Secure and Transparent Crowdfunding using Blockchain

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ABSTRACT

Crowdfunding is a popular method for raising funds for various projects, where a large number of individuals contribute a small amount of money to finance a particular project. It provides an opportunity for entrepreneurs, startups, and artists to seek financial support from the general public, rather than relying on traditional funding sources such as venture capitalists, banks, and angel investors. This project aims to create a decentralized crowdfunding platform using Ethereum blockchain technology. The platform allows creators to post projects with funding goals and deadlines, and investors can contribute funds to these projects. Smart contracts are used to manage the crowdfunding process, ensuring that funds are released only when milestones are met, and that investors have a say in the progress of the project. The platform is designed to be transparent, secure, and accessible to anyone with an internet connection. By using blockchain technology, the platform eliminates the need for intermediaries, reduces transaction fees, and enables global participation. This project demonstrates the potential of blockchain technology in transforming traditional funding models and enabling decentralized innovation. The platform utilizes various features of Solidity, including structs, mappings, and events, to enable the creation, management, and tracking of projects, milestones, and investments. The web interface is developed using HTML, CSS, and JavaScript, with a Node.js backend that interacts with the smart contracts using the web3.js library.

Keywords: Blockchain, Crowdfunding, Solidity, Ganache, HTML, CSS, NodeJS, MongoDB, Blockchain Projects

I. INTRODUCTION

Crowdfunding is a relatively new way of funding projects, which has gained significant popularity over the past decade. It involves funding a project or venture by raising small amounts of money from a large number of people, usually through online platforms. The concept is simple, but the impact can be huge, as it allows people to support projects they believe in, even if they don't have the financial resources to support them on their own. However, crowdfunding has its own set of challenges, such as transparency, security, and accountability, which can be addressed by leveraging the power of blockchain technology.

A. How Crowdfunding Works

Crowdfunding is a process of raising money from a large number of people, usually through online platforms. It involves three parties: the project creator, the backers, and the crowdfunding platform. The project creator proposes a project and sets a funding goal, and then promotes the project on the crowdfunding platform. Backers can browse the platform and choose to support a project by making a donation or investing in the project. If the funding goal is met, the project creator receives the funds, and the backers receive a reward or a share of the profits. If the funding goal is not met, the backers are refunded, and the project creator does not receive any funding.

Crowdfunding platforms earn money by charging a fee on the amount raised or by taking a percentage of the profits generated by the project. However, crowdfunding has its own set of challenges, such as transparency, security, and accountability.

B.   Blockchain

Blockchain is a distributed ledger technology that allows the creation of decentralized applications (DApps) that are secure, transparent, and immutable. Each block in a blockchain contains a record of transactions, and once a block is added to the chain, it cannot be altered or deleted.

Our project aims to use blockchain technology to improve the crowdfunding process. Crowdfunding is a method of raising funds from a large number of people, typically through an online platform. Crowdfunding has become a popular method for entrepreneurs, artists, and other creative individuals to raise funds for their projects. However, traditional crowdfunding platforms have several limitations, such as high fees, slow transaction times, and lack of transparency.

By using blockchain technology, our project aims to address these limitations and provide a more efficient, transparent, and secure crowdfunding platform. The use of smart contracts on the blockchain allows for automatic execution of crowdfunding rules, ensuring that funds are released only when specific criteria are met. The blockchain also ensures transparency in the crowdfunding process, allowing donors to track their donations and ensuring that funds are used for their intended purpose.

Our project is unique in that it combines the use of blockchain technology with a user-friendly interface, making it accessible to a wide range of users. The use of smart contracts ensures that the crowdfunding process is transparent and secure, while our user-friendly interface makes it easy for users to participate in crowdfunding campaigns.

In addition, our project also allows for the creation of milestones, which are specific goals that need to be achieved before funds are released. This ensures that funds are released only when specific objectives are met, reducing the risk of fraud and ensuring that funds are used for their intended purpose.

II.   LITERATURE REVIEW

In this literature review, we will examine the existing literature on crowdfunding using blockchain technology.

