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Fone Pengnate

Fred Riggins

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Decentralized Autonomous Organizations (DAOs) as a New Organizational Form: An Analysis of Trust Formation in DAO Participant Relationships

Supavich (Fone) Pengnate
fone.pengnate@ndsou.edu

Frederick J. Riggins
fred.riggins@ndsou.edu

College of Business
North Dakota State University

ABSTRACT

Distributed Autonomous Organizations (DAOs) are a new organizational form that exists solely on a blockchain. In a DAO, the rules of governance are hardcoded in a fully-transparent smart contract that executes on the blockchain. In these organizations there is no traditional hierarchical management structure, rather the organization exists as a group of token holders who have invested in the DAO by contributing to the DAO treasury and in return receive tokens that may increase (or decrease) in value and provide token holders with voting rights in the operations of the DAO. These voting rights are important since new initiatives within the DAO may take the form of proposals made by token holders which are then voted on by the group. In this way, DAOs exhibit an interesting form of organizational management and governance. We investigate how trust forms between DAO participants and how these relationships further the goals of DAOs.

Keywords (Required)

Distributed autonomous organizations, DAO, blockchain, governance.

THE PRINCIPAL-AGENT PROBLEM IN ORGANIZATIONAL DESIGN

In a traditional organization, authority flows from a top-down management structure where management (the principal) provides directives to workers (the agent) in order to accomplish tasks that are beneficial to the organization. The management must provide oversight to ensure that the worker is acting in the best interests of the organization as the worker executes tasks as assigned by management. The principal-agent problem arises when the manager is not able to ensure via monitoring or other means that workers are doing their best effort in which case the principal is subject to moral hazard (Jensen and Meckling, 1976; Laffont and Martimont, 2002). Incentive structures may be constructed to better align the actions of the agent on behalf of the principal. In this way, higher levels of trust may be achieved between different parties in the operations of the organization.

Blockchains have been created to try to build trust into relationships where it might not otherwise exist (Tapscott and Tapscott, 2017). Indeed, the first blockchain, Bitcoin, was created to allow two parties to conduct financial transactions with each other without the use of a trusted third-party intermediary, even when they have no reason to otherwise trust each other (Nakamoto, 2008). The combination of cryptographic proofs, pseudonymity, transparency of transactions, and a decentralized network of nodes recording the blockchain transactions are designed to build trust into the network. In DAOs, there is no management in a traditional sense. Rather specific activities of the DAO's operation are encoded in the smart contract for the DAO. However, token holders can make proposals for additional activities that then get voted on by all token holders. The decision to move forward on a new proposal/task is a joint decision by the group (the principal) which is then executed by a person or team (the agent) as assigned in the proposal. For example, a proposal could be made to develop a new software project in the form of a new smart contract that would be assigned to a developer team, and if approved, then the developers would write the code and upload a new/revised smart contract to the blockchain for the DAO.

This research examines the nature of the principal-agent problem and trust building in DAOs. Prior research has discussed how the principal-agent problem in DAOs may be much less, or even eliminated, due to a number of factors. First, the rules for how the principal and the agent interact in a DAO is encoded in the smart contract. This may reduce opportunistic behavior on the part of agents (Hsieh, Vergne, Anderson, Lakhani, and Reitzig, 2018; Tapscott and Tapscott, 2017). Also, because the rules of the relationship between the principal and the agent is hard-coded in the smart contract, there is less need for the principal to monitor the actions of the agent (Murray, Kuban, Josefy, and Anderson, 2021). Third, whatever work is conducted on the part of the developers is completely transparent, as the final product of code is fully auditable and transparent to the token holders

(Yermack, 2017). Finally, once put on the blockchain, the code executes precisely with no ambiguity. For these reasons, it is possible that the end result is that the costs of the principal-agent problem may be much less, or even zero, in the DAO context (Kaal, 2019).

On the other hand, there are several reasons why the principal-agent problem may be exacerbated in this context. For example, because the DAO operates based on hard-coded rules in the smart contract, the developers may have excessive power to alter the nature of the DAO in the new smart contract (developers may seek to take advantage of a high level of information asymmetry) (Kotsialou, Riley, Dhillon, Mahmoodi, McBurney, Massey, and Pearce, 2018). In addition, a large number of token holders may not be able to execute proper oversight of the developers' actions/results due to complexity of smart contract effort/code. For example, might developers insert small code that could be disruptive? Furthermore, token holders may lack of expertise necessary to exercise oversight of the developers. In this case, the end result may be that the principal-agent problem is more complex in this setting (Murray et al. 2021).

