

Starting our journey from ground zero, first a DAO must settle on a vision, mission, and goals for its existence to make sense. The mission will guide the founders and those after them in the midst of turbulences ahead which are statistically common in all organizations.

The mission will also help shape the decisions and concessions along the road, they will modify rules or contracts only because of their adherence to the mission or not. In a situation where some people might divert from the organization's mission towards their own self-interests, the mission will help decide the right thing to do. Lastly any DAO mission should be in accordance and not in conflict with the main vision and values of the decentralized autonomous organizations.

The next step for a DAO is to decide what platform or digital form they would like to be built upon, but what does that mean exactly? According to (Rikken et al., 2021) DAOs have two classifications in total in this matter. They are either created based on smart contracts coded from scratch by the founders or by some developers hired by them, or they are created based on smart contracts pre-deployed before on the web.

The first classification is named "on-chain". It means that the way the founders chose to build the DAO in the beginning made the governance style of it to be on a

blockchain of its own. Using an on-chain governance model is to have your own distributed ledger, your own newly made blocks of data, your own minted tokens, your own coded rules, your own security systems and measures, and your own standards.

Obviously, it will be a more costly decision than other alternatives because you will have to hire people to do all the work from scratch, they will have to spend a lot of time to come up with code and rules for your organization thus the deployment time of your DAO will be higher resulting in running the risk of missed opportunities in the market. You will also have to pay separately for the organization security system and its maintenance. It also runs the risk of being unfamiliar to the industry standards, which would result in additional costs and barriers for any new hires or members to the organization as they would have to learn those basics too. In other words, this decision will affect the present/founding stage of the DAO but also its future position in the market. Another issue that comes with this, is that this type of deployment makes it harder to modify or change rules inside the organization's smart contracts in the future. Meaning that the organization most probably will be less flexible against change and growth from its original form as it is almost impossible for the founders to have had thought of all conditions and situations at the beginning and included them in the contracts. To be fair there are some great benefits too to this decision, having your own security system and different language boosts the organization stability and resilience against hackers or ill-intentions as it means those people will also have to spend more time getting familiar to your unique system which in return gives the organization a good time window to repel most attacks.

As for the second classification, it is named "off-chain". It means that the governance of a DAO built on the second choice is happening on blockchain borrowed from another entity or on a common blockchain upon which multiple DAOs share their infrastructure. How can this happen? By using one of two methods. One is to get online templates for smart contracts which contains common rules and procedures among the industry (for example, GitHub), the other method is using newly developed now-famous platforms that offer user-friendly parameters to build a DAO in a fraction of other methods' time.

It is obvious that this choice will lead to significant cost reduction compared to the first choice. You will save on the deployment costs, in terms of hiring and time, so an embedded benefit in this is the elimination of missed opportunities in the market. It is also good for people with no or little knowledge to begin with, in-experienced investors, as they will be provided with a wide range of templates with different factors that will widen their options. Thus, in that matter, in a relatively short time,

it will exponentially increase market penetration and expansion, as it becomes more and more easy to adopt a DAO idea and deploy it in the market. At the same time, it became very typical work and common that it removed entry barriers and learning costs for future growth of any DAO who chose this method, more members were able to join, and more dealings were made and faster. On top of that, these platforms offer parameters to tweak and modify a smart contract easily (of course after members reach a consensus) making a DAO built using them more flexible and change friendly as opposed to the first choice. If you still don't get the huge difference, you can picture two situations, one where you use an R-studios software and programming language for conjuring some statistics and plots from a big database, vs. two, where you use SPSS software with pre-made statistics and plotting tools ready for you to use and switch between and compare results to test your hypotheses fast and easy. You are more flexible and experimental using the second option rather than the first option.

Examples of these platforms are a lot these days but to mention the most important ones are Aragon, DAOstack, Colony, MakerDAO, MolochDAO. (Baninemeh et al., 2021). For valuable insights into the decision to choose which platform out of them to build your own DAO, check the same paper cited here. These platforms' existence has created a hype and ripple effect in the industry as mentioned before, to say the least. Before and after the creation of Aragon in late 2017, the total number of DAOs has increased more than 200% (Rikken et al., 2021).

Although at the same time there are some downsides to this choice. Security measures and protocols being common will make it easy for a hacker to have multi-access to DAOs deployed on one of these platforms. It will be harder to solidify your own DAO security different than the others as you all will be using the same infrastructure and source code. Using the same infrastructure also have other downsides, for example how many ongoing projects will it take to make the blockchain overloaded, so the service quality will be instable. If something hits that one blockchain, all organizations depending on it will be at the same risk, for example: malicious attacks targeting the chain, cryptocurrency market devaluation will result in devaluation of local cryptocurrencies too in each DAO as they are always pegged to the chain value, same token usage will be influenced by multiple DAOs performance reports and success rate which in turn will cause volatility of its value in a persistent pattern.

To conclude this section, it is up to the founders themselves to decide what is more important for them in accordance with their DAO mission. It is a clear choice between fast but risky deployment with less costs vs. slow but safe deployment with relatively higher costs. Although in the future it is very likely that such platforms

could fortify their security standing and decrease the difference between them and on-chain choice, more studies are needed to test in real time if that can be guaranteed.

The next step in a DAO journey is to usually do an ICO initial coin offering, it is not a must do, it purely depends on the founders' decision and need for more funding for their idea. A DAO would offer stakes and ownership tokens to investors in exchange for their funding to the initial stage of deployment. Most of the time these tokens are only for ownership shares and don't come with voting privileges, but if an investor wants that they would have to pay relatively more. Another aspect is that ICO is done with a discounted price of a DAO's token to attract as many investors as possible in a short time window that ensures no missed opportunities. Consequently, it means that a regular member or investor after the ICO period is finished, must pay the full price of the token, but also for a short time because after some time the full price of the DAO's token would be affected by its success or traction record either in a positive or a negative way. There is also an issue with registering these ICOs as securities and dealing with them under SEC laws in USA, but that is out of our scope.(Bellavitis et al., 2022; Braun et al., 2022; Santos, 2018; Zwitter & Hazenberg, 2020).

1.3.2. Internal Task Management

After all these steps it is time to manage internal affairs inside a DAO. Any DAO would start with original rules and task management measures, they also should have the means and procedures to modify them when a need arises. Task management here means everyday operations inside a DAO, how to handle projects, how to reach consensus to take decisions, how to ensure continuity of business as usual. There are some important factors affecting these operations. I will list them one by one and explain what was included in the literature about them.

1.3.2.1. Voting Mechanisms and Their Consequences

The core feature of task and operations management in a DAO is using a voting mechanism to reach a decision on a subject. What all DAOs have in common is that a member must have a utility token "voting rights token" or in other circumstances called "governance token" to be able to participate in the process, but not all DAOs agree on which voting mechanism to utilize in their process. That's why we need to talk about all these different types or at least the most popular/used of them.

- **One person one vote:**
  This voting system gives a total value of 1 to each person voting in the process no matter how long they have been a member, no matter how many tokens they own. For a bill or a proposal to pass in this kind of system there are several options. Simple majority (50%+1) number of votes agree with the proposal. Super majority 60%+ more than two thirds of the votes. or a "super super majority" which is more than 75% of votes.(Bellavitis et al., 2022; Mini & Gregory, 2021)
  Each choice of them is up to a DAO to decide, there's also another factor that can be differentiated, which is whether to calculate this percentage based on the total number of members or only the number of voters, because sometimes the number of active members voting are less than the total number of members in a DAO. Also, there can be a minimum number of participating members to be reached to be able to count the voting as eligible (a quorum).
  The things that could go wrong with this system are the difficulty of reaching those numbers or those minimum thresholds for participation. That goes back to the problem of incentives and the lack of enthusiasm to participate in every voting process, it is also because as time passes a lot of these votes become repetitive and discouraging (Rikken et al., 2019). Another problem is spending too much time to be able to satisfy these conditions every time which would result in a delay and more operation costs and maybe missed opportunities in general.

The biggest advantage of this system is that it fully represents the concept of distributed decentralized power, where every member is equal in rights and voice.

- **Token-based voting:**
  This system depends on the number of tokens obtained by members to give them the right to vote in each proposal. Some proposals would require a high threshold of tokens ownership to be able to vote, some others require the opposite. This system will result in different privileges between members depending on how much money they spent on the DAO, which could discourage penetration of DAO market to more demographics and markets. An advantage to this system is that a DAO would be much faster in passing resolutions and dealing with operational tasks, it would also imply an obligation to those members to participate in most of the voting procedures increasing incentives and recurrent active members' overall number.
  another consequence of this system is turning the DAO in into a special members club or more clearly a centralized oligarchy organization (Chohan, 2017).

- **Token-weighted voting:**
  This time the system is open for everyone to vote no matter how many tokens they have, but the total tally of the votes is not counted 1 for 1. It is counted as weighted votes for how many tokens are spent by this member. So, for example if a DAO has 100 members 99 of them own 1 token each but the remaining member owns a hundred tokens then the total tally of the votes is 199 not 100 that means if all 99 members of this DAO voted No, and this one member voted Yes, the final result would be 100 Yes against 99 No thus the proposal would pass by just one member voting in favor.
  Consequences of this system are the increasing vulnerability of a DAO against a most famous attack called "51% attack" or "Majority robs Minority attack" the same type of attack that was reason "The DAO" failed, the first ever DAO made and gained traction in a short time (Bellavitis et al., 2022; Chohan, 2017; Santos, 2018; Wang et al., 2019). One member or a very small colluding number of members with enough number of tokens in their possession "Whales" would be able to hijack the organization and change every rule then siphon all the money for their own.(Rikken et al., 2019)

- **Rage-quitting voting:**
  This is an added feature to an existing voting system. For example, a DAO could have token-based or token-weighted voting system with an option of

Rage-quitting added to them. It gets invoked in case that the voting system led to unsatisfying result to some opposing members, they have the option to literally quit in a rage. In a grace period after the vote, they can withdraw their membership and liquidate their digital assets inside the DAO. Examples of platforms using this system is Moloch DAO & its derivative DAOhaus, they also have a safety mechanism against spamming this option when the number of members requesting this option reaches 30% the algorithm block the proposal itself altogether (el Faqir et al., 2020; Faqir-Rhazoui et al., 2021; Mini & Gregory, 2021; A. Wright, 2020). This option is suitable for people saving their rights or expressing their power inside the DAO. It is a good fix to an unfair system; thus, it frees the will of the members and ensures that they are always there by choice not by force (Boss, 2022).

- **Delegable voting:**
  In this system a member can delegate their vote to another member to vote for them. Usually, those delegates will be most reputable or most engaging in the DAO or they could just be anyone, one of the platforms offering this option is DAOStack (Baninemeh et al., 2021; Boss, 2022). This option is designed to overcome the problem of lack of enthusiasm or weak numbers of participation, which in turn will help fulfill other conditions of voting systems like one person one vote quorum or minimum participation conditions. What could be a con to this option is that it opens an opportunity for creating caucuses inside a DAO, which are groups of members following the same ideals and voting in the same way in many proposals. It could be harmful if one of these groups is big enough to take over a DAO, but if many groups are created the possibility of one being able to achieve that is not serious.

- **Holographic voting:**
  It can also be named "Futarchy" voting. This name goes back to economist Robin Hanson definition of this form of government. It basically means that a set of proposals are raised with attached solutions and measures, and the members' job is to predict which proposal would survive the voting measure or would work in its concept in general. And they would bid on this prediction using their own tokens in the DAO, if they win, they gain more tokens by taking over the tokens that other members used to bid against the winning proposal. One of the platforms that offers this system is DAOstack (el Faqir et al., 2020). The benefit of this system is to deal with scalability problems and the pressure of having too many proposals to deal with when the DAO reaches a huge growth rate, so the system is only meaningful if the

number of members is big and/or the size of a DAO business is considerably large. A possible con to this system is that it gives an edge to powerful members right from the start, as they have more tokens to bid and more to spare if they lose, risking being hijacked by an oligarchy system inside the DAO because by using this voting system they can bypass the quorum of absolute majority to a smaller relative majority to approve more proposals favoring their motives (Faqir-Rhazoui et al., 2021).

- **Conviction voting:**
  This system is all about sticking with your initial choices. It is built differently than all previous systems, it doesn't consider one vote registered once as the ultimate vote, it only considers votes that hasn't changed overtime for a number of proposals produced at the same time. So, if a member after some time changed their preference to another proposal, they lose their leverage in the previous one, and they would have to show conviction to the new proposal for much more time. At the end a proposal is approved when it reaches the minimum number of votes that showed conviction enough to them. This fixes the problem of having members changes their votes at the last minute after seeing where others are voting or after colluding with others (Faqir-Rhazoui et al., 2021; A. Wright, 2020).
  A bad side of this system is spending too much time dealing with this mechanism and not being able to intervene in emergency or haste situations which would put the whole DAO at risk.

- **Quadratic voting:**
  This system gives a new dimension to previous voting systems. A member could vote 1 yes or 1 No but, in this system, they could vote either with more than one voice, in this case their vote is calculated in a quadratic equation style, that's where the name came from. Of course, this would require them to pay more to be able to emphasize their voice toward a proposal (A. Wright, 2020). This system has the same pros and cons as the voting system called "token-weighted voting".

- **Meritocratic voting:**
  Also named Reputation-based voting. It is built on the concept of rewarding hard working members by making their vote more valuable than the others. Hard working here means always engaging in discussions and voting process, maybe also suggesting new proposals. This work-driven reputation is not indefinite, it is switchable and changing every other time according to the amount of work or participation achieved by the members, you can earn

reputation scores either by contributing regularly and/or by getting good ratings from other members on your past contributions. one of the platforms offering this system is Colony (Boss, 2022; el Faqir et al., 2020; Santos, 2018). According to these rules, this system is quite fair as it doesn't depend on money spending or on influence buying, and it is available to all members to achieve.

Another more detailed approach to this system is the one offered by Backfeed. They split the reward of a hard-working member into two types of tokens, one economically based on returns of their related successful/profitable proposals, the other based on reputation score that add weight to their vote in any proposal after that, so the most impactful token here is the token related to their reputation score not their earned money (Davidson et al., 2016).

Finally, after settling in on an overall voting mechanism a DAO would implement these rules onto their smart contracts and use it as the governance core concept and means. No matter which system is used, there will arise 3 types of problems one is consensus, another is wasting a long time, and another is non-specialization (Bellavitis et al., 2022). The problem of consensus arises from the lack of reaching a decision easily when all members are equally powerful in changing this decision, which will push the boundaries of amount of network nodes between members needed to agree on common ideas. Consequently, this will lead to the worsening of the second problem, extending the time needed to reach a decision at every opportunity. But more specifically, there will be a huge lack of specialization and knowledge among the members as it is nearly not probable to have all DAO's members with enough background on all decisions' science or knowledge. All these problems should be counted as new types of transaction costs inside a DAO as they primarily happen because of the characteristics of a DAO, particularly decentralization.

How to deal with these types of costs or problems was explained in detail in another paper (Zhao et al., 2022) which we will illustrate in the next points.

1.3.2.2. Task Classification

To be able to reduce the negative effects of the three problems mentioned before, we use the institutional theory by Puranam in 2014 of new forms of organizing which was used to extensively study DAO organization form in the paper by (Zhao et al., 2022). The first step is to classify the decisions themselves, into strategic tasks, and operational tasks.

Strategic tasks are decisions that have major, irreversible, and long-term effects. Typically, these tasks happen within a long period of time. Examples of strategic tasks are modification to the voting mechanism of a DAO, deciding which cryptocurrency to peg the DAO's native token to, deciding which resources-rich project to have a green light, and changing the rules of accountability and emergency procedures in the DAO.

Operational tasks are short-term recurring decisions and most of the time have a repetitive nature. Examples of these tasks are admitting new members, deciding the interest rates on the DAO's native token, voting on recurring procedural motions which are purely based on what is written inside the smart contracts at the time, and considering which projects with short-term impacts to fund.

Of course, there can't be a person classifying each task, the appropriate way for a DAO is to use the definitions of strategic & operational tasks and create a filter-like function inside their smart contracts to flag each task according to its type which in return help in the process of decision making and governance.

1.3.2.3. Task Allocation

Having classified which task is which, second step is to allocate resources and time accordingly which will increase efficiency of decision making, decrease some consensus costs, decrease the time needed to reach a decision and the problem of non-specialization in the DAO.

The notion of task allocation as explained by (Zhao et al., 2022) is far too hard to police or guarantee in a decentralized governance system from the lack of central management and the pseudonymity status of the DAO members, on the contrary in a centralized traditional organization a team leader or a C-level manager has the full authority to allocate tasks according to their team's skills and availability. Thus, in a decentralized organization task allocation can only happen by volunteering or self-recognition of a member's skills.

This for sure creates shear force on the dynamics of internal task management, especially in operational tasks. Operational tasks are skill-focused and skill-sensitive at the same time. They need experienced people to handle them and sometimes in more than one skill at a time. They are also repetitive in their nature, so they are usually ignored from or less encouraging for non-concerned members which gives legitimate room for experience-related members to have their weighted say in these tasks. But a problem could arise from false proclaims by members that they have enough expertise in the related matter during members' deliberation before votes and then the DAO faces the consequences of inexperienced opinions and decisions.

For strategic tasks there would be another higher need in place negating the effects of lack of task allocation, this higher need is the need for mass support from the entire DAO. This is self-explanatory only because of the nature of strategic tasks and their huge demand for resources and their huge impact on the whole organization path in the long-term. Thus, we don't have to wait for an experienced member to adopt a strategic task to be able to decide collectively. It is also because strategic tasks require everyone to be on board when deciding the future of the organization, i.e., most members must be involved.

1.3.2.4. Information & Communications Flow

A huge factor in reaching consensus and reducing time wastes is having a communication-rich environment with easy tools to access. This is a straightforward matter for traditional organization as they use virtual or physical meetings to discuss decisions and ideas before going through with a plan, they also don't get gridlocked by lack of consensus as they have their central authority to intervene and move things along.

Communication here includes debating and discussing decisions or matters of concern either outside or during a timeline of voting procedures between a DAO's members. With the pseudonymity status of the members, using social media or a mobile messaging system is not available for a DAO. If the DAO was built with the help of off-chain governance platforms like Aragon, DAOstack …etc., They rely on embedded chatting services inside these platforms that keeps their pseudonymity status intact. If not built on these platforms or simply not included in the service, they typically depend on decentralized messaging service apps like Whisper, DAOtalk, or other anonymous-friendly platforms to communicate. Although these tools are not as effective as physical and remote meetings. (Baninemeh et al., 2021; Faqir-Rhazoui et al., 2021; Rikken et al., 2021; Santos, 2018; Zhao et al., 2022).

Another factor that affects the problem of time-consuming decisions and non-specialization, is information flow. It includes making information available about each decision during the period of discussion and to all members. It also includes making public all rules and conditions of smart contracts related to each decision and in some cases previous discussions and opinions about similar decisions.

Now to study the different impacts of both factors on the two types of tasks in a DAO, strategic and operational. Communication is always going to have a positive impact on any type of task no matter how different or repetitive it is. As it enriches the characteristics of a DAO and ensures decentralization. To be precise the positive impact of communication on strategic tasks are more than those of operational tasks, simply because strategic tasks come with the need for wide support, and

support at that level can only be achieved through clear and open communication between concerned parties. As for operational tasks it gives clear explanation to the members with no background knowledge and for those with skills it helps them determine the correct numbers to consider inside a decision for example determining the interest rate on the native token is not reliable if it didn't include UpToDate information from the markets to help secure a better value (Zhao et al., 2022). Only in some cases it would be counter-productive to spend more time discussing recurring or repetitive matters than actually deciding them.

1.3.2.5. Incentive System

The last element affecting internal task management is the ability to incentivize members to always participate in the process and add their useful input whenever needed. Referring to agency theory that governs traditional organizations, because of using agents (CEOs) to act in benefit of principles (shareholders) an incentive system is a must to align the intentions and motivations of an agent with those of the principle. For example, linking a bonus rate for the CEO to the company's profit rate, motivates the CEO to include in their self-interests the company's profit rate too (Boss, 2022). Now for a decentralized autonomous organization, there's no agency theory as all members are shareholders at the same time, which in return would have meant the elimination of the need for incentives.

Surprisingly, A DAO still needs that system and can't only rely on loyalty and commitment from their members towards its mission and goals, there has to be an incentive system built on the premise of rewarding. Because, in real life, other problems arise and bring back the need for incentives, one of them is free riding. This happens when some members own small value of tokens (shares) and they are part of a DAO that relies in its voting mechanism on "token-weighted" system, which means their impact is minimum during the voting process compared to large token-holders in governance issues thus they will lose interest in participating and depend on free riding of receiving a reward in relation to their token ownership value (Zhao et al., 2022). Another reason, even without token-weighted voting system but in the presence of token-weighted reward system they will still be discouraged to participate, seeing that their reward is relative to their small amount of ownership only and not based on efforts, contribution, or other factors (Zhao et al., 2022).

The example of the basic form of incentive system is found in the paper (Barinov et al., 2019) using the proof of stake method for validation consensus mechanism. It offers an equal share and distribution of the stakes' rewards after completion of the process based on the number of blocks registered by each validator directly. Or another method in the delegated proof of stake, by offering 70/30 reward

distribution ratio with the validators taking 70% as minimum and 30% distributed between them and their delegators.

However, if we return to the task classification mentioned before, an operational task will be affected negatively by this common approach of reward system it will push the large token-holders to choose any decision that magnifies their profit in the short-term other than caring about the organization (what affects their next paycheck). For the strategic tasks it will also have negative outcome, it will embolden them to vote for long-term risky decision just to benefit from its short-term income increase then cash out their money from the DAO and leave the organization (Zhao et al., 2022). The main trouble with this approach is creating an unbalance of power between members of the DAO that opens the door for a minority to dictate their wishes to the whole organization as if they are C-level managers but in anonymous mode. Consequently, this will transform the DAO easily into a centralized organization and will make no room for personal growth of DAO's members, no environment to contribute their thoughts which overall destroys DAO's purpose.

Some applications tried to fix this botched approach to rewarding system in DAO, Swarm City and Backfeed. Using Meritocratic voting system that is based on reputation scores earned from hard work and contributions. Then they put forward two types of currencies linked to two types of rewards. An economic token that is transferable in value and a reputation score that is nontransferable, and the final rewarding value is compromised from both tokens scores which will differ from one member to another. This separation will prevent anyone from buying their way into power. They diverted the problem away from the money influence and at the same time given the full opportunity to any member to reach this score without any hurdles caused by their status or finance. This helps keep a dynamic power distribution not a stagnant central one (Beck et al., 2018; Davidson et al., 2016; el Faqir et al., 2020; Santos, 2018). This is also similar to the concept introduced in the paper (Barinov et al., 2019) to use dual token environment to deal with the volatility of the markets and the different ratios and rates used to peg a one token of a DAO. By assigning one as economic (transactional) token pegged to a fiat money and another a governance (staking) token that can stand the volatility and chaos of the market, at the end that would help incentivize members to use the staking token more often as its value would not remain the same and they can profit more.

Although there's no clear guidelines for an incentive system in the literature, many papers talk about two factors that affect the nature of the incentive system in a DAO often. The first is Gas money. It refers to the total cost being borne by the members to validate and document a vote result into the ledger, some costs also go back to

merely running the smart contracts of a DAO and its related infrastructure. The gas money differs based on the consensus mechanism used in the organization to validate the voting process, either proof of work (PoW), proof of stake (PoS) or delegated proof of stake (DPoS). Proof of work is the costliest choice, but it was the oldest and the most commonly used tool. The landscape of the industry nowadays is much different, as more and more organizations choose the proof of stake instead of the default proof of work mechanism, it is much cheaper, faster, and significantly more environmental-friendly choice of governance. Proof of work requires a huge amount of calculations that evidently needs high amount of processing power that cost more money and consume a lot of electricity that at the end increases the amount of global warming emissions released. Proof of stake and delegated proof of stake only depend on people staking their assets (tokens, security tokens) to prove their worth in validating the voting results in any process. So, it does not require processing or computing powers thus much cheaper and faster.(Barinov et al., 2019).

Based on this situation it is clear that the incentive system key numbers will differ from an organization using (PoW) consensus than another using (PoS) as the total profit for a member will differ if they used the same income reward numbers subtracted with different cost numbers.

The second factor is the number of active members at the same time in a DAO. As I have explained previously that the core process of governance in a DAO is the voting mechanism to proceed with decisions, changes, or rules. During a "50%+1" attack a DAO could be hijacked by a coordinated majority to do their bidding in every decision leading even to the end result of siphoning the DAO's own money into this majority's accounts. The probability of an attack like this happening and succeed increases proportionally with the decrease of number of active members of a DAO, for example instead of needing 100+1 members they only need 5+1. Another consequence is that the lower the number of members in a DAO the more the DAO becomes an echo chamber of a group to dictate whatever they want and discourage others from participating as they have no power, and the environment lacks enough diversity to ignite debate and engagement.

According to the paper study done by (Rikken et al., 2021), there is a minimum threshold for the number of active members of a DAO that secures the system and prevents the collapse of the organization. Using survival analysis technique on several DAOs and their related activities and members the paper showed that mostly all DAOs with number of active members voting regularly on every process equal to or less than 20 active members, quickly lose their base members and engagement, thus dissolving all the DAO afterwards. In other words, a DAO is

advised to have more than 20 active members to maintain its existence and pursue its goals. Thus, it is in the interest of the incentive system to increase the number of active members too as much as it is concerned by rewarding the already participating ones. This factor will put the spotlight on a new type of members "churning members" in the incentive system.

1.3.3. External Task Management

There are three types of external tasks identified that a DAO could do regularly in their day-to-day business.

1.3.3.1. External Governance-related Tasks

Based on what was established before, most DAOs now are relying on off-chain platforms for deploying their blockchain and doing all their related voting processes and smart contracts management. With this path comes the problem of having to communicate between members outside of the chain and having the actual voting logs and history outside of the ledger itself, this leads to a delay in the overall voting process and governance, but it also leads to the need of documentation outside of the chain and coming up with rules to define their validity and how to deal with them. This task should be dealt with and included inside the smart contract of a DAO, it also helps nurture engagement and keep it alive in the off-chain governance path.

Another example happening off-chain is research activities and third parties' conversations needed to be documented as a reference for future proposals or future stalemate in a voting procedure. Another example is any marketing plans or media coverage representations (public relations work) whether it is for marketing the DAO business itself, or it is for merely acquiring more members to the DAO. This kind of PR work needs to be documented too and kept in place for public access to any member concerned with the history related to the DAO. Not to mention the rules regulating these issues and their consequences should also be included in the smart contracts.

1.3.3.2. Collective DAOs working for the same DAO.

Instead of creating one DAO to deal with all tasks related to everyday business to its goals, a new trend is creating multiple DAOs often task-oriented to serve collectively the purpose and goal of the main DAO. For example, a DAO with smart contracts dedicated only for regulating and managing the value of the governance and economic tokens of the main DAO, another DAO with smart contracts dedicated for admitting new members or dealing with membership issues and demands, another DAO with smart contracts dedicated for dealing with 3rd parties' issues and so on. The Idea of having a Collective DAO like this, raises the need for regulating the relationships and interactions between them, when should they report their results, what happens when they suffer a delay in performance but at the same time another DAO needs their work to proceed with their own procedures.

All this should be included in the main DAO smart contracts as well as each smaller DAO with their other respective related DAOs.

An example of this is KyberDAO the sets up relays to activate interoperability to connect different blockchain systems(Mini & Gregory, 2021). Another one is some DAOs with small number of members found in Aragon DAO platform, like "mStable" which provides stablecoin infrastructure to exchange stable coins without additional fees and PieDAO is focused on profitable investments using automated tokenized strategies (Faqir-Rhazoui et al., 2021).

