RAFAŁ ŁABĘDZKI*

MANAGEMENT IN DECENTRALIZED AUTONOMOUS ORGANIZATIONS (DAO): ANALYSIS OF PROPOSALS

Introduction

The fourth industrial revolution represents a transformative shift in the organization of global value chains. Driving this revolution are advancements in information technology, biotechnology, nanotechnology, and quantum technology [Schwab, 2017].

Arguably, the most critical aspect of information technology's impact on the fourth industrial revolution is artificial intelligence. However, there is another emerging trend in IT that warrants attention – WEB 3.0. This new approach to the Internet involves content that is not only co-created by users but also hosted and delivered in a decentralized manner. The primary tenets of WEB 3.0 include decentralization, transparency, and openness [Korpal, Scott, 2022]. WEB 3.0 ushers in a new era of collaboration between humans and machines by providing the tools necessary to create Decentralized Autonomous Organizations (DAOs).

My previous research [Łabędzki, 2023] demonstrated that DAOs possess features and tools enabling their managers, whether AI or humans, to execute all four fundamental functions of management: Planning, Organizing, Controlling, and Leading. That study highlighted the proposal and voting mechanism as the most crucial management tool, serving as an integral part of the DAO's code.

Despite the growing interest in DAOs and their potential to revolutionize organizational management, there is a significant gap in the literature regarding the practical application of these entities in executing traditional management functions. Existing studies have largely focused on the theoretical aspects of DAOs and their technological underpinnings [Davidson et al., 2018], but there is a lack of research

* **Rafał Łabędzki, Assistant Professor** – SGH Warsaw School of Economics. ORCID: 0000-0002-0239-4125

examining how DAOs operationalize these management functions through specific mechanisms, such as proposals and voting. Additionally, the available literature discusses the legal challenges associated with DAOs, including issues related to liability, regulatory compliance, and the legal status of smart contracts [DuPont, 2017; Reyes, 2019]. This research aims to fill this gap by exploring how DAOs utilize proposals to carry out the fundamental functions of management.

The methodology employed involved Latent Dirichlet allocation (LDA) analysis of both the titles and content of proposals, which are publicly available due to the transparent nature of DAOs. To access this data, I utilized the GraphQL API from https://snapshot.org.

The study reveals that the proposal mechanism in DAOs is primarily used for the functions of Planning and Organizing, while proposals concerning Controlling and Leading are notably less frequent. Specifically, DeFi, Investment, and NFT DAOs tend to focus their proposals mainly on Planning. Social and Games DAOs direct their proposals more toward Organizing activities. Only DeFi and Social DAOs utilize proposals as a tool for Controlling, while Investment, NFT, and Games DAOs employ them for Leading functions.

The main contributions of this study are twofold. First, it provides empirical evidence on the practical application of DAOs in executing management functions, thereby addressing a critical gap in the literature. Second, it offers a framework for analyzing and understanding the operational dynamics of DAOs, which can inform both academic research and practical implementation of decentralized organizational models.

1. Decentralized Autonomous Organization (DAO)

Two technologies are essential for the existence of DAOs: Smart Contract (SC) and Blockchain (BC). BC serves as a digital ledger of events that is public, immutable, and anonymous [Nakamoto, 2008]. The sum of all events recorded in the ledger since its inception determines its current state at any given moment. To alter this state, a new event must be recorded in the ledger. A key feature of BC is its ability to create digital accounts through events recorded in the ledger. Such an account can either be 1) controlled anonymously by its sole creator, or 2) function as an autonomous entity containing programmatic code that allows it to interact with its environment in a predefined manner. The first type of account, known as an Externally Owned Account (EOA), is commonly used to hold virtual goods or for the anonymous signing of transactions. The second type of account, a SC, is a computer program executed by a network of mutually distrusting nodes without requiring any third-party intervention [*Introduction to smart contracts*, 2024].

Smart Contracts, embedded within the blockchain, facilitate the execution of contract terms without the need for a trusted third-party [Jani, 2020]. They can also be described as digital protocols that automatically execute specified technological processes without intermediaries [Buchleitner, Rabl, 2017].

The use of BC renders the SCs both public and transparent. Moreover, it ensures execution by a decentralized network of computers. Consequently, once the conditions specified in the programmatic code are met, the smart contract's execution cannot be halted, nor can it be deleted or modified. Given these attributes, SCs can be viewed as a form of digital agreement [*Introduction to smart contracts*, 2024]. Such contracts form the cornerstone of decentralized autonomous organizations.

Within just a few years after the advent of SCs on BC, tens of thousands of DAOs have been established, holding digital assets valued at over 10 billion USD [DeepDAO, 2022]. Therefore, the significance of DAOs in shaping the future economy should not be underestimated. DAOs have the potential to become one of the fastest-growing organizational structures in the new economic landscape shaped by the fourth industrial revolution.

A DAO can be defined as an organization managed according to rules encoded in computer programs known as SCs [Chohan, 2017], or as an organization whose structure and conduct guidelines are codified in the form of SCs [Virovets, Obushnyi, 2021]. At its core, a DAO is a simple organizational structure that enables collective management [Metjahic, 2018].

In a broader context, a DAO is an organization based on standardized, automatic processes capable of replacing complex coordination routines in the value chain through programmatic rules or protocols [Hsieh, Verhne, 2018]. According to Kondova and Barba [2019], a DAO is a decentralized entity that creates value for customers and operates entirely autonomously via blockchain. Here, crucial managerial decisions are made based on logic defined in the programmatic code and executed by smart contracts.

The autonomy of a DAO involves a collaborative effort between humans and AI. The latter is embodied in the programmatic code of smart contracts, which are stored and executed by a decentralized network of computers using blockchain technology [DuPont, 2017].

DAOs are dynamic entities whose rules of conduct can be modified through member voting [Chohan, 2017].

In summary, a DAO can be considered a structure created by anonymous humans and AI, operating according to rules encoded in programmatic code, which is stored and executed in a decentralized and transparent manner.

2. Fundamental functions of management in DAO

From the perspective of management theory, a DAO is a structure that facilitates all four fundamental functions of management, albeit in a unique manner. These unique features and tools arise from the DAO's digital nature and the use of blockchain (BC) and smart contracts (SC). On one hand, these elements grant unparalleled freedom and independence in operations compared to other organizational structures. On the other hand, they introduce limitations in interactions with the real world and make DAOs susceptible to hacker attacks [DuPont, 2017].

For the purposes of this study, management is understood as the process of planning, organizing, controlling, and leading an organization's resources to achieve specific goals [Griffin, 2022]. Each of these fundamental functions is facilitated by the unique mechanisms of DAOs.

Planning in DAOs involves setting organizational goals, establishing methods to achieve them, and selecting the best approaches for realization [Griffin, 2022]. This process occurs in two steps: proposal submission and digital voting. Members can submit proposals on a digital platform, and decision-making is facilitated through voting by DAO members. All proposals and decisions are recorded on the blockchain and are publicly accessible, ensuring transparency and accountability.