Li and Li (2021)[1] proposed a crowdfunding system using blockchain technology to reduce transaction costs and increase transparency. The authors demonstrated that blockchain-based crowdfunding platforms can address the problem of trust and transparency in traditional crowdfunding.

Yurtsever et al. (2018)[2] explored the potential of blockchain technology in crowdfunding and argued that blockchain can help address issues such as fraud, lack of transparency, and centralization in crowdfunding.

Kshetri (2018)[3] conducted a comprehensive review of the existing literature on blockchain and

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crowdfunding. The author concluded that blockchain technology can provide an efficient and secure platform for crowdfunding, which can help overcome the limitations of traditional crowdfunding platforms.

Laporte et al. (2019)[4] proposed a blockchain-based crowdfunding platform that uses smart contracts to ensure transparency and reduce intermediation costs. The authors demonstrated that their proposed system can reduce transaction costs and increase transparency in the crowdfunding process.

Kshetri et al. (2019)[5] conducted a survey of blockchain-based crowdfunding platforms and identified the key benefits and challenges of using blockchain technology in crowdfunding. The authors concluded that blockchain technology can provide an efficient and secure platform for crowdfunding, but the technology is still in its early stages of development.

Eyal and Sirer (2018)[6] explored the potential of blockchain technology in crowdfunding and identified the key benefits and challenges of using blockchain in crowdfunding. The authors argued that blockchain technology can provide a decentralized and transparent platform for crowdfunding, but the technology is still in its early stages of development.

Yao et al. (2020)[7] proposed a blockchain-based crowdfunding platform that uses smart contracts to ensure transparency and reduce transaction costs. The authors demonstrated that their proposed system can address the challenges of fraud and lack of transparency in traditional crowdfunding platforms.

Medeiros and Santos (2019)[8] proposed a decentralized crowdfunding platform that uses blockchain technology to ensure transparency and reduce intermediation costs. The authors demonstrated that their proposed system can reduce transaction costs and increase transparency in the crowdfunding process.

Tsygankov et al. (2019)[9] proposed a blockchain-based crowdfunding platform that uses smart contracts to ensure transparency and reduce intermediation costs. The authors demonstrated that their proposed system can reduce transaction costs and increase transparency in the crowdfunding process.

Gong and Huang (2019)[10] proposed a blockchain-based crowdfunding platform that uses smart contracts to ensure transparency and reduce intermediation costs. The authors demonstrated that their proposed system can reduce transaction costs and increase transparency in the crowdfunding process.

III. METHODOLOGY

Our crowdfunding platform leverages various cutting-edge technologies to provide a secure, transparent, and efficient crowdfunding experience. At the core of our platform is the use of blockchain technology, specifically the Ethereum blockchain. Our smart contracts, which are written in the Solidity programming language, are deployed to the blockchain to ensure transparency and security in the crowdfunding process. For the project publishing module, we use Node.js and Express.js for the backend development, along with MongoDB for the database. The frontend is built using HTML and CSS, with JavaScript for interactivity. For the funding module, we utilize the web3.js library to interact with the Ethereum blockchain and handle transactions. Additionally, we use Ganache as a local blockchain for testing and development purposes. Our platform also includes a voting mechanism, which is implemented using smart contracts and the Ethereum blockchain. This provides an additional layer of transparency and accountability to the crowdfunding process.

A. Technologies Used
Solidity Contracts: Solidity is a programming language used to write smart contracts on the Ethereum

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blockchain. In this project, we use Solidity to create a contract for managing crowdfunding projects.

Node.js: Node.js is a JavaScript runtime environment that allows developers to run JavaScript code outside of a web browser. In this project, we use Node.js to build the backend of the web application using the Express.js framework.

Express.js: Express.js is a web application framework for Node.js that provides a set of features and tools for building web applications. In this project, we use Express.js to handle HTTP requests, define routes, and manage the API endpoints.

HTML/CSS: HTML (Hypertext Markup Language) is a markup language used for creating web pages, while CSS (Cascading Style Sheets) is used for styling and formatting web pages. In this project, we use HTML and CSS to build the user interface of the web application.

Ganache: Ganache is a personal blockchain for Ethereum development that allows developers to test and deploy smart contracts on a local blockchain. In this project, we use Ganache to test the Solidity contract and interact with the blockchain during development.

