

Dx Club: Achieving Transparency in Organizational Decisions through Blockchain

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Abstract:- It is often seen that there is a lack of openness in decision-making at the organizational level. This project focuses on creating a decentralized decision-making platform for organizations that helps them to achieve transparency. The organizations may include NGOs, College Clubs, or any institution which has an interest in public welfare. Thus, multiple viewpoints will be considered for crucial decisions which make the process effective. This can be achieved by internally implementing smart contracts that ensure complete autonomy and security of data. The main reason for choosing Blockchain over other technologies is it provides decentralized data storage and the transactions carried out do not involve any middlemen making it completely secure and robust. The solution will be a Decentralized Application (DApp) that will get deployed on a public blockchain. Hence, this application will enable the creation of transparent governance rather than the traditionally opaque systems.

Keywords:- Blockchain, Decentralized Systems, transparency, DApp, NGO, DAO, Distributed Systems.

I. INTRODUCTION

Blockchain technology is changing the way organizations operate, and it has the potential to revolutionize the voting process. By using blockchain, the voting process can be decentralized and transparent, providing more security and trust to the voters. In this paper, the use of blockchain technology in creating a decentralized application (DApp) for voting in organizations will be explored, with a specific focus on a college club as a generalized example.

The DApp will be created based on NFTs (Non-Fungible Tokens), with each member having a unique student NFT and the admins having an admin NFT. The use of NFTs will provide a secure and tamper-proof way of identifying and tracking members and admins. The admins will not have any extra powers but will be responsible for creating proposals on which everyone can vote.

The first proposal created by the dev admin will be the election of the president, which will be voted on by all members. Once the president is elected, they will create head roles for positions such as ML head, App head, web head, design head, content head, etc. These head roles will also be elected through a voting process. Once the heads are elected, the organization will be set up, and only the heads will be able to create proposals on which everyone will vote for the collective good.

The use of blockchain technology will ensure the transparency and security of the voting process. Each proposal created by an admin will be treated as a transaction and added to the blockchain, following a smart contract. Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code. The smart contract will ensure that the proposal meets the requirements set by the organization and that it is valid for voting. Before any transaction is executed, hash checks will be done to ensure it is legitimate.

Once the transaction is added to the blockchain, it will be broadcast, and all members will be able to vote on it. Every vote will be treated as a transaction too, and the smart contract will have global storage for checking votes. This will ensure that each member can only vote once and that the results are accurate and transparent.

A. Motivation

Currently, volunteer organizations follow a centralized decision-making approach. However, this leads to a lack of openness in decision-making at the organizational level. This can lead to the misuse of funds if the decision-making power rests in the wrong hands. Also, the process becomes slower involving multiple approvals for proposals to get passed. Thus, introducing a trustless environment that can facilitate effective and unbiased decision-making through a decentralized approach.

B. Contribution

The proposed blockchain project aims to create a decentralized application that can be used by various organizations for conducting transparent and secure voting. The project will use NFT-based membership, where each student will own a unique student NFT, and admins will have an admin NFT. The admins will not have extra powers but will have some extra tasks, such as creating proposals that everyone can vote on.

Once the app is developed, the dev admin will distribute the NFTs to all the members, and a presidential election proposal will be created on which everyone can vote. Once the president is elected, the head roles for positions such as ML head, App head, web head, design head, content head, etc., will be created through a voting process. From this point on, only the heads can create proposals, which everyone can vote on for the collective good.

The backend of the application will follow a smart contract protocol that will ensure that every transaction is verified and transparently recorded on the blockchain. All proposals will be treated as transactions and will be added to the blockchain through a series of hash checks to ensure the security of the platform. Each vote will also be recorded as a transaction, and the smart contract will maintain global storage to keep track of all the votes. The proposed application can potentially revolutionize the way organizations conduct voting by eliminating fraudulent practices and increasing transparency, ultimately leading to a more democratic process.

II. RELATED WORK

According to Shiho Kim et al. (2019) [1], Centralized Autonomous Organizations (CAO) lack transparency and are managed by few efficient managers whereas Decentralized Autonomous Organization (DAO) is novel scalable, self-organizing coordination on the blockchain, controlled by smart contracts, and its essential operations are automated agreeing to rules, and principles assigned in the code without human involvement. It's found that there is a need to update the software standards.

Christodoulou et al. (2020) [2] presented a study on the design and deployment of a Solidity smart contract that can interact with any Ethereum-based token (ERC-20) to help decentralized organizations to run public voting campaigns while at the same time engaging tokens holders in decision-

making. Instead of implementation, the system's structure is stressed more. The application of both public and private blockchains must be mentioned.

Suad Kunosić et al. (2022) [3] suggested that the public procurement process can be made much more objective and transparent to all participants if an Ethereum network is used and create applications that run on this network by utilizing the power of smart contracts. The main drawback observed in this paper is that it does not describe private blockchains and detailed design is required for organizational use cases.

