Decentralized Autonomous Organizations (DAOs): Sustainable Cooperation through Reputation Based Governance and Smart Consensus?

Overrated Hype or Golden Key to Sustainable Cooperation?

"New" collaborative organizational forms (Kolbjørnsrud, 2018; Kruse et al., 2022) are often hailed as arrangements that might be better able to solve complex societal challenges and their "wicked" problems (Termeer et al, 2015) than their "traditional", more hierarchically organized counterparts (Billinger & Workiewicz, 2019). New Organizational Forms solve at least one of the fundamental problems of organizing (task division and allocation, reward distribution, and information provision) in a novel way when compared to other organizations that share similar goals (Puranam et al., 2014). A key element of such arrangements, which often are referred to as "new hybrids" because they combine elements of communities, markets, and hierarchies (Kolbjørnsrud, 2018) is a strong reliance on cooperative selfgovernance and mutual adjustment rather than on formal authority and bureaucractic rules procedures. The alleged advantage of such forms over the classical bureaucracy is not only their assumed superiority in terms of operational flexibility and ability to adapt to complex and fast changing environments. They also are appreciated for their value based ambitions: to create work environments and organizational processes that avoid the dysfunctions of "traditional" forms of organizing by fostering participatory, more democratic practices of governance, fairer allocation of rewards, more transparent decision procedures, or a better alignment between individual talents and ambitions and organizational roles. Technological innovations often have played a major role in boosting the invention of new organizational forms. For example, railways and telegraph were an important enabler of the modern corporation, and the current proliferation of platform organizations would not have been possible without the manifold communication and transaction opportunities provided by the World Wide Web. More recently, Blockchains have entered the scene. Blockchains are the general purpose technology behind the cryptocurrency Bitcoin. Many regard it as a revolutionary innovation that sooner or later will fundamentally transform not only work and organizations but the whole economic system as we know it (Berg et al., 2020; Fenton, 2021). blockchains allow potentially radically new solutions to the fundamental problems of organizing and therefore to making cooperative endeavors far more sustainable. The two projects in this cluster therefore investigate to what degree and under which conditions Blockchain Governance (Fisher & Valiente, 2021) succeeds or fails in sustaining cooperation within and between (new) organizational arrangements.

State of the Art

Blockchains represent a digital technology that uses encrypted peer-to-peer network computing to enable the creation and maintenance of tamper-resistant decentralized public ledgers. Ledgers are databases that record any kind of information, ranging from financial transactions to property certificates or individual identities. A distributed ledger differs from a centralized one in that the information is not stored by one single individual or organization, like a bank or a state bureaucracy, but that it is distributed decentrally across many different entities: every participating node in the network has a copy of the ledger.

Whereas blockchains are the technology underlying cryptocurrencies such as Bitcoin, their potential uses by far exceed applications in the financial sector. In fact, there seems to be hardly any

societal domain in which the opportunities and limitations of blockchains have not been discussed since the introduction of the technology in the year 2008. For example, blockchains are used in the humanitarian sector, in supply chain management, in healthcare and in public administration reforms (Bustamante et al., 2022). The reason for this fascination lies in what can be considered one of blockchain technology's institutional core implications: minimizing the amount of trust that is required from actors in a system of exchange or joint production. Since at any point in time consensus about the "true" state of the ledger is ensured through a cryptographic mechanism, participants do not need to trust a centralized record keeper or authority. Users do, however, need to trust in technology.

Claims about the "trustless" nature of blockchain governance are less straightforward than they seem at first sight. Trust in authorities is still of the essence in blockchain systems (Lehdonvirta, 2022; Vergne, 2021). Crucially: it is only administration that is decentralized, not legislation. This means that blockchain developers can send out updates to the underlying code that changes the rules of the game. In the case of The DAO, which was the first Decentralized Autonomous Organization based on the then new Ethereum blockchain, a hacker used a flaw in the system to transfer 50 million dollars to their own account arguing that no rule was broken and they were completely in their right to do so. In the end, developer and Ethereum co-founder Buterin updated the system to return these funds back to their original owners (Dupont 2018). However, doing so also fundamentally disproved that blockchain is a trustless system without central authorities. Instead, participants still need to have some confidence in the blockchain system itself, which, as some scholars have argued, critically depends on the governance structure of the blockchain system (De Filippi et al., 2020). While the original Bitcoin blockchain has never been hacked like The DAO, the wider governance of the ecosystem surrounding it and other cryptocurrency experiments has been prone to governance failures, most recently exhibited with the FTX exchange collapse. Despite these and other concerns particularly related to energy usage, experiments with blockchain persist and raise concerns about sustainability.

