Decentralized Autonomous Organizations

A Project Work Synopsis

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Abstract

In recent years, Decentralised Autonomous Organisations (DAOs) have become prominent across our worldwide community. These organizations have put a great support system to the upcoming organization structure with a dominant role of blockchain technology. This particular technology works as a foundational infrastructure that validates the creation, operation, and governance of DAOs. DAOs also rely on their major working on smart contracts to execute predefined functions after the specific conditions are satisfied.

This paper presents a complete description of the working principles of the DAOs, their limitations, and challenges, their autonomous capacity for making decisions along with the dependency on smart contracts.

Furthermore, the research work will explore the varied uses of DAOs in industries including economics, logistics management, art, and more. It looks at the benefits of accountability, improved productivity, and broad availability that DAOs may offer, promoting more inclusion and minimizing the need for middlemen.

This research intends to make a contribution to a better-informed discussion on the upcoming direction of decentralized administration and autonomous cooperation by providing greater knowledge of the technological equipment, advantages, and concerns regarding ethics underlying DAOs.

Keywords: Decentralized Autonomous Organization, blockchain, MetaMask, economy, Ethereum, localhost, hardhat, web3, node.js.

1. Introduction

1.1 Problem Definition

Conventional centralized decision-making, a lack of public ownership, and manual administrative procedures frequently result in inconsistencies, lower inclusiveness, and difficulties upholding openness and trust in modern organizational frameworks.

These problems limit how collaboratively and quickly an organization may operate. The issue is the lack of creative answers to these problems, which encourage decentralized decision-making, encourage community ownership, and automate organizational procedures while maintaining security and compliance.

This initiative will also offer a means of further improving this still-evolving technology so that it may be widely used throughout the global community.

1.2 Problem overview

In a world characterized by evolving digital landscapes and dynamic business paradigms, the limitations of traditional organizational structures have become evident. Centralized control, opacity, and inefficiency plague conventional systems.

Furthermore, emerging technologies such as blockchain offer the promise of decentralization and autonomy, yet the adoption of such technologies presents its own set of challenges. This research paper focuses on the exploration of Decentralized Autonomous Organizations (DAOs) and their potential to overcome the shortcomings of centralized models.

Specifically, this study delves into the challenges surrounding the implementation of DAOs, with a keen emphasis on the pivotal role of smart contracts. By investigating these challenges and the application of smart contracts, this paper seeks to shed light on the transformative power of DAOs in reshaping organizational structures and interactions.

1.3 Software Specifications

- Gitpod: It is a cloud based integrated development environment that empowers application developers to test, create and code their endeavours entirely from a web-based browser.
- Remix IDE: It offers a compelling and efficient suite of resources for creating, deploying, identifying, and validating smart contract applications that are interoperable with Ethereum and the Extended Virtual Machine (EVM).

- MetaMask Wallet: It is a mobile application and web-based plugin that lets you administer your Ethereum wallet's private keys remotely. This enables you to engage with decentralized events or dapps and acts as a digital wallet for Ether and other currencies.
- Hardhat Configuration: It is a framework for creating the digital currency applications. It is made up of numerous components that may be used to modify, compile, troubleshoot, and launch your dapps and smart contracts, collectively forming a whole development platform.
- Localhost: It is an address of a host or a system that is currently being used to execute a program, on which a machine serves a s a sort of a virtual server. A developer uploads the source code and thus exports the data to this particular localhost address.

2. Literature Survey

2.1 Existing system

- The taxonomy in this paper focuses on prevalent issues and research connected to blockchain and DAO, including numerous assaults and risks associated with blockchains, as well as challenges with counter-trends. It also emphasizes the problems with DAO governance and the continual growth of a deeper debate. Additionally, it assesses the most recent DAO developments in a variety of disciplines, including e-government, economics, and others, and forecasts the future prospects for growth of the pertinent fields.[3]
- By offering an empirical examination of each of the major DAO frameworks (Aragon, DaoStack, and DAOhaus) in terms of growth, activity, voting mechanism, and funding, this paper intend to add to the expanding body of research on the issue.[4]
- The question of whether or not legislation should be changed to take into account DAOs is investigated in this piece of writing. They further present a debate on should they be given independent legitimate identities and restricted liability similar to that granted to their token holders.[5]
- This study demonstrates the use of smart contracts to automate cryptocurrency payments, the substitution of manual labour with AI, and the implementation of an online platform to communicate together with AI.[8]
- The current study piece offers a real-world scenario to illustrate how DAO web-based government is used and assess its efficacy.[9]
- By proposing a smart-legal-contract markup language (SLCML) for legal- and business-related structures to create a legally-binding DAO (Decentralised Autonomous Organizations) this article closes an empty spot in the current state of the artwork.[10]
- This article provides a thorough examination of the setup process for intelligent contracts before discussing various platforms on blockchain that facilitate the creation of these contracts.[16]