Pashkevych et al. [4] introduced blockchain technology in accounting and contributes to the innovative development of the system in the enterprise during the use of cryptocurrency in payments between buyers and customers. However, he does not give detailed designs for the backend implementation of smart contracts.

Faiza Loukil et al. [5] present a comprehensive survey of blockchain-enabled smart contracts from both technical and usage points of view. To do so, a taxonomy of existing blockchain-enabled smart contract solutions is presented, the included research papers are categorized, and the existing smart contract-based studies are discussed.

L. Liu et al. [6] The paper discusses the potential of Decentralized Autonomous Organizations (DAOs) in governing society in a decentralized manner and introduces DAO. The paper notes that a comprehensive survey of the state-of-the-art studies of DAO is missing and aims to fill this gap by identifying and classifying the most valuable proposals and perspectives related to the combination of DAO and blockchain technologies.

R. Qin [7] This paper explores a new management framework for organizing, managing, and measuring knowledge works in smart societies. It proposes a parallel management framework that enables virtual-real interactions between humans, robots, and digital entities. The article also suggests a new management paradigm driven by decentralized autonomous organizations and operations. Finally, it presents management operating systems as a new management solution emphasizing simple intelligence, provable security, flexible scalability, and ecological harmony.

Y. Jiao [8] This paper discusses how swarm intelligence and the internet have become crucial to IoT research. With the rise of crowd network systems, traditional centralized data management faces challenges, particularly regarding privacy and security. The article proposes a blockchain-based trusted uploading scheme for IoT nodes, which focuses on trusted design from three dimensions of node hardware, transmission link, and platform, and could serve as a reference for similar designs.

Gyeongsik Yang [9] The paper explores the importance of the consensus algorithm in the blockchain network and highlights the limitations of previous studies. The study focuses on resource consumption analysis and performance evaluations of three major consensus algorithms (Kafka, Raft, and PBFT) to address the issue of resource provisioning in blockchain-as-a-service (BaaS). The experiments reveal that proper resource provisioning is crucial, as resource consumption can differ up to seven times. This study provides insights into resource provisioning of consensus algorithms and could benefit the deployment of blockchain services in the cloud.

Ilhaam A. Omar [10] a blockchain-based solution using smart contracts to automate the Group Purchasing Organizations (GPOs) contract process in healthcare supply chain management is proposed. The solution aims to promote transparency, streamline communication, and minimize the procurement timeline while avoiding pricing discrepancies and inaccuracies. The proposed solution connects all stakeholders using the Ethereum network and is economically feasible as only stakeholders expend a minimal transaction fee.

Jiyu Tao [11] This paper proposes a medical file-sharing scheme using blockchain and decentralized attribute-based encryption to ensure privacy and data security. Smart contracts provide an interactive platform, and attribute-based algorithms support multi-person democratic decision-making and dynamic personnel changes. The proposed model is closer to real-life scenarios and has undergone security and performance analysis to meet the needs of practical medical file sharing.

III. THEORY AND IMPLEMENTATION

A. DAO

DAO, or Decentralized Autonomous Organization, is a blockchain-based organization that operates through smart contracts. It is a type of organization that is governed by its members and operates in a decentralized manner, without the need for a central authority. The rules and decision-making processes of a DAO are encoded in smart contracts, which are self-executing programs that run on a blockchain. Members of a DAO have voting rights and can propose and vote on decisions, such as how funds are allocated, what products or services are developed, and who should be hired or fired.

DAOs are designed to be transparent, democratic, and trustless, with the goal of eliminating the need for intermediaries and creating a more equitable and efficient way of organizing. They can be used for a wide range of purposes, including managing decentralized applications, investing in blockchain projects, and organizing social communities. While DAOs are still a relatively new concept, they have the potential to revolutionize the way organizations are structured and managed and to create a more decentralized and democratic future.

B. Smart Contracts

Smart contracts are self-executing contracts that have the terms of an agreement between two or more parties written in computer code. The code and the agreements contained within it exist on a decentralized blockchain network, making them immutable and unchangeable once they are deployed.

Once a smart contract is deployed, it can be executed automatically by the blockchain network when certain pre-determined conditions are met. These conditions can include things like a certain date or time being reached, a specific amount of cryptocurrency being deposited into a certain address, or a particular event being triggered on the blockchain. Because smart contracts are self-executing and automated, they can save time and reduce the need for intermediaries to oversee the execution of the contract.

Solidity is a programming language used for creating smart contracts on the Ethereum blockchain. The language was designed with the unique characteristics of blockchain technology in mind and has features that facilitate the secure and efficient execution of smart contracts. Solidity is a high-level language, which means it is easy to read and write but also supports low-level programming for better control over the details of a smart contract. Additionally, Solidity is statically typed, which allows for early detection of errors and easier maintenance of code. Overall, using Solidity for smart contract development provides a reliable and effective toolset for building decentralized applications on the Ethereum blockchain.

For this project smart contract is written in Solidity that represents a DAO (decentralized autonomous organization). The contract's functioning is described below.