Organizing involves providing and structuring the resources needed to execute the plan, encompassing both human capital and other types of resources [Griffin, 2022]. The only assets a DAO can possess are virtual goods stored in the blockchain. Since a DAO lacks a legal entity, it cannot open a bank account and, consequently, cannot make payments in fiat currency. Its anonymous nature also prevents it from entering into traditional agreements to acquire real-world goods. Therefore, the resources that can be organized are confined to those that can be storable on the blockchain. Despite this limitation, DAOs can accumulate digital equivalents of money, such as cryptocurrencies, and non-fungible goods like digital artwork or cryptographic keys [Tse, 2020]. DAOs can also employ smart contracts to engage with anonymous human contractors, representing a fascinating innovation in human capital management. Team collaboration among anonymous members is novel, especially in the context of hybrid and remote work [Wojtczuk-Turek et al., 2022]. These teams can also include AI, presenting new challenges in human-AI capital management.

Controlling is the process of monitoring whether the organization is progressing as planned [Griffin, 2022]. This function is achievable due to the complete transparency afforded by the DAO. Every action taken is recorded in the blockchain and is immutable. The digital ledger enables the implementation of automated self-control mechanisms, allowing pre-planned actions to be executed automatically. Thus, control can be exercised by both human members and AI. However, due to the anonymity

of smart contract parties, this level of control is somewhat limited. DAO members can only periodically verify the progress of contracted work when certain deliverables must be approved to activate the smart contract.

Leading involves processes designed to encourage cooperation among organizational members [Griffin, 2022]. In DAOs, leading is arguably the least typical management function due to the autonomy and anonymity of its members. The presence of AI in the organizational structure, which currently does not require motivation, means that leading is only relevant in certain areas of the organization. For human members, leading is constrained by anonymity and the entirely remote nature of communication. DAOs address the motivational gap among human members through participation in a governance token pool. This allows all members to submit proposals, vote on decisions, and work for the DAO. It can be viewed as an extreme form of the employee ownership motivation model, which is particularly well-received in IT organizations and can enhance productivity [Łabędzki et al., 2021]. DAOs can also leverage their virtual resources, such as cryptocurrencies, as remuneration-based motivational incentives.

DAOs offer significant potential in the new economic landscape by enabling decentralized, transparent, and autonomous organizational management. However, their implementation also presents several challenges and uncertainties, particularly in the legal domain. The decentralized and autonomous nature of DAOs raises questions about liability, regulatory compliance, and the legal status of smart contracts [DuPont, 2017; Reyes, 2019]. These legal issues need to be addressed to fully realize the potential of DAOs in the new economic landscape.

As my previous research indicated [Łabędzki, 2023], DAOs possess the necessary tools to perform all four fundamental functions of management. Among these, the proposal and voting mechanism is most crucial, allowing all members to submit proposals and vote to accept or reject them. This tool aims to decentralize all decisions made within the DAO, with all the implications that entails. Interestingly, the process of placing proposals and making decisions can be a double-edged sword. While it enables each DAO member to participate in Planning, it also requires such participation. Under certain conditions, a DAO may become paralyzed, unable to make any decisions at all [Chohan, 2017]. This bottom-up approach diverges from the traditional top-down methods outlined in the principles of scientific management, which emphasize efficiency and productivity through a hierarchical structure where decisions are made by a centralized authority and disseminated downward [Taylor, 1911]. This method relies heavily on clear lines of authority, division of labor, and a rigid organizational structure, whereas DAOs operate on a decentralized framework where decision-making is distributed among the members, leveraging BC to ensure transparency and consensus [Buterin, 2014].

3. Method

The aim of this research was to investigate how DAOs utilize proposals to execute fundamental functions of management. The method employed was Latent Dirichlet allocation analysis of both the titles and content of proposals, which are publicly available due to the transparent nature of DAOs. To access this data, I utilized the GraphQL API from https://snapshot.org, with documentation available at https://docs.snapshot.org/. The code for this research was written in Python, and the data was collected on May 4th, 2023.

As of the data collection date, a total of 15,256 DAOs were accessible using the chosen method. However, only 25% of these had at least three proposals. The highest number of proposals for a single DAO was 2,380. Given this wide range, only the top 10% of organizations, based on the number of proposals, were selected for further analysis. This criterion narrowed the dataset to 1,525 organizations.

Each organization was then verified based on two conditions: 1) Being active, and 2) Having described governance. To conduct this verification, the list was further reduced to organizations that maintain a functional website, resulting in a database of 406 organizations. The final step of verification involved two stages. First, to ascertain the DAO's activity, I checked for a valid SSL certificate associated with its website. If this condition was met, I then verified whether the website contained a link to a governance description.

This manual verification process yielded a shortlist of 175 DAOs, which constitutes 11.5% of the organizations available in the initial database. Only DAOs from this verified list were included in the subsequent analysis.

For the analysis of proposal titles and content, machine learning techniques were employed. Specifically, Latent Dirichlet allocation (LDA) was used to extract proposal topics. The LDA implementation was carried out in Python, utilizing open-source libraries available through https://pypi.org. LDA is a generative probabilistic model that is widely used for topic modeling in text corpora. It assumes that documents are mixtures of topics, and topics are mixtures of words [Blei et al., 2003]. This method is particularly useful for identifying abstract topics within large collections of text, making it suitable for analyzing the content of DAO proposals. Extracted topics of proposals were then categorized according to the fundamental functions of management. This categorization was performed manually, based on the context of each topic.

As with any other type of organization, DAOs have various purposes, which significantly impact the subjects of the proposals submitted within a particular DAO. For LDA to be meaningful, it was necessary to group listed DAOs according to their type. Since there is no definitive list of DAO types, classes were created based on the analysis of descriptions available on each DAO's website. Six classes were created and

defined with corresponding descriptions. In the final step, each DAO was classified into one of these classes based on its website description. If a DAO could fit more than one class, the best-fitting class was chosen. As this was the first iteration of the research, all DAOs were classified into the created classes. However, in future research, a seventh class, "other," should be included for DAOs that do not fit any of the created classes. The types of DAOs (classes), their descriptions used for classification, and the count of classified DAOs are presented in Table 1.

Table1. Types of DAOs in the sample

Type of DAO	Count	Description
Defi	83	The Defi group comprises DAOs specializing in decentralized finance, a subset of blockchain that focuses on disintermediating traditional financial services. (Nakamoto, 2008)
Investment	23	Investment group includes DAOs that focus on investing in other blockchain projects. These DAOs might invest such as cryptocurrency assets, initial coin offerings, and decentralized applications. (Tapscott & Tapscott, 2016)
Social	23	The social group is the most diverse, comprising DAOs that offer digital services or products related to social media. Social media platforms enable the creation and sharing of content in virtual communities and networks (Kaplan, 2010)
Infrastructure	18	The infrastructure group contains DAOs specializing in providing products and services geared towards software developers.
NFT	16	The NFT group consists of DAOs that generate profit through creating and/or selling non-fungible tokens. Non-fungible Tokens (NFTs) are digital assets that are used to represent ownership of a wide range of items and assets, both digital and physical. (Tapscott & Tapscott, 2016).
Games	8	The game group contains DAOs that develop and/or publish video games.

