

How DAOs Can Use Votermedia

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Future drafts at votermedia.org/publications*

Summary:

Designers of future [DAOs](#) (Decentralized Autonomous Organizations) may find some useful ideas at votermedia.org/publications, especially in the paper [Global Software Users' Co-op](#).

A decentralized voter information system called votermedia, originally designed for corporate shareowners, has been developed and tested for several years in a large university student union – see [Experiments in Voter Funded Media](#). Evolution of these ideas has generated several innovations, including:

- A continuous-time voting system for allocating flows of funding among teams who compete to serve the interests of a voting community – see pages 7-9 of [Global Software Users' Co-op](#).
- A design for liquid democracy – see [Proxy Voting Brand Competition](#), proxydemocracy.org and page 2 of [my 2010-09-29 comment letter to the SEC](#).

Any new DAO could adapt these ideas to create a competitive market for providing its token holders multiple benefits:

- voter information, analysis, insight, voting advice;
- software infrastructure, bug checking;
- contractors monitoring and critiquing each other;
- investment allocation, accounting, auditing;
- DAO governance oversight, critique, amendments.

Implementing these governance innovations in DAOs can stimulate similar reforms in conventional organizations, including corporations, co-ops and governments.

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1. TheDAO's Governance System

Those unfamiliar with DAOs (Distributed Autonomous Organizations) can find background info in [this blog post](#).

The first DAO (called "TheDAO") was created in May 2016 with [a governance system](#) that could be thought of as a venture capital investment fund. It raised over \$150 million in ether cryptocurrency from thousands of anonymous investors, and issued an open invitation to submit investment proposals. These would be screened for validity and security by a group called [the Curator](#), then judged for quality by all TheDAO investors, who decide which to accept by majority vote of their tokens (shares). Each investment proposal would specify a Contractor to manage that investment, and other terms (such as the possibility of [firing the Contractor](#)).

Comparing that governance design to a typical publicly traded corporation, the Curator stands in the position of a board of directors, but with far less power. Like a corporate board, the Curator could be replaced by a vote of shareowners.

An organization where power is exercised by majority vote can suffer the dangers of a "51% attack" where a minority is abused or exploited by a majority. To reduce this risk, TheDAO's designers built in [an option for token holders to split](#) out their share of TheDAO into a separate organization. Unfortunately, the code for implementing splits had a bug that was exploited to siphon off about \$50 million of TheDAO's ether. To undo this hack, the [ether community implemented a "hard fork"](#) which reversed the hack's transfers of ether, and refunded all ether invested in TheDAO back to the token holders.

Various commenters have been sharing ideas on how to build better DAOs in future. Quote from [The History of the DAO and Lessons Learned](#):

Lesson 4: Governance and voting mechanisms adapted to decentralized systems need to be developed

... From the DAO's inception to its sunsetting, a lot of people in the community looked for leadership regarding governance rules, the proposal framework, the soft/hard forks and other contentious topics.

Here are some of TheDAO's governance challenges that might be solvable by adapting votermedia ideas described later in this paper:

(a) The Curator has significant concentrated power –

The Curator decides which Proposals will be voted on by token holders. Like any concentration of power affecting other people's money, this might be abused. For example, if the Curator has or develops relationships with project contractors, they might favor some over others for the sake of receiving bribes or other benefits from contractors.

(b) Voters' free-rider problem –

As in any voting organization, incentives are very weak for spending time and effort on voting intelligently. This is a well known collective action problem, often called the voters' free-rider problem because voters who don't bother making that effort will benefit from those who do, getting a "free ride" on the efforts of others. So voters generally tend not to exert enough effort.

Had TheDAO continued into its project investment stage, its potential for success would have depended on the token holders' ability to choose profitable projects. That is a very complex and challenging decision process.

This problem was already apparent in TheDAO before the project investment stage. A token holder [outlined on Reddit](#) an idea for the active voters to split off from the inactive voters and form a new DAO:

"It appears we've got a very active group that constitutes about 10-15% of DAO members, and we have an inactive groups (the other 85%) holding tokens that include:

- Apathetic members just along for the ride.

...

- People who have not taken the time to learn how to vote (let's face it, it is not that hard)

...

These groups are dead weight, and they are bring the value of DAO tokens down."

