# TRACKING CHARITY AND DONATIONS

**BACHELOR OF TECHNOLOGY**

**IN**

**COMPUTER SCIENCE AND ENGINEERING**

**Use Case Report**

submitted by

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**Kanuru, Vijayawada-520 007**

**2024-25**

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## CERTIFICATE

This is to certify that the Use Case report entitled **"Tracking Charity and Donations"** that is being submitted by **K.Rohitha(22501A0590)**, as part of Assignment-1 and Assignment-2 for the **Blockchain Technology(20CS4601C)** course in **3-2** during the academic year **2024-25**.

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| **MARKS** |
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| **ASSIGNMENT-2: _____ /5** |

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# 1. INTRODUCTION

The Blockchain-Based Charity and Donation Tracking System is a blockchain-powered platform that enables donors, recipients, and non-profit organizations to track and manage donations in a secure and transparent manner. Built using React.js for the frontend and Ethereum smart contracts for the backend, this application ensures a trustless and intermediary-free donation process [1][2]. By leveraging MetaMask for authentication [3] and Ethers.js for blockchain interactions [4], users can seamlessly donate and monitor funds on the Ethereum network. The decentralized nature of the system removes reliance on a central authority, ensuring donors maintain full control over their contributions [6].

One of the key features of this project is the ability for donors to track their contributions in real-time. Donors specify the donation amount and intended cause, and the smart contract securely stores this information, ensuring transactions follow blockchain protocols [7]. Once a donation is made, recipients can view and request funds through a secure approval system [8]. The use of smart contracts automates fund disbursement, reducing the risk of fraud and ensuring efficient allocation of resources [9].

Security and transparency are at the core of this donation tracking system. Each transaction is recorded on the Ethereum blockchain, ensuring immutability and preventing fund mismanagement [10]. Donors can verify how their contributions are being used, while recipients must provide proof of fund utilization before receiving further disbursement [6]. Additionally, identity verification mechanisms ensure that only legitimate organizations and individuals can request donations, reducing fraud risks [7].

This project showcases the potential of blockchain technology in transforming charitable donations by providing a decentralized, secure, and efficient method of tracking and managing contributions [8]. With smart contracts automating transactions and removing intermediaries, the platform offers a trustless and permissionless environment, ensuring that funds reach their intended beneficiaries [9]. The increasing adoption of Web3 technologies highlights how decentralized applications are shaping the future of philanthropy and digital giving [5].

# 2. BACKGROUND

The use of blockchain for tracking charity donations introduces a transformative approach to ensuring transparency and security in philanthropy. However, despite its advantages, blockchain-based donation systems face several challenges that need to be addressed for widespread adoption. Below are the key obstacles in this domain.

## 2.1 Integration with Existing Charity Systems

Many non-profit organizations still rely on traditional banking and centralized donation platforms. Transitioning to a blockchain-based donation system requires major technical changes, making integration complex and costly. Additionally, organizations may resist blockchain adoption due to the high initial investment, lack of technical expertise, and the need to modify existing donation management processes [1].

## 2.2 Transaction Costs and Scalability

Blockchain networks, particularly public blockchains, often experience high transaction fees, which can reduce the efficiency of processing donations. These costs can be a barrier for small-scale donors who wish to contribute minimal amounts [2]. Furthermore, scalability issues may arise as an increase in donations and transactions can lead to slower processing times and higher costs [3]. Ensuring cost-effective and scalable blockchain solutions is essential for the widespread adoption of decentralized charity systems.

## 2.3 Smart Contract Security and Vulnerabilities

Smart contracts facilitate automated donation tracking and fund distribution, but any vulnerabilities or coding errors can lead to security risks, including hacks, exploits, or loss of funds [1]. Ensuring the security of smart contracts through rigorous audits and best coding practices is crucial to maintaining donor trust and preventing fraudulent activities [2].

## 2.4 Regulatory and Legal Uncertainty

Blockchain-based donation platforms operate across multiple jurisdictions, each with different regulations regarding financial transactions, taxation, and anti-money laundering policies. The lack of a clear legal framework for decentralized donations can create

compliance challenges [4]. Governments may impose restrictions on cryptocurrency transactions, affecting the global reach and adoption of blockchain-based charity systems.