Source: own study.

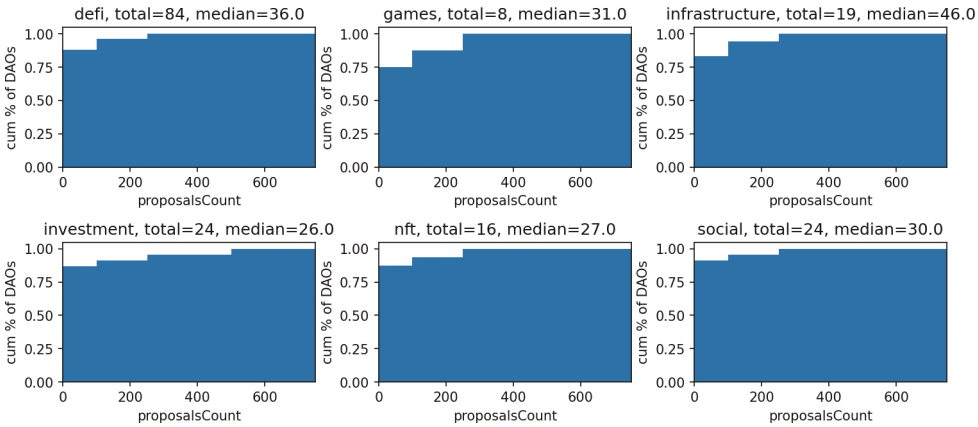
4. Results

The total number of proposals in the sample of 175 DAOs had a mean of 67 and median of 35, with a minimum of 11 and a maximum of 765. It is worth noting that the medians for the groups range from 26 and 46. This indicates relatively low dispersion, considering the wide range between the minimum and maximum values.

The content and titles of proposals were analyzed separately for each group of DAOs. Tuning the LDA model resulted in the exclusion of words shorter than five characters from the corpus. Many abbreviations and unimportant phrases were used in proposals; these were so common that LDA produced uninterpretable results.

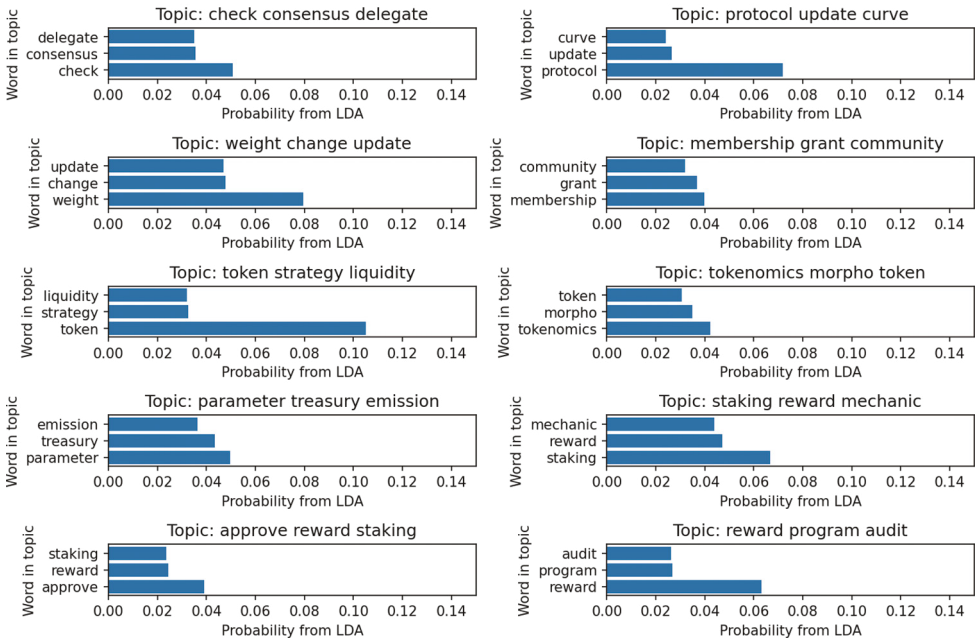
The goal of the LDA was to identify the most common topics of proposals in the respective groups of DAOs.

Figure 1. Cumulative histograms of proposals counts per DAO type



Source: own study.

Figure 2. Top10 topics in proposals in the DAO group: DeFi



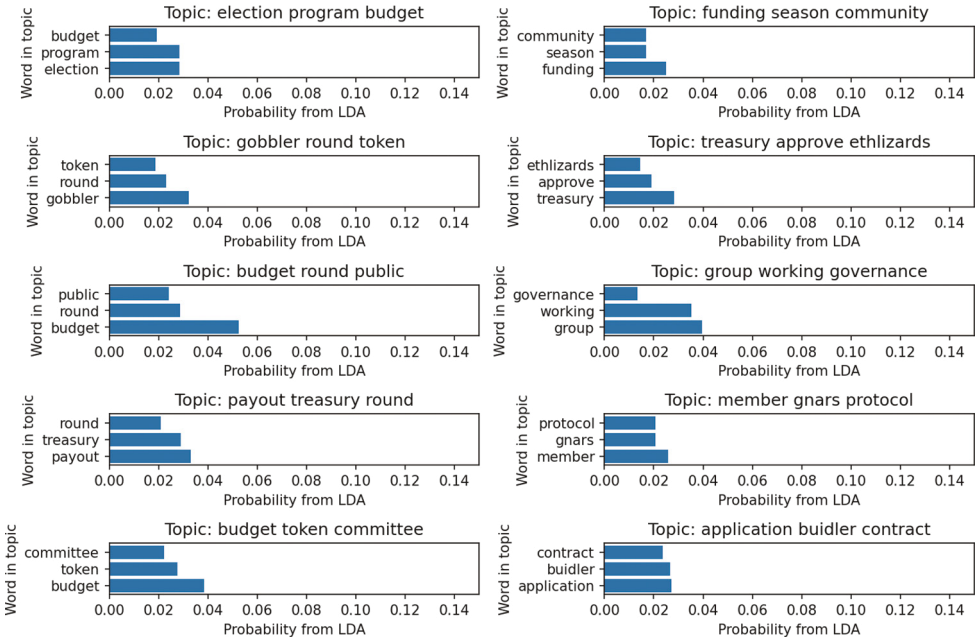
Source: own study.