2.2 Proposed System

This proposed research paper aims to provide a comparative study on the Traditional Centralized Autonomous Organizations and Decentralized Autonomous Organizations based on various conceptual features such as its working model, challenges and future trends. This study will also stimulate and provide the functioning and operational stats which are looked into for the successful management of a DAO.

The implementation of the Dapp system has numerous fundamental components, including:

- Self-executing contracts known as "smart contracts": These will make digital transactions possible. They will control a number of operations, including linking to MetaMask, ether withdrawal and deposit, and wallet address display.
- Hardhat Localhost Network: The Dapp will operate on a localhost network, guaranteeing user confidentiality and unanimity. Ethereum is regarded as the fundamental blockchain because of its developed ecosystem and support for smart contracts.
- User Interface: For communicating with the Dapp, an intuitive interface will be created. Users will be allowed to both open and close the contract as well as view their wallet address, and deposit, and retrieve ether.
- Transaction Activity: Information about previous transactions will be kept on a blockchain analytics and explorer site like Etherscan.

2.3 Literature Review summary

Year and Citation	**Article/ Author**	**Tools/ Software**	**Technique**	**Source**
October 2019, pp. 870-878, vol: 6, issue: 5, doi: 10.1109/TCSS.2019.2938190.	Shuai Wang, Wenwen Ding, Juanjuan Li, Yong Yuan, Liwei Ouyang, and Fei-Yue Wang	Blockchain, artificial intelligence, Swarm Intelligence, and Aragon	It contains a five-layer architecture-based justification	IEEE TRANSACTIONS ON COMPUTATIONAL

		Network Token.	supporting DAO.	SOCIAL SYSTEMS
August 2020, DOI:10.1145/3412569.3412579	Youssef El Faqir, Javier Arroyo, Samer Hassan.	Genesis Alpha, Aragon Connect, Moloch Dao, Genesis DAO, and Visualisation	In order to show the prospect of DAO, it develops a free software application that visualizes its activities.	OpenSym 2020: 16th International Symposium on Open Collaboration
2021, vol. 2, pp. 204-215, 2021, doi: 10.1109/OJCS.2021.3072661.	Lu Liu, Sicong Zhou, Huawei Huang, Zibin Zheng	Smart contracting, distributed ledger technology, DaoStack, blockchain, and fault-tolerant systems	It addresses the frequent concerns with blockchain innovation that are linked to it, such as the counter-trend concerns and numerous bitcoin assaults.	IEEE Open Journal of the Computer Society
01 October 2021, doi: 10.1186/s13174-021-00139-6, pp 2-20	Youssef Faqir-Rhazoui, Javier Arroyo and Samer Hassan	Blockchain, xDai, GraphQL Language, Quantitative Research, DaoStack, and the	It examines each of the three primary frameworks (Aragon, DaoStack, and	Journal of Internet Services and Applications

		Ethereum Mainnet.	DAOhaus) used today for rendering it easier to create and operate DAOs.	
November 1, 2019, pp 423-458,	Alexandra Sims	Smart contracting, decentralized administration, tokenization, airdrops, forking, and distributed ledger systems.	It demonstrates how organizational frameworks have changed, and DAOs are only the latest iteration.	Social Science Research Network
March 6, 2021	Wulf A. Kaal	Decentralized accounting, token models, reputation staking, sock puppet acts of violence, inadequate economic approach, and assault resilience.	It investigates the key components of a potential DAO's architecture, its capacity to widen the DAO ecosystem, and its potential applications in both the private and public sectors.	Social Science Research Network