### 2.5 User Experience and Adoption Barriers

Donors and organizations using blockchain-based donation systems must manage private keys, digital wallets, and transaction fees, which can be complex for non-technical users [3]. Unlike traditional donation platforms that offer simple payment gateways, blockchain-based systems need to improve user experience by simplifying wallet integration, reducing transaction complexities, and offering intuitive interfaces to encourage mass adoption [5].

### 2.6 Trust and Transparency in Fund Utilization

While blockchain ensures transaction transparency, concerns remain about how donations are allocated and spent by recipients. In traditional donation models, oversight bodies manage fund distribution, but in decentralized charity systems, ensuring accountability without intermediaries is a challenge [2]. Implementing decentralized identity verification and smart contract-based fund release mechanisms can enhance trust between donors and beneficiaries [3].

### 2.7 Energy Consumption and Sustainability

Certain blockchain networks, particularly those using Proof-of-Work (PoW) consensus mechanisms, require significant computational power, raising concerns about environmental sustainability [4]. As more organizations focus on sustainable solutions, transitioning to energy-efficient blockchains like Proof-of-Stake (PoS) can help reduce the environmental impact of blockchain-based donation systems [5].

### 2.8 Data Privacy and Transparency Balance

While blockchain enhances transparency by recording transactions on a public ledger, organizations and donors may have privacy concerns about exposing sensitive information such as donation amounts, recipient details, or funding sources [1]. Striking a balance between transparency and privacy using privacy-preserving.

# 3. BLOCKCHAIN BASICS

Blockchain technology is transforming the charity and donation sector by ensuring transparency, security, and efficiency. Traditional donation systems often lack traceability, leading to concerns about fund misuse. Blockchain eliminates the need for intermediaries, providing a decentralized and tamper-proof system for tracking donations. Below are key blockchain concepts relevant to donation tracking applications.

## 3.1 Decentralization

- In a blockchain-based charity system, donors contribute directly to verified beneficiaries without relying on centralized financial institutions.
- Decentralization reduces administrative overhead and operational costs, ensuring that a larger percentage of donations reach intended recipients[1].
- Peer-to-peer (P2P) donation systems allow seamless fund transfers without requiring approval from banks or third-party platforms.

## 3.2 Immutability

- Once a donation is recorded on the blockchain, it cannot be altered or deleted, ensuring accountability in fund allocation.
- Transaction histories remain permanently accessible, allowing donors to verify how their funds are used.
- Blockchain prevents corruption and mismanagement by providing an unchangeable ledger of all transactions.

## 3.3 Smart Contracts

- Smart contracts automate the donation process, ensuring funds are disbursed only when predefined conditions are met.
- For example, a smart contract can release donations to a non-profit organization only after completing a verification process or achieving a specific milestone.
- Automating fund distribution minimizes fraud risks and improves efficiency by removing manual interventions[3].

### 3.4 Key Components of Blockchain

- **Blocks**: Each block contains donation details, timestamps, and a reference (hash) to the previous block, ensuring a verifiable record of transactions.
- **Consensus Mechanisms**: Blockchain networks validate transactions through consensus protocols to prevent fraud and ensure security.
    - **Proof of Work (PoW)**: Secure but energy-intensive, used in Bitcoin.
    - **Proof of Stake (PoS)**: More energy-efficient and widely adopted in modern blockchain networks.
    - **Delegated Proof of Stake (DPoS)**: Allows voting-based transaction validation, improving scalability.
    - **Byzantine Fault Tolerance (BFT)**: Ensures network security even with some malicious actors.
- **Tokens**: Some blockchain-based charity platforms use tokens to facilitate donations and incentivize participation in fundraising initiatives.
- **Public and Private Keys**: Donors use cryptographic keys for secure transactions, with public keys acting as donation addresses and private keys ensuring access control.

### 3.5 Key Advantages of Blockchain Technology

- **Transparency**: Every donation is recorded on a public ledger, preventing mismanagement and ensuring accountability.
- **Lower Fees**: Eliminating third-party financial institutions significantly reduces processing costs, allowing more funds to reach beneficiaries.
- **Security**: Cryptographic encryption and decentralization make donation records highly resistant to hacking and fraud.
- **Real-Time Tracking**: Donors can monitor their contributions in real time, verifying fund allocation and impact.
- **Automated Fund Disbursement**: Smart contracts ensure that donations are released only when predefined criteria are met.
- **Fraud Prevention**: The immutable nature of blockchain prevents data manipulation, reducing corruption risks.