1.3.3.3. Third Parties agreements

This category includes all legal agreements or contracts brokered by a DAO with a 3rd party to complete their day-to-day business. It includes contractors for physical or digital official works as a result of voting procedures that settled on the details of this contract. It also includes any campaigns or financial dealings agreed upon with 3rd parties whether to promote the DAO's works or help finance part of it. This particular category needs to be drafted inside a separate smart contract in a DAO which includes all possible outcomes and conditions to handle any situation that may arise during or after these agreements.

1.3.4. Accountability & Emergency Response

After choosing a governance path and all details of internal and external task management in a DAO, A DAO needs to have accountability measures and if needed other measures to handle emergencies. This point has two sides, legal accountability, and internal accountability. The literature extensively studied the legal or external liability side only, how can a DAO be held accountable in case of breaking the laws or fraud or merely how to define the DAO personality in front of the laws. This side of accountability is out of the scope of this paper, however internal accountability of the organizational concern is in this paper's scope. I will try to mention most related parts to this point that were reported randomly in the literature.

Accountability here means the need to hold every member to the same standards and responsibility. It covers the situations where there's a punishment needed to be taken on members who defy rules and order or deal with people having a dispute. A control mechanism as named in the paper (Zachariadis et al., 2019) to ensure a good behavior by the members and good communications. For example, Aragon platform for DAOs has created the Aragon Court which is a decentralized programmed protocol that is designed to manage and settle any human disputes inside a DAO by the help of "human guardians" that make these judgements to settle disputes. Another, in MolochDAO protocol to approve Rage Quitting only to members who voted No on proposals. Another, in creating a monitoring core software to track, record and report any suspicious behavior from a DAO member during the governance process like in Aragon, or to raise the process of "Guild kick" proposal that allows members to punish and remove a malicious member like in MolochDAO (Mini & Gregory, 2021).

Another part of accountability is to protect the organization itself from opportunistic behavior that comes with members actions. One of them is from new members or fake new members that their purpose is to sway votes or mess up the rules inside the DAO, there's entry fees that creates a barrier to this behavior. Another bad behavior mitigation was mentioned by the paper (Braun et al., 2022) to deal with the situation of shirking of some members from exerting efforts in a DAO which would lead to an overall loss of revenues to this DAO. It lays out a process of documenting every effort of members then observe with the help of this public record the shirking attitude of a member then raising a motion of accusation, followed by a voting procedure to punish this member however the member can bribe and collude with others to acquit himself of all charges, but a rigorous system

is put in place to punish this behavior and if it fails to stop it, the last resort is to leave it to the judgement of the members themselves as this will ultimately lead to the loss of trust and devaluation of their DAO which in return would increase their loss.

All the above is concerned with future and past situations that needs time to be deliberated and settled, but for the present situations that have no time window to act and require a quick and decisive response from the members, which is emergency response. In the event of price market chaos or token devaluation or the event of financial risk of all the savings and assets of the members there is software protocol & human-based mechanisms embedded in smart contracts that allow quick and decisive interventions to protect the DAO's internal assets valuation, for example, Aragon shutting down and freezing operations mechanism by only a member request and postponing reasoning for later. The DAO controversy which is the failure case of the first DAO ever achieving market traction, is the perfect example of why emergency procedures are needed in any DAO governance model. The hacker didn't syphon all the money in one second or by one click, they used a loophole in the smart contracts to trick the algorithm into believing the actual transaction didn't happen yet, so they kept sending multiple transactions to their own account. The whole period of this incidence wasn't enough for the DAO to reach consensus and quorum to stop the attack, simply because this was the wrong mechanism to follow during this emergency if there was a shutting down or override mechanism in place all the harm would have had been avoided (Morrison et al., 2020; Santos, 2018; Zachariadis et al., 2019; Zwitter & Hazenberg, 2020).

2 Research Gaps & Questions

It is clear now after this comprehensive review of the literature, that there are serious gaps in identifying and studying a governance model for a Decentralized autonomous organization. The elements of this model are missing, their definition, the way they are being used and why. Another crucial aspect missing is the studying of the market landscape of the DAO and the shape and behavior in their success story because studying the market behavior helps identify the successful examples and their performance over time. The literature was either keeping it at the general definition level in most aspects or studying repeatedly a case (a DAO) that shows the effects of one element of the governance model or a fraction of the market.

All of this is preventing mass adopting of the decentralization model of governance by the existing corporations. There can be no convincing case for an incumbent corporate to enter the decentralized model without a literature comprehensively studying the complete model and extracting the learned lessons in every element to try to make organizational theory literature catch up to the already advanced technology adopted in this model.

So, the research questions of this study are:

RQ1: what is the DAO's market landscape and key trends that shape the market performance?

RQ2: what is the current consensus among DAOs about the elements of a decentralized governance model?

RQ3: what are the new ideas of approaching decentralization found in the DAO market now and not in the DAO literature?

3 Research Methodology

The main goal is to gather and analyze information on the market landscape of DAOs, their governance model and their protocol details. Being transparent as part of their characteristics means that the research sources should rely on public-sourced information.

According to multiple online sources and to latest literature (as late as last year), there are over 4000 DAOs already in existence since the beginning of the industry. Not all of them are still active since the day they were created, for example as of the end of year 2021 only over 1600 DAOs were active (Rikken et al., 2021) so less than 40%. As a result, another approach is followed in this study, given that our main goal is to find the latest governance trend and the consensus of elements chosen by the industry, it makes sense to link the number of DAOs in this study to the maximum possible market share they collectively capture together of the DAO Market. This comes from being successful enough to capture and maintain the majority of market share, meaning that they are collectively controlling the DAO market and setting its trends.

The market share of DAOs is represented by the market valuations of their digital and physical assets, which is mostly represented by token valuation. This is because any DAO would have to use a token to enforce a smart contract with the mission to create a new value for the DAO. They would also have to peg their physical assets' value and link it to the same financial token or a separate one. Thus, at the end, the overall approximate market share of each DAO in the DAO market would be represented by their respective treasury token's valuation. Two websites made it their main mission to report live data about DAO market and DAO valuations, their sources are none other than the DAOs online public records themselves. "DeepDao.io", "CoinMarketCap.com".

"DeepDao" is concerned with reporting treasury valuation of each DAO, and the internal management aspects of the DAO, comparing their governance decisions to one another and collecting classification variables about them like the industry of operations, and the main chain used. The other website is mainly concerned with reporting the volume of token trading and issuance for each DAO, so its purpose is more aligned with financial related goals not governance ones.

More in-depth information about each DAO governance model is found inside their respective public documentation website, as it so happens most of the DAOs recently are using one website, "GitBook". For the other number of DAOs that don't

use this website, other public sources are utilized like their own blog that can be found in "Medium" website, or off-chain page "Snapshot or others" or on-chain page for voting on proposals. Other sources influencing the governance elements are something called governance Forums. They are internet forums public to view but exclusive to DAO members only to use, they use them for debating and expressing opinions about proposals or the organization goals. They are a great source to watch their journey in governance as well as feedback about satisfaction or dissent against the governance elements/decisions.

All collected information is dated as of 20th of March 2023. It's important to report that because of the nascent nature of this Industry and constant change. The data is then extrapolated and tabulated. Using data analysis and descriptive analysis methods, I try to find relations and interpret performance merits out of it.

The variables in this study include the following:

1- Rank: ranking the DAOs in descending order from the biggest Market Value to the lowest Market Value.
2- DAO name: reporting the name of each DAO in the list. "DeepDao" website
3- Treasury M$: also, can be named inside this paper as Market Value M$. reporting the market valuation of each DAO from "DeepDao" website in the value of millions of US. Dollars.
4- Industry: reporting which industry each of the DAOs operates, the area where their product/service takes place. "DeepDao" website
5- Main chain: reporting the blockchain where each DAO decided to build its chain on. "DeepDao" website
6- Voting System: reporting what system of counting votes each DAO follows in their voting process. This variable's sources are: "Gitbook" page of the DAO, or "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO, or "Snapshot" or "Tally" page of the DAO.
7- On/off chain: reporting where the protocol operations of the DAO happen. On-chain is only for DAOs that can't implement smart contract changes without including a voting stage inside the contract. Otherwise, the votes are happening off-chain before changing the protocol with no vote. This variable's sources are: "Gitbook" page of the DAO, or "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO, or "Snapshot" or "Tally" page of the DAO.
8- Voting Stages: reporting the number of votes needed to happen during the voting process of a DAO before implementing changes to the protocol/smart contract. This variable's sources are: "Gitbook" page of the DAO, or

"Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO, or "Snapshot" or "Tally" page of the DAO.

9- Proposal Classification: reporting whether a DAO decided to classify a proposal before entering it inside the voting process, with each classification having a different voting path/parameter. This variable's sources are: "Gitbook" page of the DAO, or "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO.
10- Communication Tool: reporting each DAO communication tool where discussions and debates are part of the voting process. This variable's sources are: "Gitbook" page of the DAO, or "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO.
11- Emergency Response: reporting whether a DAO decided to adopt an emergency response path. This variable's sources are: "Gitbook" page of the DAO, or "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO.
12- Accountability: reporting what measures of accountability a DAO has taken or embedded into the governance model. This variable's sources are: "Gitbook" page of the DAO, or "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO.
13- Feedback: this variable is for reporting any member's feedback about past or current governance issues, also for reporting any incentive measures implemented by a DAO. This variable's sources are: "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO.
14- PR & 3rd parties: this variable is for reporting any external relationship management measures done by the DAO in the governance structure. This variable's sources are: "Gitbook" page of the DAO, or "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO, or "Snapshot" or "Tally" page of the DAO.
15- Progressive Decentralization: reporting any current or future plans for implementing Progressive decentralization concept into the DAO governance model. This variable's sources are: "Gitbook" page of the DAO, or "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO, or "Snapshot" or "Tally" page of the DAO.
16- Polycentric: reporting any current or future plans for implementing the polycentric governance theory in the DAO governance model. This variable's sources are: "Gitbook" page of the DAO, or "Medium" blog page of the DAO, or "Discourse" governance forum page of the DAO, or "Snapshot" or "Tally" page of the DAO.

In the next chapters Research findings by descriptive and statistical analysis will be reported for multiple aspects of the DAO vision: The DAO market landscape statistics to show general information and parameters measuring the market to paint the picture clear about who controls the market and how it is concentrated. The consensus in governance model elements among the DAOs to show in each element what did the most successful DAOs chose to adopt and use to reach that success and comparing that to the literature arguments about the same elements. Trying to find patterns of success among the DAOs based on their choices. Finally, a special report on new ideas for decentralization combined with the theoretical and literature side explaining these ideas first and then comparing them to what the DAOs implemented in the market.

4 Research Findings: Market Landscape

In this chapter we will try to get a sense of how the market is shaped in DAO market, and what are the main elements intertwined with bigger market shares. Thus, it will try to answer the first Research Question.

As of the year 2023, the DAO market consists of more than 10k+ companies, not all of them are active. Some of them are still in the deployment phase, these companies are operating on something called Testnet. Testnet is a test blockchain network designed to experiment with the parameters of operations and implementation, through these tests they settle on the shape of governance and smart contracts parameters of a DAO, and in the final stage they deploy the agreed-upon output onto the "Mainnet" which is the actual working (live) blockchain network where real transactions and smart contracts executions are happening.

Another large part of the market is "Archived DAOs". This category of DAOs are old organizations either with a completed short-term mission or the ones which were forced to cease business operations after hacks or security attacks. Important to note that being hacked or having tokens siphoned out of a DAO doesn't mean the DAO will cease to exist, they still in some cases perform forking or enhance their security then move on with their business.

To cut short, the main parameter of the study is how many of these DAOs control the most market share (absolute majority) to this date. This market share is evaluated by valuating the tokens owned or issued by a DAO, these tokens often represent face value of the digital value of the organization itself and how much they can handle or pay to fulfil their smart contracts, or in other instances they represent physical assets owned by the organization but translated into a pegged value of digital token in the digital space. The reason to choose this parameter is the nature of DAOs business as mainly approving or tying any business to a token transaction embedded inside a smart contract, whether it's a sale or purchase. First the value was set as how many DAOs with treasury valuation (absolute market share) more or equal to $100K, this resulted in a small number of DAOs roughly 206 ones. To make sure that this value will capture most of the market share, an analysis was done and found that the first 200 DAOs of the market hold more than 95% of the whole DAO industry's value.

As of March 2023, the DAO market value is at $14.5 Billion, with the first 200 DAOs valued at $13.852 Billion which makes their collective market share at 95.5% of total industry. From this point on in our study, any market share percentage will actually be a relative value to 95.5% of the grand total value because they will be calculated as part of the $13.852 Billion share not the grand total $14.5 Billion.

That will result in a mean value of $69.26 Million, only 28 DAOs are above that average treasury value so about 14% of the top 200 DAOs. It will also result in a median value of $5.6 Million at the 100th DAO on the list, because this value is too low it indicates that the distribution of this variable is not normal distribution and a very small number of entries (DAOs) capture more than half of the overall summation of the variable (Total relative Market Shares), as the median value stands at 1.273% percentile left in the list, meaning that the second half of the variable (the second 100 DAOs) is only valued at 1.273% of the total summation of the relative market share. All of this is easily demonstrated by the box plot in Chart (01) along with the descriptive analysis values reported in the table below that table (01).

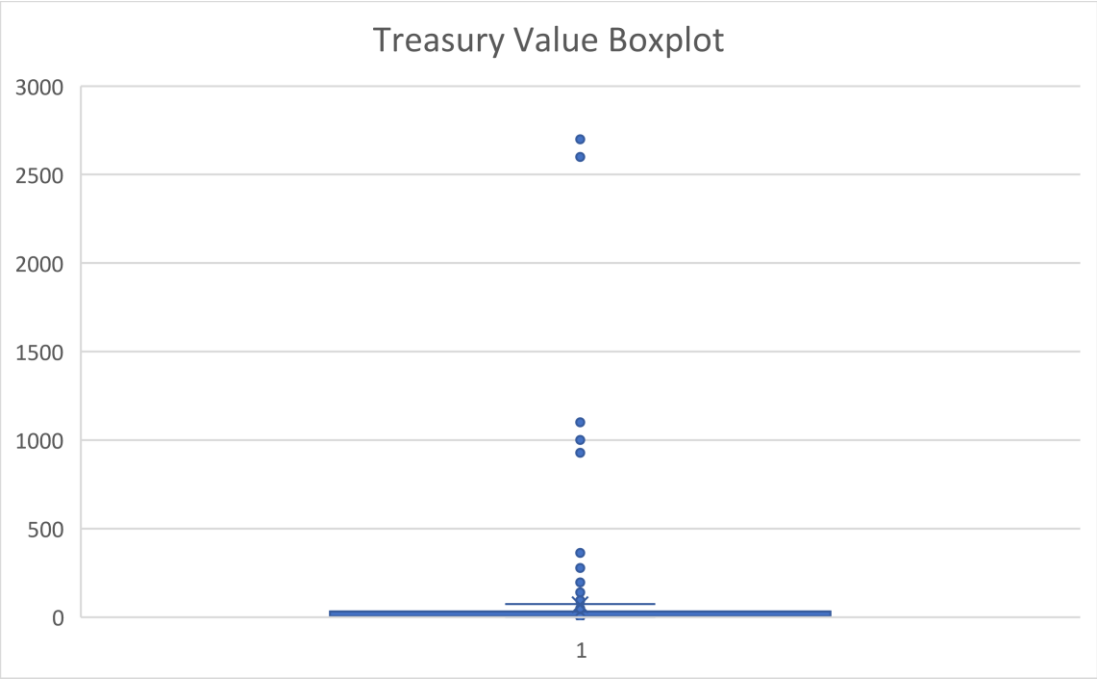

Chart (01) – Distribution of the variable Treasury value (market value)

Min	0.112 M$
Q1	1.325 M$
Median	5.600 M$
Q3	31.425 M$
Max	2700 M$
Mean	69.263 M$

Table (01) – Descriptive analysis for "Treasury value M$" variable

Now that the general layout of the industry market share is clear, let's dive into the different compositions inside the industry. For example, what is the share layout of the 200 DAOs exactly? in which market or specialty do these DAOs operate? And how are they compared to each other?

Market Share by DAO

The exact relative market share of each of the 200 DAOs is visualized in Chart (02) the Pie chart is represented in both absolute value of the share and the percentage of the share too. The absolute value is in M$ meaning that Uniswap for example has a share value of 2.7K M$ or $2.7 Billion, that's what the K stands for in the chart. From this visual, it can be seen that only four DAOs capture around 50% of relative market share (Uniswap, BitDAO, ENS, Gnosis) so only 2% of the first 200 DAOs control 50% of the relative value of the market.

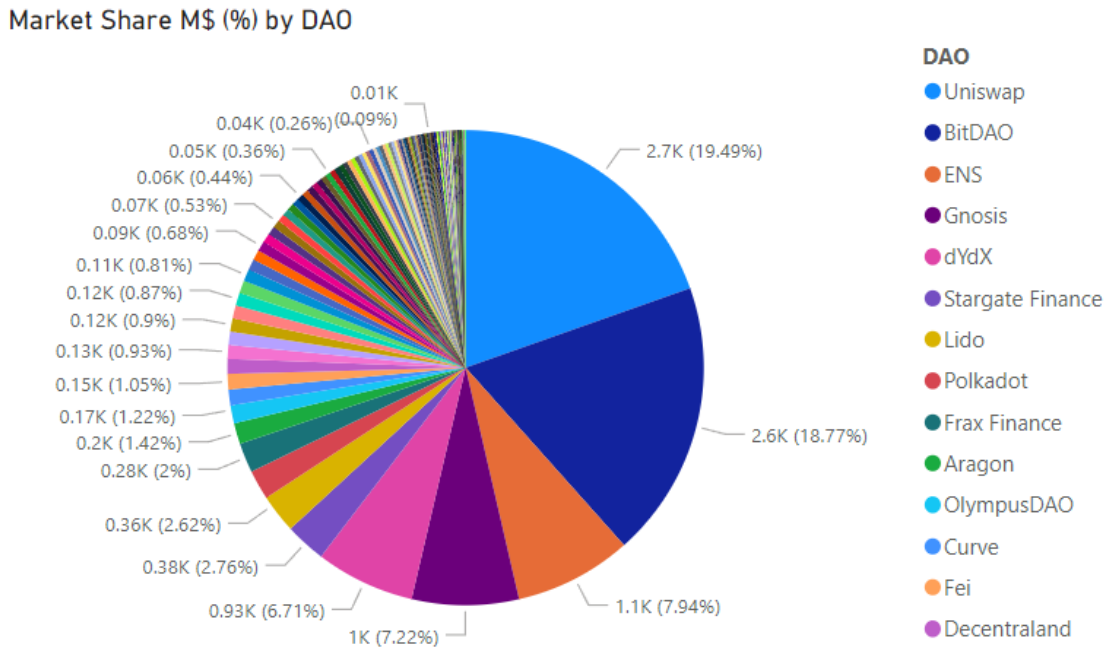

Chart (02) – Market share distribution for each DAO

But do all these DAOs have a particular specialization or industry? The website defines 12 industry classifications for these DAOs. Let's understand their definitions first:

1- **Art & Culture**: this industry's mission is to promote and support Art & Culture related causes either by donations, direct investments or trading physical and digital assets that is characterized by this classification.
2- **DAO Tool**: this industry's mission is to create and maintain tools that are part of the DAOs operations, examples: tools to communicate, tools to manage liquidity pooling or investments streams, tools to facilitate financial deals brokerage.
3- **Decentralized Science**: their mission is to create a decentralized crowd-funded environment for scientific research and its publication. They will also crowd-invest into topics that have more potential for advancing science overall. Reviewing and publishing is also organized in a decentralized manner.
4- **Decentralized Finance (DeFi)**: their mission is to offer the same financial system that exists now but in a decentralized vision, meaning there won't be any intermediaries, public ledgers always available which will eliminate the need for banks and exchange agents.
5- **Funding**: this type of industry is only about fundraising missions; they can support causes or just help fund any mission. They are different than investments as they do not use their own money only as a means for financial returns. They fundraise from other entities and sometimes do not seek return on funds after that.
6- **Gaming**: their mission is to help develop or maintain dApp based games. They also seek to help the gaming industry itself to reach a decentralized environment to help developers and gamers. Some of the new models they developed in the gaming industry that caught a lot of traction is the play to earn business model.
7- **Greater Good/Political**: their mission is to be political and social activists. They accomplish this mission by fundraising or investments or just public awareness campaigns to pollster movements or causes for the greater good of humanity.
8- **Infrastructure of DAO**: this industry is the blockchain layers themselves that DAOs choose to operate on. Or any network or sub-chain created under a blockchain to group some DAOs and provide their infrastructure. They are also governed by a DAO that helps determine their rules of operations and industry standards.
9- **Investments**: this industry could also be called venture capital. Their mission is to invest in firms or funds that are at the emerging early-stage of their life

span. This is particular sometimes for companies operating as DAOs or operating in industries helping DAOs.

10- **Media & Communications**: their mission is to advance the DAO cause and vision through media and communications power. Campaigns, knowledge, information, public awareness are all their tools in doing so.
11- **NFTs**: they are non-fungible tokens connected to unique digital art or digital assets. Their mission is to create nurture and trade in NFTs market and regulate their identification and credits.
12- **Physical Assets**: their mission is unique as they seek to connect and integrate the physical world assets' value with the digital world assets' value. They connect them by investments or by development. They seek to solidify trust and longevity for the DAO mission itself through stable valuation and true ownership of the real world.

Market Share by Industry

Now that the industry classifications are clear, let's see their visualization and statistics.

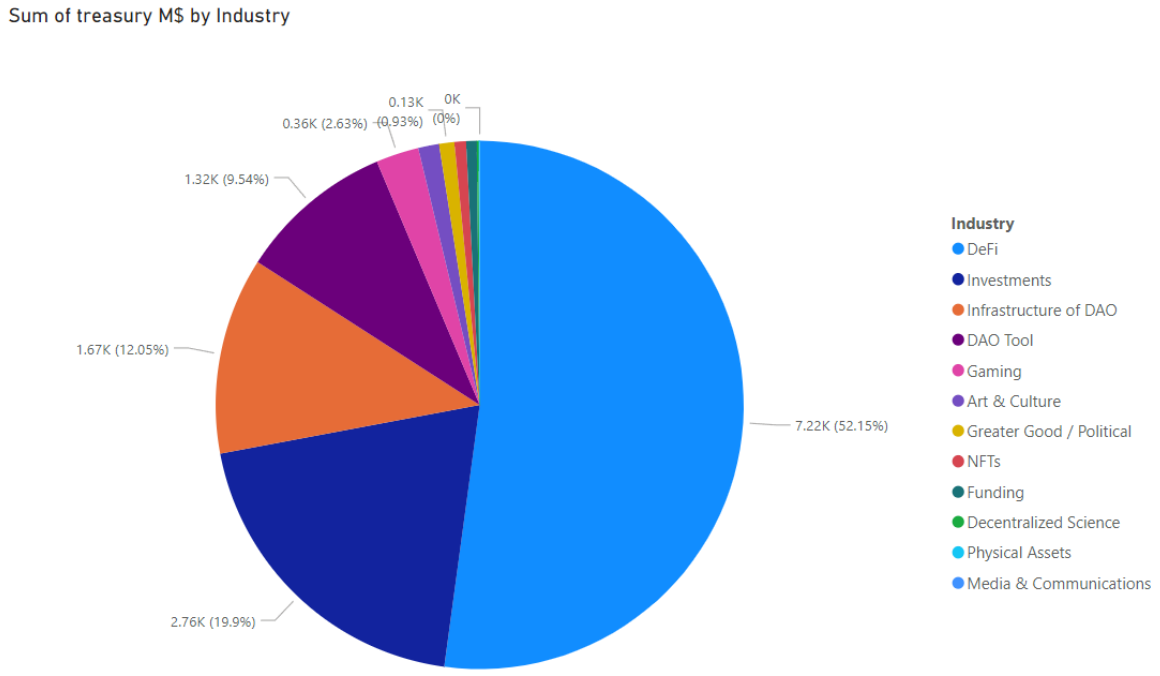

Chart (03) – Market share per each industry

As it is clear in Chart (03) the majority of DAOs operate in the industry of Decentralized Finance, more than $7.2 billion of DAOs market value. The second biggest industry is not too different from the dominant one, Investments or Venture

Capital is similar to DeFi, there is a clear reason for that beside other possible explanations. For a nascent industry early adopters and users would prefer fast or short-term return on their risky decision to be this early, compared to physical assets, political issues, art and culture and scientific research (almost 6% of market share), financial investment and digital transactions connected to digital currency and assets trading and business funding (a little more than 72% of the overall market share) are much more attractive and short-term rewarding (or disappointing in other cases) than the other side. Yes, even short-term disappointment is sought after because the idea is to reach fast and quantifiable feedback about the new product which is better for brief commitments than long-term ones in risky context. Other explanations are: proven success and financial returns from those industries encourage more new users to jump on their train and recommend others to, another is that one of the biggest distinct features of blockchain technology is eliminating the middle man and ensuring transparency both of these characteristics offered a revolution in the banking industry that gained a lot of traction and sometimes scrutiny so the point was that these industries are connected to a cause and a clear rebel ideology to the status quo unlike the other side of the industries that only offer speculations and wishful thinking. It's the old argument of incremental improvement vs. radical improvement. In science, arts, and gaming plus other industries the current DAOs' vision offers only incremental improvement compared to radical improvement that is being offered with clear steps of implementation in the financial and investment industries.

The second biggest group of industries in DAOs are very predictable, Infrastructure of DAO and DAO tool. As the DAO industry as a whole grows bigger and bigger, the need for bigger infrastructure of the blockchain itself or other diversities of it or the need for more capable and advanced tools to help the DAOs mission would all grow proportionally. They represent 21.6% of DAO market, almost a quarter of market share.

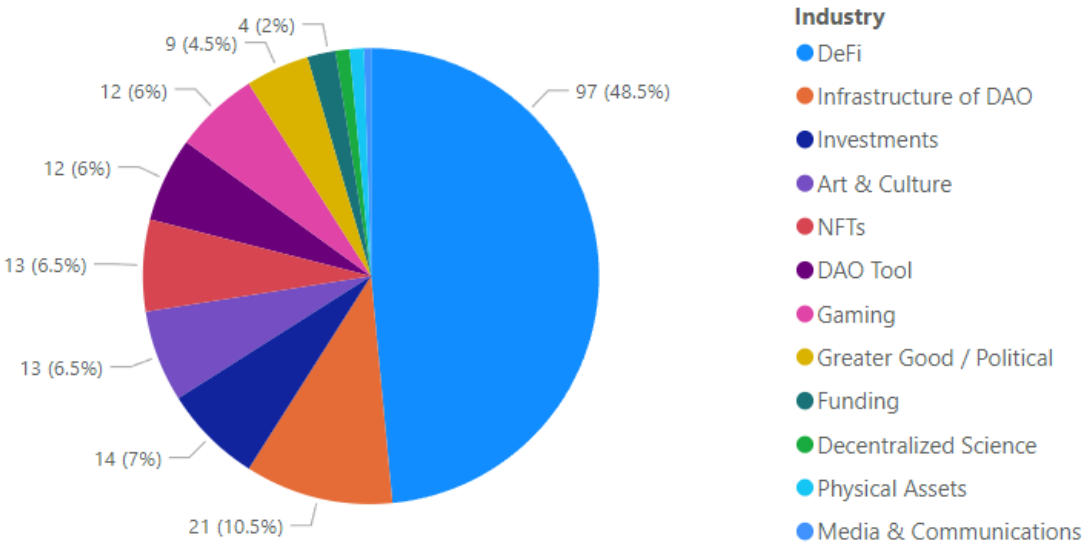

Chart (04) – Number of DAOs operating in each industry.