(c) Ongoing management of projects –

Think of TheDAO as a venture capital investment fund. Most venture investments require a long series of decisions, not just a single initial decision to invest or not. There is a process of interim progress reports, and subsequent decisions that may involve further injections of capital, project management changes, termination or liquidation of the project or some part of it, return of capital, etc. These feedback loops and investor-controlled options are crucial to maintaining returns on investment. Perhaps TheDAO's proposal review and approval system could have evolved to handle such a process effectively, but that seems far from certain. [This discussion thread](#) on TheDAO's forum addressed the issue:

"Therefore, every contract must allocate money automatically and incrementally. After each stage of the implementation and progress there must be report from contractors and only after that should be allocated a new part of the money, not 100% immediately."

(d) Defending against 51% attacks –

Compared with typical democracies, the risk that a majority could abuse a minority is much greater in organizations like corporations and TheDAO, where one voter can have far more votes than another. By buying 51% of TheDAO's tokens, a 51% attack can be launched by one person. This problem is hard to solve, so I have devoted Section 5 of this paper to it.

2. Background on Votermedia

Votermedia is a voter information system designed to improve the performance of corporations by helping shareowners vote smarter, thus decreasing the concentration of power in CEOs and directors. It reduces the shareowners' free-rider problem by paying for voting advice with funds owned collectively by the voters. Any advisor (individual or team) can enter an open competition by providing advice publicly to all shareowners of a corporation. Then when shareowners vote on the annual board election and any other resolutions, they also vote on how much to pay each advisor.

In spite of several publications (e.g. [Proxy Voting Brand Competition](#) section 3) and proposals ([votermedia.org/proposals](#) > Proxy Advisor), no corporation has yet implemented votermedia. However, it has been successfully tested for four years in the University of British Columbia's student union – see the paper [Experiments in Voter Funded Media](#). Those tests spurred the evolution of a continuous year-round

system for voting funds to competing media, rather than just annual funding during an election.

Extending those ideas to other types of organizations, I studied cooperatives and found a pervasive tendency toward [undermining democracy as a co-op becomes large](#). In 2012 I proposed creating a new co-op with member democracy baked in via votermedia, and with a particular focus on funding and sharing digital goods – see section 2 of the paper [Global Software Users' Co-op](#). That design has some striking similarities to TheDAO, with additional features that could be adapted in future DAOs.

3. How Votermedia Can Be Adapted to DAOs

For the following outline, I will take TheDAO's design as a starting point, and propose some modifications. So suppose a new DAO has been funded by an initial offering process similar to that of TheDAO, but resulting in a more modest investment pool of 1 million ETH (about US\$11 million).¹ If the next stage is for token holders to vote on investment proposals, then they could benefit from a voter information system like votermedia.

Their information needs will be continuous through time, so token holders should vote continuously to allocate a budget among competing providers of information. They can also determine that information budget by continuous-time vote. I would suggest setting the budget as a flow rate expressed as a percentage of the DAO's funds pool, e.g. 1% per year = 10,000 ETH/year. Each token holder can vote for any flow rate, and change their vote at any time. Once a day, the vote tallying program sets the budget equal to the median of voted flow rates, using each token holder's latest voted rate.

Any person or organization can compete for a share of this flow budget, by paying an entry fee (e.g. 1% of the flow budget – this too can be set by vote) and providing info to the token holders (voters). Token holders reward competitors by voting them shares of the budget, on a ballot that might look like [votermedia.org/vancouver](#). You vote each competitor a percentage share of the budget. Votes are aggregated daily by an algorithm like the one on pages 7 to 9 of [Global Software Users' Co-op](#).

The above system creates an incentive for competitors to provide the most benefit (value per cost) to the DAO token holders by any means they can think of. If token holders' greatest need is for info and analysis to help decide which investment proposals to accept, then that is what competitors will provide (perhaps after some trial and error). But votermedia is a general-purpose tool. If different DAOs have different needs, or needs change through time, competition will adapt to provide what is needed.² Other needs might include:

- checking for bugs in the DAO's software;
- developing software upgrades (including governance upgrades);
- advising on what shares to vote for each competitor;
- advising on what percentages to vote for the votermedia budget and competition entry fee;
- creating and/or checking accounting statements of investment projects already undertaken.

