Utkal University Journal of Computing & Communications,
Vol. 2, Issue. 1 (2024) *e-ISSN:2584-203X*

Modelling Blockchain based Crowdfunding System with Ethereum Network

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Abstract: A decentralized platform such as a blockchain-based crowdfunding application enables start-ups and business owners to solicit funding directly from investors. Smart contracts and blockchain technology based model is proposed in this paper to achieve reliability, security, and transparency in crowdfunding scenarios. By doing away with intermediaries like banks and other financial institutions, the use of blockchain technology lowers transaction costs and boosts efficiency. Additionally, the platform offers a peer-to-peer fundraising model, enabling start-ups to produce their own digital money. A blockchain based crowdfuding system using Ethereum Network is modelled, designed and deployed; further, evaluation of the system performance is presented.

Keywords: Crowdfunding, Blockchain, Ethereum

1. Introductıon

Decentralized systems are becoming increasingly popular as businesses and individuals look for ways to improve security, scalability, and reliability. Blockchain is a prominent example of how decentralized systems are being used today. It is a promising technology that has the potential to revolutionize the crowdfunding industry. By using blockchain, crowdfunding platforms can provide a more transparent, secure, efficient, and scalable way to raise money [1]. It is a decentralized system that is used to record transactions. It is the underlying technology behind Bitcoin and other cryptocurrencies. Peer-to-peer (P2P) are the other type of decentralized system for file sharing. Users can connect directly to each other to share files, without the need for a central server. Distributed computing is also a decentralized way to run applications. Applications are split up into smaller tasks that are run on multiple computers. Decentralized systems are still in their early stages of development, but they have the potential to revolutionize the way we interact with the internet. Traditional crowdfunding platforms struggle with issues like third-party intermediary fraud, maintenance costs that are exorbitant, system transparency, and a lack of trust. Blockchain technology can reduce transaction risks and intermediary costs of the crowdfunding platform through cryptocurrency transactions and improve data security in the crowdfunding process. Blockchain technology provides a transparent ledger of all transactions, making it easier for investors to see how their contributions are

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being used. Through smart contracts, the costs of operation are reduced, and fundraisers save the portion of the money they would have had to pay to the crowdfunding platform from the raised funds. Blockchain crowdfunding platforms are decentralized, meaning a single entity or authority does not control them. This ensures the platform is transparent, secure, and less susceptible to manipulation. In this paper a decentralized system in proposed with following salient features:

No central authority: A decentralized system does not have a central authority that controls the network. This means that there is no single point of failure, and the network cannot be shut down by a single entity.

Greater expansion: Decentralized systems can easily scale up to accommodate more users and traffic. This is because the network is not limited by the capacity of a single server.

Trustless system: In a decentralized system, users do not need to trust each other or any central authority. This is because the network itself verifies all transactions. Lowers the risk of systemic fever.

Centralized systems are less likely to suffer from systemic failures. This is because there is no single point of failure that can bring the entire network down. Blockchain can address the issues of transparency, security, and high fees in crowdfunding. Blockchain is a transparent ledger that records all transactions on a network. This means that all crowdfunding transactions would be publicly visible, which would help to build trust between backers and creators. Blockchain is a secure platform that is resistant to hacking and fraud. This would help to protect backers from losing their money to frauds. Blockchain-based crowdfunding platforms can reduce fees by eliminating the need for third-party intermediaries. This would mean that more of the money raised would go to the creators of the projects.

This paper is structured as follows: Section 2 defines the problem statement. Section 3 delivers the proposed methodology. Section 4 describes the system performance. Finally, Section 5 mentioned the conclusion.