Sustainability Threat

As with all impactful new general purpose technologies, also the invention of blockchains was received with opposing reactions, some of which are reminiscent of the debates sparked in the early days of the introduction of the World Wide Web (Hütten, 2019). Zealots point to blockchains' potential to literally revolutionize not only market interactions, but society at large. Blockchains would not only minimize the need for trust, they also increase visibility, traceability and security of transactions. In contrast, critics emphasize, among others, high implementation costs, limitations to data modification (which is problematic when programming errors have to be corrected), energy use and the fact that the related computations are time consuming. More recent criticism even raises serious doubts about Blockchain Governance's alleged potential for disintermediation (Bernards et al., 2022). These factors also lead to high levels of power concentration in the hands of the administrators, thereby undermining the argument that blockchains can decentralize enforcement of rules. Anyone who controls more than half of the mining power could stop any and all transactions they don't like. When one of Bitcoin's developers proposed to increase the block size on which transactions are recorded, to speed up the system, Chinese mining companies opposed this change because it would increase their operating costs. So in fact there are two authorities on which blockchain systems depend: developers (legislation) and miners (administration).

With the technology being relatively recent, so far not much is known about the inner workings of blockchain based cooperative arrangements, particularly outside of alt-finance experiments with cryptocurrencies (Dallyn and Frenzel 2021). However, a quite bleak picture emerges from the little systematic evidence that is available. For example, one survey found that of the more than 80.000 blockchain based projects that have emerged after Bitcoin entered the scene (and the cryptocurrency Bitcoin would count as such a project), only about 8% were still active in 2017. Moreover, the average lifespan of such projects was 1.22 years (Kelso, 2017). Nevertheless, interest in Blockchain projects keeps growing. An analysis of the evolution of Blockchain related projects on the open source developers platform GitHub shows a rise from 9000 of such projects a year in 2009 to 26000 in 2016 (Trujillo, Fromhart & Srinivas, 2017).

Main Proposition

Whereas much of the discourse on blockchains considers them as just another new general purpose technology, some scholars emphasize that they represent a new type of economic institution, in fact providing an unprecedented form of institutional technology (Davidson, De Filippi & Potts, 2018). Blockchain Governance constitutes a new and unique arrangement that significantly differs from common contractual and relational forms in at least four major ways (Lumineau, Wang & Schilke, 2020; Murray et al., 2021). First, the defining features of Blockchain Governance are self-contained and autonomous systems of rules. In contrast, contractual governance is based on enforceable promises, rights and obligations, whereas relational governance is about conformity to expectations. Second, where BG's regulatory principle are protocols and code-based rules, contractual governance builds on the law, and relational governance on social norms (Galloway 2004). Third, enforcement in BG "smart contracts" is automatic, whereas contractual governance invokes third parties and in relational governance it is the involved parties themselves who enforce the norm. Finally, BG is enacted through code and programming languages, whereas relational governance is informal and contractual governance uses legal prose. A key claim following from this institutional approach is that under specific circumstances, blockchain governance may outperform the other two forms of governance. A core proposition explored by the two projects of this cluster is that, though providing an unprecedented new institutional technology for sustaining cooperation, that Blockchain Governance will be as vulnerable to cooperation decay as this is the case for relational and contractual forms of governance. In fact, rather than resolving problems of "traditional" forms of governance, it may exacerbate them (Bernards et al., 2022). For Blockchain Governance to be effective in the middle and long run, additional safeguards to improve its institutional strength need to be in place. These safeguards involve practices sustaining joint production motivation, countering institutional corrosion, increasing ambiguity tolerance, and fostering relational embeddedness.

Main Outcome

The two projects of this cluster address two different levels of analysis. Project 1 focuses on intra-organizational processes. It provides an in-depth ethnographic analysis of cooperation and value creation processes within a small selected set of Decentralized Autonomous Organizations (DAOs), which are blockchain enabled virtual cooperative entities. The project's main outcome is a better understanding of the inner workings and cooperation dynamics inside the DAOs and their outcomes (organizational value creation). Project 2 studies the emergence and functioning of a set of DAOs in a specific organizational field, Decentralized Science (DeSci). This project focuses on comparing the institutional grammars of these DAOs, their interplay with established centralized science institutions, and the implications for sustaining cooperation and value creation related to all dimensions of the scientific endeavor.

Decentralized Autonomous Organizations (DAOs): Sustainable Cooperation through Reputation Based Governance and Smart Consensus?

Aim of the Project

The project has two interrelated aims. The first, descriptive aim consists in mapping, through time, the decisions, actions and outcomes following the foundation, growth, consolidation and eventual decline of selected so-called Decentralized Autonomous Organizations (DAOs). The second aim is to explain how different governance mechanisms, in particular reputation based governance and consensus voting and the social processes they trigger can account for variations in DAOs' capacity to sustain value creation.