ISSN: 2455-3956, Volume-17, Issue-1, July 2023 Pages 18-25	Romex K Jha	Integrity, Token disseminati on, Meta Cartel, Decentralis ed accountabili ty, and decision-making.	It intends to make creative suggestions for improving the efficiency of DAO procedures for making decisions, providing them with the resources they must conquer challenges and realize their transformati onal ability within the decentralize d ecology.	World Journal of Research and Review
2019, pp. 667-671, doi: 10.1109/ISCON47742.2019. 9036152.	Anjani Raj Yadlapalli, Ninad Mohite, Vijayant Pawar, Shelly Sachdeva	AI, auxiliary conditional GAN, centralized physical structures Google collaboratio n, Google cloud.	Its goal is to build a fully autonomous , decentralise d organisation that does not require outside assistance to function.	2019 4th Internationa l Conference on Information Systems and Computer Networks (ISCON)
April2018, DOI:10.1109/ICEDEG.2018. 8372356	Nour Diallo, Weidong Shi, Lei Xu, Zhimin Gao, Lin Chen, Yang Lu, Nolan Shah, Larry Carranco, Ton-	Ethereum, Remix	The paper addresses ways to enhance digital	2018 Internationa l Conference on e-

	Chanh Le, Abraham Bez Surez, Glenn Turner		government systems using the blockchain and a decentralized autonomous organization (DAO). It refers to the use of encryption methods, consensus protocols, and smart contracts for securing and automating various government procedures.	democracy & eGovernment (ICEDEG)
May 2021, DOI:10.1109/ACCESS.2021.3081926	VIMAL DWIVEDI, ALEX NORTA, ALEXANDER WULF, BENJAMIN LEIDING, SANDEEP SAXENA, AND CHIBUZOR UDOKWU	Solidity, Smart Legal Contract Markup Language (SLCML)	The goal of the study is to discuss the difficulties in creating smart contracts for intricate cooperation like DAOs that appropriately reflect legal and commercial logic. The study intends to simplify the creation of	IEEE Access

			legally enforceable smart contracts for intricate cooperation like DAOs by proposing the SLCML.	
September 2022, DOI: 10.1016/j.techfore.2022.121806	Carlos Santana, Laura Albareda	SPSS, web of science database	The main tenets of DAOs—decentralized, automated, and autonomous organizations—are covered in the paper. The importance of smart contracts, blockchain technology, and task automation as essential elements of DAOs is underlined.	Technological Forecasting and Social Change
April 2021, DOI: 10.14763/2021.2.1556	Samer Hassan, Primavera De Filippi	Aragon, DaoStack	The history of Decentralized Autonomous Organizations (DAOs)	Internet Policy Review

			and how they relate to blockchain technology are both covered in the paper.	
June 2018, DOI: 10.1186/s41469-018-0038-1	Ying-Ying Hsieh, Jean-Philippe Vergne, Philip Anderson, Karim Lakhani and Markus Reitzig	Blockchain, Cryptocurrency, fsQCA, formal software protocols	The term "decentralized autonomous organizations" (DAOs), which is proposed in the research paper to describe the novel organizational forms made possible by blockchain technology, is explored along with the organizational structure and characteristics of Bitcoin.	Journal of Organization Design
April 2023, DO10.48550/arXiv.2304.09822	Tanusree Sharma, Yujin Kwon, Kornrapat Pongmala, Henry Wang, Andrew Miller, Dawn Song, Yang Wang	Etherscan, Aragon	The results of this study shed light on the complex interactions among decentraliza	Computer Science ArXiv

			tion, autonomy, and proposal execution, providing useful knowledge for creating and improving DAO structures to fulfil their intended purposes.	
June 2023, vol. 33(1), pages 1-14 vol. 33(1), pages 1-14ol. 33(1), pages 1-14 DOI: 10.1007/s12525-023-00659-y	Nils Augustin, Andreas Eckhardt, Alexander Willem de Jong	Zotero, SPSS	In order to highlight parallels and differences in their organizational structures, governance, and underlying beliefs, the study presents a first comparison between DAOs and open-source software (OSS) communities.	Electronic Markets

September,2021 VL - 14 DOI -10.1007/s12083-021-01127-0	Shafaq Naheed Khan, Faiza Loukil, Chirine Ghedira-Guegan, Elhadj Benkhelifa, Anoud Bani-Hani	Solidity, Fabasoft Contracts	This study offers a thorough examination of blockchain-enabled smart contracts, their difficulties, and potential solutions in a number of different application domains. It emphasizes the significance of Layer 2 protocols and contract managemen t tools as emerging trends in the creation of smart contracts.	Peer-to-Peer Networking and Application s

3. Problem Formulation

The Traditional Autonomous Organisation models in many industries frequently result in inconsistencies, a lack of accountability, single points of breakdown, lower inclusiveness, and difficulties upholding openness and trust. Therefore, there exists a need for a framework which will enhance the decision-making process by providing community involvement, and automate administrative processes while maintaining compliance and privacy.