The proposals in DeFi group can be grouped in the following 10 topics:

1. Topic 1: Focuses on governance processes, with terms like "check", "consensus", and "delegate" indicating discussions around verification procedures and delegating responsibilities.
2. Topic 2: Concerns technological protocols, suggested by words like "protocol", "update", and "curve". It may include topics on upgrading or changing existing protocols.
3. Topic 3: Relates to system adjustments, with terms like "weight", "change", and "update" signaling discussions might about changing parameters or weightings within the system.
4. Topic 4: Appears to be community-focused, featuring terms like "membership", "grant", and "community". This could involve proposals on how to grow the community or distribute grants for projects.
5. Topic 5: Has a financial orientation, as indicated by "token", "strategy", and "liquidity". This topic could include discussions on token strategies and maintaining liquidity.
6. Topic 6: Likely pertains to economic models within the DAO, suggested by "tokenomics", "morpho", and "token". This may involve the economics of token issuance or utilization.
7. Topic 7: Covers financial management aspects, as indicated by "parameter", "treasury", and "emission". This might include proposals about changing parameters for financial operations or managing the DAO's treasury.
8. Topic 8: Focuses on incentive systems, featuring terms like "staking", "reward", and "mechanic". This likely involves proposals on how rewards are distributed to those who stake tokens.
9. Topic 9: Also pertains to rewards but emphasizes approval processes, suggested by "approve", ":reward", and "staking". This could indicate topics that require community approval for staking and rewards.
10. Topic 10: Centers around security and incentives, with "reward", "program", and "audit" as key terms. This may involve discussions on implementing reward programs and conducting security audits.

The LDA analysis for the DeFi group of DAOs reveals a strong focus on technical and financial aspects like tokenomics, protocol updates, and consensus mechanisms. There is also significant attention on community involvement through membership and grants. Overall, the topics suggest that DeFi DAOs are primarily concerned with governance, strategy, and optimizing financial operations.

Figure 3. Top10 topics in proposals in the DAO group: Investment



Source: own study.

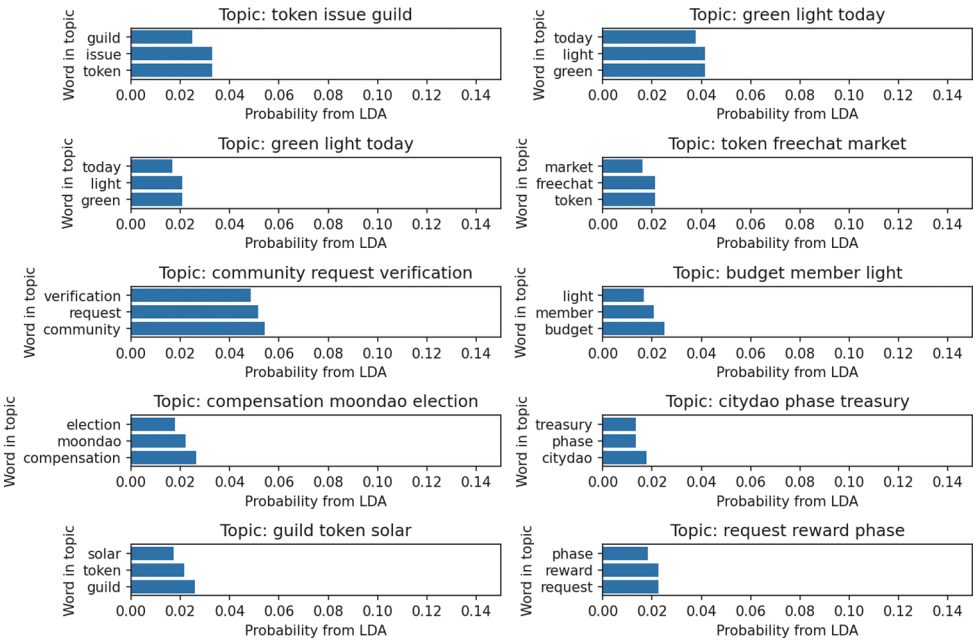
The proposals in investment group can be grouped in the following 10 topics:

1. Topic 1: Revolves around organizational processes such as "election", "program", and "budget", likely involving electing leadership roles.
2. Topic 2: Deals with community and project funding, indicated by terms like "funding", "season", and "community". This might discuss cycles of funding for different community projects.
3. Topic 3: Seems to focus on investment rounds, represented by the terms "gobbler", "round", and "token".
4. Topic 4: Concentrates on financial management and approval processes, indicated by "treasury", "approve", and "ethlizards". This could cover budget approval or specific initiatives like "ethlizards".
5. Topic 5: Focuses heavily on budget planning and transparency, with terms like "budget", "round", and "public". Proposals might relate to how budget rounds are managed and disclosed.
6. Topic 6: Deals with group dynamics and governance, evident from terms like "group", "working", and "governance". This likely covers the formation and functioning of sub-committees or working groups within the DAO.

7. Topic 7: Discusses payouts and treasury allocations, indicated by "payout", "treasury", and "round". This likely involves how funds are distributed from the treasury during different rounds.
8. Topic 8: Seems to involve members and specific protocols, suggested by "member", "gnars", and "protocol". This might deal with membership criteria and specific initiatives like "gnars".
9. Topic 9: Also involves budgeting, but in the context of tokens and committees, as suggested by "budget", "token", and "committee". This could involve budget allocations specific to token-related endeavors.
10. Topic 10: Focuses on the technical aspects like "application", "buidler", and "contract", potentially covering proposals related to smart contracts and applications for them.

The LDA analysis of the investment group of DAOs highlights governance and financial planning, with topics such as treasury management, budgeting, and funding rounds. Other prevalent themes include elections and community involvement, signifying a balanced focus between fiscal responsibility and governance in investment oriented DAOs.

Figure 4. Top10 topics in proposals in the DAO group: social



Source: own study.

The proposals in social group can be grouped in the following 10 topics:

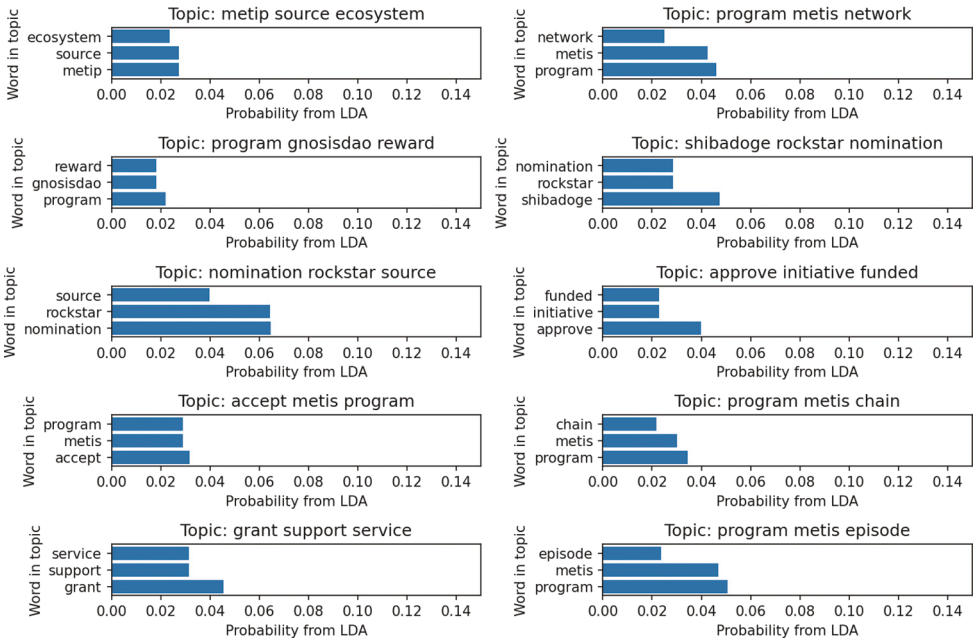
1. Topic 1: Centers on issues related to tokens and guilds, with key terms such as "token", "issue", and "guild". This topic could involve token distribution or governance structures within guilds.
2. Topic 2: Focuses on real-time activities or trends, indicated by terms like "green", "light", and "today". It may involve decisions or activities that are considered go-aheads, symbolized by a "green light".
3. Topic 3: Repeats the theme of real-time activities, through with lesser weight, featuring "green", "light", and "today".
4. Topic 4: Discusses market dynamics, particularly involving tokens, as indicated by "token", "freechat", and "market". This topic might include token valuation and trading.
5. Topic 5: Concentrates on community management, particularly verification processes, as suggested by terms like "community", "request", and "verification". This could involve member verification to ensure community integrity.
6. Topic 6: Talks about budgeting and membership, represented by "budget", "member", and "light". This may discuss budget allocations for community activities.
7. Topic 7: Covers compensation schemes and elections, featuring "compensation", "moondao", and "election". (Note: "Moondao" refers to a specific project).
8. Topic 8: Discusses a specific project or initiative, as suggested by "citydao", "phase", and "treasury". This could involve financial planning for a particular phase of the "CityDAO" project.
9. Topic 9: Focuses on guilds projects, with key terms like "guild", "token", and "solar". This topic might discuss token use within guilds and the DAO's possible involvement in solar projects.
10. Topic 10: Revolves around rewards and project phases, indicated by "request", "reward", and "phase". This may involve reward distribution for completing certain phases or tasks.

The LDA analysis for the social group of DAOs suggests a blend of community-oriented and governance themes, with topics as community requests, token issues, and member participation. The presence of words like "guild" indicates the importance of sub-communities. Overall, proposals in social DAOs appear to be focused on community engagement, verification processes, and token management.

The proposals in infrastructure group can be grouped in the following 10 topics:

1. Topic 1: Focuses on ecosystem development and source management, as indicated by "metip", "source", and "ecosystem". This could involve managing resources or tools that benefit the blockchain ecosystem.
2. Topic 2: Revolves around network programs and possibly a specific technology or project called "metis", as suggested by "program", "metis", and "network".

Figure 5. Top10 topics in proposals in the DAO group: Infrastructure

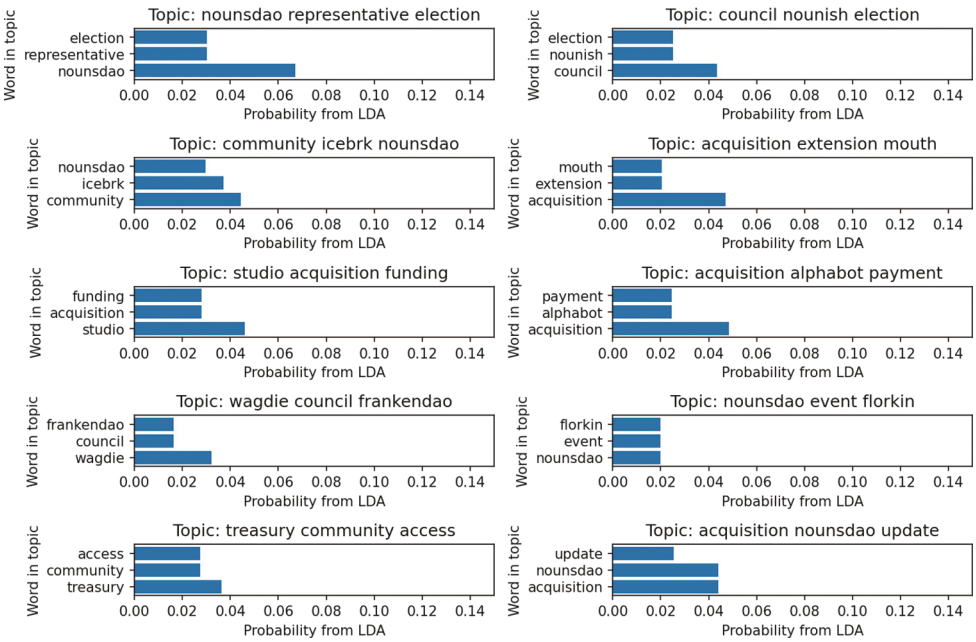


Source: own study.

3. Topic 3: Deals with rewards and a project known as "gnosisdao", as represented by "program", "gnosisdao", and "reward".
4. Topic 4: Appears to be centered on nominations and perhaps a specific initiative or project called "shibadoge", featuring "shibadoge", "rockstar", and "nomination".
5. Topic 5: Also heavily involves nominations, perhaps for key roles or achievements, shown by "nomination", "rockstar", and "source".
6. Topic 6: Discusses approval for initiatives and funding, as indicated by "approve", "initiative", and "funded". This likely covers how projects get approved and funded.
7. Topic 7: Talks about program acceptance and possibly a specific technology or project known as "metis", as shown by "accept", "metis", and "program".
8. Topic 8: Focuses on chain-related programs and perhaps another specific technology or project, "metis", as represented by "program", "metis", and "chain".
9. Topic 9: Appears to be focused on grants, support, and services, as indicated by "grant", "support", and "service". This might involve funding for infrastructural development.
10. Topic 10: Revolves around episodic programs and potentially a project or technology called "metis", as suggested by "program", "metis", and "episode".

These topics highlight that the infrastructure DAOs are primarily concerned with ecosystem development, technological advancements, and governance-related initiatives.

Fig. 6. Top10 topics in proposals in the DAO group: NFT



Source: own study.