There are a number of issues that complicate this situation. Due to the pseudonymity of DAOs, the token holders (voters on the proposal) may not know the identify of the developers. Could it be that the developers are actually token holders of a rival DAO and might seek to disrupt the DAOs operations/success? While the developers might be token holders for the DAO in question, there is no way to know that they don't have a larger stake in a competing DAO. Furthermore, if something goes wrong, there may not be an opportunity to execute legal action against parties involved (developers for example) due to the pseudonymity of DAOs. Even though DAOs have a level of pseudonymity, in some cases the developer team makes their identity known prior to the proposal vote. Might a DAO require this in the DAO smart contract? Finally, in some DAOs voters (token holders) delegate their vote to delegations, who could be experts in the DAO operation and smart contracts. To what extent does the existence of voting delegations impact the ability to conduct an efficient and efficacious vote? Also, when creating delegations, individuals running to be delegates may choose to make their identities known to the token holders. The extent to which self-revealing impacts the efficiency and efficaciousness of the voting process is important.

SOCIAL NETWORK ANALYSIS IN DAOS

Social network analysis (SNA) has been widely used in the social and behavioral sciences fields to understand networks and their stakeholders. Specifically, SNA attempts to identify the main actors and the relationships between them in a specific context. SNA has been used in several research areas, such as online social networking sites (Kim & Hastak, 2018), social networking sites online forums (Fronzetti Colladon, Guardabascio, and Innarella, 2019), and academic research recommendations (Xu, Guo, Hao, Ma, Lau, and Xu, 2012).

In the context of DAOs, analysis of social networks can provide researchers with useful insights into the following areas:

1. SNA holds promises as a methodology that can assist researchers to understand the structure of relationships between stakeholders in a DAO. Consequently, the most influential stakeholders and their coalitions can be identified and the influence on potential collaboration and voting patterns can be determined.
2. SNA can shine a light on the influences within a DAO in order to identify potential collaboration along a continuum between small DAOs and larger DAOs, which might identify potential skeptical stakeholders and suspicious activities.
3. In addition, SNA can also be used to determine the relationships between members across different DAOs. While certain level of pseudonymity is maintained by the DAO platform, it has potential to identify spurious relationships between members across DAOs. For example, it is possible that members of a DAO might attempt to disrupt the operations of a rival DAO. Consequently, SNA can be used to uncover patterning of members and suspicious interactions across DAOs.

As a demonstration, we conducted a preliminary study to examine how social network is developed on sixty DAOs with the biggest market capitalization (at least \$10 million) as listed on DeepDAO. The results are shown in Figure 1, indicating a high degree of collaboration of the stakeholders across certain DAOs. Further study can be carried out to investigate the voting patterns and characteristics of those stakeholders to be evaluated for potential suspicious voting activities.