Once votermedia competitors have built reputations for intelligent voting advice loyal to token holders, the effort required to vote intelligently will drop, thus reducing the voters' free-rider problem. We can enhance this further by building some form of liquid democracy system, for example letting voters automate a policy to vote as recommended by their favorite advisor.³

1 Henceforth I will refer to this new DAO as "the DAO", as opposed to the original first DAO which is "TheDAO". If that gets confusing, maybe I should call the new one "DAO-VM" to denote its use of votermedia.

2 As one interviewee described it: "One of the great things about [votermedia] is that it's self-regulatory." [\[votermedia.org/videos/1\]](#)

3 For liquid democracy design examples, see [Proxy Voting Brand Competition](#), and page 2 of [my 2010-09-29 comment letter to the SEC](#).

4. Votermedia for Project Investments

It is tempting to consider whether the votermedia setup outlined in section 3 above could expand its scope to also provide investment project management, including:

- finding promising projects;
- screening to choose the best projects;
- channelling votermedia funds voted by token holders to a given competitor, toward the best projects chosen by that competitor;
- managing those projects;
- reporting on each project's performance;
- returning projects' cash outflows back to the DAO's main account.

This can be seen as a natural simplification of the liquid democracy automation suggested at the end of section 3 above. If token holders respect a votermedia competitor enough to vote them funds and follow their voting advice on which projects to accept, why not combine those multiple steps into one?: Vote that competitor enough funds to pay for their work plus to invest in their chosen projects. Then evaluate the competitor's performance based on that whole package of services and its resulting profitability. Keep in mind that other competitors (can, should, will) provide a check and balance on that competitor by auditing everything it does, especially its project accounting reports.

One key system feature that would help make this investment management system work, is some kind of investment asset ownership system. Once some DAO funds have been invested in a project, who owns the assets created during the project's life? In a conventional corporation or venture investment fund, ownership is defined by the legal system. If the plan is to restrict a DAO's projects to investing in assets with ownership defined by blockchains, then I guess that answers my question. I welcome any education on this issue, which I think must be faced by any DAO design, with or without votermedia. The concept of ownership must arise if/when DAO voters decide to change management of a project from one team (competitor) to another. Surely the DAO should own the assets created by investing DAO funds. Voters should reward competitors who manage and account for their projects in a modular fashion, so that management of any project can be easily transferred to other competitors.

So if a DAO's votermedia competition can include project management, then we can expect competitors to start investing in projects gradually as voters increase the contest budget. Each project will have a life cycle with possible stages including:

- being created with an initial investment;
- growth fueled by further investment;
- internal growth fueled by its own profit;
- generating and returning profits not needed for its growth;
- shrinking if/when its business area shrinks or it becomes less competitive;
- dissolution or sale of entire project.

When a project returns funds to the competitor managing it, the competitor could choose to return those funds to the DAO, or invest them in other projects. Voters might want to incentivize competitors to always return such funds to the DAO, so as to give voters full control over which competitor(s) to allocate the funds to.

Having outlined how a DAO's token holders could use votermedia to control project investments, there remains one important variable that still needs a control mechanism: the DAO's total investment capital. In the first paragraph of section 3 above, I assumed that this is initially determined by the amount of ether people choose to put into the DAO in its initial funding period. But what about possible future token issues

and/or returns of capital to the holders?

I would suggest letting holders vote in continuous time to determine a flow rate of DAO token issuance (positive number) or repurchase (negative number). Each voter specifies their preferred rate in tokens per day, and the vote tally routine determines the median every day. To reduce transaction costs, the number of tokens to be issued or repurchased could be accumulated each day until the number exceeds 100, and then a 100-token trade is executed in the public market for trading DAO tokens vs ether.

Sections 3 and 4 above outline how a new DAO could use votermedia to solve three of TheDAO's governance challenges described in section 1:

(a) The Curator has significant concentrated power –

While there may still be some need for a Curator, votermedia removes its greatest power – screening project proposals. Instead, the votermedia competitors are choosing what projects to invest in. There should be no screening needed for deciding which competitors to allow into the votermedia competition. Any team can enter by paying the entry fee. If a particular competitor would be harmful to the DAO, such a problem can be proclaimed to the voters by the other competitors.

(b) Voters' free-rider problem –

Reducing this is votermedia's main contribution. Competitors will quickly build reputations for helping the DAO succeed, by informing token holders (voters) and investing in successful projects. The information role in particular will make intelligent voting much easier.

