An approach for crowd funding using blockchain

Dr. K.M. Anandkumar¹, Shravan Vignesh², M Sivakumaar E³* and Syed Adnaan I⁴

¹Professor, Department of Computer Science and Engineering, Easwari Engineering College [Autonomous], TamilNadu, India,
²Department of Computer Science and Engineering, Easwari Engineering College [Autonomous], Tamilnadu, India,
³Department of Computer Science and Engineering, Easwari Engineering College [Autonomous], Tamilnadu, India,
⁴Department of Computer Science and Engineering, Easwari Engineering College [Autonomous], Tamilnadu, India,

Abstract: Contributing to charity is universally regarded as the moral thing to do. Moreover, billions of dollars are contributed every year as a result. Since the methods used by charitable organisations to collect donations are not always transparent to the public, they frequently struggle to gain the trust and attention of donors. This emphasises how crucial it is to address these problems to improve the transparency of the fundraising process and spending for contributors. A system built on the blockchain might be the solution to this issue. The shortcomings of the current distribution system served as the inspiration for this idea. We present a blockchain-based crowdfunding platform that we believe will be effective, open, and safe. This approach enables recognised charities to post their identities for investor verification in order to aid donors in avoiding funding to fake organisations. This is because blockchain limits other parties' capacity to tamper with, or even view, data, which is crucial for any organisation looking to increase the trust of its donor base. Nobody other than the trusted entity can edit or remove data once it has been stored in a blockchain. Investors, fundraisers, and fundraising platforms are all involved. Through the site, fundraising and charitable efforts are facilitated.

1 Introduction

Customers can invest in innovative companies through crowdfunding. The problem with today's method of crowd fundraising is that investors don't have control over their contributions, and third-party middlemen don't guarantee the money individuals provide to the project. Because of the development of Internet technology, which has expanded the channels via which people may access information, philanthropy has become more open and transparent. There are several problems with charity that have come to light.

*Corresponding author : skmishra@iisermohali.ac.in

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The public now has a new way to get involved in projects related to public welfare thanks to online crowdfunding.

With the help of establishing a traceability system using internet technologies, Transparency of charity can be improved.

Even whether the funds were sent through a bank account, the internet, or a mobile device. Usually, the donors had no knowledge how their funds were spent. This initiative utilizes the Ethereum Blockchain for the same.

2 Literature survey

[1] In this article, we examine the design principles, organisational framework, and technical implementation of a proof-of-stake charity platform. The study also looks at how businesses could use the suggested method to start CSR initiatives. By incorporating blockchain technology into the process, changes that give people control over their own destiny may be verified.

[2] One use of this cutting-edge technology is the smart grid, and another is blockchain. This technology has been increasingly popular in recent years, particularly in the world of virtual currencies like Bitcoin and Ethereum. The article describes how the blockchain may be utilized as the cyber-physical layer of the smart grid and discusses the possibilities, benefits, strategies, and technical challenges involved.

[3] The Karma-Token project is a blockchain-based platform for charitable foundations that is in charge of allowing the creation of a reliable network and collecting monetary donations. Organizations with a high level of credibility and prestige would make up the blockchain network. By utilising the platform's immutability, provenance, and non-repudiation qualities, all an organization's operations will be completely open and viewable. Thus, the platform will reduce the negative effects of dishonest activity by bringing the schemes of fraudulent institutions into the open.

[4] Blockchain technology has the potential to make donation and financial transaction processes accessible to everybody. I'll analyse the justification provided for the creation of a blockchain-based platform for tracking charitable contributions in this article. The immutable ledger of the blockchain-based system makes it simple to follow the effects of charitable gifts. So that everyone can see exactly how and by whom the money is being spent, donations made through the platform should be totally transparent.

[5] Hanyang Wu, who focuses on the structural design, sector style, and layout of the contribution service system, talks about key technologies. This paper gives a quick overview of the system's operation in relation to the needs of users who want to ask for help, give help, and manage the system. All these proposals as stated, could be helpful to address the confidence issue in China's charitable services brought on by a lack of transparency. The article aims to be a useful tool for philanthropic business innovation powered by blockchain.

[6] Xin Fan can create a reliable database for organisations since the blockchain is immutable, distributed, autonomous, observable, verifiable, and shares data. The ring signature procedure can be used to conceal the identities of supervisors. A contract system was created using the Ethereum experimental environment, with the traditional charity text contract coded, contracts stored on the blockchain, and contracts' execution facilitated by smart contracts. This was done to ensure the independence, dependability, trustworthiness, and credibility of the charity project. This strategy is a ground-breaking improvement that could displace the current public charity infrastructure.