2. Existing System and Problem Statement

Existing crowdfunding platforms such as Kickstarter, Indiegogo, Giveth, Coin-space, Swarm, Judo Baby are already using blockchain. For example, Kickstarter is using the Ethereum blockchain to create a decentralized platform for crowdfunding. This platform would allow backers to make payments directly to creators without the need for a third-party intermediary. Other platforms such as FundRequest and BitGive are focused on specific areas of crowdfunding, such as open-source projects and charity donations. FundRequest is a platform that allows developers to raise money for open-source projects. BitGive is a platform that allows people to donate money to charity using Bitcoin. The success of these blockchain-based crowdfunding platforms depends on community adoption. If enough people start using these platforms, they will be able to address the issues of transparency, security, and high fees that are currently associated with crowdfunding. Some of the inherent challenges are mentioned in the literature [2-3].

Cases of fraud: Scammers have raised money from investors in a number of instances on crowdfunding platforms, only to fall short of their promises. Because of this, some people are reluctant to invest in projects that are not supported by established investors and have lost faith in crowdfunding platforms.

Exorbitant fees: Fees charged by crowdfunding platforms are frequently high and can reduce the amount of money that can be raised for a project. This can make it challenging for start-ups and small businesses to raise the capital they require to launch their projects.

Scam start-ups: Several scam start-ups have raised money through crowdfunding platforms. These start-ups frequently make exaggerated claims about their goods or services, and it's possible that they'll never fulfill those claims. Investors may lose money as a result, and crowdfunding platforms may suffer as a result.

IP risk: When you start a crowdfunding campaign, you essentially let everyone know what you have to say. It might

be more challenging to safeguard your intellectual property (IP) as a result. It might be challenging to sue someone who steals your concept and produces a comparable good or service.

DIY advertising: Crowdfunding websites frequently offer little assistance for advertising campaigns. This requires entrepreneurs to handle all of their own marketing, which can be time-consuming and costly.

Fine print rules and regulations: Crowdfunding platforms often have complex rules and regulations that entrepreneurs must comply with. This can be a challenge for entrepreneurs who are not familiar with the legal requirements for crowdfunding.

These are just some of the flaws of current crowdfunding platforms. It is important to be aware of these risks before start-ups launch a crowdfunding campaign. Here are some tips for avoiding these risks: Make sure to do your research and pick a platform with a good reputation and reasonable fees before launching a crowdfunding campaign. If you have a valuable idea, it is important to protect your IP by filing for a patent or copyright. Having a strong team in place can help you to mitigate the risks associated with crowdfunding. Being transparent with your backers about your project and your plans for the money you raise is also beneficial. Keep your backers updated on your progress and let them know how their money is being used, hence regular communication is must. Not all crowdfunding campaigns are successful. Be prepared to fail and learn from your mistakes. Crowdfunding can be a great way to raise money for your business or start-ups. However, it is important to be aware of the risks involved before you launch a campaign. By following these tips, you can help mitigate the risks and increase your chances of success. There are four types of crowdfunding contracts. Multiple signatures are necessary to execute a multi-signature contract. By doing this, it is possible to guarantee that no one person will be in charge of the funds raised. A project might, for instance, demand that two out of the three founders sign before any money can be withdrawn. By doing this, fraud could be avoided and the money would be used as intended. The second category is Contracts with caps, where the amount of money that can be raised under these contracts is limited. This can be used to stop projects from soliciting excessive funding, which could result in waste or poor management. The maximum amount of money a project can raise, for instance, might be $100,000. This would guarantee that the project has enough funding to achieve its objectives without having too much which makes it challenging to manage. The project may use these contracts to freeze tokens that have been raised but have not yet been used. In order to avoid a market crash caused by investors selling their tokens, this can be used. Tokens may be frozen, for instance, for six months following the conclusion of a campaign. Before the tokens are released onto the market, this would give the project time to develop its product or service and create a user base. Contracts called "time vaults" let the project specify the window of time after which a user won't be able to withdraw tokens. This can be used to motivate investors to keep their tokens and support the project's community development. For example, a project may specify that it must be completed within a year of the campaign's end. This would promote the development of the project's community and guarantee a steady flow of funding by incentivizing investors to hold onto their tokens for at least a year. These are just a few applications for blockchain that could enhance crowdfunding.