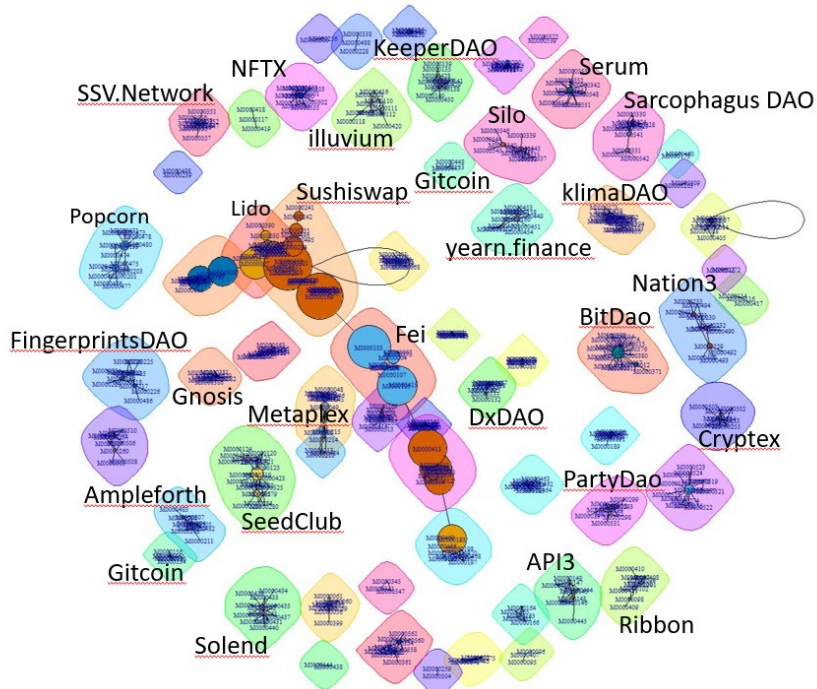


Figure 1: Formations of Voting Coalitions in DAOs
 (note: larger circles represent higher influence of the stakeholder in the group)

FORMATION OF TRUST IN DAOS

According to McKnight, Cummings, and Chervany (1998), organizational participants can develop trust at the beginning of their relationship although the participants do not know each other and had no interaction history, referring to the concept of “initial trust.” In today’s online environment, interacting with a new party or individual remotely has become more common. Such an interaction involves the development of initial trust because the parties do not know each other or having to work together long enough to establish interaction history. This situation is typical in the DAO setting because of the nature of the structure and pseudonymity of DAOs. Therefore, in this research, we argue that initial trust may be explained by factors and processes that enable trust to be high when stakeholders of DAOs barely know each other as follows:

1. Unit grouping

According to McKnight et al. (1998), unit grouping is one of the factors of cognitive processes and refers to individuals who share common goals and values tend to perceive each other in a positive light; hence, are grouped together (Kramer, Brewer, & Hanna, 1996). Therefore, being a new stakeholder of a DAO, unit grouping can enable one stakeholder to immediately form trust about another stakeholder since they share the goals and objectives of the same DAO.

2. Reputation categorization

Reputation categorization is one of the attributes of cognitive processes. In general, reputation reflects professional competence, benevolence, or honesty (Barber, 1983; Dasgupta, 1988; Powell, 1996). Apparently, individuals with good reputations are recognized as trustworthy. In the context of DAO, a stakeholder may be perceived as he or she is a stakeholder of a competent DAO or because of the stakeholder’s performance in actions in proposal voting. Consequently, voters or delegates who are experts in the DAO operation can be perceived as trustworthy without firsthand knowledge since their decisions appear to be reasonable, of the common interests, and in intended direction.

3. Structural assurance

Structural assurance is one of the key components of institution-based trust, and refers to structural safeguards such as regulations, guarantees, and legal recourse are put in place to mitigate risks involved in forming trust (Shapiro, 1987). Structural assurance is closely related to the concept of system trust that refers to a belief that proper impersonal structures are put in place to enable individuals to feel assured about their expectations of the other individuals’ future actions, even their identify is

unknown to each other (Pennington, Wilcox, and Grover, 2003). In the DAO context, according to Pennington et al., 2003, system trust can be enabled through structural assurances—which include safeguards, such as the blockchain mechanism and smart contracts, that make the stakeholders feel safe depending on the other stakeholders.

Consequently, according to the initial trust in new organizations theory, we proposed the following research framework to study trust in DAOs as shown in Figure 2.

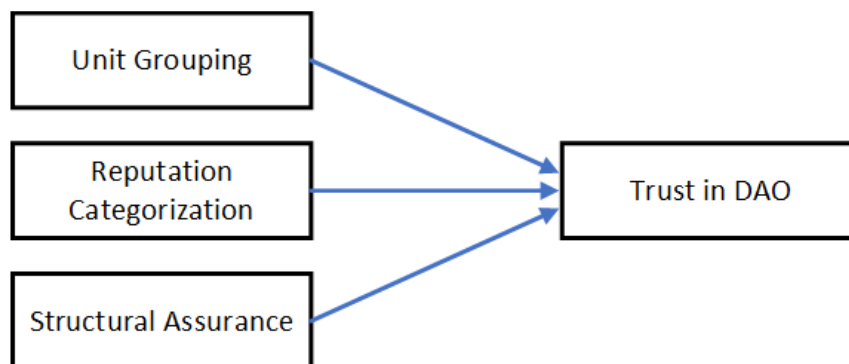


Figure 2: Model of Trust Formation in DAOs

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