[7] Based on the tried-and-true maximum flow technique for networks, this research also develops a model for evaluating the effectiveness of financial contributions to social
welfare. Following a four-month investigation, the team came to the conclusion that the consortium blockchain can significantly boost user confidence in the research findings, raise the system’s handwashing correlation value, and increase the potency of socially conscious fundraising efforts—all of which are beneficial to the overall success of charitable donations. This blockchain network is suggested in the paper as a technical technique of enhancing societal wellbeing.

[8] The strategy will enable charitable organisations to obtain funding for the protection of cultural treasures without the need for a middleman. Utilizing NFT (Non-Fungible Token) technology, cultural artefacts are transformed into one-of-a-kind digital works of art. The decentralised file system IPFS stores meta data on newly minted tokens (NFTs) (Interplanetary File System). Smart contracts are made a part of an autonomous system. In use, the proof of concept seems to be doing nicely. Researchers in Milas have conducted a case study about preserving old olive trees with the help of a local organisation. Two possible outcomes are heightened knowledge and easier access to finance for cultural heritage protection.

[9] The blockchain mechanism is presented in detail and then compared to the three main platforms where blockchain has been examined in depth: bitcoin, Ethereum, and Hyperledger. In this study, we propose employing proof of authority in the Ethereum blockchain as a consensus procedure. In a similar vein, a thorough analysis of blockchain's achievements in the philanthropic and not-for-profit sectors is given. A computationally effective economic model to operate within the framework has been presented by researchers.

[10] In order to gauge users' viewpoints and receptivity to implementing blockchain technology on the crowdfunding site, Yaqi Zhou developed a scenario-based questionnaire by fusing design theory and innovation dissemination theory. In comparison to more traditional alternatives, several combinations of blockchain design elements were found to significantly change consumers' likelihood to adopt the technology. P2P adoption among users has significantly expanded, particularly on blockchain-based online fundraising platforms that leverage peer-to-peer networks and distributed ledger technology (DLT) as design inspiration (P2P).

[11] The potential of blockchain technology to address issues with conventional crowdfunding platforms is examined in this article. In order to automate and safeguard transactions, the authors suggest a decentralized crowdfunding platform that makes use of smart contracts on the Ethereum blockchain.

[12] This paper provides a comprehensive review of the existing literature on blockchain-based crowdfunding. The authors identify gaps in the research and suggest future research directions, such as investigating the impact of regulatory frameworks on blockchain-based crowdfunding.

[13] This paper compares three blockchain-based crowdfunding platforms: Swarm, KICKICO, and WINGS. The authors evaluate the platforms based on their features, governance structures, and token economics. They conclude that these platforms have the potential to overcome the limitations of traditional crowdfunding platforms.

[14] This article discusses the potential of blockchain technology to disrupt the crowdfunding industry. According to the authors, blockchain-based crowdfunding systems can offer higher levels of efficiency, security, and transparency than conventional platforms.

[15] This book chapter provides an introduction to distributed crowdfunding, which utilizes blockchain technology to enable decentralized fundraising. The author discusses the benefits of this approach, such as reduced fees and increased trust, and provides examples of successful distributed crowdfunding campaigns.
3 Existing system

In the past, bridge loans were mostly issued by banks and venture capital firms. An entrepreneur seeking startup capital would approach a lender or a venture capital firm, where he would present his business plan and, if successful, receive investment in proportion to the value of the company's future earnings. The pursuit of a loan from a bank may hold down the construction scope because banks often want real proof of how a development will create revenue. A bank loan's value is backed by collateral delivered by the company's original investor.

4 System design and development

Interacting with one another are campaign creators (those trying to fundraise through the platform) and campaign investors (people looking to invest their own ether through the platform). It is simple to launch a new initiative thanks to the user-friendly interface for both campaign creators and investors. The user has the option to group the campaigns into whichever categories they like. Users can use the search box to focus in on the campaigns that most closely match their requirements. A user is directed to the campaign details page after selecting a campaign tile. This website contains all the campaign's documents, descriptions, and media.

