Decentralized Autonomous Organizations: The Radical Reshaping of Organizational Structures

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The proliferation of blockchain technology in Fintech and Web3 is driving a paradigm shift in organizational structures in the form of decentralized autonomous organizations (DAOs). DAOs are a novel way of coordinating and managing organizations via collective decision making. As opposed to typical organizations where there is a clear hierarchical leadership structure, DAOs are self-coordinating organizations whose essential operations are regulated by a set of automatically enforceable rules on a blockchain (Singh et al., 2019). DAOs envision an organization owned and managed by its members, where any new decisions are voted on by DAO members via a decentralized, democratic, and bottom-up approach (Ziolkowski et al., 2020). DAOs offer a new way of organizing human resources that has the potential to upend traditional models of business and governance. DAOs have the ability to implement low-cost, virtual voting mechanisms and rapidly pool and allocate capital on the Internet without the need for a middleman (El Faqir et al., 2020). However, the ideal design of DAOs has yet to be explored fully, raising questions about their feasibility that may impede the development and growth of this nascent technology. Given that DAO technology is still in its infancy and thus poorly understood, I explore the nature of DAOs and highlight several common characteristics of a successful DAO. While much of the DAOs' use cases remain in the early experimental stage, their social implications are far-reaching and warrant greater examination. This research paper argues that DAOs provide a more autonomous, transparent and open organizational structure specifically in the fields of open-source software, crowdfunding operations, and decentralized finance. Provided they are implemented in a secure and sound manner, DAOs have the potential to revolutionize the way that organizations

are run, promoting fulfilling and outcome-based work, with a fairer distribution of ownership and rewards.

Automation: Removing The "Human" Element

A DAO's ultimate goal is to create an organization that can operate well without any human involvement and make thoughtful changes to its structure autonomously (Yaga et al., 2018). DAOs remove the "human" element by leaving the automation of its essential operations to trustless, permissionless systems (Ziolkowski et al., 2020). Drawing from the works of Truong et al. (2021), this paper defines a *trustless system* as a system where there is no need for trust between parties. In a so-called "trustless" system, each party has complete confidence in the system itself, instead of having to rely on any other party for information or security. DAOs rely on trustless systems such as smart contracts on the blockchain to operate its processes (Singh et al., 2019), wherein smart contracts refer to programs that automatically execute transactions when certain conditions are met (Buterin, 2013). The presence of an intermediary middleman to moderate the organization's processes, such as a bank or broker, is replaced by trustless systems such as smart contracts. The role of smart contracts are pivotal in governing and implementing the rules set by the DAO, as you can trust the smart contracts to execute the same function without fail.

Star & Griesemer (1989) examine the role of "boundary objects" in mediating the issue of inter-actor translations between different groups of people working towards a common goal. Boundary objects are conceptualized as shared artifacts used by members of different groups to exchange information and coordinate action (Star & Griesemer 1989, p. 393). The smart contracts that govern the rules of a DAO can be seen as boundary objects, specifically "standardized indexes" which were defined as objects that held unbending information (p. 411), since they facilitate communication and collaboration between parties in the DAO with immutable rules on the blockchain. By providing a common platform for contract creation and execution, smart contracts make it possible for different groups, such as developers, users and investors, to reach a consensus

about a particular business decision in a trustless manner. Boundary objects, in the form of smart contracts, serve to remove the human element in DAOs by programmatically enforcing the terms of an agreement. This reduces possible human error, misunderstanding, and the potential for fraud or collusion.

The automation of a DAO's central processes with the use of smart contracts provides an organizational structure that minimizes the number of human employees needed. This is beneficial to organizations that require little to no human input to maintain its business operations, such as open-source software and protocols. According to a survey conducted by OnePoll (2021), the average employee makes 118 mistakes a year. Reducing the number of employees in many cases would greatly reduce operational costs especially when human errors are a significant source of expense for their firm. Uniswap is an example of an open-source protocol that utilizes DAO technology to automate most of its processes. Uniswap is a peer-to-peer market exchange platform that allows users to trade multiple assets in liquidity pools. Typically, normal centralized exchanges require a human market maker to manage the bid-ask spread of a pair of assets (Guéant, 2017). Uniswap decided to use DAO technology to create a smart contract which employs an automated market making (AMM) function that automates price changes, completely removing the need for humans in managing the orderbooks (Adams et al., 2020). The AMM automatically matches orders and execute trades, and is even able to handle liquidity and exchange fees. The complete removal of human intervention created a novel and lean business model that eliminated the chances of human error in the execution of the protocol's processes. This greatly reduced its labour and human error costs, and has led to the huge success of the Uniswap protocol with a total of $2.1 billion daily trading volume (Uniswap, 2022).