In Chart (04) we can see the distribution of DAOs by their numbers per each of the 12 industries. This distribution is not a mirror to the same percentages of the value of each industry in Chart (03), this means that the value of each industry is not affected directly by the number of DAOs operating in it, there must be other factors affecting these numbers. So, in short, the biggest industries of the DAO market are not because of many organizations choosing to be part of it but rather because of the value of their product on its own compared to other industries. This observation supports the original hypothesis that the first 200 DAOs capturing over 95% of the total DAO market is not because of coincidence but because of their success to capture, develop and deliver a good relatively sustaining product of their own compared to the remaining thousands of DAOs that represent only under 5% of the market share rendering them as nearly negligible in the market.

Value of DAO by Industry

Let's find some other factors affecting these numbers. In table (02) a new variable is calculated which is the average value of one DAO in each industry based on the industry total market value and the number of DAOs operating in this industry. A color gradient of red/white/green is introduced in all three variables with red color given to the industry with the lowest value, white for average values and green color is given to the industry with the highest value relative to each variable separately.

Industry/Variable	No. of DAOs	Sum of market share (M$)	Avg DAO value per industry (M$)
DeFi	97	7223.584	74.5
Infrastructure of DAO	21	1669.066	79.5
Investments	14	2757.063	196.9
NFTs	13	98.248	7.6
Art & Culture	13	176.749	13.6
DAO Tool	12	1320.941	110.1
Gaming	12	363.694	30.3
Greater Good / Political	9	129.26	14.4
Funding	4	89.414	22.4
Physical Assets	2	8.1	4.1
Decentralized Science	2	16.1	8.1
Media & Communications	1	0.413	0.4
Grand Total	200	13852.632	Average overall= 46.8

Table (02) – Table tracking industries' performance and statistics.

For DeFi industry despite having nearly 50% of the top 200 DAOs, the average value of a DAO is closer to the overall average of all industries together. This means that the competition in this industry is fierce and profitable too for this many DAOs to exist in it and still have an above average value.

For the other two industries concerned with DAO operations (infrastructure and tools) they appear to be both concentrated. Only 33 DAOs combined (about 16% of the 200 DAOs) serve all the DAO market and their average combined value of one DAO is nearly 90 M$ which is a very high value, double the average overall value for all industries. It indicates that their business is critical and high valued to the DAO market, but it also means that they lack competition and have too much concentrated market power with them (this key finding will be clearer later when we analyze the on-chain/off-chain numbers and the main chain choice of the 200 DAOs).

For the industry with the highest average value to be the investments or V.C industry is predictable and makes sense. It is extremely high risk to invest money in digital assets or digital forms in general, but they come with high yields too. Thus, low number of DAOs operating in the industry but capturing high yields and valuation. The industries with the lowest average values are like that despite having

relatively medium number of DAOs, like NFTs, Art & culture and gaming. Again, confirming that the important factor here is the product they offer not the number of DAOs choosing to adopt them. Each one of them has the same number of DAOs as the industry of investments, but they don't even represent a quarter of the investment industry's value.

Each Industry Composition by DAO Market Value

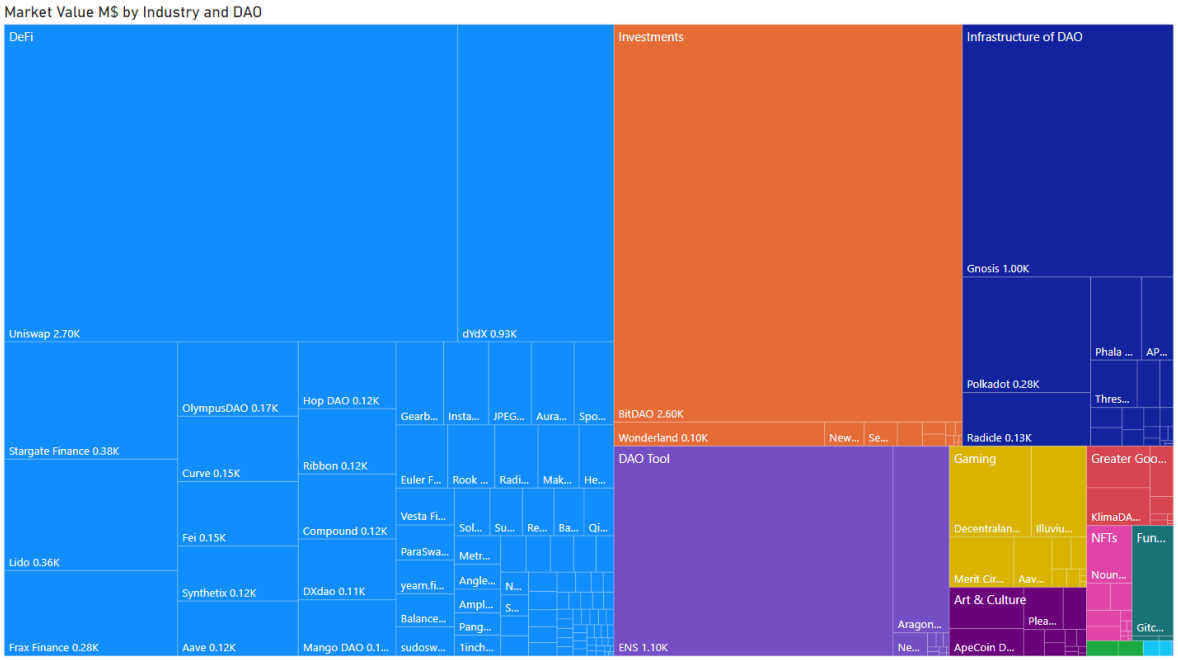

Chart (05) – Each industry's composition of DAOs and their values

In Chart (05) a deeper look at the structure of each industry of the 12 is demonstrated in a tree map to show the distribution of each industry's DAOs and whether they are concentrated or not. The bigger the size of a block named after a DAO the bigger the relative market share (power) this DAO holds inside its respective industry. In DeFi industry, Uniswap alone captures 37% of its industry power. But the rest of the industry's power is relatively distributed among over 90 DAOs. The investment industry is dominated by BitDAO with over 96% of the industry's power belonging to them. For both the DAO infrastructure and the DAO Tool industries, only two DAOs which are ENS and Gnosis are capturing over 70% of their combined industry's power (2.1 B$ compared to 2.99 B$ total). The rest of the industries look decently distributed among their DAOs except for the funding industry which out of their 89 M$ market value an 85 M$ market value is captured by one DAO name Gitcoin, so over 95% share.

Market Share by Blockchain

There's another variable to shape the landscape of the market, which is the choice of blockchain for each DAO. In the most successful 200 DAOs there are only 10 blockchains that capture the market shares (Ethereum, Polygon, Substrate, Arbitrum, Avalanche, Binance Smart Chain, Solana, Fantom, Gnosis Chain (xDai), Optimism).

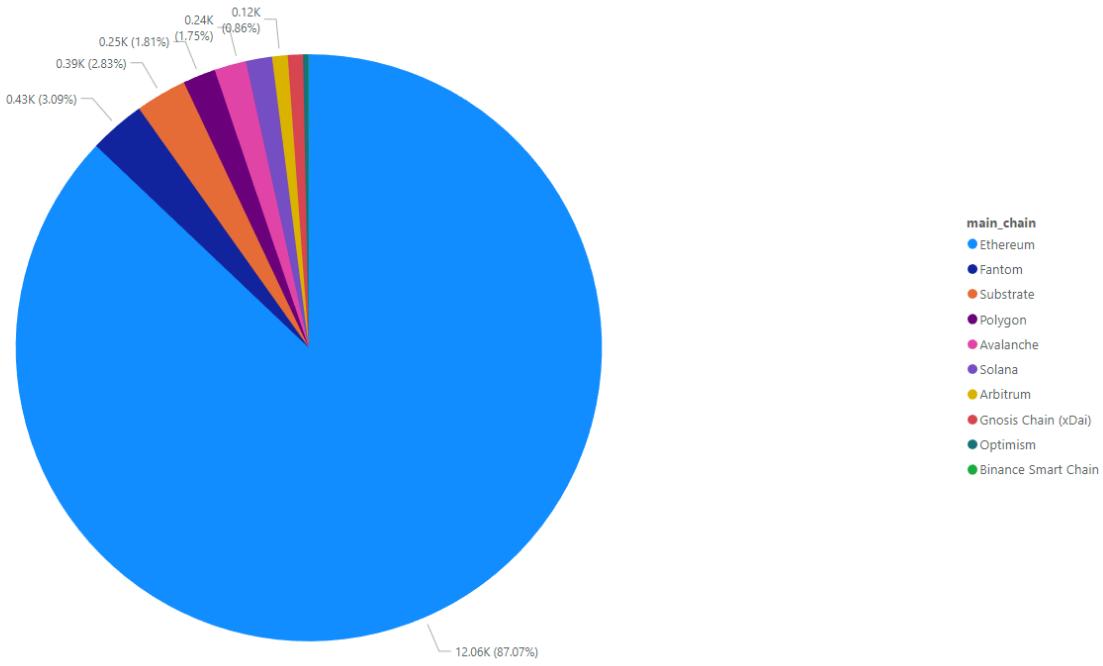

Chart (06) – Market Share (%) and Market Value (M$) distribution for each Chain.

In the above chart, it's clear that Ethereum is dominating the DAO market to a monopoly level (more than 80% of market share). Despite that, the remaining shares of the market are nearly equally distributed among the other 9 chains. If we looked at the same chains' distribution but in count of the DAOs adoption of a chain, in the below chart (07), it gives a clearer view that the rest of the market is having a perfect competition to capture the remaining 20% of the market share. There are reasons for the Ethereum chain dominance in the market, only two are the main moving factors. Mass adoption enabler and operating at low-cost option. The first factor is driven by the rise of Aragon platform, which only operates on Ethereum blockchain. The platform enables fast and low-cost deployment of new DAOs with simple design and predefined parameters. So, if Aragon adopted a different blockchain or enabled multiple blockchains, or if a competitor of Aragon had a better or an equally convenient offering, Ethereum blockchain would not have a monopoly power on the top 200 successful DAOs in the market.

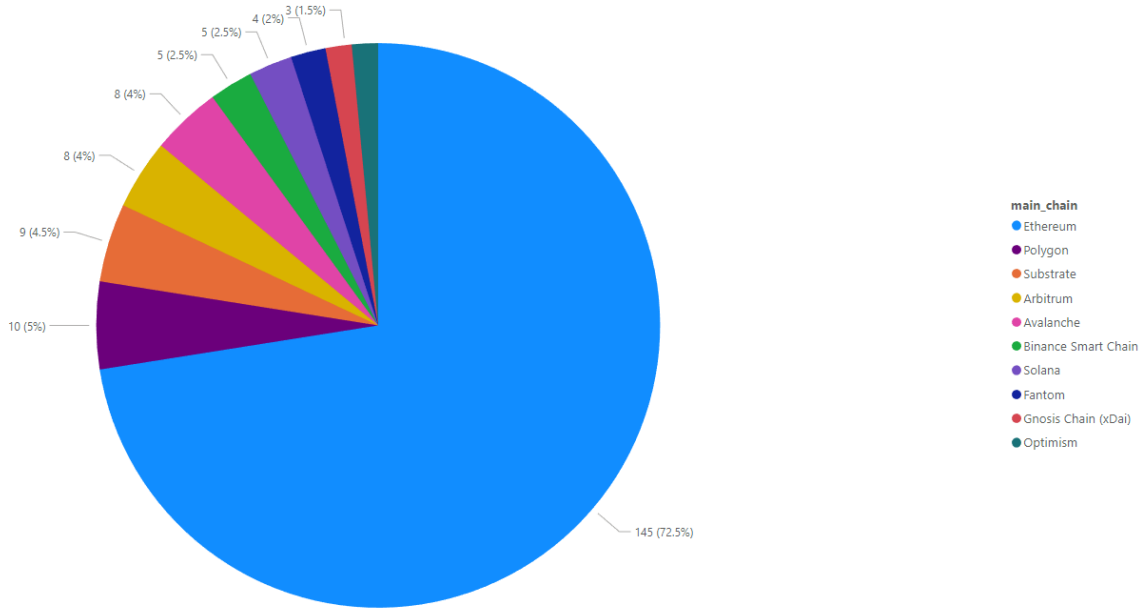

Chart (07) – Number of DAOs' adoption for each chain.

The second factor is ultimately why Aragon has chosen Ethereum blockchain as their main chain build for new DAOs, Ethereum at first enabled the option of Proof of Stake consensus mechanism as opposed to the old standard of Proof of Work. Being less costly, faster in operations and much more environmentally friendly has encouraged DAOs to shift to or adopt (PoS) in mass numbers. Until September 2022, when the Ethereum Merge happened and converted all the blockchain into one (PoS) driven chain. Consequently, it became more convenient and cost efficient to deploy new DAOs into Ethereum blockchain.

Each Industry Composition by Blockchain Market Value

If we reorganize the market landscape by the 12 industries but comparing their composition according to their blockchain choice, by plotting a tree map, we get the chart below. All 12 industries have DAOs that operate on Ethereum blockchain, 4 industries (30%) only use Ethereum for all their DAOs which are Funding, Decentralized Science, Physical Assets, and Media & communications. We can also see that even in the other 8 industries the choice of Ethereum blockchain is always harboring a super majority of the DAOs in each industry.

The most interesting number is how many DAOs in the infrastructure and tools industries are using Ethereum, out of total 33 DAOs in these two industries, 25 DAOs (75%) are only using Ethereum blockchain. This is important because these

DAOs help shape the rules and norms of the DAO market, they are the original source of creating new DAOs or testing new governance models and tools.

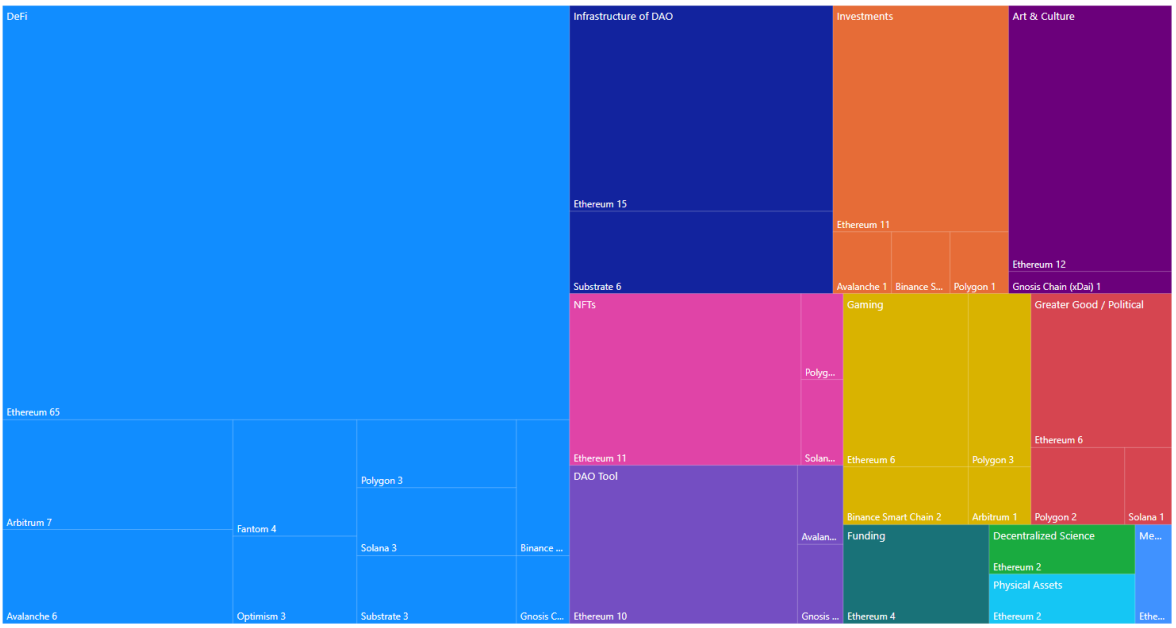

Chart (08) – Blockchain distribution among DAO market 12 industries

On/off-chain choice Vs. Blockchain choice

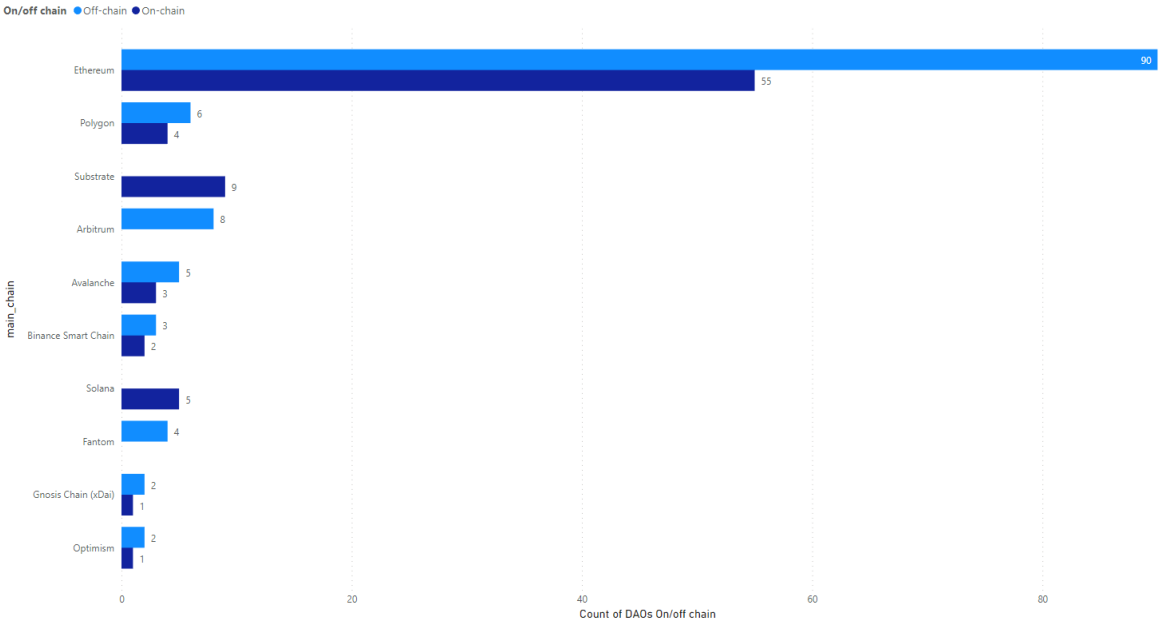

Chart (09) – DAOs operating on/off chain in each blockchain.

In the bar chart above, we can see multiple anomalies. Ethereum blockchain has nearly double the number of off-chain DAOs than that of on-chain ones which

makes sense because Aragon enabled fast deployment of new DAOs that are mostly starting as off-chain.

Another thing to notice is that there are 4 blockchains (40% of chains) that have only one type of operating DAOs. Both Substrate and Solana blockchains have on-chain only DAOs with a total of 14 DAOs or 7% of the market. However, both Arbitrum and Fantom blockchains have off-chain only DAOs with a total of 12 DAOs or 6% of the market.

Another outcome to notice is that again all chains outside of Ethereum are having a perfect competition in every parameter within themselves, as the number of DAOs on/off chain in the other 9 blockchains are nearly equally divided even in one choice chains they are not too far from each other. This could be explained by the adoption effect, as in Ethereum the trend is happening from outside factors mentioned before but for other chains they are experiencing normal development cycle without the pressure of mass adoption and constant replication that comes with great amount of polarization.

To conclude this chapter, let's summarize key findings from the market landscape:

1- DAO market is dominated by only 4 organizations named Uniswap, ENS, Gnosis and BitDAO. They capture a little over 50% of the market.
2- Other than being dominated by 2% of the 200 DAOs, the market share is not normally distributed among the rest of the organizations as the median market value is at the bottom 1% percentile only.
3- DAO market contributes to 12 different industries. Around 70% is captured by decentralized finance, investment, and funding (financial in general) industries and around another 20% captured by DAO infrastructure and Tools industries. The rest is for physical assets related industries and community/political causes.
4- The market share distribution among DAOs industries is a result of their product/service value and not the number of DAOs operating in each one.
5- The DeFi industry has the most competitive landscape in the whole DAO market (52% of the market). On the other hand, the most concentrated industries are investments, DAO infrastructure, and DAO Tools (combined 41% of the market).
6- Ethereum blockchain has a monopoly on DAO market with the rest of the other 9 blockchains having perfect competition for the remaining 20% of the shares.
7- Ethereum monopoly comes from Aragon enabling fast deployment of DAOs on it, all the while the blockchain itself having a low-cost value (gas money) after merging into Proof of stake validation only.
8- More than three quarters of DAOs responsible for infrastructure and DAO tools are relying only on Ethereum blockchain, A Third of industries is controlled by Ethereum only, and 40% of blockchains are experienced by one choice DAOs (either being on or off-chain)

5 Research Findings: Consensus in Elements of DAO Governance Model

In this chapter, a detailed report will be presented about what is the 200 most successful DAOs agree on in a majority style choice in elements of the DAO governance model that were previously illustrated in the literature review part.

5.1. On-chain or Off-chain

The literature was very clear about the choice between the two, it treated the choice as black and white with no compromise or middle ground. This turned out to be wrong in the real world. Almost all DAOs now are operating on a mix of the two sides of the chain. They separate their voting procedures into multiple stages with the first couple of those stages happening off-chain and the last stage sometimes happens on-chain.

A typical example of the process will go like the following, the first stage is called proposal introduction. At this stage a user or a designated delegate will open a discussion about their idea for a new proposal either to change the DAO's rules or to modify the operations parameters affecting financial transactions and token management and they would typically use a social media app. At this point most DAOs that adopt this stage are using "Discord" chatting app open only for members to join, view and use. Some other DAOs, however, utilize a public discussion forum and they name it governance forum which different than the discord app as it's open for public to view everything in it, but the participation is closed only for DAO members.

The next stage is where the two systems of DAOs chain split. For the on-chain DAOs the next stage is called Temperature check, after the discussion and maybe some modifications made on the initial proposal the proposal is put to a test vote. It's a non-binding unofficial vote that is designed to check the consensus of members about the proposal but most importantly it is designed to test the passion to participate or advocation for this proposal. This unofficial vote is done on an off-chain platform typically it would be "Snapshot" or other decentralized voting app. The cost for making this vote is much less than voting on-chain when a proposal doesn't achieve the required quorum for votes or participation. It makes the process of governance more seamless and cost effective.

For the off-chain DAOs, however, the second stage was their final stage. They use the off-chain voting apps to officially get a consensus on their members' opinion about new proposals. After that they task other members or sometimes a subcommittee to implement the proposal details into the DAO's smart contracts.

The last stage for the on-chain DAOs is the official vote that transforms the proposal into an official internal rule inside the smart contract related to them.

Now after explaining all this, how was the classification of being on-chain or off-chain DAO made? It's the final stage, where does it happen makes the DAO on-chain or off-chain as it's the official vote that changes the smart contracts inside the DAOs unlike any prior voting procedure that can be dismissed easily and is considered non-binding. Let's see the numbers on this choice among the 200 DAOs.

Adoption rate of the choice of on/off-chain

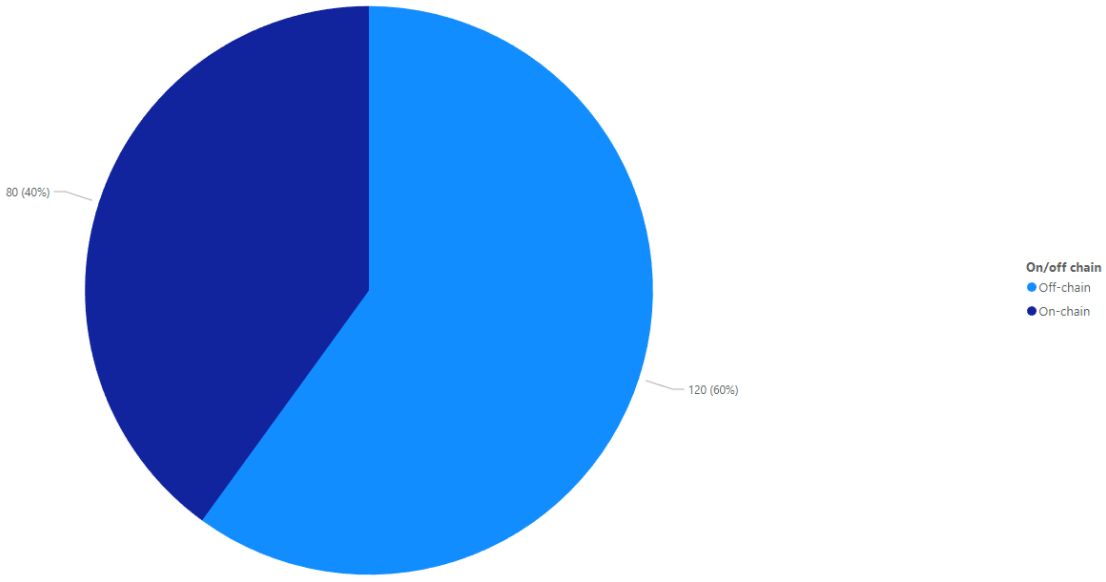

Chart (10) - Number of DAOs in each Chain system.

In Chart (10) In case we count how many DAOs adopted the off-chain system as to know how popular it is in the top 200 DAOs, we will find that a clear majority of them 120 out of 200 (60%) are using the off-chain choice. It's a clear preference among them that off-chain is easier and more cost effective. However, this is not the complete picture, is the number of DAOs adopting a system enough to judge that it's the better choice or at least the dominant one? Maybe there is another factor to

consider. For example, how much of the market share does each chain system capture? Is it the same as the number of DAOs? No.

Market Value by choice of on/off-chain

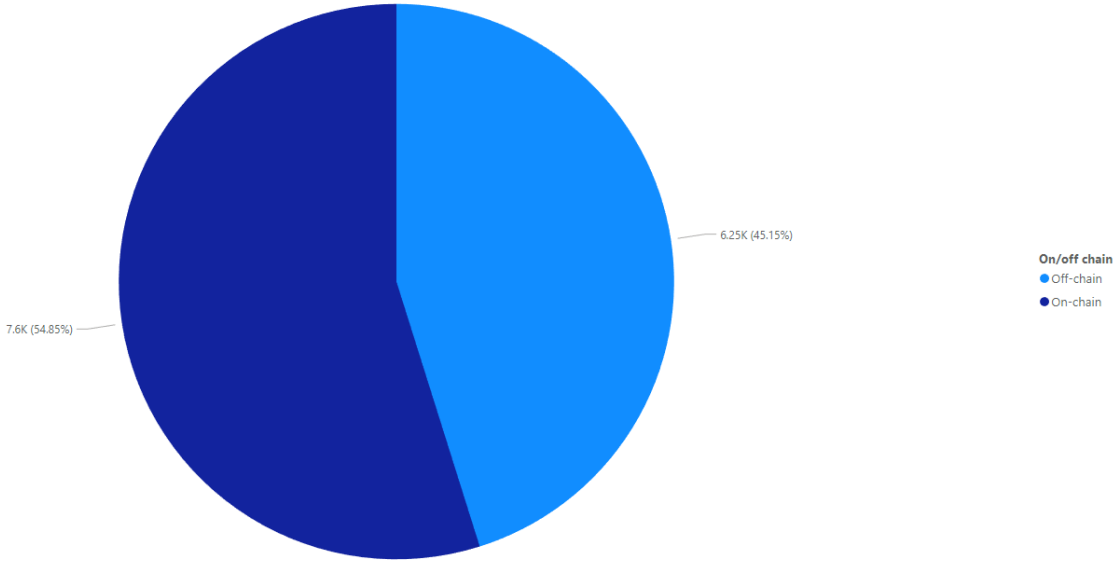

Chart (11) – Market Shares captured by DAOs in each Chain system.