The proposals in NFT group can be grouped in the following 10 topics:

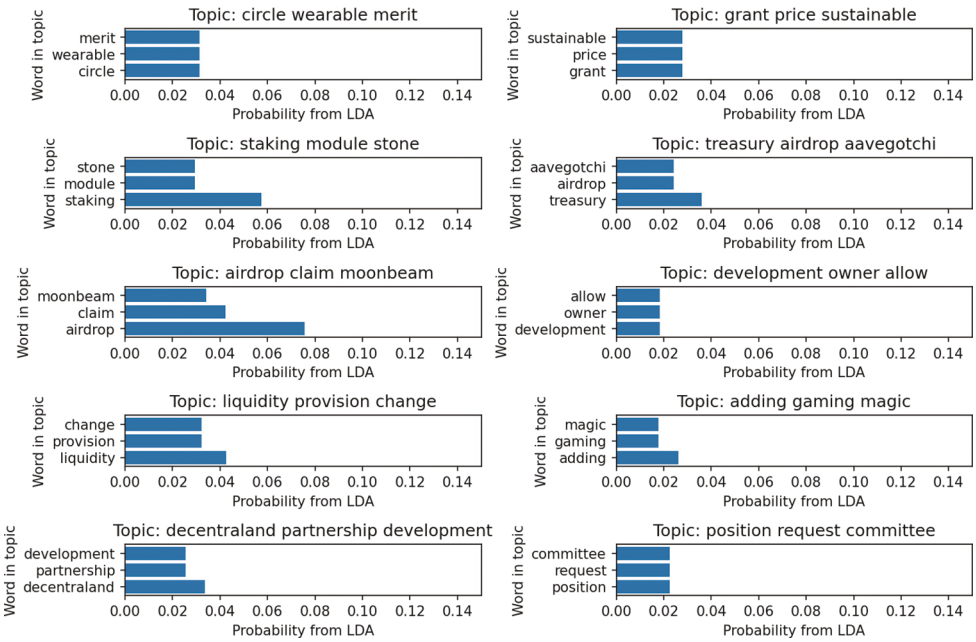
1. Topic 1: Primarily focused on elections within a specific project called "nounsdao", as indicated by the words "nounsdao", "representative", and "election".
2. Topic 2: Appears to concern governance, specifically council elections, and involves a project known as "nounish", with keywords like "council", "nounish", and "election".
3. Topic 3: Highlights community involvement, as suggested by "community", "icebrk", and "nounsdao".
4. Topic 4: Talks about acquisitions and possibly extensions or additional features, as indicated by "acquisition", "extension", and "mouth".
5. Topic 5: Discusses studio acquisitions and funding, possibly for creative projects, with words like "studio", "acquisition", and "funding".
6. Topic 6: Focuses on the acquisition of assets or projects, possibly related to a project or technology called "alphabot". Payment methods or financial transactions

might also be a key aspect, as suggested by the terms "acquisition", "alphabot", and "payment".

7. Topic 7: Seems to focus on a particular project named "wagdie" and council matters, possibly relating to a project called "frankendao", as represented by "wagdie", "council", and "frankendao".
8. Topic 8: Concerns events and perhaps special releases or collaborations, possibly within the "nounsdao" project, as indicated by "nounsdao", "event", and "florkin".
9. Topic 9: Discusses community access to treasuries, which may involve funds or resources, with keywords like "treasury", "community", and "access".
10. Topic 10: Centers on acquisitions, possibly involving the "nounsdao" project, and updates to the same, as represented by "acquisition", "nounsdao", and "update".

These topics suggest that the NFT DAOs are largely concerned with governance, community involvement, and acquisitions, possibly for extending features or obtaining resources.

Figure 7. Top10 topics in proposals in the DAO group: Games



Source: own study.

The proposals in games group can be grouped in the following 10 topics:

1. Topic 1: Appears to focus on gamification elements or rewards, potentially involving wearables, as suggested by the terms "circle", "wearable", and "merit".

2. Topic 2: Seems to discuss funding for projects, particularly concerning price sustainability, perhaps in the context of in-game assets or currencies, with keywords like "grant", "price", and "sustainable".
3. Topic 3: Primarily concerned with staking mechanisms, potentially related to in-game modules or resources represented by "stones", as indicated by "staking", "module", and "stone".
4. Topic 4: Discusses treasury management, airdrops, and possibly a specific game or project named "aavegotchi", with terms like "treasury", "airdrop", and "aavegotchi".
5. Topic 5: Centers around airdrops again but more focused on claiming these airdrops, possibly related to a project or platform named "moonbeam", as suggested by "airdrop", "claim", and "moonbeam".
6. Topic 6: Talks about the development and ownership of game-related features or assets, possibly focusing on permissions or user roles, with words like "development", "owner", and "allow".
7. Topic 7: Focuses on liquidity, perhaps in the context of trading in-game items or assets, and mentions provisions for changes, as indicated by "liquidity", "provision", and "change".
8. Topic 8: Appears to involve adding new features or elements to the gaming experience, possibly magical or fantastical elements, as represented by "adding", "gaming", and "magic".
9. Topic 9: Discusses partnerships and developments, potentially with a focus on a project named "Decentraland", as suggested by "decentraland", "partnership", and "development".
10. Topic 10: Appears to be governance-oriented, discussing positions within the DAO or committee requests, as indicated by "position", "request", and "committee".

The LDA analysis for the games group of DAOs shows a focus on gamification elements, funding mechanisms, and governance. Topics range from treasury management and airdrops to liquidity provision and partnerships, indicating a blend of financial, developmental, and community-driven concerns in gaming DAOs.

The LDA analysis was employed to assess how the proposal mechanism functions within DAOs to carry out fundamental functions of management. The most prevalent topics of proposals in each type of DAO were categorized according to these fundamental functions. This categorization was performed manually, based on the context of each topic. If there were indications of resource allocation, the topic was classified under the Organizing function. If the topic pertained to checking or verifying, it was allocated to the Controlling function. If clues suggested activities related to human capital management and leadership, the topic was classified under Leading. In all other instances, the topic was categorized as Planning. In cases where classification based on the LDA results was not feasible,, the topic was left unclassified, denoted by a hyphen ("-") in the Table 2.

Table 2. Classification of topics to functions of management

Topic	Defi	Investment	Social	Infrastr.	NFT	Games
1	C	L	P	P	L	-
2	P	P	O	P	L	-
3	P	P	O	P	-	-
4	O	O	-	O	P	O
5	P	P	C	O	P	O
6	P	P	O	O	O	O
7	O	O	O	O	-	O
8	O	-	O	P	-	O
9	P	P	-	O	P	P
10	C	O	O	P	P	L
TOTAL CLASSIFIED	10	9	8	10	7	7
P	50%	55.5%	12.5%	50%	57.1%	14.3%
O	30%	33.3%	75%	50%	14.3%	71.4%
C	20%	0%	12.5%	0%	0%	0%
L	0%	11.2%	0%	0%	28.6%	14.3%

Note: P – Planning, O – Organizing, C – Controlling, L – Leading

Source: own study.

5. Discussion

The study reveals that the proposal mechanism in DAOs is primarily used for the functions of Planning and Organizing, which aligns with the decentralized and democratic nature of these entities [Jentzsch, 2016]. Proposals concerning Controlling and Leading are notably less frequent. Specifically, DeFi, Investment, and NFT DAOs tend to focus their proposals mainly on Planning, while Social and Games DAOs direct their proposals more toward Organizing activities. This distribution reflects the varying operational priorities and contexts of different types of DAOs [Davidson et al., 2018].