In this paper we propose a blockchain based model which by using contracts, reduces the risk of fraud, ensures that funds are used for the intended purpose, and builds a stronger community of investor.

3. Proposed System

Dataset(s) Description: The proposed model is developed using campaign data, donor data and transaction data. The Campaign dataset consists of campaign-specific data like the title, description, goal amount, start date, end date, and

status. The donor dataset contains information about donors such as their name, email address, and amount donated. The Transaction dataset is collection of data includes data on the transactions, such as the sender, recipient, amount, and timestamp. This dataset is available at Kaggle (https://www.kaggle.com/datasets/sripaadsrinivasan/kickstarter-campaigns-dataset).

Table 1. Datasets Explored.

Website	Category	Minimum Funding Goal	Fees
Kickstarter	Creative projects	$100	5% + 3% + 25 cents per pledge
Indiegogo	Creative projects, product development, and other causes	$0	5% + 3% + 25 cents per pledge
GoFundMe	Personal and charitable causes	$0	2.9% + 30 cents per donation
Patreon	Ongoing creative projects	$1	5% + 10 cents per patron
Wefunder	Start-ups	$10,000	5% + 1% + $100 flat fee
Republic	Start-ups	$5,000	5% + 1% + $100 flat fee
SeedInvest	Start-ups	$100,000	6% + 4% + $125 flat fee

These datasets as depicted in Table 1 is used to track the progress of campaigns, identify potential donors, and process payments. They are also used to provide insights into the crowdfunding market, such as the most popular types of campaigns, the average amount raised, and the demographics of donors. Figure 1 depicts the working mechanism of the proposed system [4]. The system will be a decentralized application (DApp) that runs on the Ethereum blockchain and consists of following modules:

Module 1: A smart contract module that will manage the crowdfunding process.
Module 2: A web application module that will allow users to create and participate in crowdfunding campaigns.
Module 3: A mobile application module that will allow users to create and participate in crowdfunding campaigns from their mobile devices.

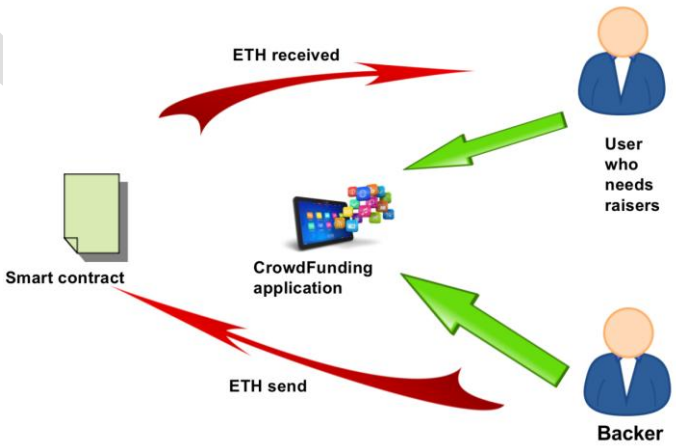

Figure 1. Working mechanism of the proposed system

The proposed system is implemented with a distributed database to store the data related to crowdfunding campaigns, such as the campaign title, description, goal amount, start date, end date, status, and donor data. The system explores a variety of security measures to protect the data, such as encryption, authentication, and authorization. The system is capable to scale up to accommodate a large number of users and campaigns.

Figure 1 depicts the proposed system for crowdfunding that is based on the Blockchain platform [5]. The Ethereum blockchain is used as a blockchain platform that offers the necessary infrastructure and tools for smart contract development, decentralized storage, and transaction processing. Smart contracts are simple programs that run when predetermined conditions are met. automate the crowdfunding process, including fund collection, distribution, and reward issuance. Here, programming language Solidity is used for developing the Ethereum based blockchain system to write the smart contracts that govern the rules and login for crowdfunding campaigns. Wallet integration is essential for cryptocurrency wallets to enable users to securely manage their funds. Wallets allow users to connect to respective crowdfunding application for sending contributions. Decentralized applications, also addressed as Dapps are applications that run on blockchain networks. They provide a user-friendly interface for interaction with the blockchain and smart contracts. Web-based technologies like HTML, CSS, and Javascript is employed here to create the front end of the module DApp. Frameworks like Hardhat helped simplify this development process. Payment gateways were integrated to facilitate flat-to-cryptocurrency conversion and vice versa This enables users to contribute funds using traditional payment transfer methods like credit cards or bank transfers, which can be converted into cryptocurrency for a blockchain-based crowdfunding campaign. The user interface of our cutting-edge crowdfunding application that uses blockchain technology is displayed below as in Figure 2.