In Chart (11) we see the clear difference between the two parameters of the comparison. By using the market value that each chain system captures we find that the majority is flipped to the on-chain system DAOs. With $7.6 Billion in market value, they capture 55% compared to the off-chain system with $6.25 Billion capturing 45%. The distance between the two systems is not too big and it makes perfect sense as only 40% of the DAOs using on-chain (a relatively low number) capture 55% of the market value. But we don't know for sure the reason why it's so close, Let's see the DAOs in the list with market value equals to or more than 100 M$ which could be called the super DAOs. It can be seen in Table (03) that only 22 DAOs are passing this threshold. With the off-chain and On-chain choice of each DAO in the same color as the pie charts in Chart (10) and Chart (11). Out of the 22 "Super" DAOs only 6 DAOs are using the off-chain system so a little over a quarter of them only.

DAO_name	Treasury or Market Value M$	On/off chain
Uniswap	2700	On-chain
BitDAO	2600	Off-chain
ENS	1100	Off-chain
Gnosis	1000	On-chain
dYdX	929	On-chain
Stargate Finance	381.7	Off-chain
Lido	362.6	On-chain
Polkadot	278.2	On-chain
Frax Finance	277.7	Off-chain
Aragon	196.7	On-chain
OlympusDAO	168.6	Off-chain
Curve	148.2	On-chain
Fei	145.5	On-chain
Decentraland	140.1	On-chain
Radicle	128.8	On-chain
Synthetix	124.7	Off-chain
Aave	124.4	On-chain
Hop DAO	123	On-chain
Ribbon	120	On-chain
Compound	119.4	On-chain
DXdao	111.8	On-chain
Mango DAO	102.9	On-chain

Table (03) – "Super" DAOs, the most valuable DAOs with over 100 M$ in market value.

Another way to study it is to see the average value of each DAO in the two systems. In Table (04) we see the average value of one DAO in the off-chain system is nearly half the value of a DAO in the on-chain system, Despite the ratio between the number of DAOs in each system being 3:2 off to on chain. Another indicator is the overall average of all DAOs, the off-chain DAO value is closer to the overall average than the on-chain DAO.

Chain System	Sum of Market Value M$	Count of DAO	Average Value of DAO M$
Off-chain	6254.5	120	52.1
On-chain	7598.1	80	95.0
Grand Total	13852.6	200	Average overall = 69.3

Table (04) – Average values distribution among the two Chain Systems.

On/off-chain choice's Market Value in each Industry

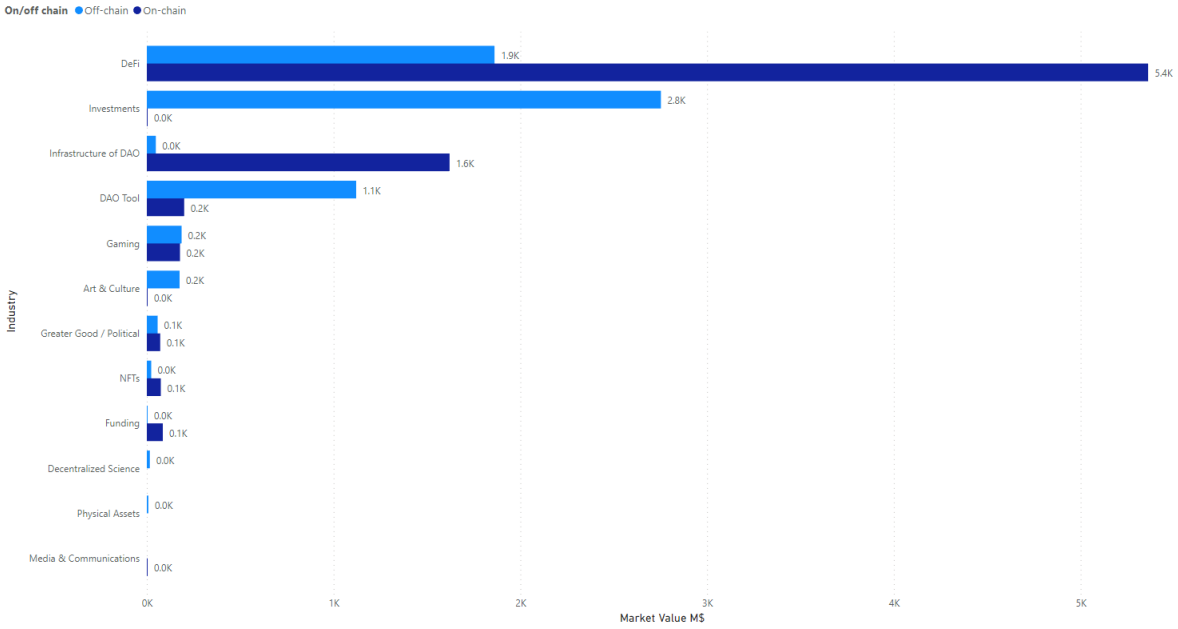

Chart (12) – On/off-chain choice's Market Value (M$) for each industry.

The above chart distinguishes the choice among the twelve industries. Both Industries DeFi and Infrastructure of DAO are overwhelmingly choosing to operate on-chain system. In the second place for market valuation is both industries of Investments and DAO Tool who are opting for the opposite choice to operate off-chain.

All the above indications are telling a story, a story that the lower the value of the DAO (first deployment) the more probable they are to opt for using the off-chain system which makes sense because it's the cheaper choice and the easier one too. The other part of the story is that the more valuable the DAO becomes over time and efforts, the more probable they are to change their system into the on-chain system. which also makes sense because the choice at this stage is to seek the more secure and durable system once the DAO has established its market value in a concrete way. It's not a definite outcome, they can still choose to stay in the off-chain system like what happens in BitDAO and ENS, but the story is saying the most probable outcome in general compared to the overall market behavior is opting for On-chain system in the later stages of the DAO journey.

5.2. Voting Process Mechanism

Here we will dive deep into the process of voting which the market now employs with more detailed stages and different choices for each stage, then we will talk about the choice of the voting system itself and how it reflects on the consensus.

The consensus in choosing the number of stages for the voting process mechanism:

The literature covering this issue was limited only to studying one or two cases for voting systems, which was a bit misleading as the market now has a voting process mechanism which is more comprehensive and detailed than just a voting system. More than 90% of the DAO market (chart (13)) implements more than one stage of voting, effectively expanding the voting system into a voting process. In addition to that the market also added multiple venues for voting in each stage and multiple communication channels in all stages even the one stage system, thus it became a process mechanism for voting.

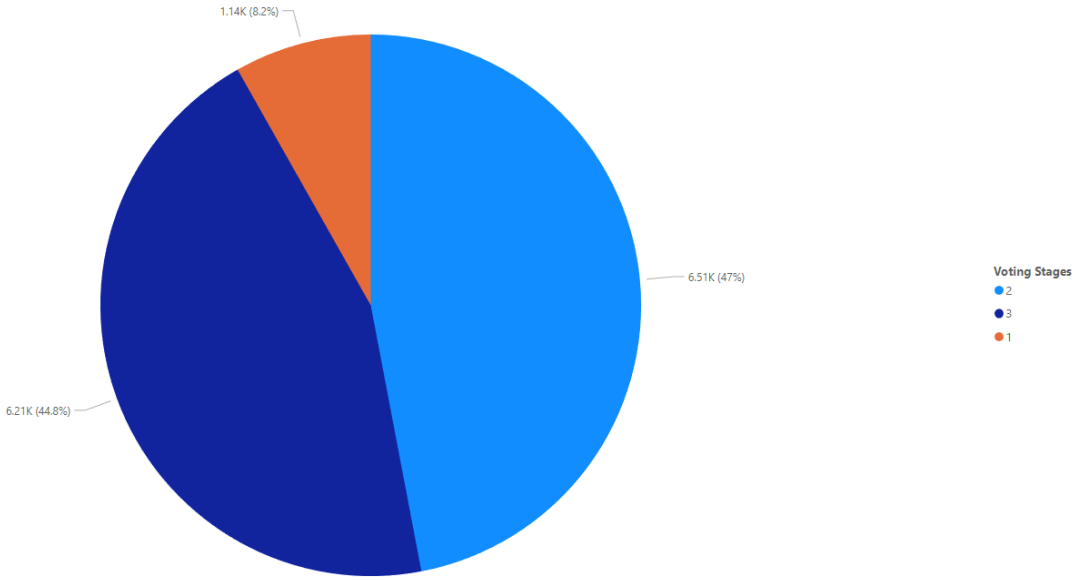

Chart (13) – DAO market value (M$) captured by voting stages.

According to market data, the market is nearly split between choosing 2 or 3 stages for the voting process. If we correctly remember this pie chart (13) looks familiar; that's because it resembles Chart (11) in market structure of the choice between on or off-chain. It looks as if the off-chain choice comes with 2 stages of voting process and the on-chain choice comes with the 3 stages instead. Using the same color indicator for off-chain + 2 stages to be light blue and on-chain + 3 stages to be blue between the two charts, let's test this theory.

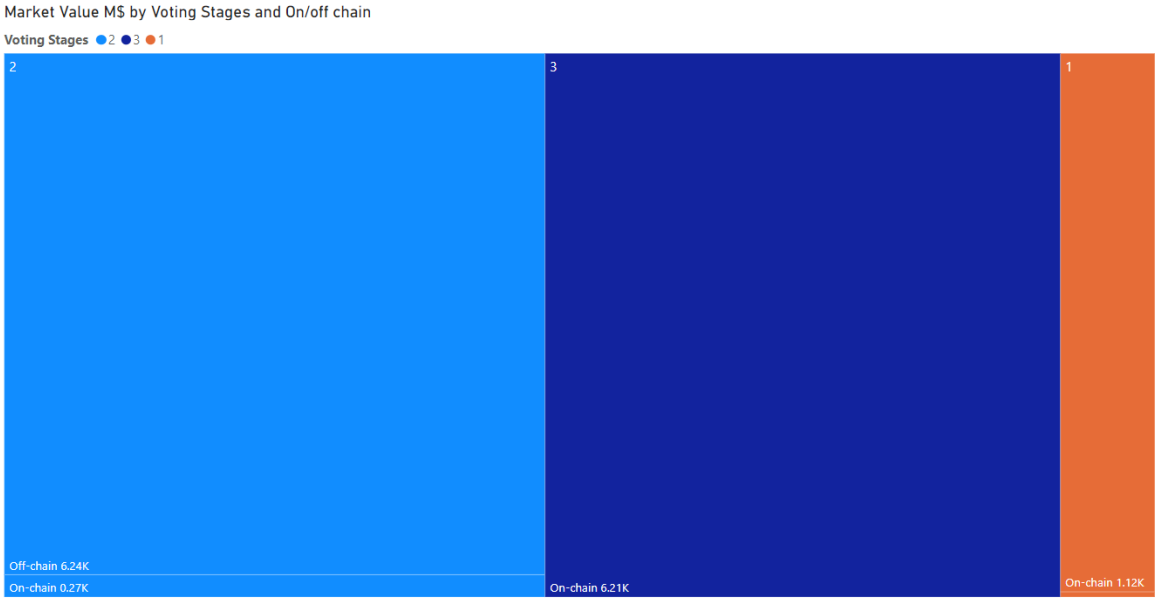

Chart (14) – On/off-chain choice market value (M$) in each voting process.

In the tree map above, it is clear that the choice of 2 stages is associated with the choice of off-chain DAO, and the choice of 3 stages is ultimately in the hands of on-chain DAOs. This situation makes sense as with the choice of operating on-chain comes greater costs of vote failures, maybe from lack of consensus or not being able to reach a required quorum to count this vote as executable, so it's more convenient to check the temperature first of the DAO's members and their consensus around the topic before paying all that. This is the same reason why off-chain DAOs are going for the lesser number to speed up the process as they won't pay as much anyway in money at the end, but they could increase their opportunity cost if they wasted time on endless times of votes.

Based on that off-chain in 1 stage of voting and on-chain in 2 stages of voting all makes sense, but on-chain choosing 1 stage of voting shouldn't make sense. However, if we looked closely at what these DAOs are doing, we can find out that before putting a proposal to a vote they use sub-committees or working groups to create these proposals from the beginning. For example, Polkadot DAO, Kusama DAO, Bifrost DAO, Hydradx DAO and Moonbeam DAO are all using their elected council to first create a proposal with complete details, then reach internal consensus on it then put it up to vote to the DAO's members on chain in one stage just to confirm their idea and they call it referendum not a vote as the purpose of their system is to rely only on the council to make it right from the first try. Other DAOs like UXDProtocol, API3, Solend, Metaplex and sarcophagus DAO are using a communication tool between members to unofficially discuss and settle on a

proposal then put it up to a vote on chain later. What any of these DAOs (and more others) are doing is separating the need for consensus from the fear of lack of interest or lack of relevance to the members. They use commitment from elected council members or volunteer working groups to make sure that the next phase is just a referendum and not a new idea testing that could fail the vote. This sense of commitment shifts the focus from questioning the source of the proposal (thus changing the idea altogether or obstructing it) to instead on the quality of and the agreement on the proposal itself.

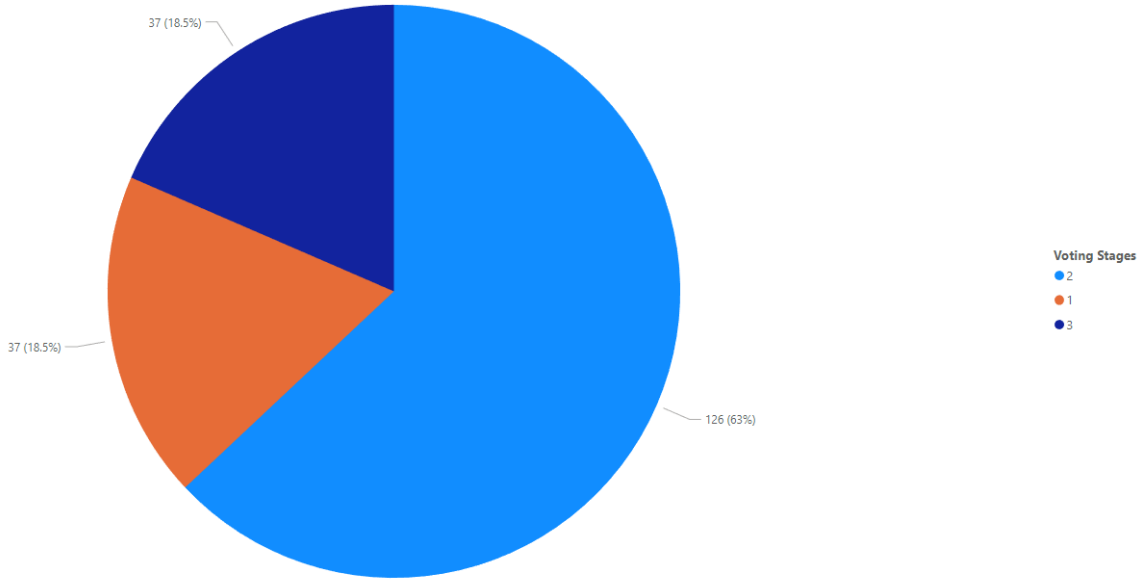

Chart (15) – Number of DAOs using each number of voting stages.

If we look at it from a different variable, for example, in the chart above it would appear to be a different story telling than the two other charts before it. The voting stages number distribution by adopted DAOs is not divided in two like the market value, however there's a new factor here in place affecting this distribution. It's the choice of off-chain operation. As established before there's a connection between being a newly created/small-valued DAO and adopting the off-chain system. Thus ultimately, the number of DAOs using 2 stages for the voting process mechanism is higher than other choices because the number of newly created and small valued DAOs is bigger. They want the balance between the low-cost option (off-chain) and not wasting too much time (3) or rushing decisions without consensus (1). The story also says that even though nearly a third of DAOs are choosing the 2 stages mechanism, the other 3 stages mechanism is adopted by highly valued DAOs at the top of the list.

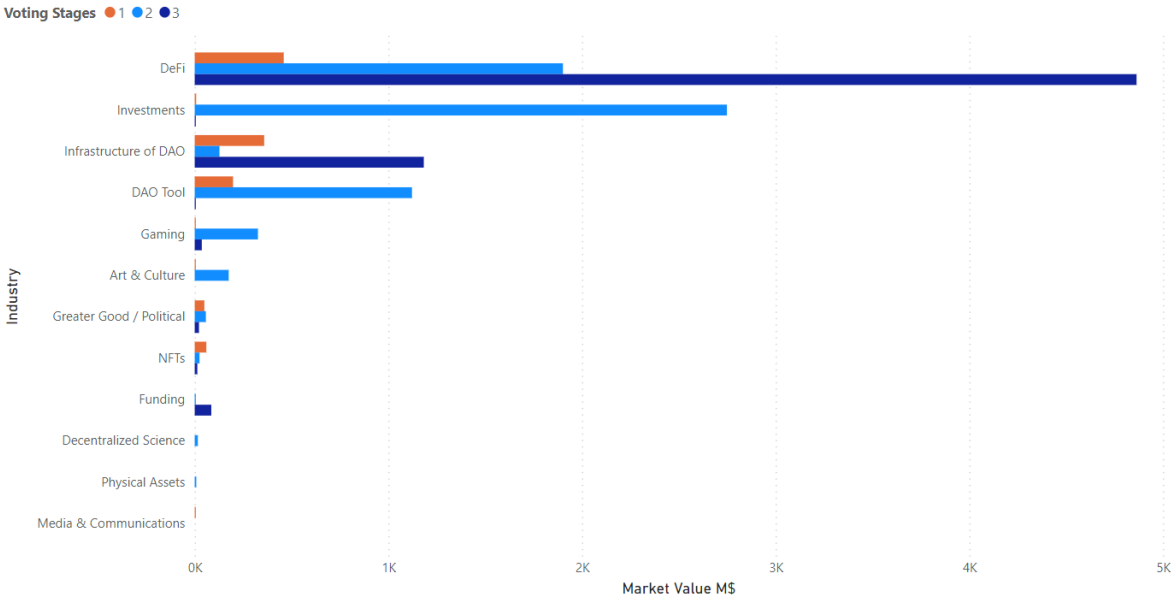

Chart (16) – Voting stages choice's Market Value (M$) for each industry.

In a deep dive inside the industries' choice between the voting stages we find some interesting insights. In the chart above (16), the only thing all industries agree on is that using more than 1 voting stage is more profitable for the industry, it's also more secure and comprehensive. In line with a previous bar chart (12) before, DeFi industry and infrastructure of DAO industry are both aligned with the conclusion that being operated on-chain will be more valuable to be accompanied by using 3 stages of voting process. The same opposite applies to the industries of Investments and DAO Tool, opting for 2 stages of voting for off-chain operation system.

The Consensus on How the voting stages work:

After explaining the choice between the three types of voting stages and how DAOs market is shaped by it, it's time to talk about how they do the stages of voting and the tools they use.

The literature in this particular part cited the use of decentralized chatting apps or web3 apps or the use of messaging or communication channels inside the off-chain DAO platform creator like Aragon and DAOhaus. The market turned out to be completely different than this. The DAO market now is using web2 or centralized web applications and websites to communicate and to do part of their stages of the voting process mechanism. It's part of the DAO vision in the future to rely solely on web3 applications and sites for all operations, however this vision is not reachable yet in the matter of technology maturity and other factors affecting mass adoption.

When the DAO chooses the voting process to be more than one stage, they usually agree on the method for doing that. **The first stage** will be a combination of two things: first the member who created or initiated the idea of the new proposal has to start the conversation in an unofficial manner using Discord social media app, where users join only by invites. This app operates as a group chat room with the ability to nest sub-groups inside the main group which are called "servers" so at the end it works as a team management focused chat app. The purpose of the unofficial communication is for the member to test the interest of the DAO in his/her proposal and to make sure that is not repetitive or contradictory all the while without issuing a vote yet. The second step in the first stage happens when the member gets the unofficial feedback that his/her proposal is promising. In this step the member creates an official off-chain vote sometimes in inside the same Discord social media app or if the DAO was able to secure another way for official votes, it would be posted on a Governance Forum, these forums are built on the open-source internet software called Discourse. Using Discourse software is much more convenient and organizing for official voting and discussions too than the Discord app. With categories separating the main topics and comments easily used and archived for future reference. It's also an open for public view website, even if you are not a member of their Forum you can still see all their votes and discussions. A very small portion of the DAOs (less than 8 DAOs out of the 200 DAOs) are choosing to make it private, you have to create an account and be accepted inside their Forum to see their discussions. When the member posts the proposal for the first official vote, they have to fill a template which was agreed on before as a standard inside each DAO for how to present new proposals. This template list the idea details, the steps needed to implement it, the related rules that will be updated or removed based on this new idea and finally also will list all outside resources that helps explain the content or offer parallel examples of what other DAOs did in the same genre. The discussion would be open for usually under 7 days where all members of the DAO are welcome to suggest changes or organize to reject the proposal. Then the official vote ends with a result, the vote would be governed by a quorum that has to be reached in the number of votes for agreement to the proposal and the number of DAO members participating in the vote (usually at least 1% of the DAO members that the time of the vote). It's worth mentioning that most of the DAOs that don't employ teams or committees who usually start the proposal process by themselves, ask their members to have a minimum number of tokens in their digital wallet to be able to propose a new idea and post it for an official vote.

In **the second stage** after the proposal has passed through the governance forum/discord tools, a technical draft is produced that helps implement the proposal into the existing smart contracts or create a new one if needed. This draft is then attached to an off-chain second vote, however, this time it is done through a token-operated tool. Snapshot is the ultimate choice for off-chain voting systems for DAOs. Nearly all DAOs who choose to do a token-based off-chain voting system always use snapshot now except maybe one of the DAOs in the top 200, Unslashed DAO chose the Scattershot app. Snapshot offers the most convenient and low-cost voting process for the DAOs, while also implementing all the voting systems (delegable voting, token-weighted voting, …etc.) and their parameters open for choice by each DAO. Here the members will vote using their digital wallet by spending their governance tokens on the vote. After the vote passes all the quorum requirements it moves on to the next step. If the DAO is operating its business by on-chain system, then the voting process mechanism will still have one more stage later. Otherwise, this is the final stage for off-chain DAOs, and all what's left is for some members to take the technical draft and implement it inside the smart contracts.

In **the third and last stage** only the on-chain DAOs are here. They advance the technical draft into the blockchain itself and create a vote on it. Sometimes they use the blockchain itself, sometimes they use a popular on-chain voting app called Tally. Some DAOs in this last stage use something called multi-signature voting (more commonly known as multi-sig stage). In this method the DAO ties their final implementation step to their digital wallet and their wallet is locked from any transactions being approved unless the people voting on it are using their signature that has the permission to authorize that. This way the DAO make sure that no hacks or unauthorized transactions can happen that would siphon away the DAO's treasury like what happened to The DAO and multiple other DAOs two years ago.

The consensus in utilizing Communication Tools:

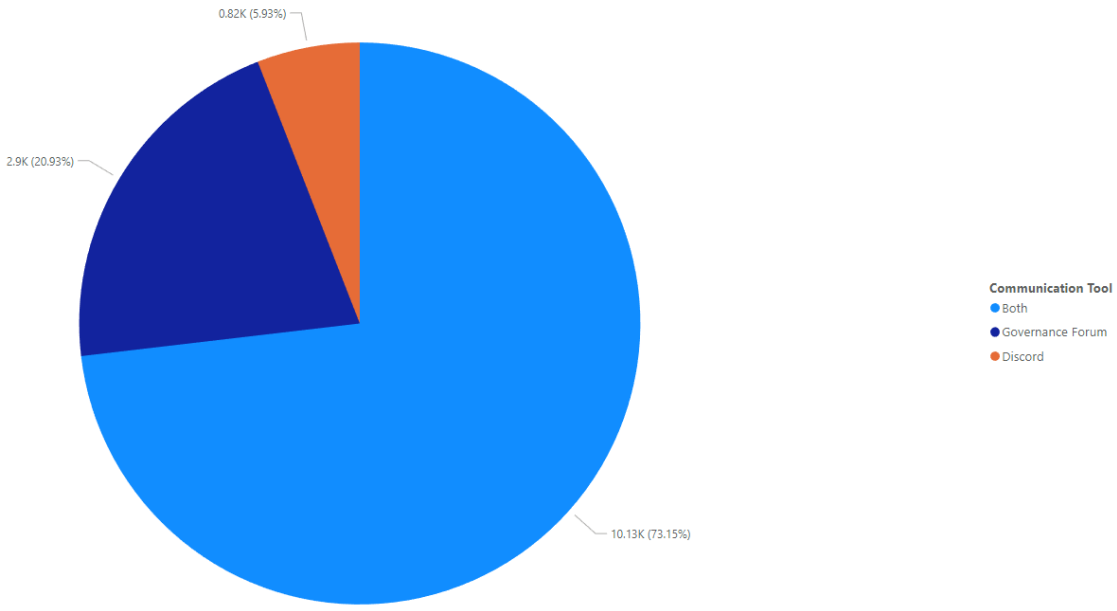

Chart (17) – Market value (M$) captured by each communication tool.

Only two tools are dominating the market of DAO for communication and temperature check voting. Discord social media App as explained before is only open by invite from the members inside the chat space. Governance Forum here means the ones created on the internet software called Discourse, however all DAOs prefer to name it as governance forum in their official documentation, which is also better to prevent confusion between the two close names of Discord and Discourse. The choice named both here refers to DAOs' choice of starting the unofficial discussion in Discord app servers then posting the first official vote on the governance forum of the DAO.

It appears from the chart above that the dominant choice is to utilize the Governance Forum, because (both + governance forum only) represents more than 94% of the market value compared to 80% of the market value for (both + discord only).

If we look at the number of DAOs instead of the market value who are using each communication tool it will be a near 3-way tie between them, as all three options in the survey are equally distributed to a third of the total 200 DAOs. This indicates that the more mature DAOs that capture the bigger part of the market are opting to use both tools as they prove they are beneficial together and more productive. Another conclusion from both charts (17) & (18) that the choice to rely on governance forum as part of your voting process and communication tool is more profitable to your DAO than using the Discord app.

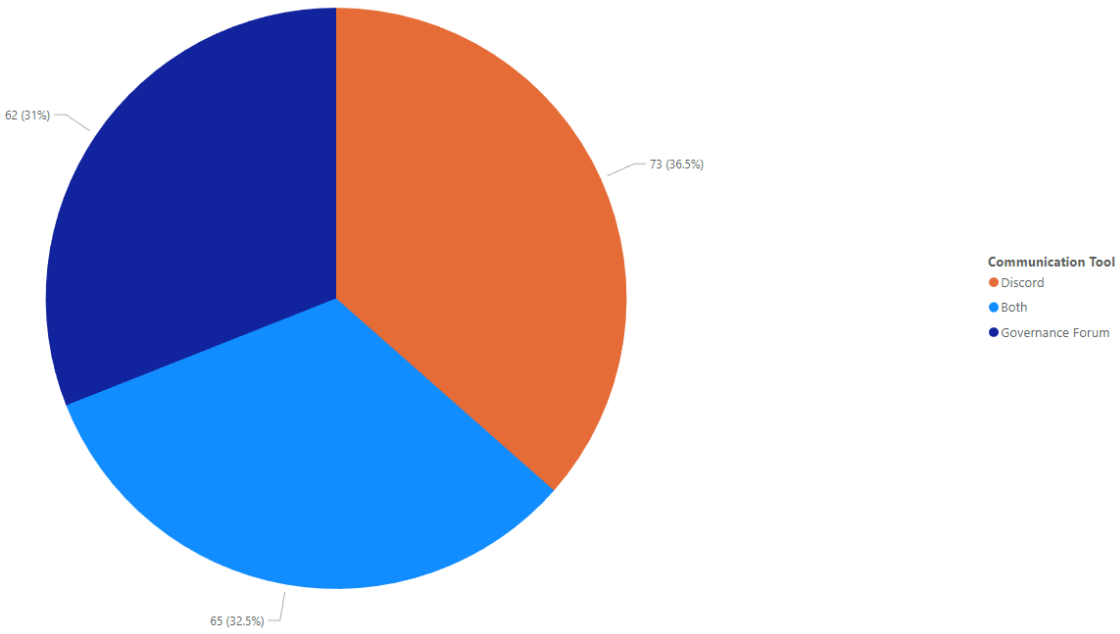

Chart (18) – Number of DAOs adopting each communication tool.