In essence, DAOs shift the trust from humans to machines. Human processes are subject to human errors, which can have devastating consequences especially when large transactions are involved. A DAO can automate the processes based on clearly defined, precise rules via smart contracts and thus remove the risk of human error. But that brings us to another question: How much trust can we put in machines?

Transparent By Design

For people to place their trust on machines over humans in trustless systems, transparency is key. DAOs can leverage on blockchain technology to provide a more transparent, accountable and secure way to manage organizational funds, especially in fields such as charity and crowdfunding operations. Kearns (1994) view accountability as the responsibility of an individual or organization to maintain accurate records of assets, funds and paperwork. In the case for a DAO, this responsibility lies on the DAO itself. Transparency is a key element in accountability in organizations, as it ensures that employees at all levels are aware of the organization's goals and objectives are held accountable for their actions (Ortega-Rodríguez et al., 2020). A key feature of a blockchain is that it allows for all transactions to be recorded on a tamper-resistant, public ledger (Yaga et al., 2018), giving full history of all the transactions made by any account. If we view a DAO as an organization owning a shared bank account on the internet, blockchain technology can be used to track organizational funds and activities in a transparent and immutable manner. Since all members of the DAO are able to monitor how funds are being used, this promotes accountability within a DAO's decision making process.

Traditional organizations, non-profit organizations in particular, often suffer from a lack of transparency and accountability to members of the organization, which can lead to corruption and abuse.. According to a report by the Centre for Policy Studies (Norton, 2018), many large non-

profit organizations lack transparency over the sources of their income. Another study by Urban Institute found that only about 10% of non-profit organizations in the United States undergo an independent financial audit (Hager & Wing, 2004). In another estimate, 75 - 85% of public charities underreport their total expenditure (Bedsworth, Gregory, & Howard, 2008). Fraudulent activities are also particularly prevalent in non-profit organizations (Greenlee, 2006). Notably, the lack of transparency in traditional non-profit organizations reduces the public's trust and makes it difficult for donors to make informed decisions on where to allocate their donation since they are unaware of whether the donated funds are being used appropriately. The transparent nature of DAOs ensures that charity and crowdfunding organizations are using their funds in the way that they claim to, since all of their financial transactions and decision-making processes are made visible on the blockchain. This makes it difficult for the DAO to commit fraud or embezzle funds.

Gitcoin is a non-profit organization that utilized the transparency of DAO technology. Launched in 2017, Gitcoin is a development crowdfunding platform built on the Ethereum blockchain that seeks to foster the development of open-source software. The platform allows developers to earn rewards for their open source contributions. Developers can request funding for specific tasks or features, and consequently for donors to contribute money directly to these requests. The platform uses the Ethereum blockchain to track contributions and reward developers with tokens. Any funds donated through Gitcoin will first be deposited on a secure proxy address, which is an account on the blockchain. When the grant has been confirmed, the funds will be released to the developer's Ethereum address automatically via the DAO's code, negating any possibility for fund embezzlement. The entire transaction history are viewable on Ethereum via the Ethereum blockchain explorer, Etherscan (etherscan.io), so the donors can track the movement of funds at any point in time (Fig. 1).