Ultimately, the goal of this research work is to provide a relative analysis in regard of Traditional Autonomous Organisation and Decentralized Autonomous Organizations (DAOs) on the basis of functional prototype and challenges it encounter. Moreover, to implement its application, this paper showcases a transaction-based Dapp that will allow the user to make authenticated as well as trusted transactions on Hardhat Localhost Network.

Furthermore, the client will be able to access the transaction history using the Ethereum explorer.

4. Objectives

The objective of investigating Decentralized Autonomous Organizations (DAOs) is to comprehend their potential to reshape traditional organizational structures by leveraging blockchain technology and autonomous decision-making processes. The goal of this study is to examine the governance structures, functions of smart contracts, security issues, and scalability issues that DAOs face. The study aims to offer insights into the viability of implementing DAOs to improve transparency, efficiency, and participatory decision-making by using various platforms such as MetaMask and Web3. Additionally, by developing transaction-based dapps, we have also offered the technology to demonstrate how DAOs function. The ultimate objective is to illuminate the DAOs' transformational impact and provide suggestions for their successful adoption and integration into contemporary ecosystems.

5. Methodology

1. Literature Review: Conduct a thorough analysis of the academic literature, white papers, and case studies that have been published about decentralized autonomous organizations (DAOs). Examine the development, types of governance, uses of smart contracts, and difficulties presented by DAOs.

2. Prototype Analysis: Analyse working DAO prototypes or ongoing DAO initiatives to learn more about the operational dynamics of these systems. Look at the implementation of decentralized decision-making and smart contracts in these prototypes.

3. Comparative Study: Analyse numerous DAO implementations across various sectors in comparison. Examine the benefits and drawbacks of various models and pinpoint what makes them effective or limited.

4. Requirements Definition: Describe the essential conditions for a DAO implementation that works well. Include details about governance frameworks, scalability issues, security procedures, and involvement dynamics.

5. Research and Design: Look into the underlying platforms, frameworks, and smart contract systems used in the creation of DAOs. Investigate the design decisions and how they affect the DAO's usability and experience.

6.Experimental software setup

1. Project Setup:

- Set up a new project directory for your dApp.
- Initialize a new Node.js project using **npm init**.

2. Smart Contract Development:

- Write your smart contract code for handling deposits and withdrawals using Solidity.
- Use the Hardhat framework for compiling, deploying, and testing your smart contracts.

3. Frontend Development:

- Create an HTML file for your dApp's user interface.
- Add buttons for "Deposit" and "Withdraw" actions.
- Set up a Web3.js instance to interact with your smart contract from the frontend.
- Use MetaMask's injected Web3 provider to enable communication with the Ethereum network.

4. MetaMask Integration:

- Install the MetaMask browser extension.
- Create a MetaMask wallet or connect an existing one to the test network you're using (e.g., Localhost).
- Import testnet Ether to your MetaMask wallet from a faucet.

5. Hardhat Network Setup:

- Install Hardhat globally using **npm install -g hardhat**.
- Create a Hardhat configuration file (**hardhat.config.js**) to define your network settings, such as the provider URL for the testnet and accounts.

6. Smart Contract Deployment:

- Deploy your smart contract to the testnet using Hardhat's deployment scripts.
- Obtain the contract address after deployment.

7. Frontend Interaction:

- In your frontend code, use the Web3.js library to connect to your deployed smart contract using its ABI and address.
- Implement functions to handle "Deposit" and "Withdraw" actions, calling the respective smart contract methods.

8. User Testing:

- Test your dApp on the testnet by interacting with the "Deposit" and "Withdraw" buttons using MetaMask.
- Ensure that transactions are properly signed and executed on the blockchain.
- Open Etherscan to see the transaction history.

7. Conclusion

The exploration of Decentralized Autonomous Organizations (DAOs) reveals a transformative potential that could reshape traditional organizational paradigms. This paper emphasizes both the opportunities and problems involved with DAO implementation through a thorough examination including governance models, smart contract integration, security concerns, scalability challenges, and real-world applications. This research shows that DAOs have the potential to alter several sectors of the economy and social structures, but their success depends on overcoming obstacles and developing enabling ecosystems. DAOs have the ability to revolutionize collaboration and resource management on a global scale as they become change agents and provide a road to decentralized, open, and effective organizational structures.

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