Because although 138 DAO are using Discord app either alone or alongside their governance forum, the remaining 62 DAOs that are using governance forum alone or both are capturing more than 94% of the market value.

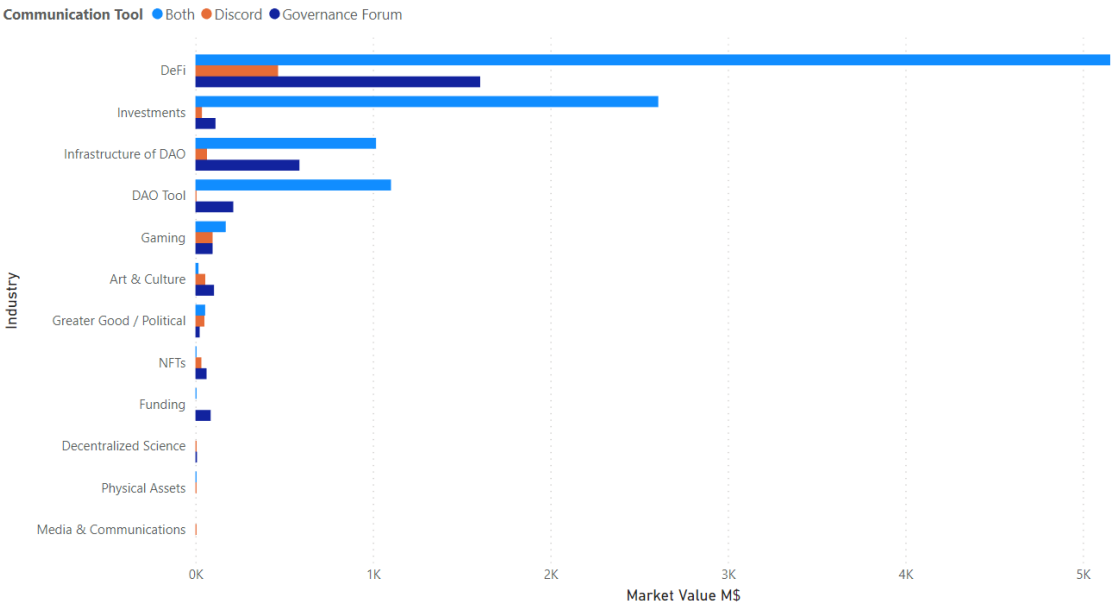

Chart (19) – Communication tool usage in each industry by Market Value (M$)

If we take a deep look at each industry's behavior regarding the usage of a communication tool in the bar chart above (19), we find that the decision is consistent in most industries, when they choose to utilize Both tools discord and the governance forum, they boost the industry's market value much more compared to the alternatives. Another observation that all industries don't have Discord as a leading valuable tool, it's either both used or the governance forum which confirms all previous conclusions. It's more organized and time cost efficient to Not rely on the social media chatting app instead of using the governance forum with easier archive and discussion tools.

The consensus in Task Classification:

In the literature part, Task Classification was a unique idea that stands out from the regular scope of the remaining literature. However, it proved to be true and part of the DAO governance model now in the market. The market defines it as a proposal type. One version of applying this method is to classify a proposal based on its impact on the smart contract of the DAO. For example, In Stargate Finance DAO if the proposal scope is to modify the basic smart contract rules that a DAO was started on, they call it a Core proposal. Compared to a proposal that would adjust the operation parameters of a DAO, like how they calculate their token value or issue new ones, they call it Protocol proposal. Multiple other DAOs agree on the same basis for classification but choose different names for the two classifiers. Other DAOs opted to classify even more than two types of proposals, sometimes 3 types as in ENS DAO where they classify the proposals into Executable, Social, and Constitutional. Examples of them are consecutively, a proposal to change the DAO core smart contract, a proposal to root keyholders or change royalties' indexes, a proposal to change the structure of the DAO and its basic constitution.

Another number of DAOs are using a different approach to classification, they start the process even before posting a new proposal. They choose to create teams or working streams inside the DAO, these teams are specialized in different operations parameters. So, when they start the proposal process from inside each team or working stream, they would have already classified the proposal into a specific type. For example, Gitcoin DAO is using workstreams named "Public Goods Funding, DAO operations, Fraud Defence & Detection, Moonshot Collective, …" and they appoint stewards inside each workstream to ensure smooth operations, so when each workstream creates a new proposal, the proposal goes down its specified route of voting process. Another format is found in Threshold Network DAO, they created 3 different Guilds that represent workstreams, a Treasury Guild overseeing any financial related operations for the DAO, an Integrations Guild overseeing new members integration and internal information flow among members, and a

Marketing Guild overseeing external relationship building, interactions and cooperation that benefit their DAO mission.

Each type of proposal would have a different quorum requirements and different consensus requirements. This makes it easier for routine proposals to fast track their path and help the DAO with upscaling their business in faster time with lower costs. It also helps in distinguishing between critical proposals that require broad agreement and other types that maybe only need specialized teams to study and pass it.

Moving on to see the market consensus about the classification method as a general idea regardless of the different formats of applying it.

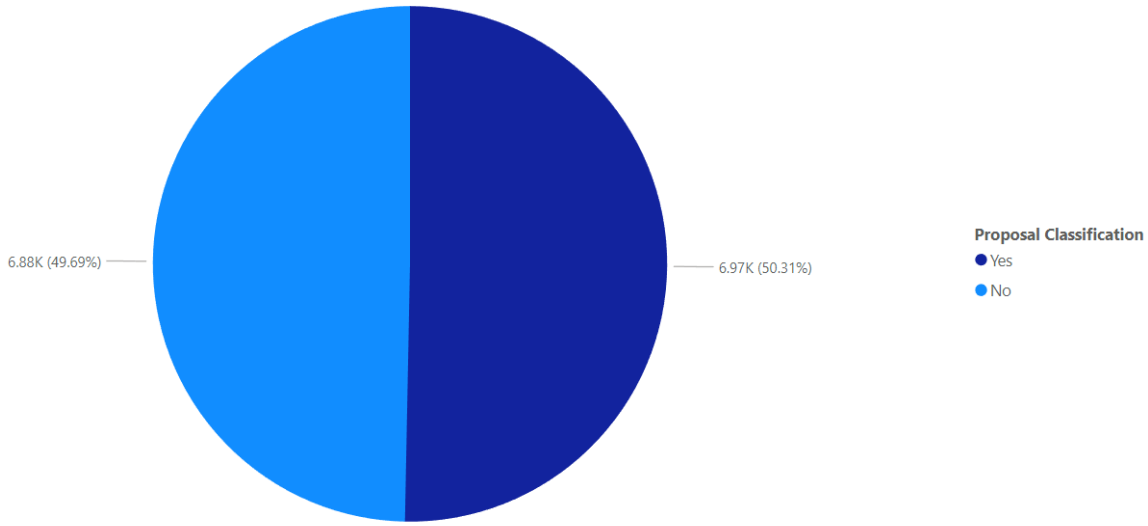

Chart (20) – Market value (M$) captured by DAOs using Proposal Classification.

It appears from the chart above that the market is split between the two choices. Maybe that would not be the case if another variable was added as a clustering factor. But first let's see the adoption rate of the method of classification among DAOs.

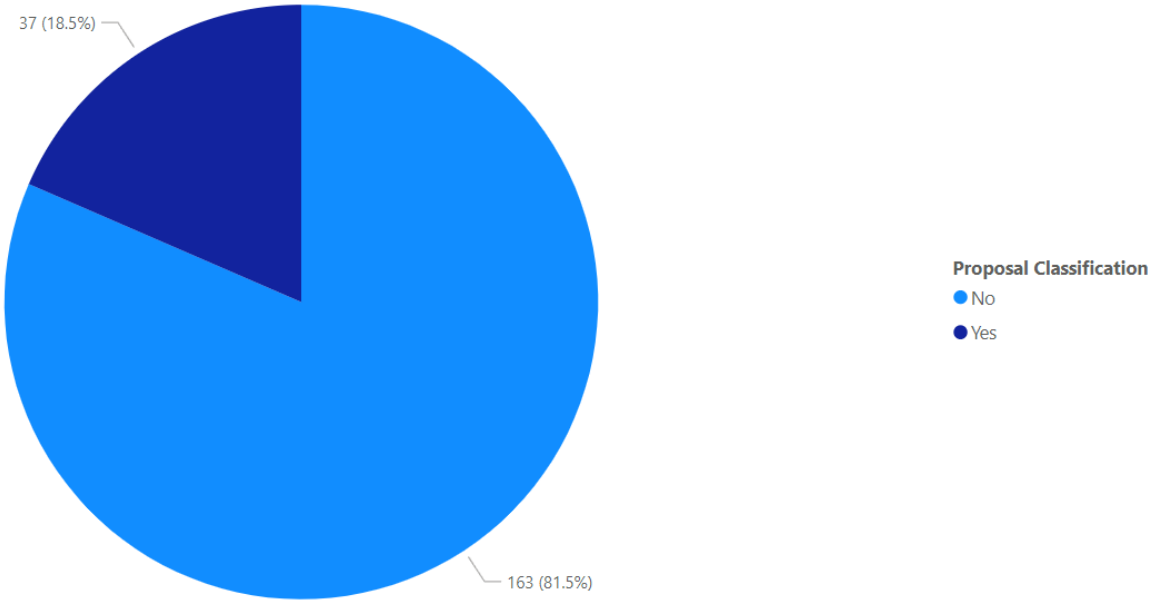

Chart (21) – Number of DAOs adopting proposal classification.

According to chart (21) the adoption rate is too low as more than 80% of the DAO market have still not decided to classify their proposal inside the voting process. Although if the two charts (20) & (21) are compared to each other, they show that despite only 37 DAOs choosing the classification route they together capture around 50% of the DAO market value against the remaining 163 DAOs that have not joined yet, which means it helps profit generation. It also implies that it's cost effective to choose classification of proposals as it stuck with the most valuable DAOs in the market without sinking them. But it also indicates that maybe it's an advanced element of governance that is more useful for stable and mature DAOs than the newly created ones.

Now a new variable is added to the chart (20) to see in detail the distribution. In the bar chart (22), it can be seen that the biggest industry (DeFi) out of the twelve total has chosen overwhelmingly to classify their proposals. This industry already captures half of the DAO market, that's why the overall effect is like that in chart (20). Another observation is that both DeFi industry and DAO Tool industry, which are operating mostly on-chain, are both opting for classification. The same opposite is observed in the other two industries that operate off-chain, which are Investments and Infrastructure of DAO, they chose not to classify their proposals. Thus, it tells us that it's more cost effective to combine proposal classification with on-chain operation system and vice versa.

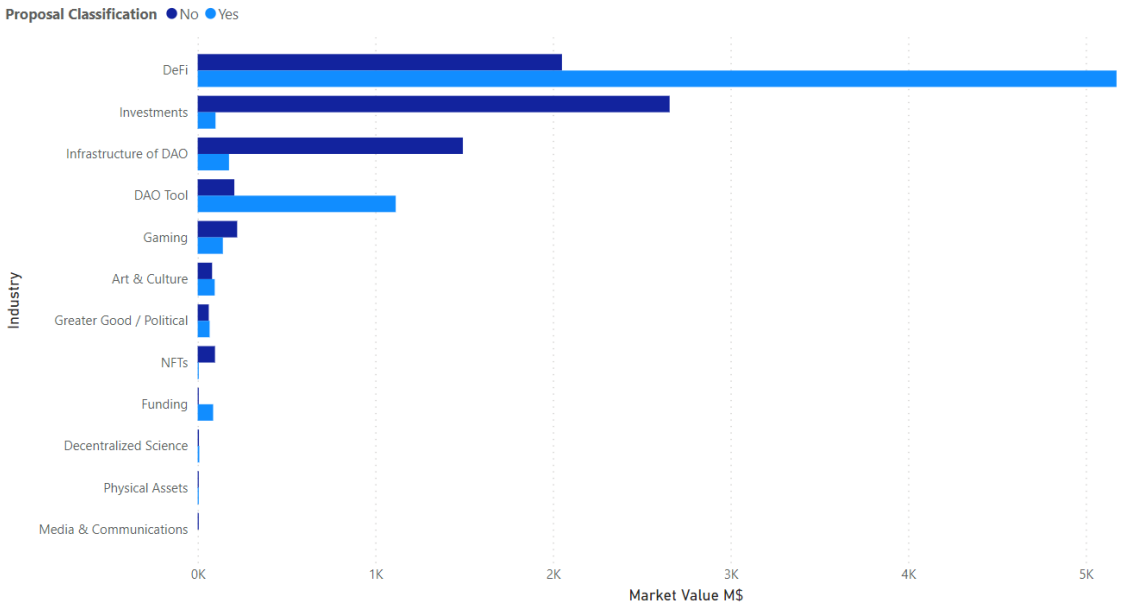

Chart (22) – Proposal Classification choice's Market Value (M$) in each industry.

The Consensus in choosing a voting system:

Up until this part, we talked only about the structure of the voting process mechanism, but nothing was said about how they count their votes. This is called a voting system. Scattered in the literature and reported here are several types of voting systems that a DAO can employ to count their members' votes. However, in the market there are currently 6 voting systems. Namely, Delegable voting, Token-weighted voting, Conviction voting, One Person One Vote, Quadratic voting, and Meritocratic voting.

In the chart (23) below, the Delegable voting system has a clear dominance over the market share with nearly 75% of the market. Conviction voting and Token-weighted voting together capture nearly 22% of the market. A striking observation is that the market doesn't have perfect competition between the voting systems, so the case in the market right now is not about equally effective and productive voting systems that many DAOs believe could work for them equally. The case is about the overwhelming success of one voting system over the other system, which alone captures more than 4 times the market share of the second alternative after it.

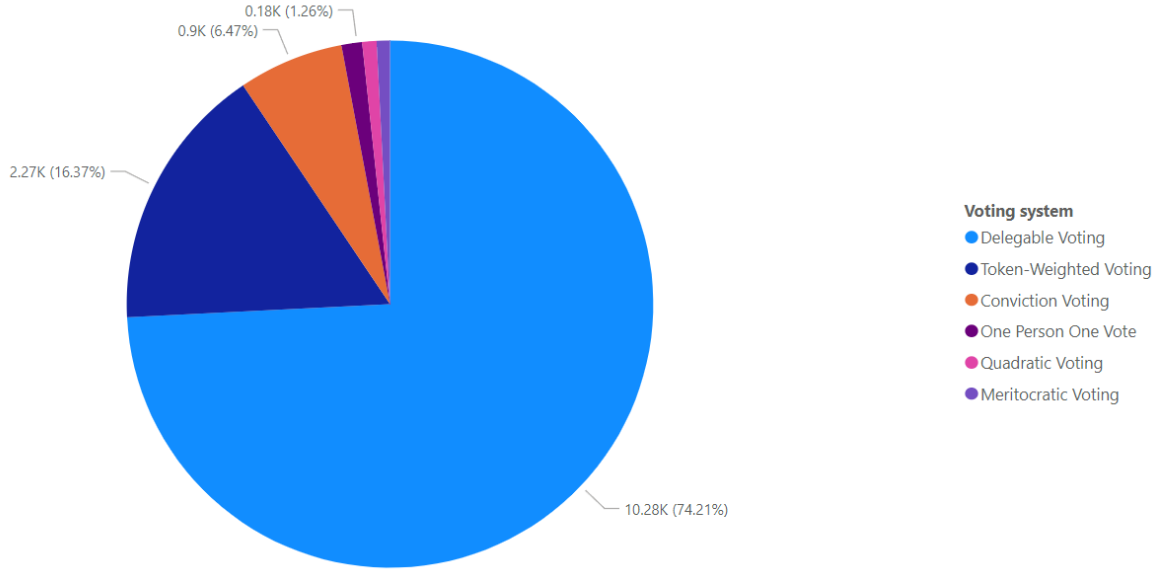

Chart (23) – Market Value (M$) captured by each Voting System.

Another way to confirm this conclusion is to look at the adoption rate of each voting system among the DAOs in the market. In the chart (24) below, only a third of the market has adopted the Delegable voting system, yet this third has captured 3 quarters of the market share (chart (23)). It also indicates that new or small valued DAOs first start by using Toke-weighted voting system and after they reach a matured and stable status, they opt for the Delegable voting system when other voting systems have a corresponding percentage between the two charts.

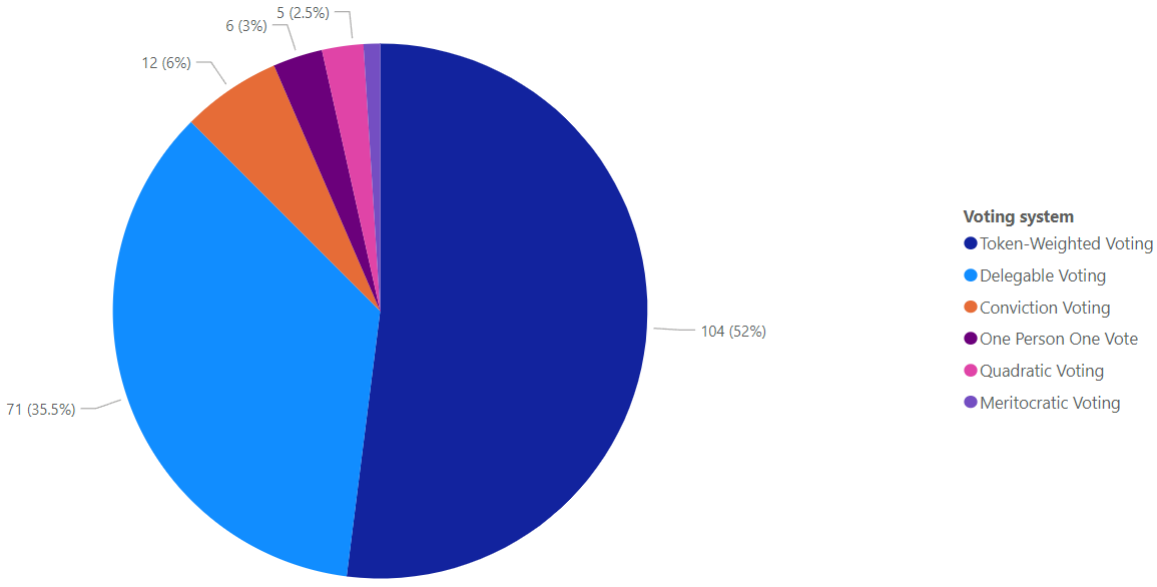

Chart (24) - Number of DAOs adopting each voting system.

Checking the voting systems distribution among the choice of on/off-chain, in the chart (25) below there's no big difference in the voting systems of Token-weighted, Conviction, and OPOV. In Delegable voting, however there's an edge for on-chain operating choice, it indicates that this is the direction of the market in the future. The meritocratic Voting system is solely operating on-chain and the Quadratic Voting is the exact opposite.

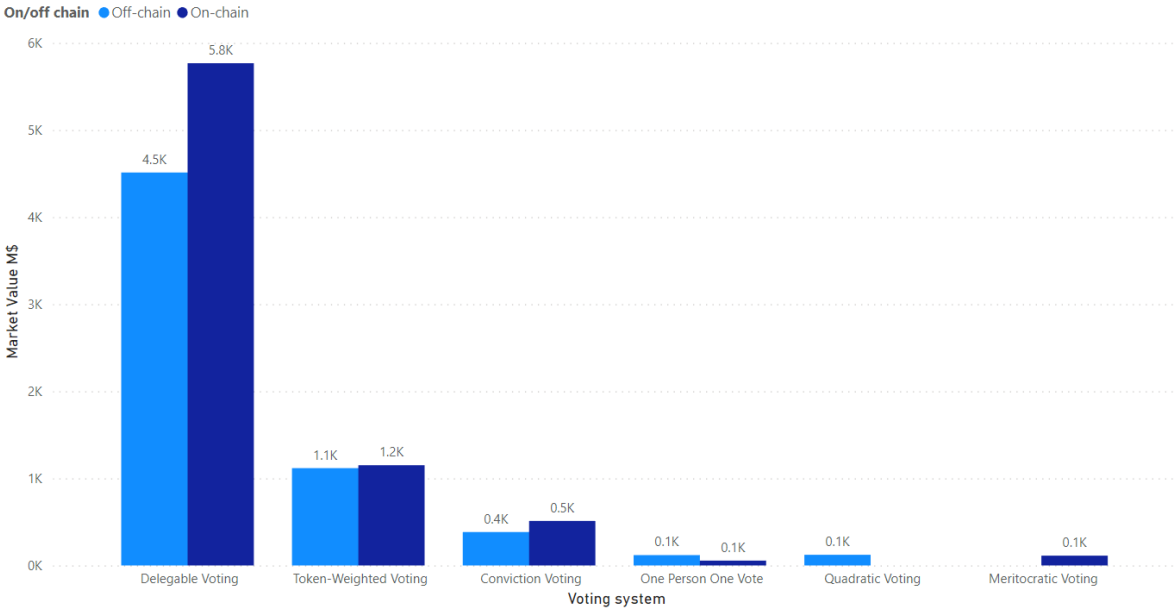

Chart (25) – On/off-chain choice's Market Value (M$) in each voting system.

Comparing the voting system choice to the choice of the Blockchain, the chart (26) below is produced. The chart however is scaled down to 0.2k M$:10k M$ for the reason that Ethereum Market value in Delegable voting system equals 10.2 B$ making the other data unreadable. We can see from that chart that Token-weighted voting system has the most diverse collection of Blockchains, that reinforces the conclusion that it's the first choice for most newly created DAOs in the market almost like a testing area for them. It also shows the other 5 voting systems belong to settled committed DAOs.

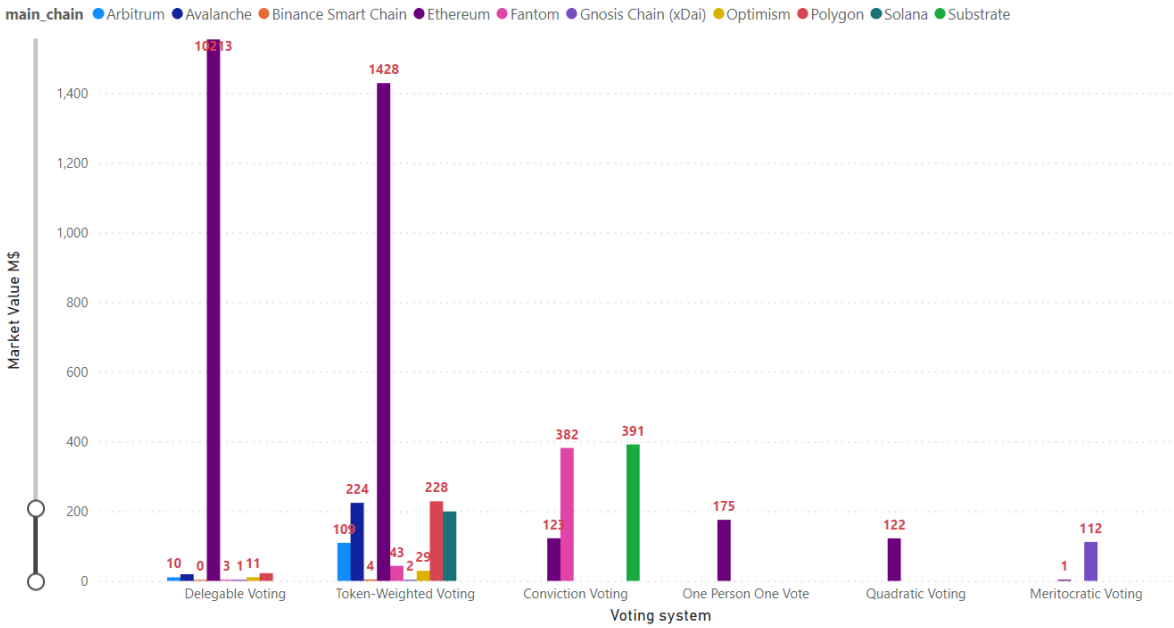

Chart (26) – Scaled Chart for Blockchain choice's Market Value (M$) for each Voting system.

Doing the same comparison but this time with the choice of the industry of operation, the chart (27) below is produced. The chart however is scaled down to 0.5k M$:5k M$ for the reason that DeFi industry's Market Value in Delegable Voting system alone equal 5 B$ making other industries unreadable. It shows that Delegable voting has created value for different industries alike and that it is flexible to adopt which will not limit an industry's needs or choices.

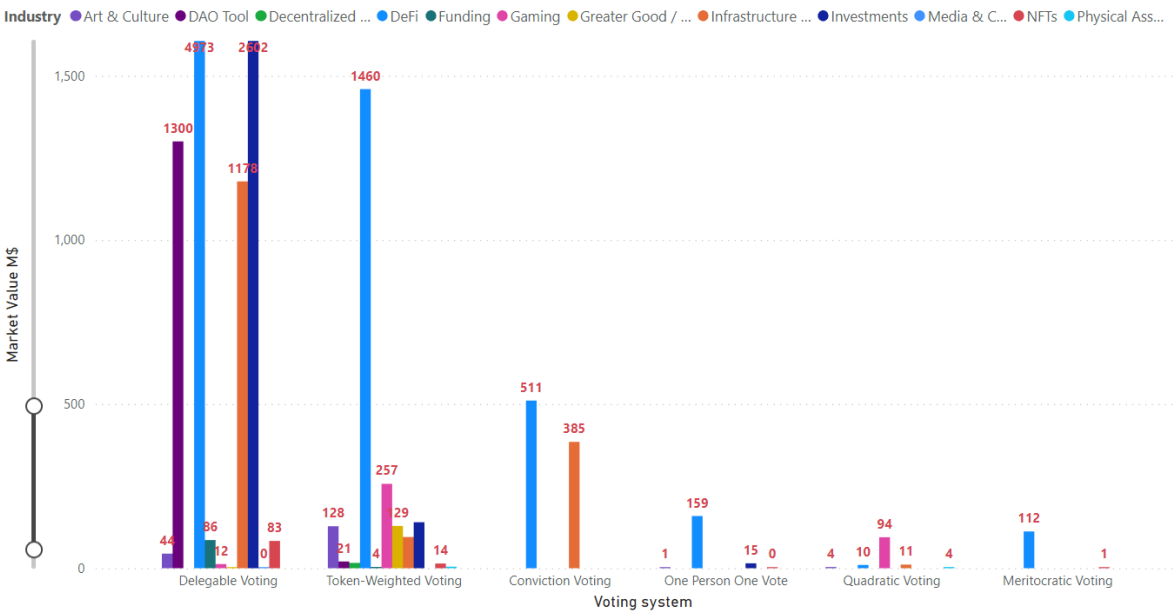

Chart (27) – Scaled Chart for Industry of operations' Market Value (M$) for each Voting system.

In chart (28) yet another confirmation to previous conclusions can be found as the Delegable voting system is taking the features of on-chain system with majority going for 3 voting stages and proposal classification. The opposite is true for Token-weighted voting system as taking off-chain features of 2 stages of voting and no proposal classification.