It contains a constant value for the minimum debate period for proposals, the period in which proposals can be debated before voting, and a constant value for the period in which a proposal can be executed after voting. It has an NFT token contract imported in the beginning that is being used for the validation of the DAO token holder. It means only the valid token holders can vote on proposals.

The contract has a constructor that sets the creator's address, proposal deposit value, and minimum quorum divisor. It also sets allowed recipients to true for the creator and the DAO contract address. It has a fallback function that accepts Ether, but it does not do anything. There is a struct called Proposal that stores information about a proposal, such as a recipient, amount, heading, description, voting deadline, and the number of yes and no votes. Some mappings store information about who has voted yes or no and the proposals that a voter has voted on.

There are various functions to add new proposals, vote on proposals, and unvote on proposals. The newProposal function allows the creator to create a new proposal and set the recipient, amount, heading, and description of the proposal. It also sets the voting deadline, and proposal deposit value, and creates a proposal hash. The vote function allows token holders to vote on a proposal by specifying the proposal ID and whether they support the proposal. The unVote function allows token holders to remove their vote on a proposal.

Various mappings store information about blocked voters allowed recipients, and proposal deposits. Various events emit when a proposal is added, when someone votes, and when a proposal is tallied.

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C. Working

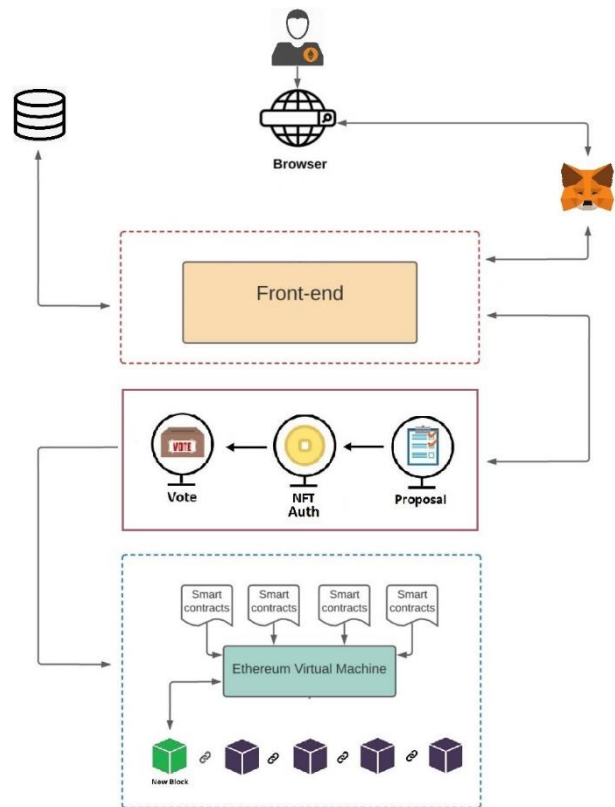


Fig 1. Architecture Diagram

MetaMask allows users to interact with smart contracts on the EVM based blockchains by providing a user-friendly interface for sending transactions and interacting with contract functions. Users can view and manage their smart contract interactions within the MetaMask wallet. The frontend of a decentralized application (DApp) is the user interface (UI) that users interact with when using the application. In our app Frontend allows us to create/view proposals, manage DAO, vote on proposals etc. It is responsible for presenting information and enabling users to perform actions within the DApp.

Proposals in a Decentralized Autonomous Organization (DAO) are requests for funding or changes to the organization's governance or operations. They typically outline the proposal's goals, implementation plan, and budget. DAO members can then vote on the proposal using the organization's governance mechanism, with successful proposals receiving the necessary funding or changes implemented. The voting power to vote on proposals of DAO is based on NFT's. If he holds valid NFT then only he can vote on proposals.

Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code on a blockchain. They automatically execute when predetermined conditions are met, enabling

trustless and decentralized execution of transactions without the need for intermediaries.

The Ethereum Virtual Machine (EVM) is the runtime environment for smart contracts on the Ethereum blockchain. It is a decentralized, Turing-complete virtual machine that executes smart contracts written in Solidity or other programming languages. The EVM ensures that smart contracts are executed in a secure, deterministic, and predictable manner, enabling a wide range of decentralized applications to be built on top of the Ethereum platform.

IV. CONCLUSION & FUTURE WORK

In this work, a website for college clubs that utilizes a decentralized decision-making approach using DAO, Solidity blockchain, ReactJS, and NodeJS is developed. By providing a platform for students to participate in decision-making processes, the aim here is to improve transparency, efficiency, and fairness in the decision-making process.

The use of blockchain technology ensures that decisions are tamper-proof, transparent, and immutable. The webapp will be deployed online, making it easily accessible to students, and allowing them to make informed decisions through a decentralized system. This website can be custom-made for specific organizations.

Future work can explore the potential of incorporating other technologies and features to further improve the performance of the website and enhance the user experience. Evaluations and feedback from users will be conducted to continuously improve and refine the system.

Overall, this project has the potential to revolutionize decision-making processes in various domains by implementing a decentralized approach that is transparent, efficient, and fair.

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