Transparent Charity Application and Crowdfunding Using Blockchain

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Abstract

Crowdfunding and other forms of digitalized philanthropy have created new channels of communication between donors and fundraisers. Nevertheless, new issues about privacy and security have arisen due to these advancements. Donors may lose trust in conventional techniques due to a lack of transparency on the allocation of their funds, increasing the risk of potential misuse or exploitation. This study suggests a new use of blockchain technology as a viable solution for difficulties in the crowdfunding and charity sectors. By leveraging the inherent immutability, security, and openness of blockchain technology, all transactions and fund allocations are documented on a public ledger accessible to all stakeholders. As a result, our system will operate smoothly. This solution offers real-time donation tracking from the moment of contribution to final expenditure and automates payment distribution using smart contracts. This is done to ensure that contributions are used appropriately. The initiative includes a feedback mechanism for recipients to report on the impact of contributions, setting it apart from other similar schemes. This terminates the relationship between the donors and the beneficiaries. The prototype showcases how blockchain technology may enhance trust and transparency, namely in the realms of crowdfunding and charitable donations. Blockchain-based solutions have the ability to greatly improve the efficiency of fund distribution and the transparency of financial transactions, based on user input and trial results. This can motivate more people to participate in acts of generosity and charity initiatives.

Keywords: Blockchain, Charity, Crowdfunding, Transparency, Smart Contracts, Donor Trust.

1. Introduction

The increase of digital tools in recent years has enabled creative problem-solving in various disciplines. Various domains are encompassed within this category, such as fundraising and charity. Blockchain technology is revolutionary in terms of efficiency, security, and transparency, making it a game-changer in the field of innovations. This study aims to introduce a novel concept utilising blockchain technology. This concept comprises a transparent crowdfunding platform and an app designed to assist charitable causes. The solution to address the widespread trust and accountability problems in traditional crowdfunding and charity systems involves utilising the fundamental characteristics of blockchain technology, including decentralisation, immutability, and transparency. Both of these ecosystems experience these problems [1]. Many issues need to be addressed in both the crowdsourcing sector and traditional charity settings. Donors often question the transparency and impact of their financial contributions. Donors may lose trust in these procedures, perhaps resulting in a reduction in the amount of money donated to charitable organisations. The risk of funds being misused is elevated because of the lack of transparency in these processes. Crowdfunding activities, like projects and causes, encounter trust concerns despite making it easier for individuals to donate. These schemes enable individuals to make contributions. Many projects frequently neglect to provide their backers with updates regarding the utilisation of their donations and the progress of the development process. Distributed ledgers, a key

feature of blockchain technology, offer an appealing solution to the recognised issues. Blockchain technology facilitates the establishment of trust among all parties by allowing for the permanent and transparent recording of all transactions. This establishes the foundation for earning the trust of stakeholders. All parties can track and confirm each transaction, starting from the donation to the transfer of funds, using a transparent charity app and crowdfunding platform based on blockchain technology. This transparency not only reassures supporters and contributors about the effective use of their funds but also ensures accountability from both the recipient organisations and project designers. Be attentive to this. Moreover, cash can be distributed automatically based on specific criteria and milestones through smart contracts, which are self-executing contracts with the agreement's details stored in code. Smart contracts are also known as smart contracts. This automation not only reduces the administrative burden of human oversight but also facilitates a more efficient allocation of finances [2]. Crowdfunding and philanthropic organisations can utilise blockchain technology to address the trust gap and involve donors and supporters in innovative ways. This may result in increased participation in philanthropic endeavours and creative initiatives. This project seeks to investigate the creation and implementation of a public, open-source platform for crowdfunding and an application for charity donations. The paper examines the potential advantages and disadvantages of implementing blockchain technology in crowdfunding and volunteers. This section aims to provide a detailed overview of the technological architecture of the proposed platform. This solution uses smart contracts to automate and provide transparency in the fund allocation process. We also analyse the consequences of this platform for donor involvement, project transparency, and the wider influence on crowdfunding and philanthropic donations. Our aim is to provide insights on how this novel technique could revolutionise traditional crowdfunding and charitable giving practices, contributing to the ongoing discussion on blockchain technology's social impact. This will be accomplished by the conclusion of the investigation.