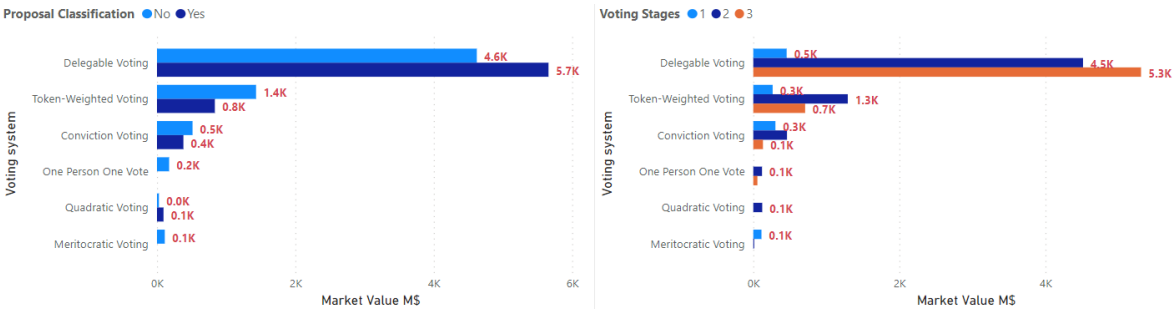

Chart (28) – Proposal classification and voting stages choice in Market Value (M$) for each Voting system.

A major anomaly is found in chart (29), as the delegable voting system is overwhelmingly choosing both communication tools. It means that the voting system encourages and requires more communication and connection with the DAO which is very important for increasing participation and incentives inside the DAO. Another observation is how other voting systems with lower market value tend to fork their choice from each other.

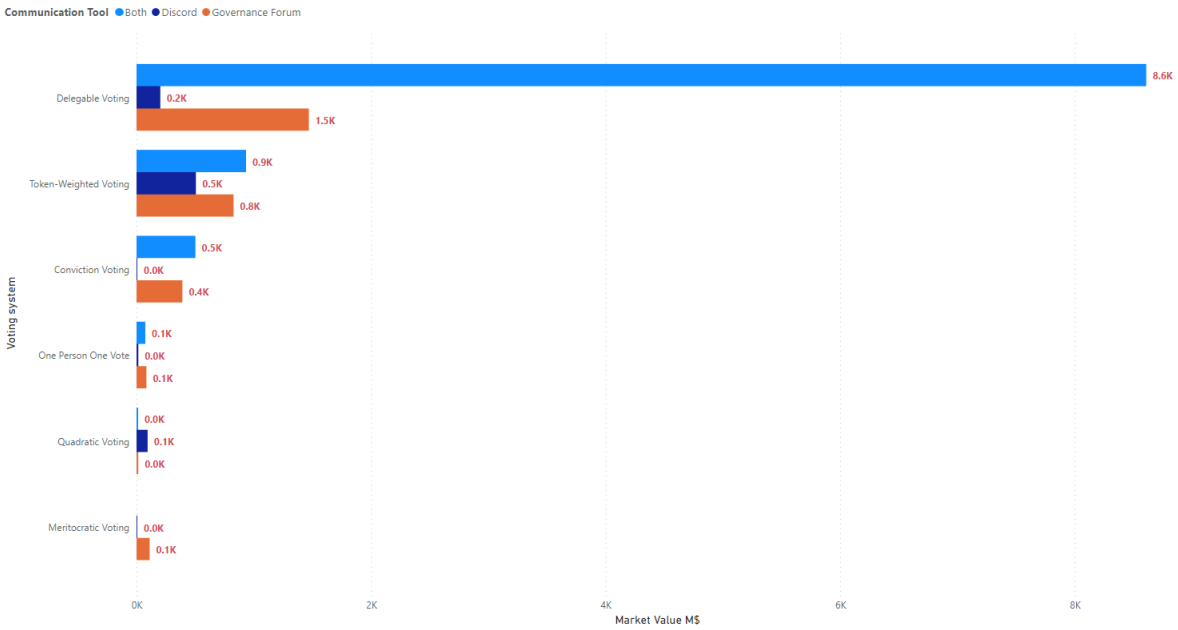

Chart (29) – Communication Tool choice's Market Value (M$) for each Voting system.

The way DAOs apply the token-weighted voting system sometimes may start from a different point but eventually they all create the same result. For example, in Curve DAO, Spool DAO, Qi DAO, New Order DAO and Mango DAO, instead of making the members declare their token ownership only when voting takes place, they make members escrow their tokens for a period of time and according to the amount escrowed and the time spent being in escrow, the weight of the token is different in the votes that follows their escrow period. This method, however, is still in favor of the members who bought more tokens to begin with. The only main benefit of this method is to ensure stability in the price of the token and to prevent any newcomer from hoarding all tokens and hijacking their governance, because they can't vote with non-escrowed token.

Other small different details are found in a few DAOs employing the Delegable voting system in the way they choose their delegates. Instead of leaving it up for the members to volunteer, they put a list of requirements and minimum token thresholds. For example, the delegate has to be a member of the DAO for quite some time before applying for that. The delegate should have a minimum of tokens in their wallet before asking other members to designate him/her as a delegate. Another idea is to make it an election cycle of delegates when they hold their delegees token balance for the whole cycle and they remain their delegate for any voting process that comes during this cycle, a resemblance of people's representatives in a democratic political system.

Other than small differences, the DAO market didn't change or present any new ideas in the voting systems from what was already reported in the literature before. Most importantly the concept of each voting system is still solid in its core of application.

5.3. Measures for Incentivizing Participation

The money approach of the problem:

Incentivizing Participation is a critical issue in DAO market, as it's the pillar of reaching decentralization in the governance model. Without members contributing to discussions and votes the DAO becomes an oligarchy then a centralized organization overtime on its own. The only factor in any incentive model is money as in token rewards. The DAO market seems to have not cracked the case yet for this, their ideas are scattered with no uniform system or one solution, however all their ideas are revolving around increasing revenues or token rewards for members who use their tokens balance more than others. Before talking about the problem with this approach let's see some examples from the DAO market.

In **BeethovenX DAO** last year 2022, they introduced a new incentive model for newcomers and small token holders to encourage them to participate more in the voting process and use their token balance. The problem was the old incentive model that awarded all members without a difference with a percentage relative to their token spending. This system didn't encourage small token holders to participate and spend their tokens because they expected the reward would be too small for the effort, maybe if they waited longer without spending them, the tokens value would go up in time. The new model takes the fees paid by all members on transactions and anything else and creates an incentive pool to pay for new members' and small token holders' incentives. They also created a dedicated Discord server for this group of members to educate them about the rewards and help guide them into choosing where to spend their tokens. This model increased community engagement and voting statistics in the months after approving it.

In **SushiSwap DAO** the problem was that DeFi industry, which they are part of, was dominated by liquidity providers (Venture capitalists or other rich individuals who deal with decentralized exchange regularly and can provide liquid assets to another DAO) who were hunting each DAO for their annual percentage yield (represents how much interest rate they score on their invested tokens) for their digital tokens. They go into a DAO and buy or exchange a lot of tokens to gain a considerable amount of voting power and then influence the DAO governance to maximize their Annual Percentage Yield from the tokens they exchanged with. This was enabled easily because of the use of Token-weighted voting system initially (until around the end of 2020) in the DeFi industry before they shifted into Delegable Voting. This trend marginalized small token holders and sometimes even big token holders inside a DAO in comparison to what these liquid providers were able to offer the DAO treasury and use it to steer the wheel. To face this problem,

they introduced a new incentive system that also controls how members might be able to vote on new proposals. First, they prevented any new members from voting without locking or staking their newly obtained tokens for several days, which would be a sufficient amount of time for liquidity providers to lose interest in hijacking the DAO tokens because the token value and interest rates on yield will not be as much profitable after this period of time. Then, they offered a reward for voter participation when they stack their token as well and increased their yield more than new members with a percentage proportional to their wallet balance. They also offer a new incentive for the new members when they stack their tokens and vote and collect more yield, they are closer to having enough wallet balance to engage or propose new Core proposals that affect the DAO governance and core operations' parameters.

In **ParaSwap DAO** they introduced a contributors committee that consists of volunteering members with something to offer for the rest of the DAO ranging from technical background to passion and vision. Rewarding this effort differently than others with a separate reward rate linked to their committed time and effort in the DAO in any form, maybe in crafting new proposals, maybe in handling technical support for the smart contracts creation, maybe in helping other members understand and be more involved in the process, ...etc.

What could be wrong with this approach is that throwing money at any problem will never solve it. The lack of participation in a DAO is more complicated than just the absence of rewarded contributions. The power dynamics between different DAO members are being left behind, the lack of consensus on a unifying vision of a DAO's work is being left behind too and many other approaches to the problem.

The power dynamics approach of the problem:

Another approach is to address the imbalance in the power dynamics inside a DAO between the members. The current structure of the DAOs still puts more power in the hands of big token holders as opposed to small token holders. The situation became so serious that a name was given to them, Whales are the big token holders where Frogs or Commoners are the small token holders. These names became viral in most governance forums and DAO blogs (which are public to view) discussing the power dynamics problem, and it's not a surprise to find them all initiated by the marginalized side of small token holders with no pushback or defense from the whales. This situation was created from the laxative conditions of buying tokens and then being able to propose or pass any new rules as easily as possible with no limitations or safeguards, mostly from token-weighted based voting process. The philosophy behind leaving this situation to take hold of many DAOs is that the higher an investor paid in a DAO the higher say they should have on the money

they spent because they will lose first when the DAO does, and this argument is sound by its own, but in the context of DAO it's very misleading. The argument is fusing two things into one thing only, the return on investment is fused here with the decentralization of governance. The whales can have their big returns and not compromise the governance at the same time, which is exactly what some DAO members offered as a middle ground solution to the problem. Let's see some examples in the DAOs.

In **Wonderland DAO** last year 2022, there was a revolt from the frogs against the whales. In a governance forum topic titled "change vote count to Quadratic", the discussion illustrates how only 5 whales are controlling the rest of the thousands of DAO members choices in the governance votes. Some of the arguments are stating that the count should not be by wealth and maybe quadratic voting will help tip the scales to a more fair outcome. Another thing they confirm in this situation is that only 3 of them bought millions of tokens 3 days before this vote in question, pointing out that there's an obvious scheme to hijack the outcome from a beneficiary party. What is more staggering is that all this was done legally and in coherence with the DAO rules, so there's no claim of wrongdoing to be able to stop them immediately, thus they have the ability to continue this behavior as long as they are allowed to do.

In **Crypto Unicorn DAO**, 6 months ago they introduced a new voting system for their DAO to employ Quadratic voting count on multi-choice voting because there were 4 whales controlling most outcomes of the votes and the DAO team acknowledged this step as a more decentralization approach to the governance to be able to operate as a community-owned IP.

In **SuperRare DAO**, several months ago, when there was a recurring important vote that required all members' consensus each time, they had multiple complaints about the whales controlling the outcome of the vote. After lengthy discussions a proposal of a solution was presented to change the voting system into Quadratic voting system, where it was estimated that the outcome in each time would have been different completely if a Quadratic voting system was used instead to write off the whales' effect. It did happen after they agreed on implementing the new voting system and they plan to expand this concept in the future.

In **Gnosis DAO**, the 4th biggest DAO in the market, last year they had a standoff situation with the super whales preventing the governance votes from reaching the required quorum to be considered applicable. They tried to the money approach, but it increased the power of the whales into becoming super whales doubling their voting power in exchange for commoners to only reach a small fraction of progress. They further argue that commoners are now discouraged to join any voting process

as they have no actual power over the final count, they also agree that based on this oligarchy rule the DAO has become a high risk investment for everyone as the whale have enough voting power to trigger any proposal and pass it on and withdraw all the treasury fund and direct it into whatever they want. They finally proposed to implement quadratic root voting system in some situations to help get commoners more involved in the governance process.

It's not all the time the mistake of token-weighted voting system, there is also a hack route for Delegable voting system if not regulated correctly. In Proof of Humanity DAO, last year 2022, they had a problem called "Delegate Farming" it means that some delegate will create new fake accounts on the digital wallet of the DAO and become members then delegate their voting power to themselves and be proportionally more powerful than the rest of the delegates creating a route for them to hijack the governance system. Their solution to this problem was effective enough to eliminate this problem, they employed a voting power cap on each delegate using quadratic voting, they also added a time lock on delegating voting power before each vote. All this in the end helped members to regain trust in the governance system and continue to contribute.

In conclusion, the problem of incentives to participate is not completely cracked yet. The one-sided approaches to the problem sentence any solution to death or lead to half-baked solutions. While it's important to face the whale problem head-on, it is also important to widen the scope of the incentive model to work on passion to the vision of the DAO, the fair power dynamics, and finally reaching the transparency sought after in the original DAO vision that is lacking so much in some DAOs now.

5.4. External Task Management

The DAO does not exist in this world alone, it needs to represent, market itself. It also needs cooperation with other DAOs or other 3rd parties that help increase its product value. Our scope is to shine light on the methods they use and integrate it as part of the governance model to fulfill these relationships. For example, all DAOs have introduced a website for their business that represents what they do and offers a chance to join them, not all offer complete transparent information about the DAO in their website sometimes they are half-basked and not conclusive. In this example it's important to know how they manage their website and who is tasked with keeping it up to date, because this is the part that affects the governance model.

Bare minimum level: Third parties' agreements

Not all DAOs have a dedicated avenue for dealing with this type of tasks, they mostly rely on volunteering from the member if there are people who can handle public relation tasks and marketing tasks and investors support tasks. Obviously, this is not a reliable solution as the notion of dealing with the tasks as volunteer work will not increase productivity or achieve sought after outcomes from it, it requires time and effort commitments. A solution to this is to make cooperation agreements, hire freelancers, or entities to do these jobs and enforce it through smart contracts. The burden here has shifted away from the DAO members focusing on how to do these tasks to instead dealing with these third parties and ensuring their accountability on their mutual agreements.

In **BitDAO** the 2nd biggest DAO in the market, they have a smart contract agreement with SushiSwap DAO to provide technical support for governance, treasury management in the aspects of design and code building. For that alone they allocated 2.6% of all BitDAO token supply to this smart contract agreement. In **Gnosis DAO**, the 4th biggest DAO in the market, they have long-term agreements with PR companies that help them organize real life events/conferences that advance their mission and the DAO community. In **Illuvium DAO**, they laid out their roadmap to market adoption by hiring third parties promoting their mission. In DeFi they plan to make smart contract agreements with Decentralized apps and web platforms that co-align with their mission to create alliances and cooperations that bolster both their adoption. In the mainstream adoption they plan to hire influencers from each relevant market that help spread the word and offer endorsements to their mission. Other forms of third parties' agreements are: creating newsletter service for any subscriber whether they are a member of a DAO

or not, creating and managing a blog (usually being deployed on a dedicated profile on the website Medium) that reports only the landmark moments of the DAO but from the perspective of the DAO itself not a third-party reporting on the DAO as part of their news cycle. And finally, the last common form is hiring digital security companies to conduct regular audits on the smart contracts of a DAO to help prevent any loopholes creation or backdoor hacks. All these other forms are too common among the DAO market nowadays that they can't be all named here together.

Medium level: In-house committee

The next level of commitment to this type of task is changing the way to handle it but doing the same ideas to fulfill it. Instead of relying on outside help, a DAO can choose a number of its members to be part of a committee that is dedicated to fulfilling these responsibilities. The way to choose this committee can differ from DAO to another, some DAOs choose the members by direct allocation of responsibilities, some others choose the members by holding an election vote that all DAO members should participate in.

In **Synthetix DAO** in the top 20 DAOs in the market, they created something called Ambassador Council. The Ambassador Council mission is to handle promotion of the DAO mission in the DeFi ecosystem. They give autonomy powers to the council to act on proposals related to its scope of work that helps promote the DAO, they also give them powers to negotiate on behalf of the DAO in further third parties' deals that help execute their routinely updated mission. They choose the members of this council by election every short-term period, which helps in keeping the council's members in check and accountable for their actions over time. In **Threshold Network DAO**, they have guilds that are community-led. They are managed by an elected committee and hold regular elections each short-term period. Their mission is not so different that other similar councils in other DAOs, spreading the words about their DAO mission, growing the network of contributors to the DAO content and protocol development. Here in this level, we see the importance of specialization in task management, the same argument that the literature was offering before is now a reality and a rewarding choice too.

High level: A Foundation

The last level is creating a foundation representing DAO's vision and mission to the whole world. Usually, this foundation will be a non-profit organization or that's how the DAO market chose to build this idea until now. The purpose of choosing a non-profit organization is because of the privileges that comes with this status, low

taxation rate and laxative laws involving non-profit organizations compared to companies. The location of registering the foundation is also in coherence with the goal of paying as little as possible in taxes, in tax haven countries like Cayman Island and Switzerland.

In **Stargate Finance DAO**, the 6th biggest DAO in the market, they created Stargate foundation with the mission of sustaining growth and protocol stability. Championing community-led initiatives, approving then managing grants to contributors to the DAO mission. Marketing and communications projects, partnerships with other crypto organizations, and maintenance of the stargate protocol. **dYdX DAO**, the 5th biggest DAO in the market, is doing the same thing with a non-profit organization based in Switzerland. Add to the list also **Lido DAO**, the 7th biggest DAO in the market, they created a non-profit organization but this time they offer donations to the cause. **Polkadot DAO**, the 8th biggest DAO in the market, created a Switzerland based foundation, Web3 Foundation, that focuses on funding and promoting technology pioneers in the decentralized web software ecosystem. In **UPDAO**, they created a Cayman Islands based foundation, called The United Planets DAO foundation. The purpose of this foundation is slightly different than others, as it focuses on helping their DAO in creating physical assets and intellectual property that gatekeeps the DAO mission in the future. In **Radiant Capital DAO**, Supernova Holdings foundation was created to safeguard the DAO mission and protocol stability. The DAO members can choose the foundation's executives and check the foundation's adherence to the four core values of the DAO mission, Innovation, Determination, Collective Benefit, and Transparency. In **ENS DAO**, the 3rd biggest DAO in the market, created a foundation in Cayman Islands called ENS Foundation. The DAO can vote to remove and appoint directors of the foundation, they can also vote to make funding decisions, contract deals, marketing, and community initiatives on behalf of the director and his mission is to execute.

In conclusion, no matter which level is used in the DAO, the absence of an option to address these types of tasks is against productivity and increases operational costs. The debate whether one level is more decentralized than the others is not useful to have, as the problem is not with the approach but with the way this approach tips the balance of powers inside a DAO. For example, a foundation handling external relationships by itself with only one or three executives doing the decision is very centralized and not helpful to the DAO vision however if the DAO members elect those executives and are the one who send those executives the consensus reaching decisions for them to execute and help nurture overtime, then it will not be a centralized approach and it will be helpful to the DAO vision.

Another example is found in the in-house committee. If the committee is hired by a central authority with unquestionable decision-making power in the committee's hands, then it's a central authority. However, if the committee is elected in a regularly held election cycles and with the participation of enough percentage of the DAO members, where the committee's decisions also are subject to checks and balances power from the DAO members or another elected committee, then it's not a central authority.

As for the bare minimum level of creating third parties' agreements, it shifts the burden of the tasks and their relevant central authority into a smart contract, but at the same time it makes the DAO itself most vulnerable. How? To be able to create the smart contract between the DAO and any party, the contract must give access to the DAO personal data with complete tracking and methodological thinking to this party to be able to use them in their line of work to fulfill their dedicated responsibilities inside the contract. So, the DAO has opened a backdoor to its core protocol to other parties outside of the market, these parties could be vulnerable to outside attacks at any time during the contract period which will put all their sub-agreements in danger i.e., the DAO. Even in the case that all parties are 100% secured and can guarantee that in all situations, there's another downside that is hidden, which is losing in-house experience. When the DAO excludes itself and its members from these types of tasks, they lost the opportunity to learn the experience that comes along with it, they also lose the opportunity to learn the technical skills and support needed to maintain these services in the future for the DAO business.

At the end the way the DAO applies their approach matters to the governance model more than the choice itself.

5.5. Emergency Response and Accountability

Emergency Response

There is a difference between emergency response and emergency procedures. An emergency response is concerned with preventing and mitigating a present and sudden event that could threaten the stability and continuity of the DAO. However, emergency procedures are a complete process facing all kinds of events that could happen in any period of time and help prevent future repeat of these events. emergency procedures steps are well known, prevention, mitigation, preparedness, response, and recovery. For Emergency prevention and mitigation almost all the 200 DAOs in the study scope have implemented two things. Security Audits and third-party agreements were utilized to check smart contracts of the DAO and regularly report on any weaknesses that can be exploited by any personality. The second thing implemented is bug bounty, they offer a reward for any outside expert that can help identify a bug inside their open-source smart contract or an exploitation hack that could make the DAO vulnerable. These two measures help reduce the impact of future emergencies as most of the obvious and common mistakes or loopholes would have been dealt with and consequently reducing the probability of future vulnerabilities. For recovery step, it's out of our scope as it deals with the aftermath of an emergency that just focuses on how to build the DAO up again and restore faith in the system. As for the remaining two steps which are the most critical ones, response, and preparedness, they need regulations and a clear path to be able to fulfill them. A part of preparedness is about putting measures in place to predict and prevent future attacks, and this is related to what is happening with security audits and bug bounties. But for the other part of preparedness is creating a path or means of handling sudden events that require a spur of the moment thinking and time sensitive reactions thus creating the response needed in a corresponding level of graveness. Not all DAOs have agreed on the way to build this path of emergency response, there are **4 major tactics** followed now by the DAO market.

Tactics for an emergency response

The first tactic is: **Delay to review**. It's the process of delaying any newly passed proposal off-chain, delaying it on-chain for 24 hours and sometimes 48 hours, before implementation to be able to review all its consequences on the smart contracts governing the DAO and when it is cleared of risks, then it's implemented on-chain. Examples of DAOs implementing this tactic include: dYdX DAO, Decentraland DAO, Radiant Capital DAO, ApeCoin DAO, FrankenDAO, Hop DAO, and Curve DAO.

The second tactic is: an **emergency track** for voting parallel to the normal voting process in everyday tasks. This tactic solves the issue from the principle that quorum requirements and minimum token threshold to create new proposals are the reason for the fail to act swiftly and quickly in the eye of the storm. This tactic will offer lower quorum requirements and open the possibility of any member of the DAO to initiate the process which increases the chances of detecting the problem early on. When triggered there's a communication announcement carried out to all members of the DAO to join the emergency vote and help save the DAO protocol. When passed, the emergency response will lock down any transactions or loan payments, any auctions or token issuance. Examples for DAOs implementing this tactic include Lido DAO, Maker DAO, Kusama DAO, Bifrost DAO, PieDAO, and BeethovenX DAO.

The third tactic is: **Gatekeeping every proposal** at the last minute. This time the whole voting process will go as normal as any other circumstances but when the proposal is about to be implemented in the smart contract whether the DAO operates on-chain or off-chain, the approval and integration of any new proposal is blocked by a multi-signature wallet. Without adding an additional voting stage at this point, the multi-signature wallet is limited to a handful of members of the DAO more often than not it is in the hands of the founders of the DAO. Their mission at this last point is only to veto (block by not implementing) any proposal that may put the DAO at risk. There's no voting here, only review to veto or to implement. Examples of DAOs implementing this tactic include BitDAO, ENS DAO, Gnosis DAO, Stargate Finance DAO, OlympusDAO, Ribbon DAO, Gearbox DAO, Aura Finance DAO, Spool DAO, Merit Circle DAO, Nation3 DAO, Alchemix DAO, Fingerprints DAO, MoonDAO, Bao Finance DAO, Tempus DAO, Beefy DAO, Float Protocol DAO, Soft DAO, JuiceboxDAO, Indexed DAO, ShineDAO, TrueFi DAO, UkraineDAO, Axion DAO, Defrost Finance DAO, Origin Dollar Governance DAO, and Yam Finance DAO.

The fourth tactic is: **Dedicated Guardians**. In this last tactic the dynamics are totally different from other tactics, there's a dedicated committee of guardians or emergency handlers that are not distracted by any other task in the daily operations of the DAO. It is also blessed by the perks of specialization, as the committee members are chosen or elected based on their expertise in matters of security, that's why multiple DAOs prefer to name this committee as a technical committee. The tactic also ensures a decentralized approach to handling a critical recurrence of emergencies, as the easy way is to give this tempting power of overriding every proposal to the founders or to a central authority, then regret the coercive impact of such power in one hand. The committee studies each proposal and smart contract then makes an internal vote among them to decide whether to interfere or not. The

committee then is put on the spot and evaluated by the DAO members if they are doing their job without abuse or not and the DAO members have a chance to recall them and replace them anytime. Example of DAOs implementing this tactic include Uniswap DAO, Polkadot DAO, Fei DAO, Synthetix DAO, Aave DAO, Compound DAO, Mango DAO, Illuvium DAO, Gitcoin DAO, Phala DAO, Nouns DAO, KlimaDAO, Threshold Network DAO, ParaSwap DAO, Yearn.Finance DAO, Balancer DAO, Badger DAO, Angle Protocol DAO, Nexus Mutual DAO, Crust DAO, DeFiGeek Community DAO, VitaDAO, Dtravel DAO, Inverse DAO, Hydradx DAO, Moonbeam DAO, Moonriver DAO, Code4rena DAO, Acala DAO, Maha DAO, and dOrg DAO.

If all four tactics were compared to each other based on what could be the most fitting tactic in a decentralized organization, the following analysis will be found. The first tactic's major downside is time cost. Making all proposals delayed by 2 days is hindering progress and will be costing the DAO more opportunities during market turmoil or during liquidity rush. It will put any DAO at a disadvantage against its competitors in the relative industry. Another downside for this tactic is the lack of specialization, any member can review the code yes, but wasting time of multiple members to do the same task is not productive. For the second tactic, the biggest downside is enabling a blind spot. The procedure to respond to an emergency is fast tracked but the detection of the emergency itself is left to chance and probabilities, which increases the possibilities of creating blind spots occasionally when no one notices the problem at the right time. For the third tactic, it can be described as an overkill of the problem. Giving God-like veto power to a handful of members that are often founders who are not elected or chosen based on expertise or merits is risky and tempting to be abused, what prevents this handle of members to disregard any vote and override those that are not benefiting them. It also creates a choke point that all proposals have to pass through to be implemented. For the last tactic, it takes the best feature of the first tactic, reviewing all proposals as they come, then takes the best feature of the second tactic, a separate emergency voting track, and combines them with a remedy to the third tactic downside, electing specialized and dedicated members that guarantee keeping the matters as professional and technical as possible. Even with some possible mistakes, the fourth tactic is the best alternative to implement an emergency response in a DAO until now.

Consensus of emergency response against different variables

Now it is time to see the DAO market consensus on whether to implement an emergency response or not and how would that choice be represented in other variables in the market. Starting with the adoption rate of the measure among DAO market, in chart (30) we find that two thirds of the DAOs in the market has not yet adopted an emergency response plan which seems extreme given that the choice is not so controversial to adopt even in a different tactic than what was reported above. So, different variables must be checked. If the market share was used instead to measure how much each choice captured of the market in chart (31), an overwhelming majority with more than 85 % of the market value is captured by emergency response plan acceptance.