Background

Decentralized Autonomous Organizations (DAOs) were first proposed in 2015. They are virtual hybrid organizational arrangements that use blockchain technology to foster joint production. Though not a prerequisite for DAOs, many DAO's are collectively owned and run by a committee whose members formulated (and agreed to follow) a set of rules in order to realize joint outcomes. Some of these rules are part of so-called "smart contracts", which means they are implemented in algorithms that automatically get activated once specific pre-defined contractual conditions are met.

Depending on the kind of governance implemented, DAOs may have several advantages when compared to traditional organizations (Choi et al, 2022; Ghavi et al., 2022). First, blockchain governance allows, in principle, providing direct control over organizational operations to all members of the organization, without interference of third parties like managers or banks. Second, they increase transparency, since all actions are recorded in the blockchain and are accessible to every member of the organization. Third, DAOs may bring considerable efficiency gains when it comes to founding and running them. In fact, one of the platforms hosting DAOs advertises with the words "Go from zero to DAO in 90 seconds" (Colony.io). Fourth, DAOs enable and encourage widespread participation and democratic decision making, which may improve decision quality. Finally, unless hackers use flaws in the code (as was the case in The DAO), DAOs foster trustworthiness about the protection of its funds, because self-executing contracts cannot violate the pre-defined rules they carry out.

Not surprisingly therefore, interest in DAOs is booming. According to a recent survey, the number of DAOs increased from about 700 in May 2021 to about 6,000 as of June 2022 (Ghavi et al., 2022; see also Faqir-Rhazoui et al, 2021). During this period, the total value of crypto funds held in DAO treasuries exploded from $400 million to $16 billion, and the number of holders of interests in DAOs rose from just 13,000 to 1.6 million (Ghavi et al., 2022). In fact, some hail DAOs as the Future of Organizations. But this claim may be premature. For one, so far there is not really much empirical evidence to substantiate it. If anything, there is a large gap between the number of DAOs and the number of active DAOs. For example, as a comparative analysis of the three most important DAO platforms has revealed, of the 2000+ DAOs, only about 10% qualify as "active", i.e. it "performed an action" during a month (Faqir-Rhazoui et al, 2021). Furthermore, DAOs, like any other organizational form, come with their own risks (Morrison et al., 2020). Among these are crypto-related risks (for example flaws in the blockchain software or security breaches), legal risks (most DAOs lack a legal

status, which formally turns them into general partnerships, with the consequence participants bearing unlimited legal liability), and environmental risks (related to the immense energy use of blockchain technology). Another class of problems are related to governance (Rikken et al., 2019). First, DAOs may fall prey to the iron law of oligarchy, i.e. despite its decentralized intentions de facto power may come to be concentrated in the hands of a small subgroup. This may also be the result of deliberative "governance attacks", during which (groups of) participants may instrumentalize the rules of the DAO for their own ends. Second, deliberative democratic decision making involving the whole community may become too cumbersome and time consuming, in particular with increasing problem complexity. Finally, the need to reprogram self-executing smart contracts that have become obsolete or dysfunctional inhibits quick adaptation to changing circumstances. Features of DAOs meanwhile have been well-described (Bellavitis et al., 2022; Santana & Albareda, 2022). In fact, the academic literature on DAOs so far excels in conceptual, theoretical, and programmatic analyses that try to come to grips with the essence of a DAO, how it differs from other cooperative arrangements, and how it may impact economy and society in the mid and long run. In contrast, with some rare exceptions (e.g. Du Pont, 2018; Schirrmacher et al., 2021) we hardly have any first hand descriptions or studies of what is actually going on inside a DAO. What motivates their founders to create a DAO, what might explain variations in choices for different governance structures and their eventual change? What kind of cooperative interactions take place, how productive are they? What kind of tensions emerge and how are they handled? But the question that probably most entices practitioners and academics alike is what it takes to build a sustainable DAO. This project aims to answer this question.