B. Working of Project

The platform consists of two main parts: the project publishing module and the funding module. In the project publishing module, project creators can create and publish their projects on the platform. Each project includes details such as the project name, funding goal, deadline, and milestones. Milestones are specific goals or deliverables that the project must achieve to receive the funding. Once a project is published, it is added to the platform's registry of projects, which is stored on the blockchain. This ensures that all projects are transparent and publicly available for anyone to view. In the funding module, investors can browse through the list of available projects and make investments. To invest in a project, an investor selects the project and the specific milestone they want to fund. They then send the required amount of cryptocurrency to the project's funding address. When the milestone is achieved, the project creator can request a release of funds from the platform. This request is verified by the blockchain to ensure that the milestone has been achieved, and the funds are then released to the project creator's wallet. The platform uses smart contracts to automate the release of funds upon completion of each milestone. These smart contracts are stored on the blockchain, ensuring that the crowdfunding process is secure, efficient, and transparent. Furthermore, our project includes a voting mechanism that allows investors to vote on whether a milestone has been achieved. This ensures that there is an additional layer of transparency and accountability in the crowdfunding process. Overall, our project aims to address the limitations of traditional crowdfunding platforms by leveraging the benefits of blockchain technology. The platform ensures that all projects are transparent, secure, and efficient, making it an ideal solution for crowdfunding in the digital age.

C. Working of Solidity Contracts

This project appears to be a web application built with Node.js and Express that interacts with a Solidity smart contract deployed on a local Ethereum blockchain. The smart contract has several functions that allow users to create new projects, add milestones to projects, get information about projects and milestones, update milestones, and add funds to milestones. The web application has several routes that allow users to interact with the smart contract through a web interface. When a user creates a new project through the web application, the web application calls the createProject() function in the smart contract with the project name, funding goal, and deadline. The smart contract creates a new project with the specified parameters and returns the ID of the new project. The web application then creates a new record in a

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MongoDB database with the user ID and project ID. This allows the web application to keep track of which user created which project. The user can also add milestones to a project through the web application. When a user adds a new milestone, the web application calls the addMilestoneToProject() function in the smart contract with the project ID, milestone description, and funding required. The smart contract creates a new milestone with the specified parameters and adds it to the milestones array. Users can also get information about projects and milestones through the web application. When a user requests information about a project or milestone, the web application calls the getProject() or getMilestone() function in the smart contract with the project or milestone ID. The smart contract returns the requested information, which the web application displays to the user. Users can also update milestones through the web application. When a user updates a milestone, the web application calls the updateMilestone() function in the smart contract with the milestone ID and completion status. The smart contract updates the milestone with the specified completion status. Finally, users can add funds to milestones through the web application. When a user adds funds to a milestone, the web application calls the addFundsToMilestone() function in the smart contract with the project and milestone ID and the amount of funds. The smart contract adds the funds to the milestone and updates the funding received for the associated project.
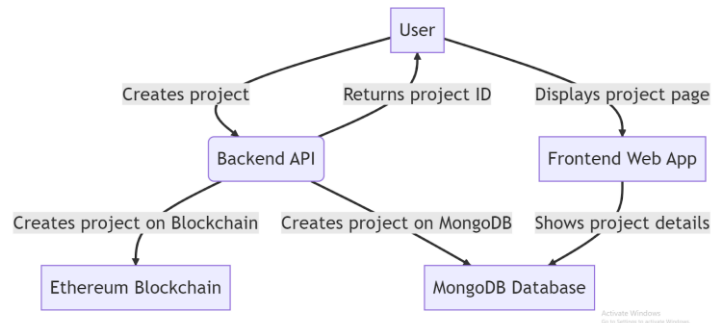