4.1 System Architecture

The modules involved are

- Creation of Campaign
- Analysis of Campaign
- Contribution
4.2 Creation of Campaign

The Approach to Crowdfunding using Blockchain, the first module is the Campaign Creation module, which involves the creation of a campaign for fundraising. The module consists of several technical aspects that need to be considered to ensure the successful implementation of the system shown in Fig 2.

![Architecture Diagram of Creation of Campaign](image)

The campaign creation module consists of the following components:

Smart Contract Creation

Smart contracts are self-executing contracts with the terms of the agreement directly written into code.

Campaign Details

After creating the smart contract, the next step is to create a campaign and define its details. The campaign details include the name of the campaign, the fundraising goal, the duration of the campaign, and other important information.

Contribution Details

The contribution details are the minimum and maximum contribution amounts that can be made to the campaign.

Fund Allocation

The fund allocation details determine how the funds raised through the campaign will be allocated.

Campaign Deployment shown in Fig.
The deployment of the campaign on the blockchain ensures that it is transparent and immutable, meaning that once the campaign is deployed, it cannot be altered or deleted.

Figure-3: Sample Code for Creation of Campaign

Formulae used in Campaign Creation Module:

**Calculation of Minimum Contribution Amount:**

\[
\text{Minimum Contribution Amount} = \frac{(\text{Fundraising Goal} \times \text{Minimum Percentage})}{100}
\]

In this formula, the minimum percentage is the minimum percentage of the fundraising goal that a user can contribute. For example, if the minimum percentage is 10%, and the fundraising goal is $10,000, the minimum contribution amount will be $1,000.

**Calculation of Maximum Contribution Amount:**

\[
\text{Maximum Contribution Amount} = \frac{(\text{Fundraising Goal} \times \text{Maximum Percentage})}{100}
\]

In this formula, the maximum percentage is the maximum percentage of the fundraising goal that a user can contribute. For example, if the maximum percentage is 50%, and the fundraising goal is $10,000, the maximum contribution amount will be $5,000.

The following steps are involved in creation of campaign:

2. Create Campaign Details such as campaign name, fundraising goal, campaign duration and other important campaign information.
3. Define Contribution Details such as minimum contribution amount, maximum contribution amount.
4. Deploy Campaign on Blockchain using smart contract to ensure transparency and immutability.

In summary, the Campaign Creation module in Blockchain Fundraising and Distributed Crowdfunding is crucial to ensure the creation of the campaign.
4.3 Analysis of campaign

The Analysis of Campaign module in approach to crowdfunding using blockchain plays a crucial role in ensuring the success of a fundraising campaign. To track the campaign's development and make decisions based on the gathered data, different technological features must be used explained in Fig 4.

![Architecture Diagram of Analysis of Campaign](image)

The module consists of several components, including data collection, performance metrics, data analysis, and decision making. The first step in the module is data collection. The data collected includes the total amount of funds raised, the number of contributors, the average contribution amount, the current status of the campaign, and other important information. The data is collected from the smart contract that was created during the Campaign Creation module.

The second step in the module is to define the performance metrics. The performance metrics are used to evaluate the progress of the campaign and identify any areas that need improvement. The performance metrics can be categorized into three categories: financial metrics, user engagement metrics, and campaign performance metrics. Financial metrics are related to the financial performance of the campaign, such as the total funds raised, the number of contributions, and the average contribution amount. User engagement metrics are related to the engagement of users with the campaign, such as the number of shares on social media, the number of clicks on the campaign page, and the number of comments and likes. Campaign performance metrics are related to the overall performance of the campaign, such as the percentage of funds raised compared to the fundraising goal, the percentage of contributors who have made a contribution, and the percentage of time remaining in the campaign.

Once the performance metrics have been defined, the data collected from the campaign is analyzed to determine how well the campaign is performing. To find trends and patterns in the data, data analysis employs a variety of approaches, including regression analysis, time series analysis, and predictive modeling. The analysis helps to identify the strengths and weaknesses of the campaign, and to make informed decisions about the future course of the campaign.
The final step in the Analysis of Campaign module is decision making explained in Fig 5. Based on the performance metrics and data analysis, decisions can be made about whether to extend the campaign duration, increase or decrease the fundraising goal, change the contribution limits, or alter the fund allocation. These decisions are made to ensure that the campaign is optimized for maximum success.