(c) Ongoing management of projects –

Token holders can change the flow of new funding allocations away from competitors who have done poorly and toward those that have done well. They can also shift management of any existing project from one competitor to another. I haven't spelled out a mechanism for this, as [the concept has been outlined by others](#). The one thing I would add, of course, is that voting to shift a project's management would be informed by the votermedia system.

Section 5 below tackles the remaining governance challenge I listed:

(d) Defending against 51% attacks.

5. Defending Against 51% Attacks

Any organization that makes important decisions by majority vote runs the risk of becoming dominated by a majority that abuses the remaining minority. This danger is exacerbated by low voter turnout, since 51% of votes *cast* is enough to cause trouble. If the voting rule is one vote per person, then a 51% attack would require coordinating many people, unless an attacker can create many fake identities (a [Sybil attack](#)). Since DAO designers have so far been basing their organizations on the [Ethereum blockchain](#) which does not identify its users, there seems to be no way to prevent someone from controlling multiple user accounts, or even to know whether that is happening.

In organizations like TheDAO with one vote per token (share), one wealthy person could do a 51% attack by buying more tokens than other holders are voting. She could hide this strategy by creating multiple accounts. She could vote DAO funds to investment vehicles that she controls (e.g. to projects where she is the Contractor, or to a votermedia competitor that she controls), then channel the funds to herself, perhaps through apparently risky business deals that turn out to give low returns to the DAO.

Recognizing these dangers, TheDAO's designers tried to guard against them by creating the option for any token holder to "split" their portion of TheDAO into a separate DAO – see Stephan Tual's 2016-03-03 post [A Primer to Decentralized Autonomous Organizations \(DAOs\)](#) > [Protecting the DAO](#). Although the coding for this split function had a bug that was [famously exploited](#), that bug can no doubt be fixed.

However, there remains the question of whether the option to split provides enough protection from 51% attacks. The problem is that the only part of TheDAO that a split would remove from an attacker's control is ether currency in TheDAO's account. Any funds already invested in projects would not be split, so would still be subject to a 51% attacker's exploitation. Like most investment pools, presumably TheDAO would have invested most of its ether within a year or two.⁴

Perhaps a better way of splitting could be designed that resembles a [shotgun clause or buy-sell agreement](#): Suppose that the market price of a DAO's tokens has fallen because a controlling group or individual (such as a 51% attacker) has started abusing their power by diverting value from the DAO to themselves. Suppose also that this is a gradual process, and the token price has fallen to reflect the expectation that the abuse will continue in the future.

It could then become profitable for a wealthy investor to offer to buy the entire DAO for a price substantially higher than the market price, because the buyer could then remove the parasitic 51% attacker. However, such a buyout normally requires at least majority vote approval, which the 51% attacker could block. A new DAO designer could build in some kind of sellout option for the minority in this scenario. If the buyout offer is rejected, those who voted to accept it have the option to sell their tokens back to the DAO at a price (for example) 20% below the buyout offer price. If the DAO doesn't have enough cash on hand to pay for those buybacks, it is required to sell enough tokens on the public market to generate the required cash. If the market price of tokens is below the buyback price, then the 51% attacker's holdings would be diluted, perhaps falling below 51%.

The above buy-sell option is just a sketch, and not a main point of this paper. Lacking confidence that it would be sufficient protection, I would suggest a more radical defense against 51% attacks: Create a DAO co-op like the one I proposed in [Global Software Users' Co-op](#). It would be one-member-one-vote instead of one-token-one-vote. And even if we did not require verifiably unique member identification, a Sybil attack would be unlikely since each member would be paying (e.g.) about \$5 per month, making a Sybil attack very expensive.

Not only would such a co-op be attack-resistant, but it would also have much less accounting and ownership complications, since it would mainly be exchanging a flow of software services for a concurrent flow of payments. At this early stage of DAO evolution, we can learn faster by starting with easier steps that are likely to succeed and grow sooner than more ambitious designs.

6. Conclusions

Votermedia can help solve several important DAO design problems, especially the voters' free-rider problem. The organizational design in the paper [Global Software Users' Co-op](#) could be implemented as is, and/or adapted to for-profit DAOs. If it proves useful, other potential implementations might include paying for a blockchain's security validation, and reforming non-blockchain organizations like corporations, democracies and co-ops.

⁴ A similar concern was raised in forum.daohub.org/t/reability-of-protection-51-attack-is-real/1309.