The emphasis on Planning and Organizing within DAOs supports the view that these entities prioritize establishing objectives and allocating resources efficiently [Buterin, 2014]. The planning function, facilitated by proposal submissions and voting, underscores the collaborative nature of DAOs, allowing for broad member participation in setting goals and strategies. This aligns with the findings of Kondova and Barba [2019], who noted that DAOs operate autonomously through blockchain technology, ensuring all decisions are transparent and collectively endorsed.

Organizing, which involves the structuring of resources, is predominantly focused on digital assets such as cryptocurrencies and NFTs, as DAOs inherently lack the

capability to manage physical assets due to their decentralized nature. This observation is consistent with Metjahic [2018], who highlighted the limitations of DAOs in engaging with real-world assets and contracts. The ability to accumulate and manage digital assets effectively is crucial for the operational success of DAOs, supporting their capacity to function autonomously and adaptively.

The functions of Controlling and Leading are less frequently addressed through formal proposals, indicating a potential gap in the comprehensiveness of DAO management practices. Controlling, which involves monitoring and evaluating performance, is achieved through the transparency and immutability of blockchain records [Hsieh, Verhne, 2018]. However, the limited formal proposals related to Controlling suggest that much of this function might occur informally or through automated smart contracts, rather than through explicit member-driven initiatives. This observation suggests a divergence from traditional management practices, where controlling is a more structured and prominent function [Griffin, 2022].

Leading, defined as encouraging cooperation among members, is notably constrained by the autonomous and anonymous nature of DAO participants. This aligns with Reyes [2019], who identified challenges in motivating and managing human capital within decentralized frameworks. The absence of formal leadership proposals suggests that leadership within DAOs might be more emergent and situational, relying on the intrinsic motivation of members and the decentralized governance token pool to drive participation and engagement.

It's clear that most proposals center around blockchain-specific subjects, in sharp contrast with the noticeable absence of topics related to human capital management, a key focus in traditional organizations. While these proposals align well with managerial functions such as Planning and Organizing, the functions of Controlling and Leading are almost conspicuously absent. This suggests that activities related to Leading and Controlling might occur outside the formal proposal and voting mechanisms.

The expected outcome of the proposal topic analysis was to find evidence of task assignments, resource allocation, and result approvals within the organization. However, the absence of such topics across all types of DAOs leads to the conclusion that a significant portion of managerial functions remains outside the proposal mechanism. This appears to contradict the ideals of transparency commonly associated with DAOs [Buterin, 2014]. The management functions carried out through proposals are relatively simple, focusing mainly on blockchain-related activities. Nonetheless, a considerable element of the traditional management approach seems to exist in DAOs, enabling effective operation.

In conclusion, the proposal mechanism in DAOs primarily facilitates Planning and Organizing functions, with Controlling and Leading being less represented. This distribution reflects the operational focus of DAOs on decentralized decision-making

and resource allocation, while highlighting potential gaps in human capital management and leadership. The findings contribute to the understanding of how DAOs function and their potential to transform traditional organizational practices, while also identifying areas for further research, particularly in integrating AI and addressing legal challenges.

Conclusion

This study provides several theoretical and practical implications for understanding DAO management. The findings suggest that while DAOs utilize proposals effectively for Planning and Organizing, the functions of Controlling and Leading are underrepresented in the formal mechanisms. This highlights a potential gap in the transparency and comprehensiveness of DAO operations, which contrasts with the ideals of decentralized and autonomous management.

This research raises the important questions about DAO management. The most pressing among these is the issue of human capital management, which is crucial for such technologically advanced entities. Is the approach to task assignment truly decentralized, or are traditional methods still being used, with only high-level plans subject to proposal mechanisms? Additionally, the role of artificial intelligence in DAOs warrants further investigation, especially given its close relationship with human capital management. As highlighted in my previous research [Łabędzki, 2023], DAOs appear to be an ideal platform for human-AI collaboration. Yet, the current study did not uncover any AI-focused proposals, suggesting that AI is either not being used or operates behind the scenes. A more in-depth analysis of proposal submitters could provide further insights into the role of AI, as submissions could be made by either human members or artificial intelligence. This is a critical area for future research, given that DAOs may be unique organizational structures where AI could potentially employ human workers. Additionally, studies could investigate the legal implications of DAO operations and the feasibility of achieving true decentralization.

This research contributes to the literature by providing empirical evidence on how DAOs manage fundamental functions, revealing both the potential and limitations of decentralized management structures. It underscores the need for further theoretical development in understanding how decentralized and autonomous entities manage human capital and integrate AI in management practices.

It's worth noting that the research methodology, particularly the verification of organizations, implies that DAOs must either have some form of legal entity or be supported by individuals associated with one, which is necessary for owning a website or domain. This raises the intriguing question of whether true decentralization and the realization of a "pure" DAO are even feasible, a subject that would benefit from

academic exploration involving both legal and managerial considerations. The study's limitations also include the manual categorization of proposal topics, which may introduce subjective biases. Additionally, the focus on publicly accessible proposal data may overlook informal or off-chain management activities that are not captured in the analysis.

As a closing note, it's remarkable that during the period this paper was written, AI technology transitioned from the pre-ChatGPT era through a voice conversation version of ChatGPT, to real-time vision in GPT-4o, all within roughly a year. If such rapid advancements continue, the topic of human-AI collaboration in DAOs will likely become increasingly important.

References

[1] Blei D.M., Ng A.Y., Jordan M.I. [2003], Latent dirichlet dllocation, *Journal of Machine Learning Research* 3: 993–1022.

[2] Buchleitner C., Rabl T. [2017], *Blockchain and smart contracts – Vom Ender der Institutionen*, ECOLEX – Fachzeitschrift fur Wirtschaftsrecht: 4–14.

[3] Buterin V. [2014] *A next-generation smart contract and decentralized application platform*, Ethereum White Paper.

[4] Chohan U.W. [2017], The decentralized autonomous organization and governance issues, *SSRN Electronic Journal*, https://doi.org/10.2139/ssrn.3082055.

[5] Davidson S., De Filippi P., Potts J. [2016], *Economics of blockchain*, Available at SSRN 2744751.

[6] DuPont Q. [2017], Experiments in algorithmic governance: A history and ethnography of "The DAO", a failed decentralized autonomous organization, in: *Bitcoin and beyond*, Routledge, London: 157–177.

[7] Griffin R. [2022], *Fundamentals of management*, Cengage Learning.

[8] Griffiths M. [2022], Is LaMDA sentient? *AI & SOCIETY*, https://doi.org/10.1007/s00146-022-01559-z.