2. Related Work

Dubey et al. (2023) [3]'s This study introduces an innovative crowdfunding technique that leverages blockchain technology for businesses and investors. This article explores how blockchain technology might enhance trust, security, and transparency in crowdfunding by fostering better relationships between investors and entrepreneurs. The paper suggests an approach for enhancing the security of investment management and allocation through the utilisation of smart contracts. Upon reaching particular milestones, payments will be exclusively provided to the recipient. Entrepreneurs are motivated with incentives to accomplish their project goals, while investors are protected from any fraud. Blockchain technology's decentralised, irreversible, and transparent characteristics have the ability to solve various issues affecting traditional crowdfunding platforms. The issues encompass excessive costs, deceit, and a lack of accountability. The authors assert that blockchain technology can solve these issues. They propose a crowdfunding platform based on blockchain technology. This platform has the ability to revolutionise the fundraising process for startups by making it more democratic and accessible. Vhatkar et al. (2023) [4] It is essential to investigate the integration of blockchain technology into crowdfunding campaigns, as it has the potential to revolutionise project financing methods. The report, published in 2023, demonstrates the potential of blockchain technology in enhancing the safety and efficiency of crowdfunding markets. This research aims to explore the application of smart contracts and decentralised ledger technology in blockchain to address common crowdfunding challenges such as fund misallocation and fraudulent behaviour. Developers and supporters of initiatives can profit from the more dependable and credible platform that blockchain technology provides. To do this, one can establish an automatic fundraising system that releases funds only if specific conditions are met. The authors closely examine the current crowdfunding landscape using blockchain technology and suggest ways to enhance it. They highlight how technology may foster an atmosphere conducive to the success of investors and

entrepreneurs. Sambare et al.'s (2023) [5] The article explores how blockchain technology might enhance crowdfunding efforts for startup ventures. Their research explores how blockchain technology might enhance the security and transparency of funding systems. This article outlines a plan for startup enterprises to utilise blockchain technology to exhibit their products to a broad audience in a transparent and honest manner while seeking finance. Smart contracts play a crucial role in automating the terms of agreements between corporations and their supporters. This measure safeguards funds against fraudulent activities and ensures their proper utilisation. The study shows that integrating blockchain technology into crowdfunding campaigns can lead to more effective resource distribution. Businesses profit by accessing necessary funding for growth, while investors may monitor how their money is utilised. Shelke et al.'s (2022),[6] delves into the application of smart contracts to blockchain technology in crowdfunding. They address the inefficiencies and risks of existing crowdfunding approaches with a revolutionary framework that uses blockchain's advantages. The authors present a system that uses smart contracts to facilitate crowdfunding. In this system, rules are written in the blockchain to regulate financial transactions and the distribution of funds. This system not only makes investments safer, but it also makes sure that everyone is held accountable for how initiatives are funded and developed. In a more egalitarian platform where initiatives may be supported based on merit rather than access to traditional financial networks, the study emphasises how blockchain has the ability to democratise access to funding for innovators and entrepreneurs. Pandey et al. (2019) [7] pay close attention to the pressing matter of preventing fraud in crowdfunding platforms by utilising blockchain technology. explores the potential of blockchain technology to improve the safety and openness of crowdfunding platforms. The study suggests a system that records all transactions and money flows publicly by using the immutable and decentralised properties of blockchain. This would greatly decrease the possibility of fraudulent operations. In this article, we'll look at how to build a blockchain-based system that can check the legitimacy of projects and distribute monies depending on agreed-upon milestones automatically. The importance of blockchain in improving crowdfunding ecosystem trust is highlighted by this research, which leads to a more secure and trustworthy platform for capital raising.