### 3.6 Use Cases of Blockchain in Charity and Donations

- **Transparent Fund Allocation**: Organizations like Binance Charity and GiveTrack use blockchain to provide real-time visibility into fund distribution.
- **Disaster Relief**: Blockchain-based systems ensure rapid and transparent aid distribution during crises, preventing misallocation of emergency funds.
- **Micro-donations**: Blockchain allows seamless small-value transactions with minimal fees, enabling wider participation in charitable causes.
- **Education and Scholarships**: Platforms use smart contracts to distribute scholarships based on eligibility criteria, ensuring fair access to educational funding.
- **Medical Aid Donations**: Blockchain verifies the use of funds in healthcare donations, ensuring contributions are spent on medical supplies and treatments.
- **Food and Resource Donations**: Organizations track the distribution of donated goods, reducing waste and ensuring efficient logistics.
- **Non-Profit Governance**: Charities using blockchain for financial reporting gain increased donor trust due to enhanced accountability and auditability.

By integrating blockchain into donation tracking, non-profits and donors can ensure a secure, transparent, and efficient system that maximizes the impact of charitable contributions.

# 4. USE CASE OVERVIEW

The blockchain-based charity and donation tracking system leverages Ethereum smart contracts to ensure secure, transparent, and traceable transactions between donors, recipients, and non-profit organizations. Every donation is immutably recorded on the blockchain, ensuring trust and preventing fraud. Donors can contribute funds directly, while recipients can request and receive donations without intermediaries. The system automates fund transfers, ensuring timely distribution and reducing delays. With lower transaction costs, automation, and tamper-proof records, the system enhances efficiency, security, and trust in charitable giving.

This case describes the implementation of a blockchain-based donation tracking system designed to provide full transparency and accountability in charitable transactions. The system eliminates intermediaries and enhances trust, security, and efficiency in the donation process.

## 4.1 OBJECTIVES

Blockchain records all donation transactions immutably, making them publicly verifiable and tamper-proof. This ensures complete trust in the donation process

### 4.1.1 Enhance Transparency

Blockchain records all donation transactions on a decentralized ledger, making them publicly verifiable and tamper-proof, ensuring trust.

### 4.1.2 Eliminate Intermediaries

Donors can transfer funds directly to recipients, bypassing banks or charities, reducing delays and transaction fees.

### 4.1.3 Automate Fund Distribution

Smart contracts enable automatic and conditional fund transfers, ensuring donations are used as intended without manual intervention.

### 4.1.4 Improve Trust

Donors can track their contributions in real time, ensuring transparency and accountability in fund allocation.

### 4.1.5 Increase Security

Ethereum smart contracts protect transactions from fraud and cyber threats, ensuring secure and tamper-proof donations.

## 4.2 SCOPE

### 4.2.1 Donation Creation

Donors can contribute funds by specifying the amount and intended recipient. The system ensures secure and verified transactions.

### 4.2.2 Real-Time Tracking

Users can track donations from the moment of contribution until final utilization. This enhances transparency and accountability.

### 4.2.3 Automated Fund Transfers

Smart contracts automatically transfer funds to recipients based on predefined rules. This reduces processing time and ensures fairness.

### 4.2.4 Recipient Verification

Non-profit organizations and individuals undergo verification before receiving donations. This prevents fraud and ensures legitimacy.

### 4.2.5 Event Logging

All donation and fund distribution events are permanently recorded on the blockchain. This prevents data tampering and ensures transparency.

### 4.2.6 Secure Transactions

Donations are made using cryptocurrency (Ether) to ensure safety. This removes the risks associated with traditional banking systems.

### 4.2.7 Decentralization

The system operates without central control, reducing fraud risks. This increases donor confidence and ensures fair fund distribution.

## 4.3 STAKEHOLDERS INVOLVED

### 4.3.1 Donors

Donors contribute funds and track transactions transparently. They can verify fund utilization through blockchain records.

### 4.3.2 Non-Profit Organizations (NPOs)

NPOs register and verify themselves before receiving funds. They create campaigns, request funding, and report fund usage.

## 4.4 SMART CONTRACT SYSTEM

### 4.4.1 Automated Intermediary

Smart contracts act as an intermediary, facilitating secure transactions. This eliminates manual processing and speeds up donations.

### 4.4.2 Conditional Fund Release

Funds are released only when predefined conditions are met. This ensures donations are used appropriately and efficiently.

### 4.4.3 Immutable Record Keeping

All donation-related events, such as fund transfers, are permanently recorded. This prevents data manipulation and ensures transparency.