Theory

The Theory of Governance Traps (Wittek, 2022) is used as a point of departure and extended to the context of Blockchain Governance in DAOs. Several theoretical analyses have pointed to the endogenous downward spirals challenging the viability of DAOs and related organizational forms. For example, some scholars argue that DAOs face the same "paradox of flexibility and structure" that threatens the viability of what has been labeled Fluid Organizations (Schirmacher et al., 2021; Schreyögg & Sydow, 2010). Similarly, analyses of algorithmic decision making and control point to the contested nature of the related practices (Kellogg et al., 2022) and highlight the inherent problems of ambiguity intolerance and pressures on social decision making practices (Herzog, 2021). A governance trap reflects a self-reinforcing process in which an institutional arrangement that is intended to elicit cooperation, also triggers behaviors that indirectly undermine it. An example are performance contingent incentives in organizations, like bonuses. Whereas such incentives are powerful in eliciting the type of behavior that yields the reward, they may also lead to the neglect of other behaviors that are not rewarded, but nevertheless important for overall performance, like not taking excessive risks (Becker & Huselid, 1992). Building on insights from research on goal framing and joint production motivation (Lindenberg & Foss, 2011), this theory argues that independently of its success in getting cooperation going in the short run, any governance structure also bears the seeds for its own decay in the middle and long run. This tendency towards endogenous decay has its roots in the brittle nature of human motivation when it comes to sustaining contributions to collective goods (Lindenberg, 2014). As recent experimental research has shown, maintaining a collective good is more difficult than creating a new one (Gächter et al., 2017). One implication is that governance structures geared towards keeping joint production motivation salient will be more successful in preventing the emergence of governance traps. DAO platforms – the digital infrastructures that potential DAO founders can use to configure their own DAOs, like Colony or Aragon – are well aware of the many potential threats that may lead to the (early) dissolution of a DAO. This is why they equipped their platforms with a series of tools that allow founders to

implement and calibrate a variety of institutional safeguards to prevent and mitigate governance failures (Baninemeh et al., 2021). Reputation and consensus systems are two particularly important elements of the broader set of governance instruments used by DAOs (e.g. Rea et al., 2020).

First, most DAOs provide the opportunity to track and reward member contributions to the collective good, like a specific project. Often, such contributions can be made visible through an individual reputation score, and thereby contribute to the reputation of the DAO member. This reputation can be expressed in the DAO's own token, and may therefore also have monetary value for the member, or it may translate into voting or control power within the DAO. The opportunity to build up reputations therefore can be a powerful incentive for individuals to invest intelligent effort into joint endeavors. But reputation systems come with their own challenges. For example, how to avoid that members who have accumulated high reputation scores in the past also keep contributing in the present? DAOs therefore differ with regard to their approach to reputation based governance. Particularly noteworthy is the solution that the Colony platform has developed. Here, the reputation algorithm is programmed such that a member's reputation decays through time (e.g. at an hourly rate), in order to incentivize members to keep contributing (Rea et al., 2020).

Second, most DAOs have some form of collective decision making process in place. Such processes are used to vote, for example, on budget allocations for specific projects, or on strategic issues. Also here DAOs differ in the way they design the related consensus and voting procedures. Again, the Colony platform's approach is pioneering in its reliance on what it calls lazy consensus, i.e. "decentralized decisions without voting". This principle is based on the idea that voting is only necessary if there is disagreement, thereby avoiding one of the potential shortcomings of participatory decision making. A DAO is sustainable if it succeeds in eliciting and maintaining joint production efforts that create internal and social value - also if circumstances for this joint production deteriorate. Pre-programmed reputation decay and lazy consensus are just two of a vast array of blockchain based governance practices designed to boost the sustainability of DAOs through a radical implementation of organizational practices geared to increase accountability, objectivity and participation. But like any form of algorithmic control (Herzog, 2021; Kellogg et al., 2020), also blockchain governance creates a whole array of new challenges, some of which may actually undermine these very objectives. This project investigates under which conditions DAOs succeed to prevent and mitigate such governance traps.

Research Design

A mixed method approach will be used for an in-depth longitudinal comparative study of selected DAOs (for an inventory of DAOs, see for example https://daocentral.com). Digital Ethnography (Pink et al., 2017), and in particular the principles of Participatory Digital Ethnography of Blockchain Governance as outlined by Rennie and colleagues (2022), serve as the point of departure for designing the research strategy for this project. Data collection methods include interviews with different DAO stakeholders (e.g. founders, members, beneficiaries), participant surveys, focus group discussions, and text analysis of communications among DAO members. With DAOs being very recent phenomena that moreover consist to a large part of online interactions, an important task for this project will be the development of a feasible strategy of collecting and analyzing different forms of data. The technique of Ethnographic Arrays (Abramson & Dohan, 2015) will be applied for this purpose. The first phase of the project will consist of inventorizing DAOs that may be suitable cases for this project. This will be followed by approaching representatives of DAOs and exploring opportunities for participant observation as part of a co-creation process (Rennie et al., 2022). The respective DAOs will be followed for a period of three years. Data collection will involve (computer

aided) content analysis of online communication and deliberation, as well as personal interviews and focus group discussions.

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Key Literature & Further Reading

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