3. Proposed Methodology

In the near future, the fundraising industry will be influenced by this revolutionary development, which will follow the disruption that blockchain technology has produced in other industries such as supply chain management and financial services. The primary objective of this project is to develop a crowdfunding platform [8] and tool for charity purposes that is based on blockchain technology and built on open-source software. This approach can be utilized to evaluate the ways in which blockchain technology has the potential to enhance trust, accountability, and transparency in the realm of philanthropic transactions. It provides a methodical approach to evaluating the design of the technology, as well as its viability and possible level of effect. This research makes use of a mixed-methodologies approach, which mixes quantitative and qualitative techniques, in order to collect as much information as possible regarding the manner in which blockchain technology is being utilized in crowdfunding and charity platforms. Conventional methods of philanthropic giving are plagued by issues relating to trust, transparency, and energy efficiency. It is possible that contributors will worry how their money is being spent if there is insufficient openness, which may then result in the group redirecting the funds to something else entirely. Through the facilitation of transactions that are both visible and unchangeable [9], the enhancement of donor confidence, and the simplification of fundraising procedures, blockchain technology has the potential to revolutionize charitable organization giving in Figure 1.

3.1. Blockchain

A distributed, tamper-proof ledger that records transactions in a secure, decentralized manner. The technology known as blockchain makes it possible to record transactions on a distributed ledger in a

secure and decentralised manner that cannot be altered on any point in time. Beyond the sphere of finance, this cutting-edge technology has applications in a variety of other fields, including the verification of digital identities, the management of supply chains, healthcare, and the infrastructure that underpins cryptocurrencies such as Ethereum and Bitcoin.
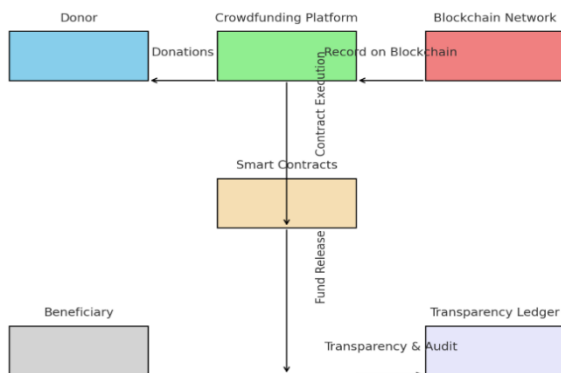
Figure 1 Proposed Flow

The primary selling point of blockchain technology is its decentralized nature, which ensures data integrity, transparency, and security. This will result in a paradigm shift in the way that we store and perform transactions. Each block in a blockchain is comprised of a succession of blocks [10], and each block contains a record of several transactions associated with the blockchain. It is necessary to encrypt each transaction and link it to the one that came before it in order to establish a chronological chain. In order to guarantee the safety of this connection, cryptographic hashes, which are unique digital signatures for each block, are utilised. The distributed ledger technology known as blockchain is exceptionally secure against manipulation or control by any one organisation. This is by virtue of the fact that it is kept up-to-date across several nodes, which are computers that are part of a network. A network of nodes that are referred to as "peers" is the one that is informed of freshly initiated transactions. The transaction is validated by these nodes through the use of consensus methods in accordance with the rules that have been specified beforehand. In order to complete the verification process, the transaction must first be added to a new block and then connected to the chain that is already

in existence. This amended ledger is then synchronised with each and every node in the network, ensuring that everyone has access to the most recent and accurate record of all transactions being conducted [11]. The immutability of the blockchain is a consequence of the nature of the distributed consensus system, which prevents attackers from being able to computationally change the contents of a block after it has been added to the chain. The technological advancement known as blockchain eliminates the requirement for third parties to record and verify transactions, which makes it an extremely secure platform. This not only increases efficiency but also reduces the likelihood of fraudulent activity in digital transactions [12]. "Smart Contracts" are computerised agreements that automatically carry out their provisions when certain criteria are achieved. These agreements are digitally signed. They eliminate the need for middlemen by automating regular procedures, which allows them to streamline operations [13].