## 4.5 ARCHITECTURE

### 4.5.1 Donation Data Structure

The system stores donation details, including donor identity and amount. This ensures accurate tracking and secure storage.

### 4.5.2 Event Mechanism

Blockchain events record and track donation-related activities. This allows real-time monitoring and enhances system reliability.

### 4.5.3 Access Control Layer

- **Donors:** Can initiate donations and track fund utilization through the blockchain system.
- **NPOs/Recipients:** Can request funds and submit reports on how the donations are used.

### 4.5.4 Fund Handling

- **Payments:** All transactions are processed in Ether (ETH) to ensure secure and decentralized transfers.
- **Fund Locking:** Funds remain in the smart contract and are released only when predefined conditions are met.
- **Verification:** The contract ensures that recipients meet verification criteria before disbursing funds.

### 4.5.5 Blockchain Storage

- **Immutable Records:** All donation records and fund transactions are permanently stored on the blockchain.
- **Data Integrity:** No data can be altered once recorded, ensuring full transparency and accountability.

### 4.5.6 Frontend Interface

- **User Interaction:** Donors and recipients interact with the platform via a decentralized application (DApp).
- **Blockchain Connection:** Uses Web3.js or Ethers.js to connect with the Ethereum smart contract.
- **User-Friendly UI:** Provides an intuitive interface for donors to track their contributions.