![Sample Code for Creation of Campaign](image)

**Figure-5: Sample Code for Creation of Campaign**

Formulae used in Analysis of Campaign Module:

**Calculation of Percentage of Funds Raised:**

\[
Percentage \ of \ Funds \ Raised = \left(\frac{Total \ Funds \ Raised}{Fundraising \ Goal}\right) \times 100
\]

In this formula, the total funds raised are the sum of all contributions made to the campaign, and the fundraising goal is the total amount of funds that the campaign is trying to raise. The percentage of funds raised is used to determine how close the campaign is to achieving its fundraising goal.

**Calculation of Average Contribution Amount:**

\[
Average \ Contribution \ Amount = \frac{Total \ Funds \ Raised}{Number \ of \ Contributors}
\]

In this formula, the total funds raised are the sum of all contributions made to the campaign, and the number of contributors is the total number of unique users who have made a contribution. The average contribution amount is used to determine the average amount contributed by each user.

The following steps are involved in Analysis of campaign,

1. Collect data from smart contract where total funds raised, number of contributors, average contribution amount, current status of campaign and other important information are mentioned.
2. Define Performance Metrics such as financial metrics, user engagement metrics and campaign performance metrics.
3. Analyze data using regression analysis, time series analysis and predictive modelling to identify trends and patterns in data
4. Make decisions about extending the campaign duration, increasing or decreasing the fundraising goal, changing the contribution limits, or altering the fund allocation
5. Validate the user’s identity and verify whether the analysis request is valid and includes all information
6. Retrieve data from smart contract layer.
7. Use query processing to identify areas where the campaign is underperforming and to make decisions about how to improve the campaign
8. Display Current Funding Status such as total funds raised, percentage of funds raised compared to the fundraising goal, and number of contributors who have made a contribution
9. Display the number of backers and their contribution amount
10. Display the amount contributed by each user

In summary, the Analysis of Campaign module in approach to crowdfunding using blockchain is crucial to ensure the success of a campaign. By collecting data, defining performance metrics, analyzing data, and making decisions, the module can help in making informed decisions about the campaign.

### 4.4 Contribution

In Approach to Crowdfunding using Blockchain, the Contribution module enables users to contribute funds to a campaign using cryptocurrency. This module consists of several technical aspects that need to be considered to ensure the secure and efficient transfer of funds shown in Fig 6.

![Architecture Diagram of Contribution](image_url)

**Figure-6: Architecture Diagram of Contribution**

The Contribution module consists of the following components:

- Wallet Integration
The introduction of a bitcoin wallet marks the beginning of the Contribution module. To store, transmit, and receive bitcoin, one needs a digital wallet called a cryptocurrency wallet. In Blockchain Fundraising and Distributed Crowdfunding System, users must have a cryptocurrency wallet to contribute to a campaign. The wallet is integrated into the system using APIs that allow the system to interact with the cryptocurrency network.

Payment Processing

After the wallet is integrated, the next step is to process the payment. Payment processing involves the conversion of cryptocurrency to fiat currency, which can be used to pay for goods and services. Utilizing a cryptocurrency exchange, a platform that enables users to buy, sell, and exchange cryptocurrency, payment processing is carried out.

Transaction Verification

Once the payment is processed, the next step is to verify the transaction. Transaction verification is done using the smart contract created during the Campaign Creation module. The smart contract verifies the transaction and updates the campaign data accordingly.

Transaction Security

The security of the transaction is crucial to ensure that the funds are transferred securely and efficiently. The security measures implemented in the Contribution module include encryption, multi-factor authentication, and anti-fraud measures. The use of encryption makes sure that any data sent between a user and a system is safe and cannot be intercepted by unauthorized individuals. With multi-factor authentication, the user is required to supply more than one form of identity, such as a password and a one-time code texted to their mobile phone, adding an extra layer of protection. Anti-fraud measures are implemented to detect and prevent fraudulent transactions shown in Fig 7.

![Sample Code for Creation of Campaign](image)

**Figure-7: Sample Code for Creation of Campaign**

Formulae used in Contribution Module:

**Calculation of Cryptocurrency Conversion Rate:**

\[
\text{Cryptocurrency Conversion Rate} = \frac{\text{Fiat Amount}}{\text{Cryptocurrency Amount}} \times 1.02
\]

In this formula, the fiat amount is the amount that the user wants to contribute, and the cryptocurrency amount is the equivalent amount of cryptocurrency required to make the
contribution. The conversion rate is used to ensure that the user is charged the correct amount and to account for any fees charged by the cryptocurrency exchange.