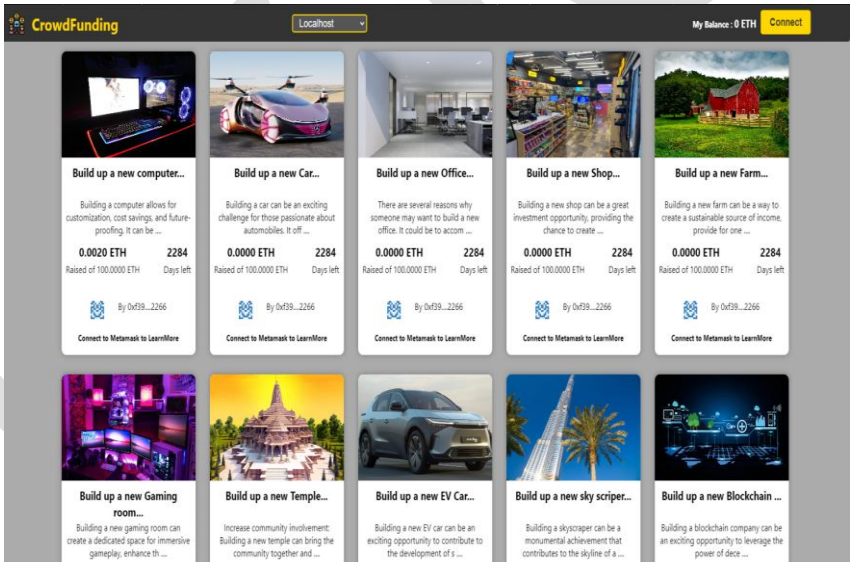

Figure 2. Proposed User Interface for blockchain based Crowdfunding

Users can explore through campaign details when they click on the "Learn More" page of any campaign. The number of days left in the campaign, the total amount of money raised so far, the number of backers who have backed the campaign and the creator's address are all included in these essential details. Users can also access a comprehensive campaign description that gives them a clear understanding of the project's goals, objectives, and any other relevant information. This professionally crafted interface ensures that users have access to all relevant campaign specifics, enabling informed decision-making and fostering transparency within the crowd funding process. Users of this

feature can enter crucial information, ensuring that complete campaign data is recorded. This feature allows users to input essential details; ensuring comprehensive campaign information is captured. Users can enter the campaigners can enter the campaign's title, giving their event a succinct answer that can communicate Users can also specify the target funding amount, which establishes a campaign's clear financial objective. Descriptors can also specify the target funding amount, which establishes a campaign's clear financial objective. To establish a sense of urgency and timeline, users can designate a deadline, indicating the date by which the campaign should reach its funding goal. Additionally, users have the option to include an image URL, which visually represents their campaign and helps create an impactful impression.

Figure 3. Transaction Hash for every modified smart contract

To establish a sense of urgency and timeline, users can designate a deadline, indicating the date by which the campaign should reach its funding goal. Additionally, users have the option to include an image URL, which visually represents their campaign and helps create an impactful impression. This professionally designed interface empowers users to effectively create and customize their campaigns, maximizing their potential for success. Every action that modifies the state of the smart contract initiates a transaction, which produces a distinct transaction hash as depicted in Figure 3. Upon the conclusion of the transaction, this transaction hash is prominently displayed and acts as a unique identifier. Users are seamlessly redirected to Etherscan, a reputable blockchain exploration platform, by clicking on the transaction hash. This enables users to confirm and look over the transaction's specifics, including the status of the transaction, its timestamp in the addresses of any parties involved, and other pertinent transaction data. This expert implementation guarantees transparency and gives users the ability to confirm the accuracy and integrity of their Ethereum blockchain transactions. The scope of such blockchain based crowdfunding platforms is growing in India [6].