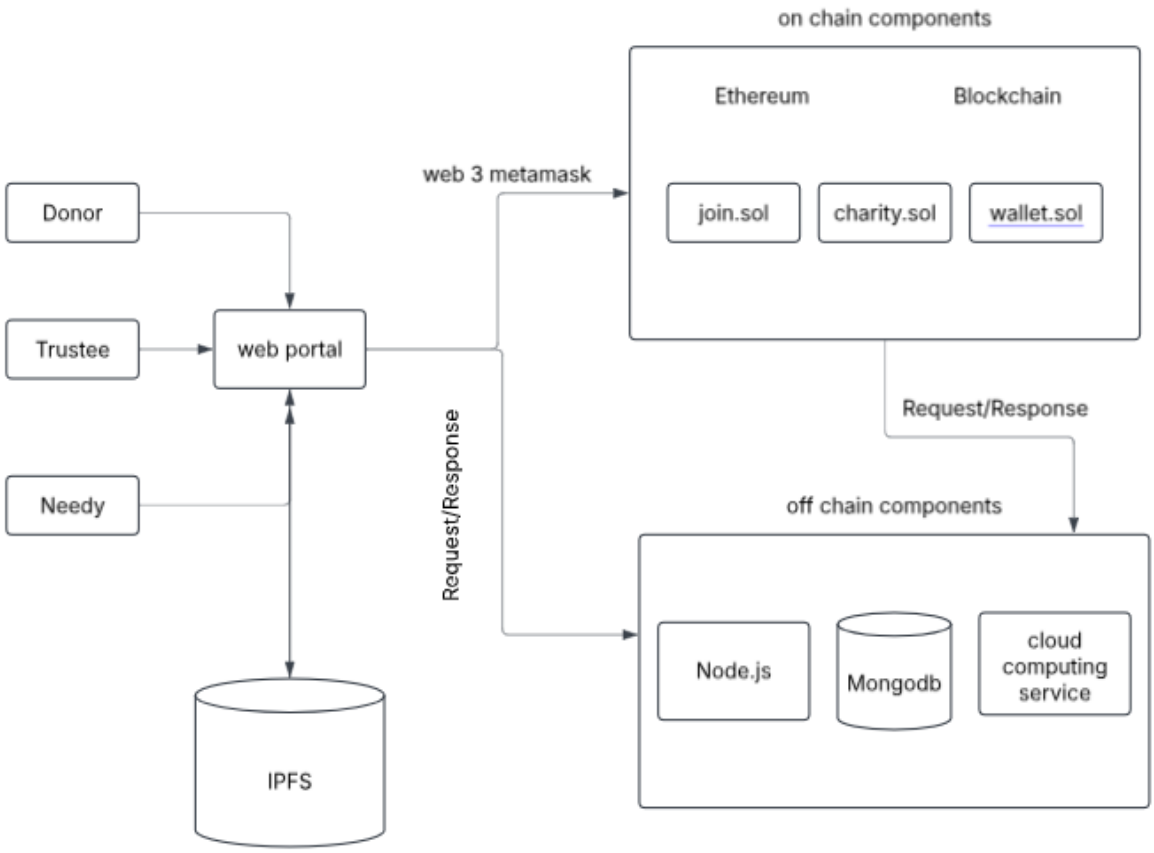


**Fig. 4.1:** System architecture

Figure 4.1 from [6] shows a blockchain-based donations traceability system that integrates on-chain and off-chain components to enhance transparency and security. On the on-chain side, three smart contracts (Join.sol, Charity.sol, and Wallet.sol) run on the Ethereum blockchain to manage user registration, donation handling, and wallet operations. The web portal, used by donors, trustees, and needy parties, connects through Web3 and MetaMask to interact with these contracts securely. Meanwhile, off-chain components employ Node.js, MongoDB, and cloud computing services for data management, with IPFS nodes supporting decentralized storage. This setup ensures a tamper-proof and traceable process that fosters trust among all participants [6].

### 4.6 Security and Privacy

Security and privacy are critical to ensuring safe and trustworthy transactions within the blockchain-based donation system. The following measures are implemented:

#### *4.6.1* Smart Contract Security

- **Require Statements:** Input validation is enforced to prevent invalid transactions and ensure data integrity.
- **Donor and Recipient Verification:** Only registered and verified users can send or receive donations, preventing fraud.
- **Reentrancy Protection:** Prevents multiple function calls in a single transaction to avoid smart contract exploits.

#### *4.6.2 Payment Security*

- **Secure Transactions:** Donations are processed in Ether, ensuring irreversible and tamper-proof transfers.
- **Conditional Fund Release:** Funds are only disbursed when predefined conditions in the smart contract are met.

#### *4.6.3 Data Privacy*

- **Minimal Data Storage:** No personally identifiable information (PII) is stored on the blockchain.
- **Transparency with Privacy:** Only essential transaction details are recorded to maintain transparency while protecting user privacy.

#### *4.6.4* Blockchain Immutability

- **Permanent Records:** All donation transactions are stored immutably, preventing any unauthorized alterations.
- **Fraud Prevention:** Immutable records eliminate the risk of fraudulent modifications or fund mismanagement.

#### *4.6.5* Prevention of Double Spending

- **Unique Transaction Processing:** Each donation is uniquely recorded and marked as completed once processed.
- **Avoiding Duplicate Transactions:** Ensures that donations are not unintentionally duplicated or exploited.

## 4.7 Benefits

The blockchain-based charity and donation tracking system offers several advantages:

### *4.7.1* Transparency

- **Public Ledger:** Every donation transaction is permanently recorded on the blockchain.
- **Donor Tracking:** Donors can verify how their funds are allocated and utilized.

### *4.7.2* Security

- **Decentralized Protection:** The system eliminates single points of failure, reducing fraud risks.
- **Secure Transactions:** Smart contracts protect funds from unauthorized access or misuse.

### *4.7.3* Decentralization

- **No Central Authority:** Eliminates reliance on third-party organizations for fund management.
- **Direct Contributions:** Donors can send funds directly to recipients, reducing delays and fees.

### *4.7.4* Automation

- **Smart Contract Execution:** Automatically processes transactions and fund releases without human intervention.
- **Efficient Fund Management:** Ensures timely distribution of donations based on predefined conditions.

### *4.7.5* Cost Efficiency

- **Lower Transaction Fees:** Eliminates intermediaries like banks, reducing operational costs.
- **More Funds to Beneficiaries:** Ensures a higher percentage of donations reach the intended recipients.

### *4.7.6* Fraud Prevention

- **Immutable Records:** Prevents fraudulent changes to donation details or fund allocations.
- **Secure Fund Management:** Ensures donations are used for their intended purposes.

# 5. IMPLEMENTATION

This section outlines the step-by-step process of implementing the blockchain-based charity and donation tracking system.

## 5.1 Define the Charity and Donation Tracking Workflow

**5.1.1 Donor Makes a Donation:** The smart contract records transaction details.

**5.1.2 Funds Are Held Securely:** The smart contract verifies and locks the donation until conditions are met.

**5.1.3 Funds Are Released to Verified Recipients:** Smart contracts ensure funds reach intended beneficiaries.

**5.1.4 UI Updates:** Donors receive real-time updates on donation status.

## 5.2 Choose the Blockchain Type

**5.2.1 Public Blockchain (Ethereum, Polygon, Binance Smart Chain):** Decentralized and transparent but may have high gas fees.