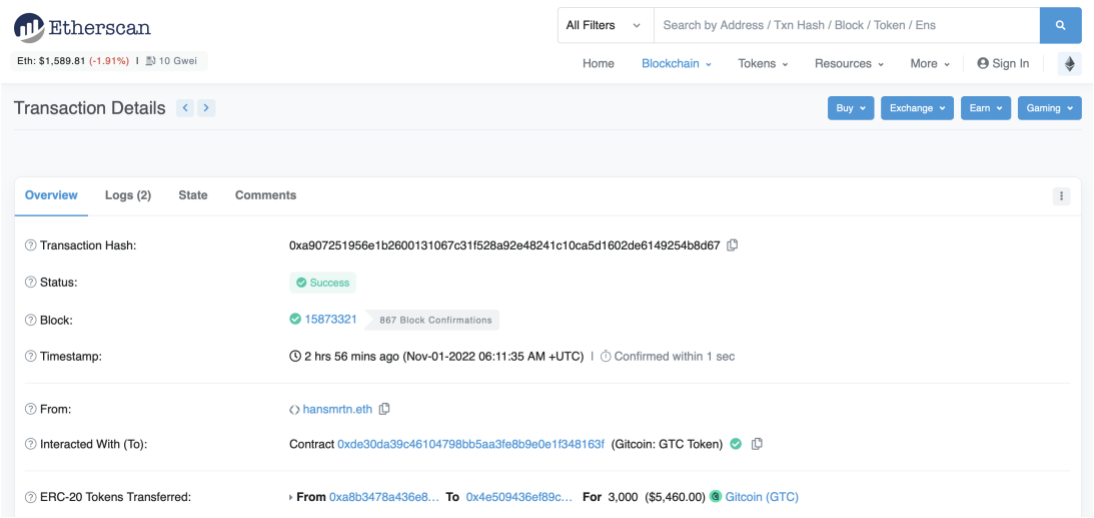

Fig. 1: An example of a Gitcoin transaction on Etherscan, an Ethereum blockchain explorer. Anyone can track where donations are going at any point in time.
Source: https://etherscan.io/tx/0xa907251956e1b2600131067c31f528a92e48241c10ca5d1602de6149254b8d67

Fig. 2: Above is a budget request proposal by the Gitcoin DAO regarding its Public Goods Funding (PGF) initiative.

The Gitcoin DAO is also responsible for making decisions about the platform, including its roadmap, budget, and governance. The entire decision-making process, from when proposals are

put up (Fig. 2) to where the DAO updates its code, are all traceable on the blockchain. Members of the DAO will then vote on the proposals, where all votes will be tallied up on-chain in real time. The reliability of Gitcoin has led to its success as one of the largest existing open-source funding platform. Since its launch in November 2017, Gitcoin has helped more than 150,000 funders reach an audience of more than 420,000 earners, with a cumulative total of $72.4m worth of funding for open-source software (Gitcoin, 2022). Evidently, transparency is cherished in crowdfunding operations.

Overall, DAOs offer a higher degree of transparency and trust with regards to organizational finance, as compared to traditional organizations. This is extremely beneficial for organizations that handle any form of fundraising, as it allows donors and other interested parties to see exactly how their money is being used. A tamper-resistant record of an organization's activity gives users confidence that the funds managed by the DAO are being used in the way they are intended. However, blind trust should never be placed on these smart contracts. If a DAO's code is not secure, the funds may be at risk. Therefore, DAO members and its users must still be responsible for auditing the code. A famous study of a DAO that got hacked due to auditing negligence was *The DAO* Hack that happened in 2016 (Mehar et al., 2017). The DAO (not to be mixed with the term 'DAO') was a venture capital fund that used DAO technology to raise over $150 million on the Ethereum blockchain. Within three months of its inception, an exploit was discovered in the DAO's code that allowed hackers to siphon funds directly from the organization's wallet which resulted in the loss of $50 million. Undoubtedly, placing full trust in machines is often just as dangerous as placing trust in people. DAOs should always go through a rigorous auditing process before the code is deployed on the blockchain, and users should be well-versed in the risks they are taking on before employing the services of a DAO. Despite the infancy of

DAO technology, the potential impact it has on any business that deals with financial transactions cannot be ignored.

Open Nature & The Democratization of Ownership and Services

Being inclusive by design, DAOs allow anyone with an internet access to participate in its governance. Alongside the attributes of transparency and trustlessness, the open nature of DAOs allows for a fairer distribution of corporate ownership and rewards, greater innovation and wider accessibility to Internet services such as decentralized financial tools.

DAOs are a natural extension of traditional corporate governance systems. In traditional corporate governance systems, actors who own a stake in the company are considered as the shareholders of the company (Pesqueux, 2005). They hold the power to appoint a board of directors and other executives responsible for making decisions with regards to the company's day-to-day operations (Tirole, 2001). DAOs take this concept one step further by completely eliminating the need for a central authority altogether. Instead, everyone who owns a stake in the organization, typically in the form of digital tokens, gets a say in how the organization is run (Singh et al., 2019). This ensures that the decisions made by a DAO is in the best interest of the entire community. In addition, the decentralized model of governance enables greater participation since anyone can partake in governance, as long as they are tokenholders of the DAO. Tokens can be seen as equivalent to stock holdings of a company, as they represent ownership of a DAO. They allow for more liquid and transparent markets for assets, meaning that investors can sell their tokens for fiat currencies whenever they want. In a traditionally formed organization, the shareholders are typically the ones who reap the majority of the benefits. With the token model, everyone who holds a token can share the profits generated by the DAO. This could lead to a more equitable distribution of wealth and a more democratic form of asset ownership.