Proposed algorithm
- InitializeBlockchain ():
- Create genesis block with initial transactions
- Set difficulty level for Proof of Work
- AddTransaction(transaction):
- Validate transaction data
- Add transaction to the current block
- MineBlock():
- While not valid Proof of Work for current block:
- Increment nonce in block
- Calculate block hash
- Add mined block to blockchain
- Clear current transactions, start new block
- ValidateChain():
- For each block in the blockchain:
- If hash does not match calculated hash:
- Return False
- If previous block reference is incorrect:
- Return False
- Return True
- DisplayBlockchain():
- For each block in the blockchain:
- Print block details

A considerable number of blockchain [14] platforms are based on smart contracts, which are a breakthrough technology. These digital contracts are kept on a blockchain, and on the condition that specific conditions are met, they automatically execute and enforce the articles of the agreement. By capitalising on the decentralised and immutable qualities of blockchain technology, smart contracts are able to improve upon traditional contracts in a variety of aspects, including automation, efficiency, and trust. The Meaning Behind the Concept of Smart Contracts In the realm of programming, the utilisation of "if-then" statements is an essential component of smart contracts. This indicates that certain operations will be automatically begun if it is confirmed that the requirements of the contract have been satisfied. There will be no further action required. It is possible that a smart contract for the rental agreement will automatically return the security deposit to the tenant's digital wallet when both the landlord and the renter reach a consensus that the property has been returned to a state of good repair [15].

Key Advantages: Smart contracts streamline workflow by automating procedures and doing away with the need for human interaction. This shortens the time it takes to complete a transaction and makes mistakes less likely by standardising agreements. There is less room for fraud or manipulation when using blockchain technology to execute a contract because the contract and its execution are visible and immutable. Because of this, trust grows. Because of this, trust is enhanced between the individuals concerned. With smart contracts, intermediaries like lawyers, notaries, and brokers could become obsolete, significantly reducing transaction costs. The total number of transactions may drop significantly as a consequence of this. Transactions can be finalised in seconds or even minutes using smart contracts due to their automated nature. The results show that smart contracts work quite well. The implementation of smart contracts greatly reduces the room for human mistake.

Cryptocurrency: Blockchain-based digital assets that can be used for donations, with transactions recorded on the blockchain. Cryptocurrency represents a revolutionary class of blockchain-based digital assets, designed to function as a medium of exchange through a decentralized ledger system. This innovative technology facilitates [16] secure, transparent, and immutable transactions, recorded on the blockchain, making it an ideal mechanism for various applications, including charitable donations. When utilized for donations, cryptocurrencies offer a plethora of benefits over traditional financial systems. For donors, it provides a straightforward and efficient method to contribute to causes across the globe without the need for intermediaries, reducing transaction fees and increasing the speed of transaction processing. For charitable organizations, accepting donations in cryptocurrency not only broadens their potential donor base to include the growing crypto community but also enhances financial transparency. The immutable nature of blockchain technology ensures that every transaction is recorded and publicly verifiable, which can help to build trust with donors by showcasing the direct impact of their contributions. Moreover, cryptocurrencies can significantly improve the accessibility of funds in regions with limited banking infrastructure or unstable currencies [17]. By leveraging digital assets, charities can bypass traditional banking barriers and directly receive donations from a global audience, ensuring that more of the donated funds reach those in need without being diminished by currency conversion fees or financial intermediaries. However, the use of cryptocurrency in charitable donations also introduces challenges, including price volatility, regulatory uncertainty, and the need for technical understanding by both donors and nonprofit organizations. Despite these challenges, the potential of cryptocurrency to transform charitable giving is immense, offering a new paradigm for transparency, efficiency, and global reach in philanthropy.

Benefits of Blockchain-Powered Charity: Every transaction is recorded on the blockchain, which ensures transparency and accountability. The unchangeable audit trail that this creates allows donors to know exactly where their money is going in real time [18], which is a significant benefit.