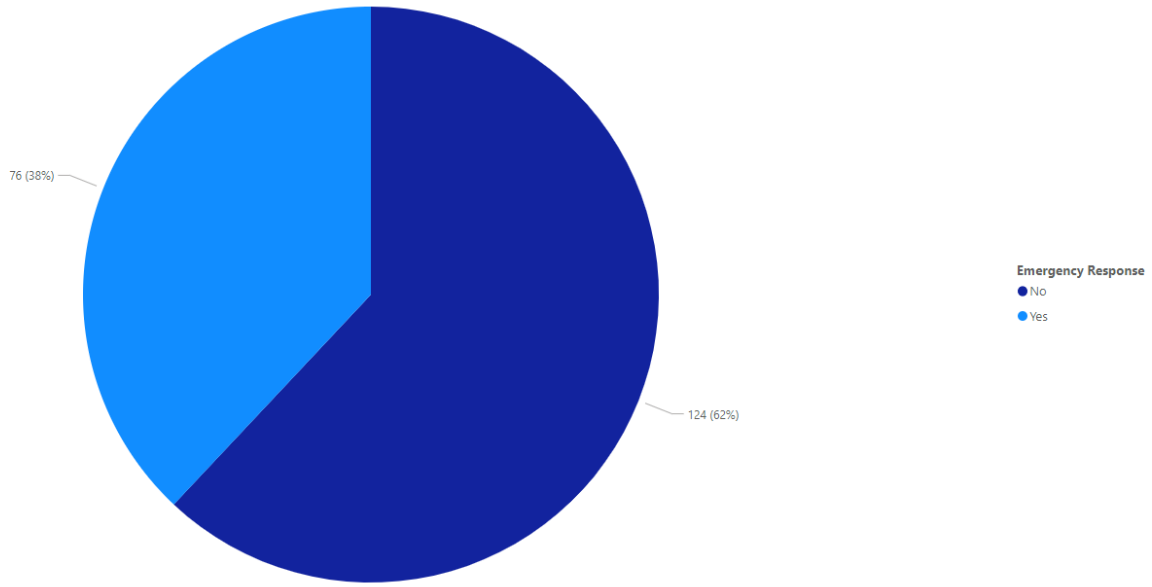

Chart (30) – Adoption rate among DAO market for creating an emergency response.

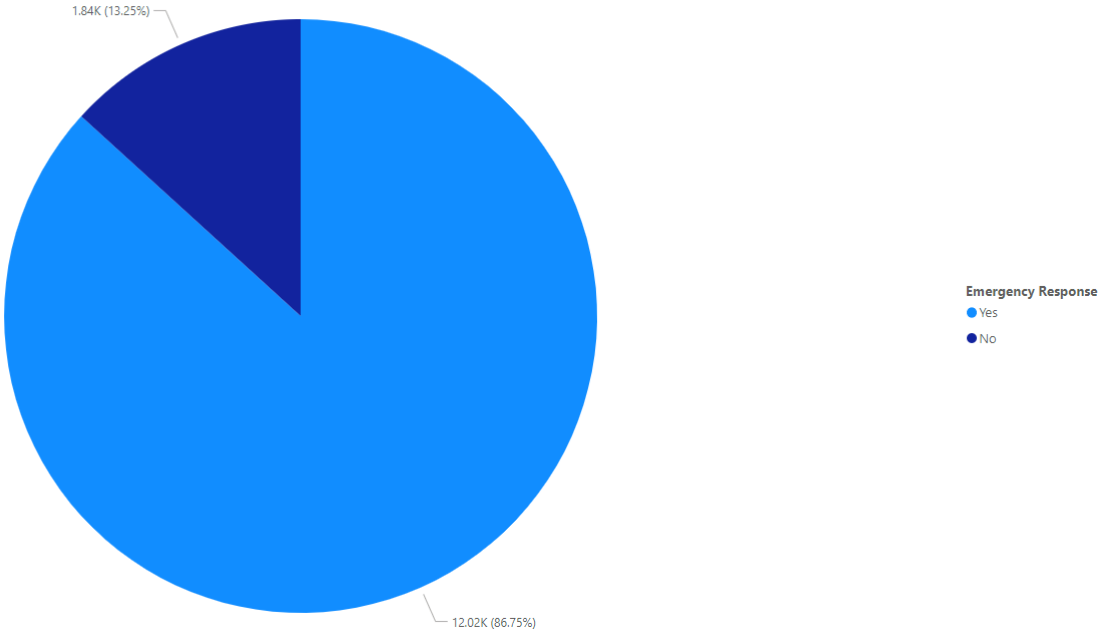

Chart (31) - Market Value (M$) captured by DAO's choice to create emergency response or not.

This means that small valued DAOs are not convinced yet that using emergency response plan in their governance model is worth it. let's see the choice against the twelve industries in the DAO market. In Chart (32), the majority in each industry is going for implementing an emergency response plan, only Art & culture are choosing the opposite, while Political and NFTs are divided. It's worth noting that the biggest 4 industries have the widest gap in market value between the choice Yes and the choice No, despite having much closer gap in adoption rate, it's a strong indication that it's more stable and profitable to choose yes and that it works.

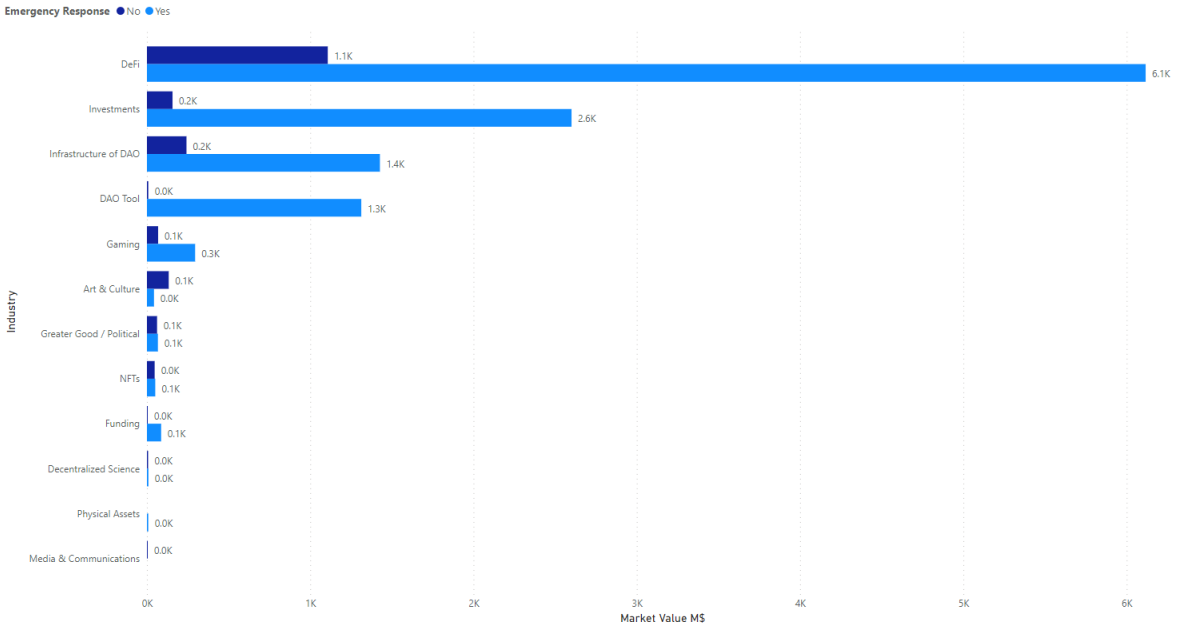

Chart (32) – Emergency response choice's Market Value (M$) captured by each industry.

If the same choice is measured against the different blockchains used in the DAO market, we get the chart (33). Only 4 out of the 10 blockchains are having most of their market share captured by DAOs choosing to implement the emergency response. The most interesting observation is found when comparing both charts (33) and (34), despite Ethereum having almost double the number of DAOs with no emergency response, the market share gap between the two choices is too big that the choice No is only 10% of total Ethereum blockchain market value. The same trend is observed in the rest of the blockchains, indicating that despite being not normally distributed by market share in blockchains, the effect of choosing yes is always going to increase the market value of the DAOs inside each Blockchain.

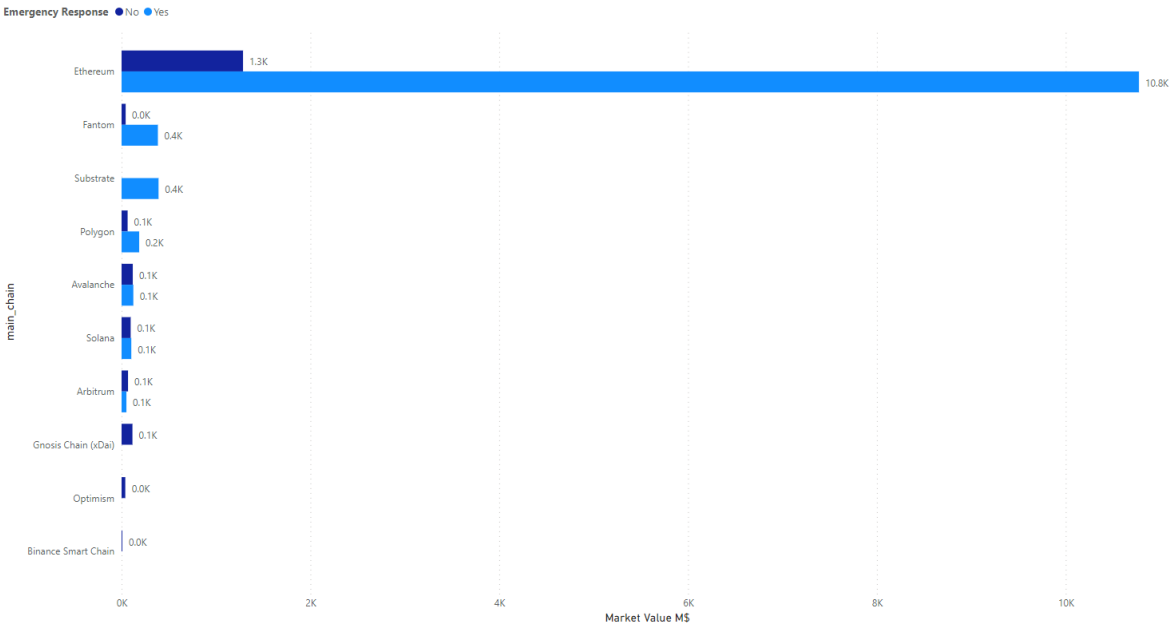

Chart (33) – Emergency response choice's Market Value (M$) captured by each Blockchain.

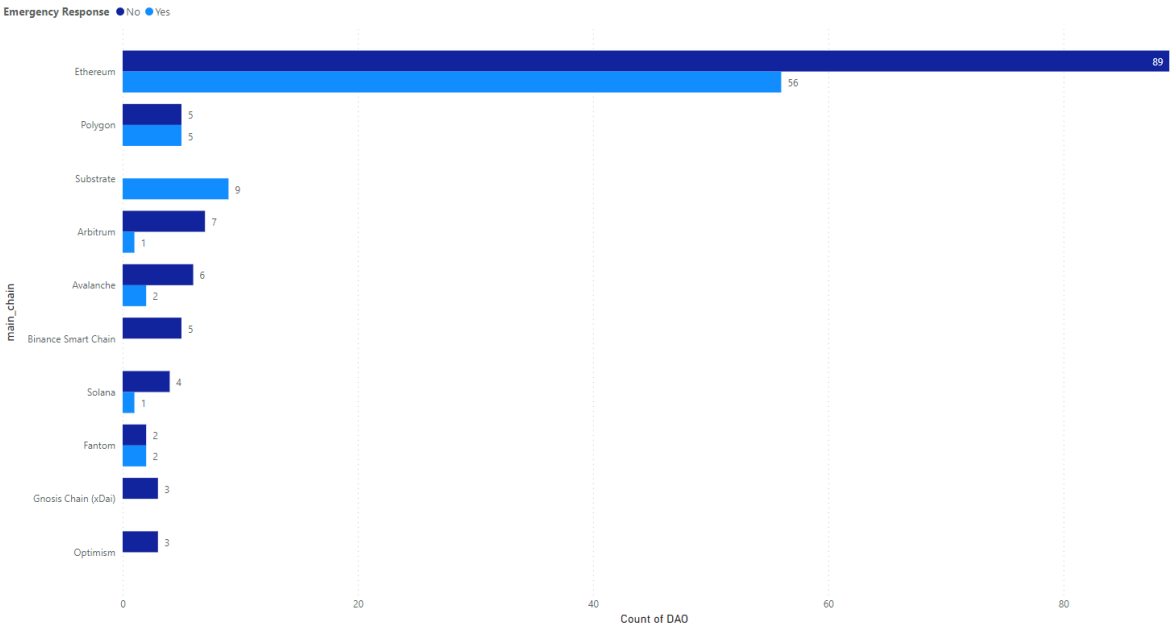

Chart (34) – Emergency response plan's adoption rate be DAOs in each industry.

Moving on to the variable of operating on-chain or off-chain, in chart (35) on-chain DAOs have the bigger gap between the two choices, despite number of DAOs on-chain choosing yes to be 37 compared to 43. Making 43 DAOs to be valued at 700 M$ against 37 DAOs (choosing to implement an emergency response) to be valued at 6.9 B$, which is almost a 10 ten times difference.

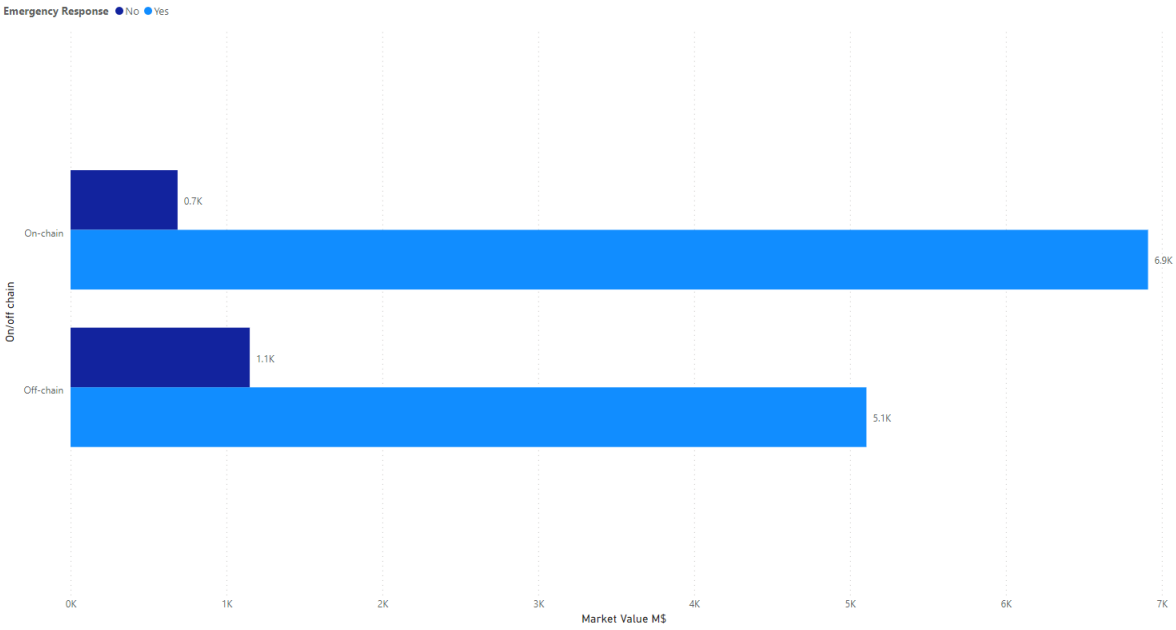

Chart (35) – Emergency response choice's Market value (M$) for on-chain and off-chain.

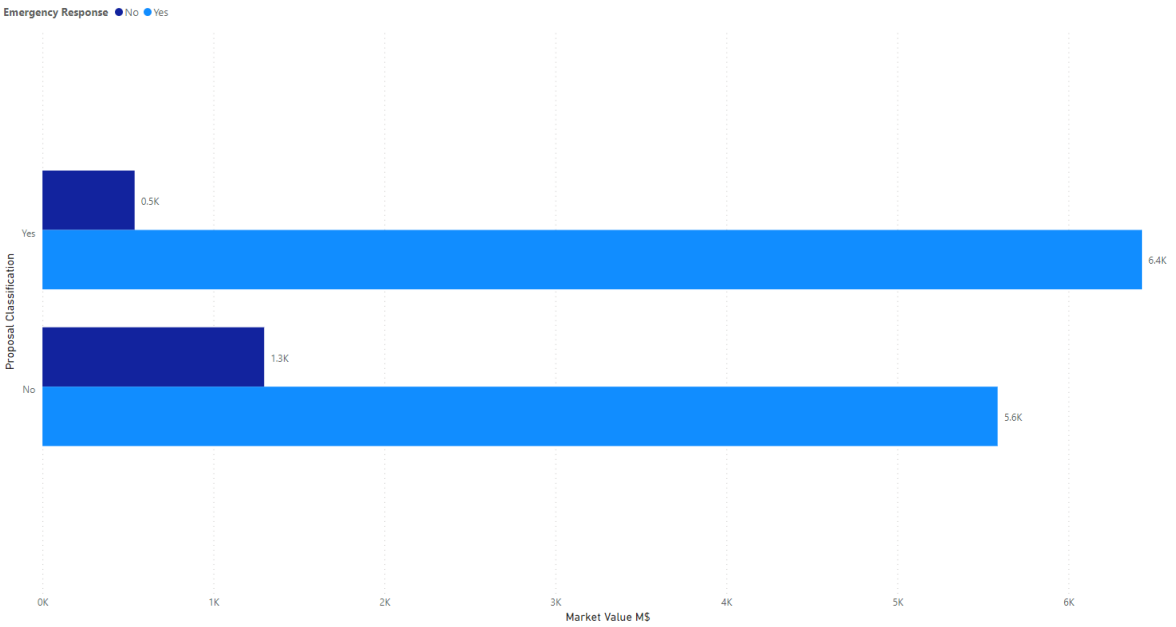

Chart (36) – Emergency response choice's Market value (M$) against the choice of proposal classification.

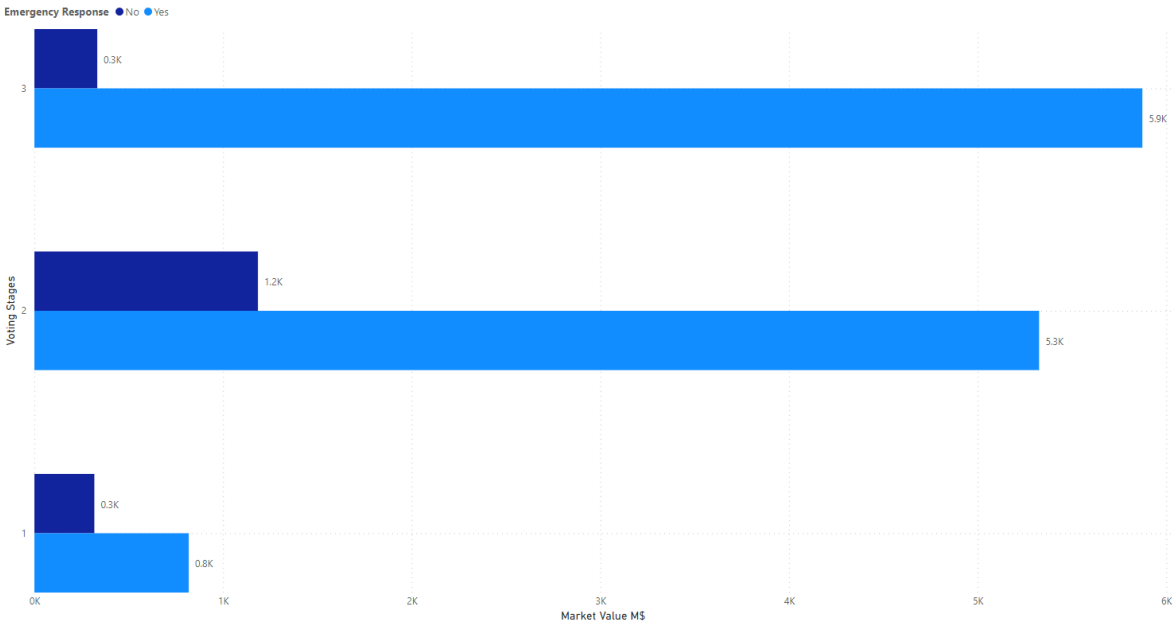

Chart (37) – Emergency response choice's Market value (M$) against each voting stage.

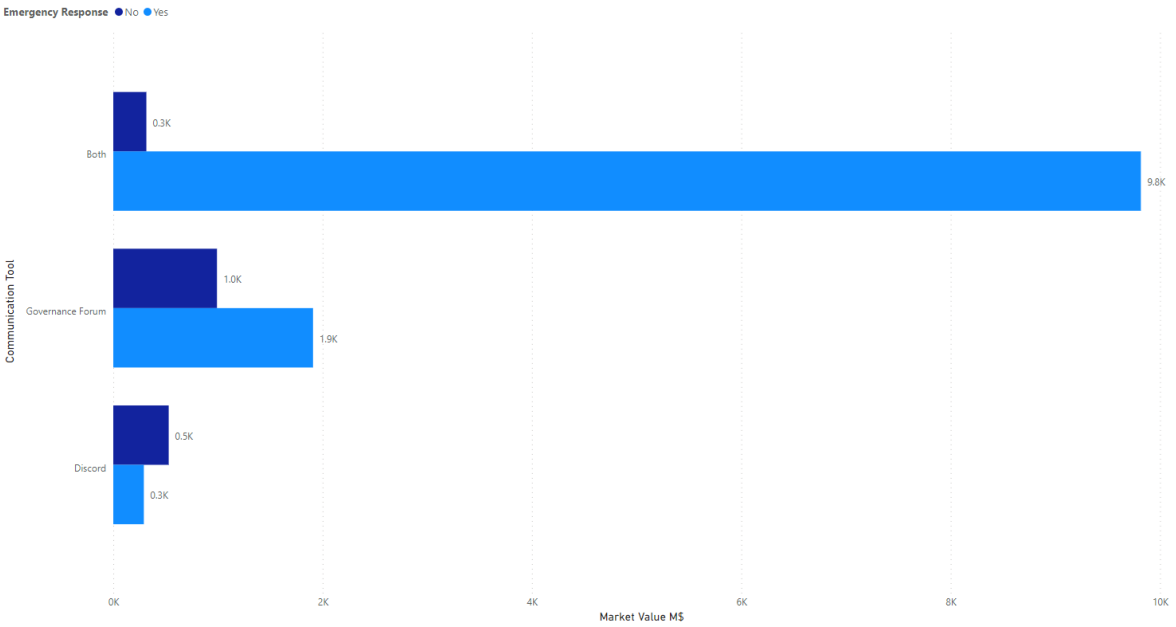

Chart (38) – Emergency response choice's Market value (M$) against communication tools.

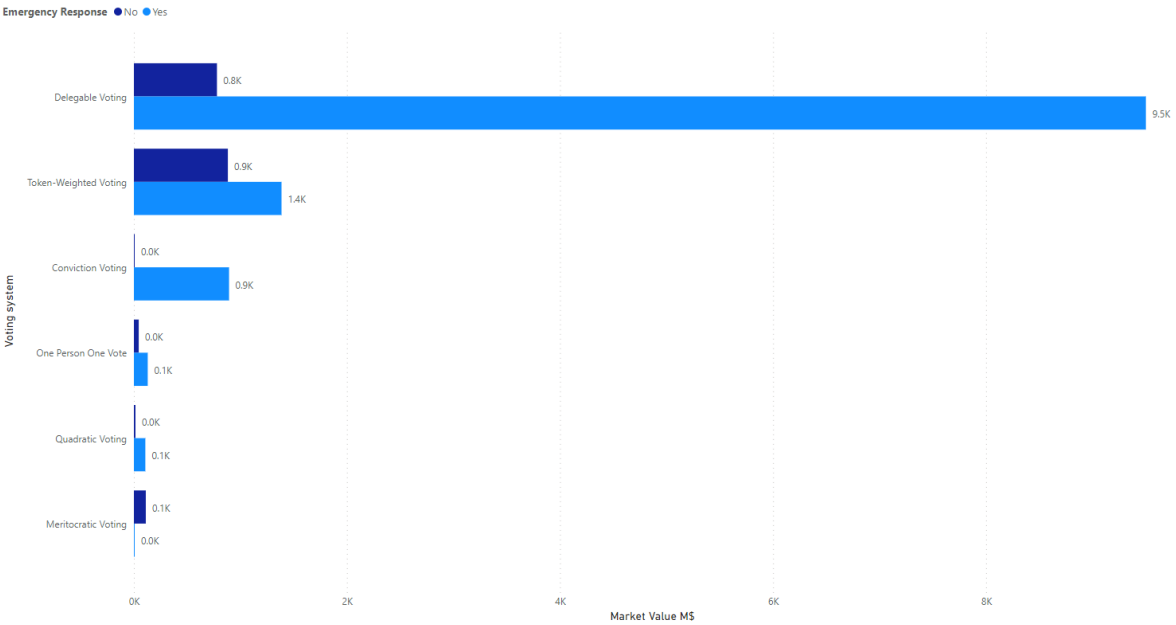

Chart (39) – Emergency response choice's Market value (M$) against each voting system.

From charts (35), (36), (37), (38), and (39) a very clear observation can be found, solidifying the previous analogy that the more mature and valuable a DAO becomes it chooses to operate on-chain, utilize 3 voting stages, employ a governance forum at least as a communication tool, and implement a proposal classification step to its voting process mechanism. Now the new added feature to this collection is implementing an emergency response plan. There are 51 DAOs in the cluster of not doing proposal classification but at the same time doing an emergency response plan compared to 112 DAOs in the same cluster but refusing to do the emergency response, despite that double size gap, the market share of those 51 DAOs is 80% (5.6 B$) of the whole cluster (No to proposal classification) market value of 6.9 B$. On the other side of the same choice there are only 25 DAOs that are choosing both yes to classification and to emergency response plan, and those 25 DAOs are valued at 6.4 B$ which is even more than the 51 DAOs market value, indicating more profit and productivity for both yes choices. The same pattern goes for voting stages and communication tool choices. For the voting system, taking a comparison between delegable voting system and token-weighted voting system, only 32 DAOs using delegable voting system are implementing an emergency response plan compared to 39 Not doing it, on the other side only 27 DAOs using Token-weighted voting system are implementing a plan compared to double of that number with 77 Not doing it, yet despite all this a synergy effect is showing in Delegable voting system being 9 times more valuable than the ones in token-weighted voting system.

Accountability

In this part a survey of examples of accountability measures in DAOs were conducted and a couple of versions of applying accountability were found. Accountability here means members' responsibility to abide by rules and regulations agreed on inside a DAO and/or not engaging in any malicious activity directly or indirectly affecting the DAO.

Starting from the **Aragon Court**, as mentioned before in the literature review part, it's a court to uphold rules and regulations in the cases of disputes among members of any DAO. Any DAO would only have to subscribe to the Aragon court services before presenting it with a case of dispute. Any case is voted on by guardians who are selected from a list after volunteering to the list. The guardians' job is not to create moral judgements, they only have to abide by the rules affecting the people who are in dispute before the court. There are also multiple levels of litigation, an initial ruling and four appeals happen before a final ruling. The brilliance of this setting is creating a credible and impartial third party to be the judge of any DAO not just Aragon DAO. The rules and the guardians are all approached from a decentralized and impartial angle.

Another example of applying accountability is found to be in trial phase at **Uniswap DAO**. **The accountability committee** is a new addition to the governance model of Uniswap but with a limited scope of responsibilities compared to overall accountability. Their scope of accountability is only for the licensing and deployment of grants and loans to other blockchains which are working in cross-chain mode with Uniswap on multiple projects and smart contracts. The purpose is to safeguard Uniswap DAO against any contract fulfilling failure and against any malicious deals that could turn out to be a scam. The members of this committee are elected regularly after the end of each term and the members are preferred to have technical background knowledge that helps them identify scam works in smart contracts and understand the technical ways to apply retributions or a fix for a cased tried by the committee. What's interesting more about this setting is that it doesn't limit the accountability on outside personalities, it includes all sides that are involved in this problem whether they are only from outside, inside, or both.