**5.2.2 Private Blockchain (Hyperledger, Quorum):** Provides more control and lower fees but limits decentralization.

## 5.3 Design Smart Contracts for Donation Tracking

The smart contract must include:

**5.3.1 Donation Struct:** Defines ID, donor address, amount, recipient, and transaction status.

**5.3.2 CreateDonation Function:** Allows donors to contribute to campaigns or individual recipients.

**5.3.3 ReleaseFunds Function:** Ensures funds are disbursed only to verified recipients upon meeting conditions.

**5.3.4 Events:** Notifies users when a donation is made, verified, or disbursed.

**5.3.5 Access Control:** Restricts fund release and tracking to authorized users.

### 5.4 Develop & Deploy Smart Contracts

Below is a basic Solidity contract for tracking donations:

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;

contract DonationTracking {
    uint public donationCount = 0;

    struct Donation {
        uint id;
        address donor;
        uint amount;
        address payable recipient;
        bool released;
    }

    mapping(uint => Donation) public donations;

    event DonationMade(uint id, address donor, uint amount,
address recipient, bool released);
    event FundsReleased(uint id, address recipient, uint amount);

    function makeDonation(address payable _recipient) public
payable {
        require(msg.value > 0, "Donation must be greater than
zero");

        donationCount++;
        donations[donationCount] = Donation(donationCount,
msg.sender, msg.value, _recipient, false);

        emit DonationMade(donationCount, msg.sender, msg.value,
_recipient, false);
    }

    function releaseFunds(uint _id) public {
        Donation storage _donation = donations[_id];
        require(!_donation.released, "Funds already released");

        _donation.recipient.transfer(_donation.amount);
        _donation.released = true;
```