Figure 1: Dataflow diagram for Communication between various services in Crowdfunding using Blockchain
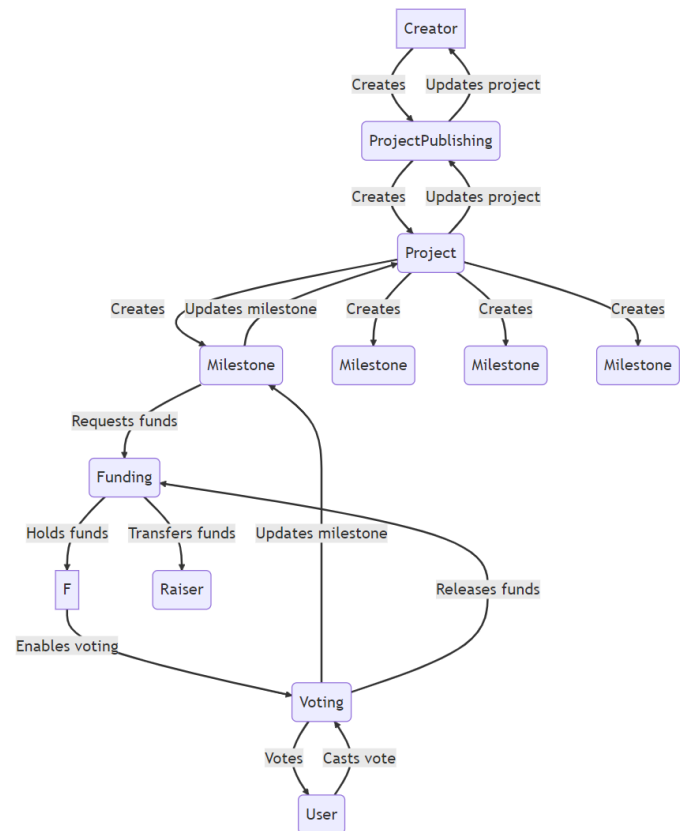

Figure 2: Dataflow diagram for working of Solidity Contract methods in Crowdfunding using Blockchain

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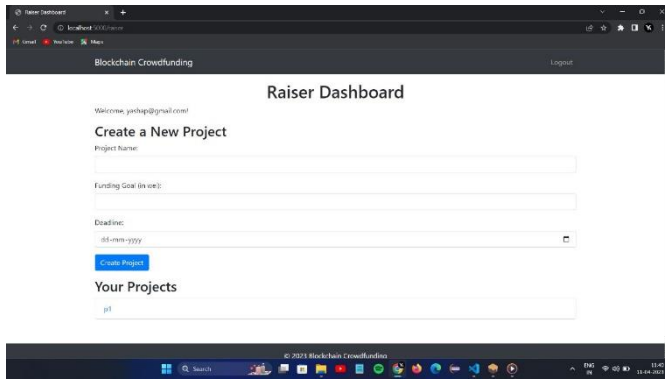
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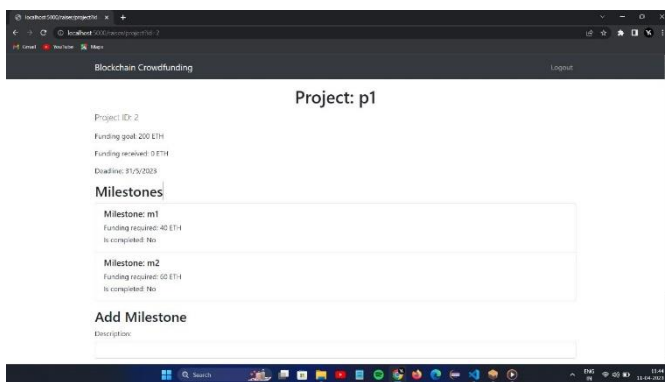Figure 3: Raiser Dashboard with Create Project and list of projects

Figure 4: Project Information with milestones and add milestone option
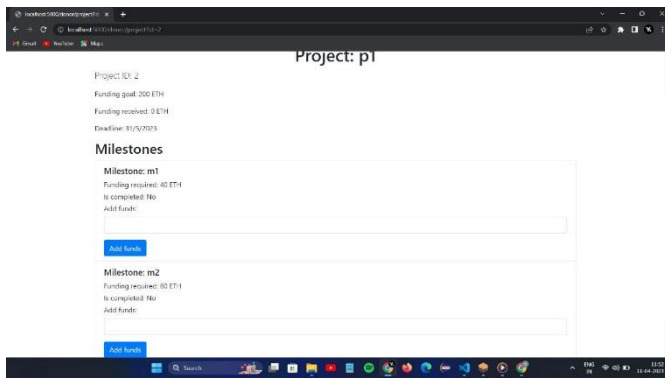