[9] Hsieh Y., Vergne J. [2018], Bitcoin and the rise of decentralized autonomous organization, *Journal of Organization Design* 7(14), https://doi.org/10.1186/s41469-018-0038-1.

[10] DeepDAO [2022], https://deepdao.io, accessed: 24.10.2022.

[11] *Introduction to smart contracts* [2024], https://ethereum.org/en/smart-contracts/, accessed: 24.10.2022.

[12] https://midjourney.com, accessed: 28.10.2022.

[13] Ilyushina N., Macdonald T. [2022], Decentralised autonomous organisations: A new research agenda for labor economics, *The Journal of the British Blockchain Association*.

[14] Jani S. [2020], *Smart contracts: Building blocks for digital transformation*, Indira Gandhi National Open University.

[15] Kaplan A.M., Haenlein M. [2010], Users of the world, unite! The challenges and opportunities of social media, *Business horizons* 53(1): 59–68.

[16] Kondova G., Barba R. [2019], Governance of decentralized autonomous organizations, *Journal of Modern Accounting and Auditing* 15(8), https://doi.org/10.17265/1548-6583/2019.08.003.

[17] Korpal G., Scott D. [2022], *Decentralization and web3 technologies*.

[18] Łabędzki R. [2023], Zdecentralizowana autonomiczna organizacja, in: Juchnowicz M., *Zarządzanie Kapitałem Ludzkim w Warunkach Niepewności. Wyzwania i implikacje*, Polskie Wydawnictwo Ekonomiczne, Warsaw.

[19] Łabędzki R., Gadomski P., Multaniak P. [2021], Impact of employee stock ownership plans on productivity in video game companies, *WSEAS Transactions On Business And Economics* 18: 1235–1254, https://doi.org/10.37394/23207.2021.18.115

[20] Metjahic L. [2018], Deconstructing the Dao: The need for legal recognition and the application of securities laws to decentralized organizations, *Cardozo Law Review* 39: 1533–1550.

[21] Nakamoto S. [2008], Bitcoin: A peer-to-peer electronic cash system, *Decentralized Business Review*.

[22] Reyes C.L. [2019], If Rockefeller were a coder, *The George Washington Law Review* 87: 373.

[23] Schwab K. [2017], The fourth industrial revolution, *Currency*.

[24] Tapscott D., Tapscott A. [2016], *Blockchain revolution: How the technology behind bitcoin is changing money, business, and the world*, Penguin, London.

[25] Taylor F.W. [1911], *The principles of scientific management*, Harper & Brothers, New York.

[26] Tse N. [2020], Decentralised autonomous organisations and the corporate form, *Victoria University of Wellington Law Review* 51(2): 313–356, https://doi.org/10.26686/vuwlr.v51i2.6573.

[27] Virovets D., Obushnyi S. [2021], Decentralized autonomous organizations as the new form of economic cooperation in digital world, *The USV annals of economics and public administration* 20 (2(32)): 41–52.

[28] Wojtczuk-Turek A. [2022], *Zarządzanie kapitałem ludzkim w warunkach zrównoważonego rozwoju*, Wydawnictwo Naukowe PWN, Warsaw.

MANAGEMENT IN DECENTRALIZED AUTONOMOUS ORGANIZATIONS (DAO): ANALYSIS OF PROPOSALS

Abstract

The emerging trend in information technology, Web 3.0, offers the necessary technology to build Decentralized Autonomous Organizations (DAOs). These innovative, fully digital organizational structures utilize both human and artificial intelligence (AI). Operating entirely in the virtual realm and unaffiliated with any physical entities, DAOs function autonomously, free from external interference. Additionally, DAOs hold virtual assets that can be used to create and sign digital contracts with humans or for investment purposes. Governance within a DAO is a collaborative effort, managed by both AI and token holders.

My previous research established that DAOs have features and tools that empower their managers, whether AI or human, to carry out all four fundamental functions of management: Planning, Organizing, Controlling, and Leading. The cornerstone of DAO management is its proposal and voting mechanisms, which constitute its core functionalities.

The aim of this study was to investigate how DAOs use proposals to execute these fundamental functions of management. Given the transparent nature of DAOs and the permanent archiving of all proposals on the blockchain, I was able to examine a comprehensive dataset of proposals across a majority of existing DAOs. Latent Dirichlet allocation (LDA) was employed for the analysis of proposal titles and content. As of the data collection date, a total of 15,256 DAOs were available for study, of which 175 were ultimately selected for in-depth analysis.

The most significant conclusion is that proposals are primarily utilized for the Planning and Organizing functions. The study also revealed that a considerable portion of management activities in DAOs occurs outside the formal proposal and voting mechanisms.

Keywords: decentralized autonomous organization, DAO, blockchain, smart contract, fourth industrial revolution, Web 3.0

JEL Classification Codes: M10, O33

ZARZĄDZANIE W ZDECENTRALIZOWANYCH AUTONOMICZNYCH ORGANIZACJACH (DAO): ANALIZA PROPOZYCJI

Streszczenie

Nowy trend w IT, Web 3.0, oferuje niezbędną technologię do budowy zdecentralizowanych autonomicznych organizacji (DAO). Są to innowacyjne, w pełni cyfrowe struktury organizacyjne, które do działania wykorzystują zarówno ludzką, jak i sztuczną inteligencję.

Operują całkowicie w wirtualnej przestrzeni i nie są związane z żadnymi fizycznymi podmiotami. DAO funkcjonują autonomicznie i są wolne od zewnętrznej ingerencji. Co więcej, dysponują wirtualnymi aktywami, które mogą być wykorzystane do zawierania kontraktów z ludźmi lub w celach inwestycyjnych.

Moje wcześniejsze badania wykazały, że DAO dysponują narzędziami umożliwiającymi realizację wszystkich czterech podstawowych funkcji zarządzania: Planowania, Organizowania, Kontrolowania i Przewodzenia. Podstawowym narzędziem zarządzania w DAO jest mechanizm wniosków i głosowania.

Celem badania było ustalenie, w jaki sposób DAO wykorzystują mechanizm wniosków do realizacji podstawowych funkcji zarządzania. Ze względu na transparentną naturę DAO możliwe było zbadanie danych dotyczących wniosków w większości istniejących DAO. Do analizy tytułów i treści wniosków zastosowano metodę Latent Dirichlet allocation (LDA). Zebrano dane z 15256 DAO, z których 175 zostało ostatecznie wybranych do szczegółowej analizy.

Najważniejszym wynikiem badania jest ustalenie, że mechanizm wniosków i głosowania jest wykorzystywany głównie do realizacji funkcji Planowania i Organizowania. Badanie ujawniło również, że znacząca część działań zarządczych w DAO odbywa się poza tym mechanizmem.

Słowa kluczowe: zdecentralizowana autonomiczna organizacja, DAO, łańcuch bloków, inteligentny kontrakt, czwarta rewolucja przemysłowa, Web 3.0

Kody klasyfikacji JEL: M10, O33