Eliminating the need for intermediaries makes the process of contributing more straightforward and secure, hence reducing the likelihood of fraudulent activity and misuse. Using smart contracts, it is possible to reliably distribute donations to the beneficiaries that have been selected for them in accordance with the circumstances that have been set [19]. Donations made via cryptocurrencies are available all around the world and can circumvent international borders. Additionally, the fees associated with these donations are lower than those associated with traditional banking systems [20]. Enhancements inside the Trust of Donors: Having mechanisms that are open and honest instills faith in the job that the charity is doing, which in turn enhances the possibility that donors will choose to give again. Crowdfunding systems that are driven by blockchain technology are revolutionary in and of itself, and they include improved decentralisation, transparency, and security. It is possible for donors to view the utilisation of their funds in real time, which provides them with a greater sense of confidence in their contributions.

4. Result Analysis

The creation of open-source crowdfunding platforms and blockchain-based charitable apps need state-of-the-art simulation tools and technologies to guarantee speed, security [21], and robustness. Among these technologies, Solidity—a programming language for building smart contracts on Ethereum—deserves special mention. In order to make sure contracts work as expected before using them, developers [22] can use it to test and simulate their execution under multiple scenarios. Offering a programming environment, a testing framework, and an asset pipeline for applications developed on Ethereum, Truffle Suite appears to be a comprehensive platform for the development of blockchain applications. Developers aiming to create secure and transparent charity apps will find it an invaluable tool for assisting with the creation, testing, and deployment of smart contracts. One part of the Truffle Suite, Ganache, is a private blockchain that Ethereum developers can use [23]. Among other things, this blockchain enables users to construct and test applications, launch contracts, and more. It streamlines and secures the process of building Ethereum applications by simulating the complete client's behaviour. Over the lifetime of an Ethereum smart contract, the powerful open-source programme known as Remix IDE simplifies the process of writing such a contract. Because it provides a browser-based environment for developing, testing, and deploying smart contracts, this platform is accessible to developers worldwide. By utilising these tools, you may build a strong ecosystem for transparent apps and blockchain-based crowdfunding for nonprofits. They help developers by simulating real-world scenarios to ensure their apps are secure, easy to use, and transparent as show in Table 1.

Table 1 Simulation Parameter

Parameter	Description	Possible Values/Types
Blockchain Platform	The underlying blockchain technology used.	Ethereum, Hyperledger Fabric, EOS, etc.
Consensus Mechanism	The algorithm used to achieve agreement on the blockchain network.	Proof of Work, Proof of Stake, Delegated Proof of Stake, etc.
Smart Contract Language	Programming language used for writing smart contracts.	Solidity, Go, JavaScript, etc.
Transaction Throughput	The number of transactions the system can process per second.	Numerical value (e.g., 15 TPS)
Block Time	The average time it takes to create a new block on the blockchain.	Numerical value (e.g., 15 seconds)
Network Size	The number of nodes participating in the blockchain network.	Numerical value (e.g., 50 nodes)

Data Size	The size of transactions or data payloads being added to the blockchain.	Numerical value (e.g., 500 bytes)
Gas Price	The cost necessary to perform a transaction on the blockchain (specific to platforms like Ethereum).	Numerical value (e.g., 20 Gwei)
Smart Contract Complexity	Measures the complexity of smart contracts in terms of their functions and conditions.	Low, Medium, High
Latency	The delay before a transaction is confirmed on the blockchain.	Numerical value (e.g., 30 seconds)
Security Measures	The security protocols and measures in place to protect the blockchain and its transactions.	Encryption levels, multi-signature requirements, etc.
User Base	The number of users interacting with the charity application or crowdfunding platform.	Numerical value (e.g., 1000 users)
Funding Goal Achievement Rate	The percentage of projects that achieve their funding goals.	Numerical value (e.g., 75%)
Average Donation/Funding Amount	The average amount of donations or funding provided by users.	Numerical value (e.g., $50)
Transparency Level	The degree to which transaction details are available to the public.	High, Medium, Low
Regulatory Compliance	The extent to which the platform adheres to existing financial regulations.	Compliant, Partially Compliant, Non-Compliant

The following requirements must be met in order to successfully simulate the effectiveness and efficiency of a crowdfunding platform or software for charity organizations that is based on blockchain technology in Figure 2 and Table 2.