Calculation of Transaction Fee:

\[
\text{Transaction Fee} = \frac{\text{Cryptocurrency Amount} \times \text{Transaction Fee Percentage}}{100}
\]

In this formula, the transaction fee percentage is the percentage of the transaction amount that is charged as a fee by the cryptocurrency exchange. The transaction fee is deducted from the total amount contributed and is used to pay for the cryptocurrency exchange's services.

The following steps are involved in contribution,

1. User selects the campaign they want to contribute to.
2. User enters the amount of fiat currency they want to contribute.
3. System calculates the equivalent amount of cryptocurrency required using the cryptocurrency conversion rate formula.
4. System displays the cryptocurrency amount to the user and prompts them to confirm the contribution.
5. User confirms the contribution and is directed to their cryptocurrency wallet.
6. User initiates the transfer of cryptocurrency from their wallet to the campaign wallet.
7. System verifies the transaction using the smart contract created in the Campaign Creation module.
8. System calculates the transaction fee using the transaction fee formula and deducts it from the total amount contributed.
9. System updates the campaign data to reflect the new contribution.
10. System displays a confirmation message to the user, indicating that their contribution has been successful.

In summary, the Contribution module in approach to crowdfunding using blockchain enables users to contribute funds to a campaign using cryptocurrency. The module involves the integration of a cryptocurrency wallet, payment processing, transaction verification, and transaction security. The use of encryption, multi-factor authentication, and anti-fraud measures ensures that the funds are transferred securely and efficiently. The conversion rate and transaction fee calculations ensure that the user is charged the correct amount and account for any fees charged by the cryptocurrency exchange.
4.5 Implementation

![Home page of the System](image)

Figure-8: Home page of the System

Fig 8 shows the output of our implemented system where we can access all the campaign. This is typically the home page of our system where the users can either create new campaign or choose the campaign to contribute.

After connecting to the Metamask wallet, the user can either create campaign or choose the campaign in which they are most interested and fund.

5 Conclusion

The approach to crowdfunding using Blockchain is an innovative solution that offers several benefits to fundraisers and donors alike. The system allows fundraisers to create campaigns on the blockchain, enabling them to reach a wider audience and receive contributions from all over the world. At the same time, donors can contribute funds to campaigns using cryptocurrency, which offers a secure and efficient method of payment. The Campaign Creation module enables fundraisers to create a campaign and define its details, such as the fundraising goal, campaign duration, and contribution limits. The smart contract created in this module automates the fundraising process and ensures that funds are distributed fairly and efficiently. The Analysis of Campaign module provides detailed performance metrics and analysis, allowing fundraisers to make informed decisions about the future course of their campaign. The Contribution module allows donors to contribute funds to a campaign using cryptocurrency, which is secure and efficient. The use of cryptocurrency in the system also offers several benefits. Cryptocurrency transactions are fast, secure, and efficient, with low transaction fees compared to traditional payment methods. This makes it easier for fundraisers to reach a global audience and receive contributions from anyone who wants to support their cause.

6 Future enhancement
The approach to crowdfunding using Blockchain to improve its functionality and increase its impact on the fundraising industry. Here are some possibilities:

1. Integration with additional cryptocurrencies: Currently, the system only allows users to contribute funds using one type of cryptocurrency. However, there are many other cryptocurrencies in circulation, and integrating them into the system would increase accessibility and user choice.
2. Integration with traditional payment methods: While the system is designed for cryptocurrency contributions, some users may prefer to contribute using traditional payment methods such as credit cards or PayPal. Integrating these payment methods could increase the user base and make the system more accessible to those who are not yet familiar with cryptocurrency.
3. Integration with blockchain-based identity verification systems: One potential issue with crowdfunding campaigns is the potential for fraudulent activity. Integrating the system with blockchain-based identity verification systems could increase security and reduce the risk of fraudulent contributions.

Overall, these potential future enhancements demonstrate the potential for the approach to crowdfunding using Blockchain to continue to innovate and adapt to the changing landscape of fundraising. By staying ahead of the curve and implementing new features and functionality, the system can continue to be a valuable tool for fundraising campaigns around the world.

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References


12. "Blockchain-Based Crowdfunding: A Review of the Literature and Future Research Directions" by Chakib Abbad and Sabri Boubaker.


15. "Distributed Crowdfunding: An Introduction" by Shermin Voshmgir.