In another format, instead of dedicating a committee for that purpose, some DAOs chose to embed this responsibility into the job description of **a high entity** inside the DAO, a governing council or an **administrative council** is what it's called. On top of the regular responsibilities of the council to maintain the governance structure and stability of the DAO mission, they are also expected to uphold the rules against malicious members. The problem with this approach is that there's no due process followed. There's no trial, no DAO members voting, and all details are

up to the council to apply. More reasons to believe that it can be abused as a power and used to target dissented people. It also adds to the friction force increasing time and operations cost for the DAO by not assigning the responsibility to a dedicated member/s of the DAO. Examples of DAOs using this format are Polkadot DAO, Decentraland DAO, Phala DAO, and TrueFi DAO.

The last format found in the DAO market is a one similar to an institutional democracy. In this format there are **checks and balances** between different powers inside the DAO, the simplest form of this, is members being able to recall/elect committee that is responsible for accountability and the committee being able to apply the accountability standards on all members of the DAO. A higher format is an added layer of check and balances by making another committee responsible for keeping the accountability committee in check. Examples of DAOs applying this format are Fei DAO, Badger DAO, MoonDAO, and Nation3 DAO. In Nation3 DAO, there's a supreme court settling disputes between members and an elected senate council. The senate is also participating in hiring this supreme court with the members of the DAO, the supreme court is also responsible for settling disputes among members themselves. All these possible connections of checks and balances offer a two-way accountability inside a DAO that doesn't leave the ultimate power in one hand, but it distributes it among all, just like the decentralized vision.

Having accountability authority is not enough in a DAO, it has to be applied effectively and it has to respect the decentralization of the DAO. Leaving the responsibility up to an existing council that is not elected or dedicated only to this task is harmful to the DAO and could risk its stability. on the other hand, relying on something similar to Aragon Court is not enough to enforce accountability in a DAO as the court is very useful in big, long-term effect disputes, but it's in no way useful or effective enough to handle everyday complaints or disputes among the members. it's also excluding to the history and behavior of the parties involved in the dispute, because an outside DAO asking the court to settle their dispute will never be able to be as informed as the DAO's members themselves about what happened before that could affect the ruling. The most effective format is the last format, dedicating a democratically elected committee to accountability while holding the same committee to a higher check for accountability is the perfect balance between the power imbalance problem and the time cost problem. The DAO Market needs to step up its act around this point as very few numbers of DAOs are considering it.

6 Research Findings: New Ideas to Achieve Decentralization

6.1. Progressive Decentralization

There is a new approach to the governance model creation for decentralized autonomous organizations. From the name it's clear that Progressive decentralization is sought to be a multi-stage implementation plan with each step having separate requirements achieved before moving on to the next stage in the plan. Let's have more background about the idea.

It started with a journal article written by Jesse Walden, an industry asset, three years ago. The article was aimed at tackling a headache problem with crypto projects adopting the DAO model, early enthusiasm then sudden loss of interest and engagement that makes DAOs fall apart or turn into another centralized startup setting. The article identifies only 3 stages of progressive decentralization, Product/Markt Fit, Community Participation, and Sufficient Decentralization (Walden, 2020).

For the first stage: the article talks about the importance of the experience and vision alignment of the founding team, the author is also stressing a controversial belief that at the first stage there should be no sign of decentralization at all in any of the management or governance processes. If the DAO is going to rely on a team only during this stage, he iterates the critical need for expertise and quick learning, also the importance of taking decisions fast with the scope of testing all possible outcomes until the DAO lands on a perfect match for the market. This will require a near dictatorship, as the team will have to cancel failed projects to stop the bleeding and immediately initiate alternative plans, all the while holding metrics and parameters on their other hand to measure the results and consequences to make sure not to repeat those mistakes again. As to how to deal with the members or community of the DAO, he suggested being upfront about where the authority lies at this stage (Within the hands of the founding team only) and limit the role of the community members to only being consultative or suggestive. This will result in denying them any governance token issuance as they would be denied the value of the token deeming their token useless at this stage.

For the second stage: at this point the DAO should have landed on a match for their product/service inside the market. With that being achieved there should be a

traction event around the DAO's product/service, which will mean more community members and now contributors have joined the circle of influence of the DAO. This will create an imbalance in the DAO between passive members carried on from the previous stage and active members who are now enthusiastic about the product and want to add their input into it or at least be part of its development. He says that it should be time to relinquish some authority from the founding team into the community members and to move on into more documentation and open practices that help transfer the knowledge and experience from the founding team into the part of the community that will begin to be proactive. But not so fast, as there are still some requirements to achieve before believing in the community's strength to handle even part of the responsibility. First the founding team must create incentives for the members to lock-in their proactivity. The incentives, however, would have to co-exist or thrive only with strong network effects. Secondly, In order to apply these incentives and engage more community members, a token distribution (issuance then airdropping/ICOs) would have to take place at the same time. The problem will be how would the founding team choose who to give the tokens to. The author advises that it should start with the most proactive members first then any willing person to participate and buy the token. Giving the token of the DAO to random entities or venture capitalists that are only interested in ROI, will not benefit the DAO at this stage, as the DAO here needs the help of whoever will hold these tokens to contribute more to the development plan and handle part of the transferred responsibilities from the founding team unto the community using delegation instead as a form of decentralization. Then the founding team must find the balance between rewarding loyal, proactive members and finding new engaging and experienced members from outside the DAO that can help enrich the process. It should be noted that the rewarding criteria is different because the goal of the first one is to preserve the member and keep them motivated, but the goal of the second one is to attract this person and offer them a more advantage and rewarding opportunity than other DAOs. Another thing that could help structure the incentives is classifying them by specialization of the member. If they are sought after because of their technological expertise or because of their funding, because of their network backing or because of their organizational background.

For the third stage: a last but crucial stage, where the focus should be on the metrics to know where the DAO is regularly. The objectives in this last stage that the founding team should regularly monitor are: how much authority is transferred from the founding team unto the DAO members, is the incentive system sufficient enough and making profits to the DAO product/service, is the product/service sustainable enough with no turmoil that requires additional interference from the founding team, and lastly, is the community earning enough to sustain its interest

and motivation into the long-term and create commitments. While the founding team is measuring the progress in each of these objectives and gradually relinquishing their authority into a decentralized governance model, a widespread token distribution should be conducted to allow the wagon effect to take place in the product/service adoption of the DAO. It's important to reiterate that the founding team must combine the measuring and the token distribution plans with a complete mapping out of a business development plan foreseeing the near and far future of the DAO based on these metrics.

Walden also described the end of each stage's objective that helps define it, for the first stage's end it will be marked by reaching network effects of the product/service. For the second stage's end it will be marked by the ability of the community of the DAO to sustain operations without the founding team doing everything. Additionally, he identified the common mistakes that some DAOs have fallen into while deploying their business or taking this theory as a guide. The first mistake is to take on everything all at once in the hope that it's going to develop and mature by itself through the process of the market. This endangers the DAO mission and product, it will result in loss of interest from the community with chaotic power dynamics changing every short time, it will also turn the DAO vulnerable against exploitations and piggybacking. The second mistake is to give everything to the community all at once, overwhelming their ability to govern or to be ready enough for any market difficulties in the near future. It will shift the focus of the community from developing a sustainable and profitable matching product/service for the market to internal squabbles about power and authority. The final mistake is to give too much trust into the community without making sure the incentive and participation plan is sustainable and convincing enough not only for the existing members but also for acquiring new ones at the same time.

Another article building on the original idea

Fast forwarding 3 years later, at the beginning of this year, a supporting article was published by Scott Kominers of Harvard business school, along with Jad Esber both have introduced a framework of how to measure and execute progressive decentralization using the concept article of Walden. It builds the framework on identifying Minimum Decentralized Units (MDU) (Esber & Kominers, 2023). It's the minimum level that a unit of the DAO's product can be independent and decentralized using 5 levers as an example to measure the decentralization rate in each aspect. A small working unit of a product will depend on: A core team, technology stack, external contributors' adoption, Finance, and any type of internal processes. The core team is the same as the founding team in Walden article, with lever limits here going between founders' authority to distributed authority among

DAO's members either old or newly acquired. The external contributors' lever is going from small input from the members to complete contributions that are driven by a rewarding system and an engaging environment where they believe their voice is impactful to the DAO's mission. The technology stack is about the infrastructure technology used to help the transfer from centralized data centers and networks to a decentralized ecosystem. The finance lever is everything related to the financial plan that will help identify the token values, the product/service values, the resources needed in every transformation stage of the DAO internally and externally. The internal processes lever is concerned with any documentation, presentation, structuring, coding, and planning needed to fulfill the rest of the levers' transformations.

Then the question will be all about how and when to upgrade each level from the zero-state value to the 100-state value of decentralization, and what levers to combine and what to separate. The plan to do that will be directly connected to measuring and assessing KPIs in each lever area, similar to what the third stage was hanging on to in Walden article.

How did DAOs do it in their governance model?

Now let's see examples of what the DAO market is implementing now as their version of progressive decentralization and how it corresponds to the concept in the original article.

The survey of the 200 DAOs in the study has found 31 DAOs (15.5%) capturing total market share of (0.9 B$) or (6.5%) of the DAO market, who either have put plans in motion or already inside the process or in-between with an intent roadmap for Progressive Decentralization. It's worth mentioning that the majority of these 31 DAOs are operating off-chain, built on Ethereum, utilizing 2 stages of voting, using governance forum or both and not classifying their proposals inside the voting process.

Laid-out phases for Progressive Decentralization: in this approach, some DAOs have laid out their plan divided into phases of what could be their goal each time until they reach the final target of decentralization. Starting with **Compound DAO**, they initiated this process back from 2020, the founder called it increasing decentralization principle (Leshner, 2020). His priority of laying out this process is ensuring security and stability of the DAO, starting with issuing governance tokens only to the shareholders but in a very limited amount as most of the token will not be used for governance at the beginning. They will then have to participate or delegate their power to others, and during this testing phase of governance a failsafe option to suspend all governance will be in the hand of the founding team. After

testing the governance stability, the failsafe will be removed, and governance will be opened for more members to reach community governance. All this is very similar to what Walden proposed in the original article, the only problem is that they didn't give enough details and scenarios for the future.

In **Gitcoin DAO**, in the year 2021, they laid out a 5 phases plan for progressive decentralization. It is not the same approach as the article. They start with protocol design and documentation, then unto releasing a beta product and documentation files, then unto increasing decentralization process of grants (funding industry core product), then moving on to cross-chain deals and cooperations with other funding or decentralized exchange DAOs, then at the end polishing and refining the decentralization in the same aspects overtime. This plan is different than the article because they started with a half-decentralized product process and documentation, with no community metrics or involvement KPIs.

In **Euler Finance DAO**, they have 3 phases for progressive decentralization. (Euler, 2022). The first phase is giving some governance tokens to members but limiting their scope of voting to only operational votes and not protocol or core smart contracts. The second phase is to make the DAO operate on-chain voting, expand the governance tokens distribution, give the members the option to vote and change the governance module itself and remove multi-signature voting from the founding team that was in phase one. The third phase is to give complete voting authority to members of the DAO on all aspects of the DAO operations and governance.

In **ApeCoin DAO**, their idea of progressive decentralization is to transform the DAO to on-chain operation, hire DAO members to work on projects separately, creating a committee that guides the community of members, electing this committee regularly. In Metronome DAO, they put forth 5 phases in 15 months for progressive decentralization that uses the same sequence of progress as Euler Finance DAO. From multi-signature voting only to progressive members voting. In **CryptoCitizen DAO**, last year they put forth 4 goals to the plan of progressive decentralization. First to give voting rights to members and create a constitution that unifies the DAO's mission, then increase decentralization in voting process from multi-signature voting to electing new members of this committee regularly. Finally, to create sub-DAOs (something that is more explained in Polycentric theory in the next sub-chapter).

Inside the process only: this type of DAOs have begun power distribution inside their DAO and given their members some authority over the DAO governance but they don't have any future plans yet for the next phase as they are still testing the application of progressive decentralization. These DAOs rely on the concept of working groups, stewards and sometimes elections. They start with a founding

team that they call it another name, Developing team, with complete authority. Then they create working groups with no authority but with specialization in tasks management. Then they choose a steward to manage them. Finally, they hold elections for the stewards and make working groups volunteer to increase decentralization more. Examples of DAOs using this strategy include VitaDAO, Nexus Mutual DAO, Klima DAO, PieDAO, Crypto Unicorns DAO, PoolTogether DAO, Fingerprints DAO, Doodles DAO, Bankless DAO, Tempus DAO, Harvest Finance DAO, Bright Moments DAO, UPDAO, and SSV.Network DAO.

Envisioning a Roadmap only: the last type of those DAOs are the ones who are either inside the process or not even started yet but they announced an intent Roadmap only. The intent Roadmap lacks any detailed phases or actual plans, it only contains a vision and a concept matching the original article of Walden intent. Examples are, Olympus DAO, Vesta Finance DAO, Alchemix DAO, Notional Finance DAO, Unlock DAO, Layer2DAO, SpookySwap DAO, and TrueFi DAO.

Although the DAOs didn't agree on one path to progressive decentralization, and they didn't always agree on the same sequence as what Walden envisioned in the original article, they are still on the track to achieve it in the most suitable path to their DAO only. This is what matters most, as there's no one theory to apply here, only a vison and an informed plan coming from experience that also comes from failure most of the time.

6.2. Polycentric Governance Approach to Decentralization

Introduction and definition

The second new approach to achieving Decentralization is a theory introduced multiple years ago as part of organizational economics, meaning it was not developed as a result of or by the influence of DAOs but at the same time it can be a fit for a DAO governance model. Ostrom workshop in Bloomington School at Indiana University, built a complete course on the basis of the works of the namesake Ostrom researching self-governance for decades from the 90s until winning a noble prize in 2009 for it. The learning material is exploring the concept of Polycentric governance, the examples of it and the consequences. Around the same time a paper was published by Turnbull exploring the need for polycentric governance expansion into the corporate world, something that the original self-governance theory didn't focus on enough. The paper takes the basis of Ostrom work and refine it to fit the corporate world problem (Turnbull, 2020). The self-governance theory was built on identifying something called Common Pool Resource or CPR, which is the same definition of Common goods, a natural or human-made resource that is made available for all people but can't be utilized by all of them at once, otherwise it would seize to exist. Examples are public transport, streets, lakes, fishing grounds and irrigation systems. Then the theory goes on to how a management system for this type of goods can look like but in a self-governance model by the people. In parallel the paper suggests a similar approach to make corporate self-govern a CPR by implementing the polycentric theory. Polycentric governance is a governance that involves many tasks carried out by many decision centers that are not of the same type or classification. It's a system in which many centers of partial authority are collectively carrying out the overall governance task load of the organization.

Principles to the framework

Since the scope of our study here is not about public institutions or governments, the interpretation of Turnbull's paper of Ostrom theory into corporate governance will be included and combined with Ostrom work. We know that they start with creating multiple centers, to be able to identify these centers. A classification by job description/task/expertise is conducted, the members (stakeholders) of each center group have a common task or a common area of application that they are working on together. The second principle is to give these groups the power to participate in making their rules and the collective group's rules about the interactions and power dynamics between the different centers and them. On top of that, giving them a

financial and logistical means to fulfil their obligations i.e., having a separate budget. The Third principle is to enable monitoring and accountability of each of the different centers, a system to hold each center group accountable for their actions and performance. The fourth principle is to enable sanctions and consequences, a system that represents the checks and balance on every center authority and power conduct. Making each center have a partial authority over another center helps keep the balance of power and accountability between them. The fifth principle is to establish a dispute resolution venue that helps solve any problems of stand-offs or infighting between the different centers. The sixth principle is the governance scaling of this small polycentric system into multiple systems replicated and then nested under a collective organization.

Summing up and examples

A sum up of these principles can be done like that: **Identifying** each center's **boundary** and area of influence. **Implement rules** governing inter-centers relations and internal center accountability combined with a **dedicated budget** and means for each center. **Employ checks and balances** combined with **dispute resolving** path. **Replicate** the same model as multiple times as needed in each project or geographic area under the **collective governance structure**.

Examples that represent the polycentric concept in real world applications include the U.S. Constitution, employing checks and balance between institutions of the United States, from the federal government and nesting the same system replicating it into each state of the 50 states with each center and collective centers having their separate budgets. The same goes for the European Union governance system starting from the European court, parliament, council of ministers and then nesting the same structure into every European country with their own courts, parliament chambers and cabinet of ministers. Other examples are the police system structure in the U.S. (precincts, departments, divisions, …etc.), and global climate change initiatives.

How did DAOs do it in their governance model?

Moving on from the concept and the framework, let's see how the DAO market employed this theory in their governance model plans. The survey of our study here included only the DAOs that have put plans in motion or at least declared their intentions to adopt the theory, excluding the DAOs that chose the path of progressive decentralization only until now. The critical excluding factor for this is not giving autonomy powers and budget to each team inside the DAO, because this reduces them to only being a group of experts consulting the DAO members each time the need arises, or a group of executioners that only follows what was laid out

to them without changing anything. The survey found 23 DAOs out of the 200, capturing a total market share of (2.6 B$) or (18.7%).

In **ENS DAO**, creation of autonomous working groups spearheaded by stewards, all of them are elected by the collective community of members. Each working group has a budget and authority to do their business. Each group is subject to removal and replacement, they are subject to rules and accountability from the community members themselves or by the members of the same working group. The working groups are identified by their area of specialization, one for meta-governance of the DAO, one for ecosystem management around the DAO, one for community management of the DAO, and one for creating public goods as part of the DAO mission. With an open window to add more groups in the future following the same path and structure.

In **Lido DAO**, they have multiple committees that are publicly elected from the DAO members. They have authority to take decisions in their area of responsibility, but each vote is up for a chance to get vetoed by the members of DAOs only if the proposal is controversial enough to reach this stage of rejection. At the end they manage the DAO as a whole with their own ideas and decisions. The committees are in total 5, one for keeping guard of the protocol and decentralization aspects of the governance, one for approving and managing the grants system to the ecosystem around the DAO, one for rewarding and incentivizing the members and stakeholders of the DAO, one for compensating any hired help from the DAO members and offering resources to ease their mission, the last one for referral and recommendation of the software developers in the DAO. Fei Protocol or also can be known as **Tribe DAO**, has a Tribal Council working with 3 other working groups (Points of Distributions or PoD). They all have the authority to take decisions and pass them, but they can be vetoed only if their decisions are controversial enough for the community members.

In **Synthetix DAO**, they have 4 councils and one committee. The 4 councils each of them is the center of decision making and passing proposals. The committee, which is called the core contributor committee, is created by one of the councils for technical help in implementing the proposals and checking the effects of the new proposals before voting on them. All the councils and the committee members are elected by the DAO members, both the DAO members and the council members can introduce new proposals that the councils then vote on after checking the technical side of it by the committee, each in their respective area of responsibility. When a DAO member wants to introduce a proposal, they get interviewed by the respective council then the proposal gets tested by the committee, then the council votes on the proposal and passes it. the four councils are the Spartan council for

managing any process or documents related to the governance of the DAO, Treasury council is for managing resources of the DAO and issuing the supporting finances for the voted-on proposals, Grants council is for managing investments outside the DAO boundaries and into its ecosystem, and lastly the Ambassador council is for managing any external relationships with the DAO that can include cooperations and deals.

In **Nation3 DAO**, they implemented a polycentric organization exactly as the U.S. constitution. They have 3 branches that separate the powers of the DAO and ensure checks and balances in the DAO. The Judicial branch represented by a supreme court whose members are actual lawyers in the world, they are elected by the DAO members. The Legislative branch is represented by the DAO voting process itself. executive branch represented by Guilds that are for executing the voted-on proposals and ensure their maintenance.

Some honorable mentions of creative structure but using the same concept: **Sarcophagus DAO**, have 4 Sub-DAOs, Ambassadors, Payroll, Liquidity, and Growth. The MoonDAO has a constitution governing the relationship between a member's house, a senate, and an executive branch that has a nested-down guilds. **Idle Finance DAO** has 3 elected leagues managing the DAO, a communication league, a Development League, and a Treasury League. **Bao DAO** has 8 Galaxies that are monitored by a group of Guardians, and all represented in a Council of Guardians that consists of at least one member of each Galaxy. The eight Galaxies are Maintainer, Community, Smart Contract, Front End, Quality Assurance, Creative Content, Treasury, and Governance Galaxy. **Cabin DAO** is a collective of sub DAOs distributed boundary by geographical city, that each Sub DAO has working groups and autonomous ruling. As a result of their scope of work of building physical assets in each city, they had to start their business with this structure.

Although Polycentric Governance is not the end of the road for decentralization, it is very useful to adopt to be the basis of testing the governance model of the DAO until the market develops a comprehensive and practical model that nurtures decentralization in every aspect of the DAO business.

6.3. Progressive Decentralization Vs. Polycentric governance

Progressive decentralization (PD) is built on the concept of relinquishing authority gradually from one center into a community that doesn't have a center to it. The working streams or stewardship that are employed in PD don't have a separate authority to them, they don't make their own rules and they don't have a separate budget to implement their decisions on the system. So, they can't be separated or categorized as an autonomous group within the collective group that can carry out its own interest and business. Additionally, PD doesn't provide them with checks and balances, they are only accountable to either the shadow central team or to the community with no center. On the other hand, Polycentric Governance (PG) gives complete authority to each center inside the collective organization to create their own rules and have their own budget and means to implement their business. It also gives complete checks and balances from each center to the other to keep each other in check according to rules and mission of the collective organization.

It can be summarized as PD is enabling passiveness and volunteering governance, it relies heavily on incentive system to cross the barrier of passiveness of the community into the badly needed activeness of the community members to fix problems and steer the wheel. After a while this centerless community will be forced to normally create caucuses inside of it (like party alliances in a congress) but these caucuses will not be held accountable, will not have checks and balances between each other and/or between them & founding team/sub-teams.

On the other hand, PG is forcing members to abandon this passiveness problem and destroying the basis of passive governance. Through creating autonomous multiple centers with separate rules and budgets, PG is engaging the members in the organization's governance, making the incentive system a plus not a necessity. All the while also keeping the separation of powers among its centers. Taking U.S. Constitution for example: an elected president can't fire or hinder an elected governor of a state (a center nested under another center), an elected congress can't fire or hinder an elected district attorney in a state (a center nested in parallel to another center). All this will result in a more efficient voting process, less time spent in decision-making, and more cross-accountability that can deter any selfish or exploitive way of governance.

7 Conclusion & Recommendations

This thesis' purpose has been to study the nature of DAOs and their market behavior that require the study of their governance model. A careful review of the available literature in this field has lacked consensus on studying the market or defining these elements of a governance model, instead the literature highlighted scattered concepts of the DAO's vision to be and case studies reflecting on the problems facing the DAOs. This prompted the need for the three research questions, answering them through market research, descriptive data analysis and interpretations as following:

RQ1: what is the DAO's market landscape and key trends that shape the market performance?

Research found that the DAO market landscape is concentrated with 4 out of the 200 most valuable DAOs capturing more than half of the market value. Out of 12 industries, the Decentralized Finance industry is capturing more than half of the market value. The 12 industries can be grouped as financial-related ones capturing more than 72% of the market value compared to the second group as infrastructure and tools of the DAO related ones capturing more than 21% of the market value. Ethereum blockchain has a monopoly control over the DAO market, because of the low-cost and fast deployment option of new DAOs offered by Aragon platform and because of the blockchain reliance on low-cost proof of stake validation mechanism.

RQ2: what is the current consensus among DAOs about the elements of a decentralized governance model?

Research found that there is indeed a consensus on the elements of a decentralized governance model in the DAO market. Most valuable DAOs in the market identified these elements as part of their documentation of a governance model: the choice of operating on-chain or off-chain. Establishing a voting process with multiple stages of voting happening for one proposal at a time. Starting from opening unofficial discussions for a new proposal through a communication tool, then drafting the proposal on a debating and deliberative communication venue, then conducting a vote using one of the voting systems that are used to count the votes differently in order to test the opinion consensus of the members against the proposal, then moving to an official vote using an outside off-chain app, then depending on the choice of on-chain they need to do an on-chain vote at the end of the voting process. Another element included in their governance model is the way

they deal with external relationships of the DAO, by either delegating the task to a dedicated committee or by hiring third parties or by creating a foundation representing the DAO and making deals on its behalf. Additional element highlighting the incentive system approach of the DAOs to maintain participation among their members, either by offering more rewards classified differently by the status of the member or by fixing the power dynamics inside the structure of governance by elections or delegating more powers to the members. additional element representing their consensus in creating path for accountability among members of the DAO by dedicated committees or setting up a dispute resolution court. additional element representing their consensus to handle emergencies from the beginning by preventing weak links and preemptively fixing bugs in the core protocol, then establishing an emergency response plan to immediately stop operations when all these measures have failed to defend the DAO.

The consensus has found that the elements of governance for one of the most successful DAOs are to be: operating on-chain, implementing a 3 voting stages, using both discord and governance forum for communication during voting process, utilizing delegable voting system, electing a committee for external relationships, using approach to fix power dynamics as an incentive system, electing a dedicated accountability committee, having a complete emergency plan that includes emergency response managed by an elected guardian committee.

RQ3: what are the new ideas of approaching decentralization found in the DAO market now and not in the DAO literature?

Research has found the market is indeed implementing some versions of two theories helping the DAO to be more closely to a decentralized vision of the governance model. The progressive decentralization offered by a veteran of the industry is being adopted in the market with complete laid out plans in phases to relinquish central authority of the founding team gradually through time and efforts. Starting from operating off-chain and with a founding team governing as a board then gradually creating working groups then electing them then establishing rules, then leaving all power in their hands.

Another theory approach found is polycentric governance approach. A concept introduced before DAO creation and now applicable to them. Where some DAOs didn't stop at electing working groups, but they created checks and balances between these groups and changing them into councils, then assigning separate budgets to them and giving them full autonomy in decision making. Through polycentric accountability, polycentric task management and polycentric governance powers the overall structure holds.

This research was necessary because of the lack of consensus reporting and studying of the DAO market, the lack of defining and collecting elements in the same place constructing the governance model of the DAO, the lack of testing theories of governance on the model of the DAO. What was expected and found are: clear trends and patterns in the market landscape, the DAOs have identified their model of governance and are already reaching consensus around it. What was not expected but found are: the DAOs following a theory or a concept in structuring their governance model outside of the classic literature of organizational theory. The DAO governance model is not stagnant but changes and gets updated over time and not in a random manner.

The limitations of this study are created by the nature of this industry, a nascent industry ever changing every period. Over time the DAO market will evolve enough to create a stagnant and permanent governance model that can look different than the one in this study but will be built on the same core principles and elements. Another consequence of the nascent industry is the lack of clear KPIs definitions and measurements that can help distinguish between the failing models and the promising models, that's why a market value KPI was used as a sign of success for the choices of governance each DAO has made.

The future recommendation for practitioners is to revisit the governance model of the DAO market over time and measure its success based on time and different KPIs until a model is reached and tested against theory as much as it is tested against the market performance now. Monitoring the DAOs that decided now to adopt either approach of decentralization "Progressive decentralization" or "Polycentric decentralization" over time and figuring out the success and failures of their applications and which one of these will produce better results or be a better fit for the DAO market.

This study builds a foundation on how to study a governance model inside a DAO and how to measure and identify its core elements. It also offers the missing piece of the puzzle which is a theory and a concept of decentralization that can be tested over time and measured against a group of KPIs. The study fills the gap between the late arrival and sometimes absence of literature and the very advanced market of testing new ideas of governance. The study shows the importance of studying the market landscape and interpreting its trends that influence and change the elements of governance model in DAOs.

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