4. Evaluating System Performance

The proposed system was implemented with the help of tools such as Ethereum,Visual Studio Code, HTML, CSS and Metamask for cyptocurrecny wallet. Ethereum is a decentralized platform that supports smart contract execution and is widely used for building blockchain applications. Visual Studio Code is a popular extension, along with the Solidity extension that provides Solidity language support like syntax highlighting and debugging capabilities. HTML , and CSS are used for creating the frontend application to create the user interface and enable Javascript interaction with the crowdfunding application using EthersJs. Etherjs also helps with communication with the wallet integration. Metamask is a popular browser extension wallet that allows users to manage Ethereum accounts and interact with decentralized applications. Testing and Debugging was achieved with Hardhat Node which is a personal Ethereum blockchain for local development and testing, providing a simulated environment for smart contract execution. In this paper the performance evaluation of the proposed model is achieved by using some known crowdfunding measures -

Success rate: This measure indicates the percentage of campaigns that successfully raise their funding goal.

Average amount raised: This measure indicates the average amount of money raised per campaign.

Time to raise funding: This measure indicates the average time it takes for a campaign to raise its funding goal.

Number of backers: This measure indicates the number of people who have donated to a campaign.

Donor demographics: This measure indicates the demographics of the people who have donated to a campaign, such as their age, gender, and location.

Table 2: Edge vs Metamask Cryptocurrency Wallet Tools

Features	Edge	Metamask
Company Name and Place	Edge, USA	Consensys, USA
Year of Origin	2014	2016
Wallet Type	Software	Software
Most suitable for	Those who trade in Cryptos more often	Those who store small amounts of cryptocurrency
Pros	Supports multiple cryptocurrencies and crypto assets and has built in exchanges	It is an open source platform with private keys that is used to access Ethereum blockchain and has integrations with ledger devices
Private key owner	Edge	User
Wallet Software	Android and iOS	Browser Extension, Android and iOS
Software Functions	Exchange, Send , Receive	Store, Manage, Send, Receive
Service Fees	Mining Fees	Wapping assests entail a service fee of 0.875%.

The other possible cryptocurrency wallets are Edge. A comparative study of Edge and Metamask is presented in Table 2. The current work explores Metamask as its an open source and a simple browser extension can enable its use. The evaluation measures of a blockchain based crowdfunding application includes parameters explained above such as number if backers, average amount raised, etc. If the success rate is low, the application may need to do a better job of vetting campaigns or providing more support to creators. If the average amount raised is low, the application may need to find ways to attract more donors. If the time to raise funding is long, the application may

need to make it easier for people to donate.

By tracking these evaluation measures, crowdfunding platforms can ensure that they are providing a valuable service to creators and donors. By tracking these evaluation measures, crowdfunding platforms can ensure that they are providing a safe, secure, scalable, usable, and customer-friendly platform for creators and donors.

5. Conclusion

Crowdfunding can be combined with blockchain technology to lower transaction costs and increase system trust and certainty, lowering the risk for all parties. Because all transactions are recorded in a transparent ledger using blockchain technology, investors can more easily see how their contributions are being used. A fundraiser can avoid paying a portion of the funds raised to the crowdfunding platform thanks to smart contracts, which also lower operating costs. Platforms for crowdfunding on the blockchain are decentralized, which means they are not managed by a single institution or authority. This guarantees that the platform is open, safe, and less prone to manipulation. Blockchain technology can also be used by establishing verifiable milestones as conditions for donations, with smart contracts only releasing money after milestones prove that the donation was made as promised.

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