```
        emit        FundsReleased(_id,        _donation.recipient,
_donation.amount);
    }
}
```

### 5.5 Frontend & Web3 Integration

- **Tech Stack:** React.js, Web3.js/Ethers.js for blockchain interaction.
- **MetaMask Integration:** Allows users to connect wallets and sign transactions.
- **Process Flow:** Load smart contract → Connect wallet → Display & track donations.

### 5.6 Test the Smart Contracts

- **Tools:** Hardhat, Truffle for testing and debugging.
- **Check for:** Security vulnerabilities, gas efficiency, and proper execution of smart contract functions.

### 5.7 Deploy on Blockchain

- **Testnet Deployment:** Use Goerli, Mumbai to test before going live.
- **Mainnet Deployment:** Deploy on Ethereum, Polygon for real-world use.

### 5.8 Monitor & Maintain

- **Track Activity:** Use tools like Tenderly, Alchemy for real-time monitoring.
- **Optimize UI & Gas Fees:** Enhance performance and reduce transaction costs.
- **Upgrade Contracts:** Implement contract upgrades if necessary.

### 5.9 Ensure Compliance & Scalability

- **Regulatory Compliance:** Implement KYC/AML procedures and GDPR guidelines for transparency.
- **Scalability Measures:** Use Layer 2 solutions and IPFS for efficient storage and processing.

# 6. ADVANTAGES

## 6.1 Enhanced Transparency

- **Real-time tracking:** Blockchain allows donors and stakeholders to monitor donations in real time, ensuring shared access to accurate information.
- **Immutable records:** Transactions are permanently stored on the blockchain, preventing alterations and ensuring data integrity.

## 6.2 Improved Traceability

- **End-to-end tracking:** Tracks donations from the donor to the final recipient, ensuring proper fund allocation.
- **Auditability:** Provides a verifiable record of all transactions, helping detect misuse of funds and enhancing accountability.

## 6.3 Enhanced Security

- **Cryptographic protection:** Encryption ensures secure transactions and prevents unauthorized access to donation data.
- **Distributed ledger:** Decentralization eliminates single points of failure, reducing risks of hacking or fraud.

## 6.4 Reduced Fraud and Misuse of Funds

- **Immutable verification:** Blockchain ensures that all donations are traceable and irreversible, preventing fund misappropriation.
- **Recipient authentication:** Ensures only verified non-profits or individuals receive donations, reducing the chances of fraud.

## 6.5 Better Collaboration

- **Shared visibility:** Donors, organizations, and beneficiaries access the same real-time data, improving trust and coordination.
- **Smart contracts:** Automate fund disbursement based on predefined conditions, reducing manual intervention and delays.

## 6.6 Increased Efficiency

- **Streamlined processes:** Eliminates intermediaries, automates verification, and reduces paperwork for donation tracking.
- **Faster transactions:** Ensures quick and secure fund transfers to beneficiaries, minimizing delays.

### 6.7 Improved Compliance and Regulatory Reporting

- **Data accuracy:** Ensures compliance with financial regulations and donor transparency policies.
- **Simplified auditing:** Transparent and consistent data makes compliance checks easier for non-profits and regulatory bodies.

### 6.8 Donor Trust and Engagement

- **Transparency of fund usage:** Provides verifiable proof of how donations are allocated, increasing donor confidence.
- **Donation verification:** Enables donors to track their contributions and confirm their impact, strengthening trust in charitable organizations.

### 6.9 Cost Savings

- **Reduced administrative costs:** Automates processes, cutting expenses associated with third-party intermediaries and financial institutions.
- **Minimized fraud losses:** Reduces financial losses due to misallocation of funds and fraudulent activities.

### 6.10 Sustainability

- **Efficient fund management:** Ensures optimal allocation of resources, preventing wastage of charitable funds.
- **Encourages ethical donations:** Provides transparency in donation usage, promoting responsible giving and sustainable aid distribution.

# 7. CHALLENGES

While blockchain offers numerous benefits for charity and donation tracking, several challenges and limitations need to be addressed for its successful adoption.

## 7.1 High Transaction Costs

- **Gas fees:** Many blockchain networks, such as Ethereum, have high transaction fees, which can make small donations less cost-effective. This limits the accessibility of blockchain-based charity solutions, especially for donors making microtransactions.
- **Scalability concerns:** As the number of donations increases, the demand for processing transactions grows, leading to higher fees and longer confirmation times, reducing cost efficiency.

## 7.2 Scalability Limitations

- **Network congestion:** Public blockchain networks can become slow due to high transaction volumes, causing delays in processing donations. This can hinder the effectiveness of emergency relief efforts that require immediate fund transfers.
- **Limited throughput:** Blockchain networks typically process fewer transactions per second than traditional banking systems, making them less efficient for large-scale fundraising campaigns.

## 7.3 Regulatory Uncertainty

- **Lack of clear policies:** Different governments have varying regulations regarding cryptocurrency donations, and the absence of universal policies creates uncertainty for both donors and charities.
- **Compliance challenges:** Charitable organizations must navigate complex financial regulations, such as anti-money laundering (AML) and know-your-customer (KYC) requirements, which may require additional administrative work and costs.