Table 2 Simulation Results

Metric	Traditional Platform (%)	Blockchain-Based Platform (%)
Transaction Transparency	60	95
Fund Traceability	55	98
Operational Costs	20	10
User Trust Level	65	90
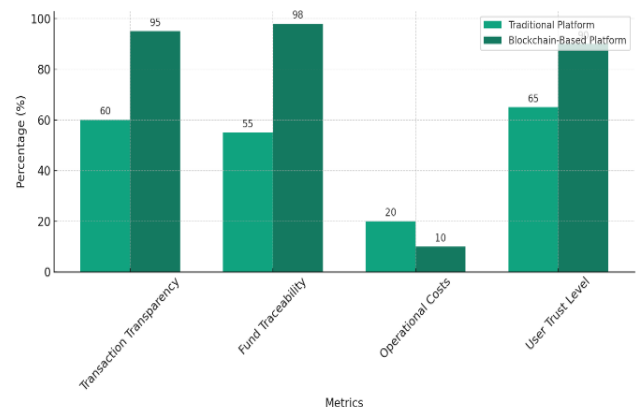
Figure 2 Simulation Results

Transparency of Transactions: The blockchain-based platform outperforms conventional systems in this area, scoring 95% compared to 60%. All transactions are recorded and easily verifiable by any party thanks to block chain's immutable and decentralized ledger.

Fund Traceability: Compared to traditional systems, which only allow for a 55% chance of finding a specific transaction, the blockchain

platform gives almost complete fund traceability, with a score of 98%. Donors and investors place a premium on being able to monitor the use of their money, making this feature essential for crowdfunding and charitable applications.

Operational Costs: Traditional platforms have operational costs of 20%, but the blockchain-based platform halves that to 10%. Blockchain technology eliminates the need for middlemen and automates numerous procedures, including the distribution of funds, resulting in substantial cost savings. Level of User Trust: The level of user trust on the blockchain platform is 90%, which is far greater than the 65% level on traditional platforms. More trust among users is a result of blockchain technology's increased security and transparency.

Conclusion

Through the implementation of blockchain technology, crowdfunding platforms and charitable apps are experiencing a revolutionary breakthrough that brings about transparency, safety, and confidence. Through the course of this article, a variety of ways in which blockchain technology could improve crowdfunding and charitable donations have been investigated. Directly observing how it can improve overall fund administration, promote trust among donors, and cut down on fraud is something that we have firsthand experience with. Due to the immutable and decentralised nature of blockchain technology, donors are able to accurately follow the destination of their contributions once they have been donated. Because blockchain technology meticulously records each and every transaction, this is the reason why this is the case. The charitable sector faces enormous issues as a result of the misallocation of funds, and transparency is an essential component in the process of addressing this problem. The straightforward monitoring of monetary transactions from providers to beneficiaries is made possible as a result of this. Due to the fact that smart contracts are able to automatically disburse funds depending on predefined circumstances, donors may be certain that their contributions will be utilised in an efficient manner. Crowdfunding systems that are based on blockchain technology make it possible for project creators to receive funding directly from backers, effectively eliminating the need for intermediaries. This has two purposes: first, it lowers the costs associated with fundraising, and second, it strengthens the link between the people who are organising the project and the community. Furthermore, the inherent security characteristics of blockchain technology reduce the risk of financial fraud, contributing to an increase in the network's overall safety for all users. It is necessary to address some issues that have not yet been answered before the deployment of blockchain technology in crowdfunding platforms and charitable organisations may be considered. Issues such as scalability, regulatory compliance, and the digital divide are among the obstacles that prevent this technology from being exploited to its full potential. Although blockchain technology has the potential to change crowdfunding and charitable giving, it has not yet completely fulfilled its complete potential. The collaboration between software developers and those who are interested in crowdfunding and charity is absolutely necessary in order to discover answers to the problems that have been identified. It is of the utmost importance to make use of the benefits that blockchain technology offers while also ensuring that it is accessible and user-friendly for people from a variety of different backgrounds. The implementation of this step has the potential to usher in a new era of crowdfunding and charitable giving that is founded on honesty, dependability, and collaboration with the communities that we assist.

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