Since a DAO's code is open-source, anyone is able to contribute to a DAO's code as long as they are approved by members of the organization. This allows DAOs to tap into a global pool of talent and ideas, attracting greater innovation while opening up to some unique compensation structures. Once a DAO is set up, bounties are given to anyone that finds a bug in the code, or is able to improve on the efficiency of a particular smart contract. This can give rise to a more outcomes-based economy, where compensations are linked to the achievement of outcomes and not based on the amount of hours an employee has put in. Contributors can also choose to be rewarded in the DAO's tokens, which is an interesting way to directly align the interest of its employees with the success of the organization since they are incentivised to improve the value of the token. Granted, the "tokenomics" of the DAO, which is the economic design behind a token's distribution and revenue collection as defined by Cong et al. (2018), needs to be well designed and able to efficiently accrue value for the protocol. To a larger extent, DAOs pushes society into a working culture that adopts the open-source ideals of collaboration and meritocracy.

The permissionless nature of DAOs democratizes access to their services to the masses, especially in the field of decentralized finance (DeFi). DAO technology plays a huge role in the governance of DeFi protocols, a field that is booming with a total of $43 billion in value locked (DefiLlama, 2022). DeFi, or distributed finance, aims to replace the centralized legacy banking system by providing automated, decentralized financial instruments such as savings, borrowing and lending and insurance products to the masses. At their core, the operations of DeFi applications are not managed by an institution—instead they are ruled by DAOs. DAOs facilitate the creation and operation of financial protocols and applications in a trustless manner by allowing anyone to contribute to the code. Once the DAO's code is deployed to the blockchain, DeFi applications can run by themselves with little to no human intervention. Since everything is open-source, everyone

has equal access to these financial services and tools, as opposed to their traditional counterparts. DeFi gets rid of the financial bureaucracy that currently clogs up the traditional financial system, giving users full custody of their assets and personal financial information when dealing with financial products. For the first time in history, DAO technology is enabling a financial system to develop at a large scale without the need for intermediaries. DeFi applications represent a formidable alternative to traditional financial services, where internet users can participate in this new generation of financial services without the need for centralized permission structures and rent-seeking intermediaries.

Moreover, the openness of DAOs attracts more innovation as anyone with programming skills can participate in developing financial services and products for DAOs, due to the low barriers to entry. This is in contrast with the existing traditional financial system, where there are onerous entrance restrictions such as the need for proper licenses and authorizations from regulators. The rigidity of traditional finance greatly stifles innovation and prevents entrepreneurs from disrupting the status quo.

Conclusion

The disruptive potential of DAO technology as a new form of organizational structure cannot be ignored. As DAOs reach wider mainstream adoption, it is vital to understand their larger implications on society. This paper presents several distinct aspects of decentralized autonomous organizations that radically reshapes the way organizations are organized: self-autonomy, transparency and openness. Though many of its current use cases remain limited, DAOs show much promise as a viable alternative to traditional organizational models of business and governance.

The ideal application of a DAO is one that requires minimal human input to maintain its operations, where user trust is paramount especially when it comes to having a transparent transaction history, and a business model that would benefit from creating an open network for all users to participate in. Understanding the key aspects of a DAO gives potential founders insights on whether it is advantageous to build their organizations on DAO technology. Depending on the need for decentralization and organizational autonomy, DAOs could play a pivotal role in providing a more democratic and efficient organizational structure that promotes greater accountability and innovation.

Placing our trust on DAOs over traditional organizations obviously comes with some caveat. Smart contracts that govern DAOs are only as smart as their creators; they are not immune to exploits, poor design, poor adaptation and weaknesses at its interface with the external world. Rigorous auditing processes should be mandatory, and users must be cognizant of the intricacies of the code. Only if implemented safely, DAOs promise a future with fairer distribution of ownership and rewards, and where transparency is held to high regards.

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