## 7.4 Security Risks

- **Smart contract vulnerabilities:** Poorly written smart contracts can be exploited by hackers, leading to fund mismanagement or loss. Auditing and securing smart contracts is essential but can be expensive.
- **Cyber threats:** Donors and recipients may fall victim to phishing attacks, hacking attempts, or fraudulent blockchain addresses, putting funds at risk.

### 7.5 Complexity in User Adoption

- **Technical barriers:** Many users lack an understanding of blockchain and cryptocurrency, making it difficult for them to participate in blockchain-based donations.
- **Onboarding difficulties:** Managing digital wallets, securing private keys, and understanding gas fees can be overwhelming for non-tech-savvy donors and non-profits, reducing adoption rates.

### 7.6 Lack of Donor Trust

- **Market volatility:** The value of cryptocurrency donations can fluctuate significantly, affecting the actual amount received by beneficiaries. This unpredictability may discourage donors.
- **Fear of fraud:** Some donors are hesitant to use blockchain platforms due to concerns about scams, lack of oversight, and the irreversibility of transactions.

### 7.7 Energy Consumption

- **High power usage:** Proof-of-Work (PoW) blockchain networks consume significant energy, raising sustainability concerns.
- **Environmental impact:** Many donors and organizations are becoming more environmentally conscious and may prefer eco-friendly blockchain alternatives, such as Proof-of-Stake (PoS) networks.

### 7.8 Limited Interoperability

- **Cross-chain compatibility:** Many blockchains operate independently, making it difficult to transfer donations across different networks.
- **Integration challenges:** Connecting blockchain-based donation systems with traditional banking platforms and financial institutions can be complex, requiring additional technological infrastructure.

# 8. CONCLUSION

The adoption of blockchain technology for tracking charity and donations provides a robust framework for ensuring accountability, efficiency, and security in the donation process. By leveraging smart contracts, funds are distributed based on predefined conditions, reducing the risk of mismanagement and fraud. The immutability of blockchain records ensures that all transactions remain transparent and tamper-proof, enhancing donor confidence. Despite its numerous advantages, blockchain-based donation systems face several challenges, including high transaction fees, regulatory uncertainties, security vulnerabilities, and technical barriers to adoption. Addressing these issues requires collaborative efforts from technology developers, policymakers, and charitable organizations to create scalable, cost-effective, and user-friendly solutions. Integrating Layer 2 scaling solutions, adopting energy-efficient consensus mechanisms, and developing regulatory-compliant frameworks will play a crucial role in overcoming these limitations.

As blockchain technology continues to evolve, it holds the potential to reshape the philanthropic sector by offering real-time donation tracking, secure cross-border transactions, and automated fund disbursement without reliance on intermediaries. With continued advancements and adoption, blockchain-based charity platforms can foster greater trust, efficiency, and inclusivity in global giving, ensuring that contributions reach those in need more effectively and transparently.

# 9. SDG's ADDRESSED

A blockchain-based charity and donation tracking system contributes significantly to multiple United Nations Sustainable Development Goals (SDGs) by improving transparency, accountability, and efficiency in the donation process. Below are the key SDGs addressed by this system:

## 9.1 SDG 1: No Poverty

- **Ensuring Fair Distribution:** Tracks donations to ensure they reach the intended recipients without intermediaries, reducing leakages and corruption.
- **Supporting Vulnerable Communities:** Provides a transparent and efficient system for distributing financial aid and resources, ensuring those in need receive help.
- **Financial Inclusion:** Enables unbanked and marginalized communities to receive donations through digital transactions, bypassing traditional banking barriers.

## 9.2 SDG 4: Quality Education

- **Transparent Fund Allocation:** Ensures that donations meant for educational initiatives, such as scholarships and school infrastructure, are properly distributed.
- **Scholarship Management:** Tracks and verifies scholarship disbursements, ensuring funds are utilized for their intended purpose without fraud.
- **Resource Accessibility:** Facilitates donations of educational materials, including books, digital learning tools, and internet access for students in underserved areas.

## 9.3 SDG 10: Reduced Inequalities

- **Equal Access to Aid:** Ensures that financial and material donations reach marginalized and disadvantaged groups without discrimination.
- **Global Donation Network:** Allows donors from different parts of the world to support causes in underserved regions efficiently.
- **Eliminating Corruption:** Provides a transparent and tamper-proof record of transactions, preventing the misuse of charitable funds and reducing inequality in aid distribution.

## 9.4 SDG 16: Peace, Justice, and Strong Institutions

- **Trust and Accountability:** Uses blockchain's immutable ledger to prevent fraud and enhance trust in charitable organizations.
- **Prevention of Misuse:** Ensures that donations are not diverted to illegal activities, enhancing governance and credibility in the non-profit sector.

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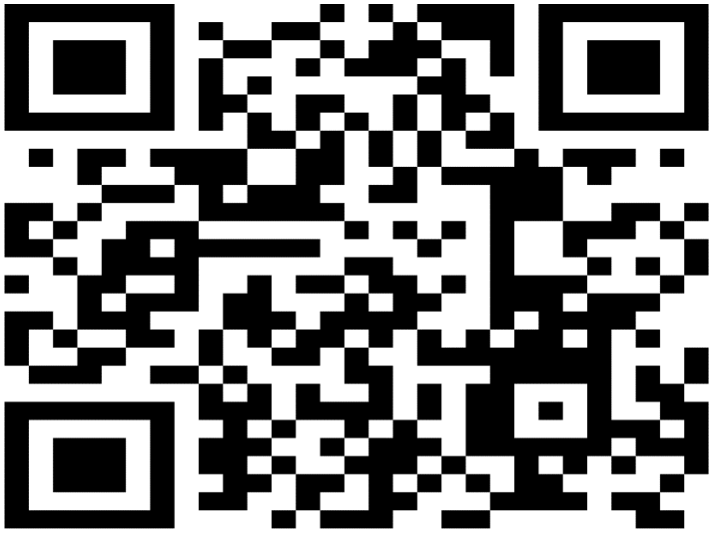
## 11. APPENDIX A



https://drive.google.com/drive/u/0/folders/1S3H3nZlzFLY9ufI2DeG5LxxAo4cPa2TX