Figure 5: Donors project funding page with milestone based add funding and voting options

IV. COMPARATIVE ANALYSIS

Li and Li (2021): This paper proposes a crowdfunding system based on blockchain technology. While their system is also based on blockchain, it focuses on using a reputation-based system for managing crowdfunding projects. Our project, on the other hand, focuses on automating fund allocation and enabling voting on project milestones, making it more transparent and democratic. Yurtsever and Karaçalı (2018): This paper proposes a crowdfunding platform on blockchain that uses a token system for investment. Our project also uses blockchain for crowdfunding, but allows for investment in cryptocurrency directly, making it more user-friendly and accessible. Kshetri (2018): This paper discusses the use of blockchain technology in supply chain management. While the focus is on supply chain, it highlights the benefits of using blockchain technology for transparency and security. Our project uses blockchain technology to ensure transparency in crowdfunding and reduce intermediation costs. Laporte et al. (2019): This paper proposes the use of blockchain technology for crowdfunding, focusing on ensuring transparency and reducing intermediation costs. Our project aligns with these goals and also enables voting on project milestones, making it more democratic. Kshetri et al. (2019): This paper discusses the use of blockchain technology in crowdfunding and highlights the potential benefits of using smart contracts for automated fund allocation. Our project leverages smart contracts for automatic fund allocation and also allows for voting on project milestones, making it more transparent and democratic. Eyal and Sirer (2018): This paper discusses the regulatory challenges of Initial Coin Offerings (ICOs). While ICOs are not the same as crowdfunding, they are similar in that they involve the sale of tokens or coins for investment. Our project focuses on cryptocurrency investment for crowdfunding, but also ensures transparency and security through the use of blockchain technology. Yao et al. (2020): This paper proposes a smart contract-based crowdfunding platform using blockchain technology. Our project also uses smart contracts for fund allocation and enables voting on project milestones, making it more transparent and democratic. Medeiros and Santos (2019): This paper proposes a decentralized crowdfunding platform using

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blockchain technology. Our project also uses blockchain technology for crowdfunding and ensures transparency through automated fund allocation and voting on project milestones. Tsygankov et al. (2019): This paper discusses the use of blockchain-based crowdfunding platforms. Our project aligns with the goals of transparency, security, and democratization of crowdfunding through the use of blockchain technology. Gong and Huang (2019): This paper proposes a blockchain-based crowdfunding platform for entrepreneurs. Our project also focuses on crowdfunding and allows project creators to create a project and set a funding goal, while also enabling voting on project milestones to ensure transparency and democratization.

In comparison to existing projects, our project focuses on ensuring transparency and democratization of crowdfunding through the use of blockchain technology. It leverages smart contracts for automated fund allocation and enables voting on project milestones to ensure transparency and democratization. Additionally, our project allows for investment in cryptocurrency directly, making it more accessible to a wider range of users.

V. CONCLUSION

This project is a decentralized crowdfunding platform built on Ethereum blockchain technology. It enables creators to post projects with funding goals and deadlines, and investors can contribute funds to these projects using smart contracts. The platform utilizes Solidity contracts and Truffle framework with Ganache for testing. By using smart contracts, the platform eliminates intermediaries, reduces transaction fees, and enables global participation. The web interface is developed using Node.js and Express for the backend and HTML, CSS, and EJS for the frontend.

Compared to traditional crowdfunding platforms, this project offers improved transparency and security by

leveraging blockchain technology. The use of smart contracts ensures that the crowdfunding process is managed efficiently, with funds released only when milestones are met. Moreover, the decentralized nature of the platform eliminates intermediaries, reducing transaction fees, and enabling global participation. This approach provides a more accessible and democratic way for creators to seek funding, while also providing investors with greater transparency and control over their investments. Overall, this project showcases the potential of blockchain technology to transform traditional funding models and create decentralized, secure, and transparent platforms that benefit creators, investors, and society as a whole.

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