**Journal of Neonatal Surgery**
*ISSN(Online): 2226-0439*
*Vol. 14, Issue 21s (2025)*
https://www.jneonatalsurg.com

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# Sustainable Crowd Funding Solutions Using Blockchain Technology

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Cite this paper as: Mrs. P. Suganya, S. Mega, B. A. Thaheen Zareen, J. Tharani, Karkatesh, (2025). Sustainable Crowd Funding Solutions Using Blockchain Technology. *Journal of Neonatal Surgery*, 14 (21s), 73-84.

**ABSTRACT**

Abstract Although funding is important in today's society, the Proof of Work (PoW) algorithm, which lacks transparency and data immutability, is frequently used in the systems that now manage donations for NGOs. A decentralized funding system utilizing blockchain technology and the Proof of Stake (PoS) algorithm is suggested as a solution to these issues. Through this system, students can post their financial or resource requirements, charities can publish their needs, and anyone with business ideas can submit their applications. A clear and effective financing procedure is ensured by donors' ability to view these needs and make direct contributions. Every transaction is safely documented by utilizing blockchain technology, which offers data immutability and guards against unwanted changes.Compared to PoW, the PoS algorithm guarantees a quicker and more effective transaction validation process, improves security, and uses less energy. By removing middlemen, this system not only increases confidence between donors and receivers but also expedites the funding process. In the end, the suggested funding management system improves accessibility to financial aid and resources by providing a dependable solution for assisting startups, students, and nonprofit organizations with increased transparency, security, and efficiency.

**Keyword:** *Blockchain, Proof of Stake (PoS), Transparency, Data Immutability, Decentralized System, Smart Contracts, Startup Funding, Student Aid, Charity Donations, Secure Transactions*

## 1. INTRODUCTION

Effective and transparent financing management is essential for entrepreneurs, students, and nonprofits in the quickly changing financial landscape of today [2]. Conventional fundraising methods, including those employed by NGOs, frequently depend on the Proof of Work (PoW) algorithm, which has drawbacks such as data immutability and a lack of transparency. Inefficiencies, resource misallocation, and a lack of trust between donors and recipients can result from these problems [1].

An algorithm-based blockchain-based funding management system called Proof of Stake (PoS) is used for removing the need for middlemen and promoting general confidence, this system guarantees a decentralized, safe, and effective method of managing funds [2]. The suggested approach enables charities to declare their particular needs, students to upload their financial or resource requirements, and individuals with business ideas to submit their bids. To guarantee that the money reaches the right people, donors can peruse these requests and send direct donations [5].

Blockchain technology ensures that every transaction is safely documented, giving data immutability and guarding against unwanted changes. Compared to PoW, PoS improves transaction validation speed and uses less energy, making the system more effective and sustainable [17]. This solution greatly increases money distribution security and transparency by utilizing blockchain's decentralized structure. By automating transactions, smart contracts ensure that money is only released when certain requirements are satisfied [16]. This reduces fraud and poor management while promoting confidence between contributors and receivers. Startups, students, and nonprofit organizations can easily obtain the assistance they require thanks to the Funding Management System's dependable, scalable, and effective financial aid distribution system [5].

### a. Block chain:

Blockchain is a safe, decentralized digital ledger technology that keeps track of transactions across several computers while guaranteeing data immutability, transparency, and integrity[5]. Blockchain functions on a distributed network, as opposed to traditional databases that depend on a central authority, and each transaction is validated by consensus processes like Proof of Work (PoW) or Proof of Stake (PoS). Cryptographic hashes are used to link transactions after they are recorded in a block to the preceding block, creating a chain of blocks—thus the term "blockchain." Because of this structure, it is practically impossible to change or remove historical records, guaranteeing security and trust in a variety of applications, such as data storage, supply chain management, and financial transactions. Furthermore, to further improve efficiency, smart contracts—self-executing programs kept on the blockchain—automate and enforce agreements without the need for middlemen[17]. From voting systems and decentralized finance (DeFi) to banking and healthcare, blockchain's decentralized structure reduces fraud, improves transparency, and offers a safe framework for a range of sectors.

### b. Proof of Stake (PoS) – Introduction

In contrast to Proof of Work (PoW), Proof of Stake (PoS) is a consensus process used in blockchain networks to validate transactions and generate new blocks more energy-efficiently. Rather than depending on processing power, PoS chooses validators by how many coins they own and are prepared to "stake" as security[6]. The likelihood that a block will be selected for validation increases with stake level. Modern blockchain networks like this approach because it greatly lowers energy usage and improves scalability. PoS also improves security since it gives validators a financial incentive to behave honorably because they risk losing their staked assets if they act maliciously. Variants such as Delegated Proof of Stake (DPoS), which enables users to elect representatives to validate transactions on their behalf, also increase efficiency[18]. PoS, which supports applications in digital identity verification, finance, and decentralized apps (DApps), has emerged as a key mechanism for blockchain platforms due to its benefits in sustainability, security, and transaction speed

## 2. LITRATURE SURVEY:

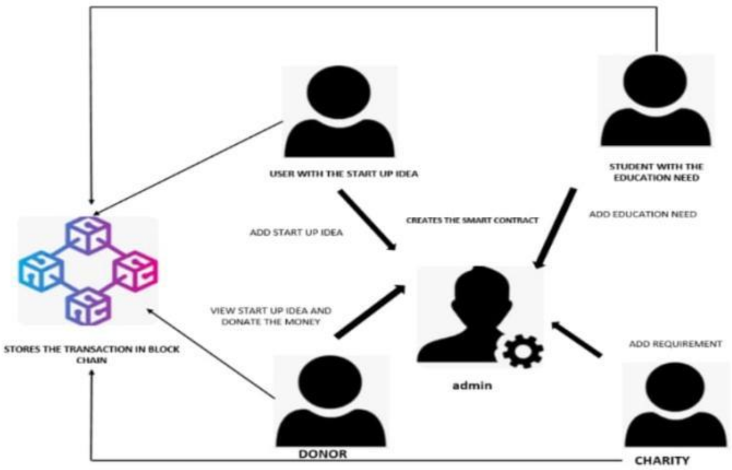


**Fig 1.: System Flowchart**

The existing literature presents a comprehensive examination of how advanced machine learning and deep learning techniques are applied to mental health prediction, diagnosis, and management. Goyal et al. [1] and Pang et al. [2] emphasize the significance of longitudinal data analysis in predicting depression, employing deep learning models that utilize joint anomaly ranking and classification for improved accuracy. Meng et al. [3] extend this research by applying transformers to multimodal electronic health records (EHRs), demonstrating how bidirectional representation learning enhances the predictive capability for detecting depression. Cakmak et al. [4] further explore mental health prediction through convolutional variational autoencoders, using actigraphy data to predict post-trauma health outcomes, thus introducing a robust technique for analyzing time series data. Additionally, Wang et al. [5] focus on ensuring data privacy in stress detection using differential private federated transfer learning, which is particularly valuable in real-world healthcare settings where sensitive patient data must remain confidential.

In Fig 1 the blockchain-based crowdfunding system is shown so that it facilitates the interactions between multiple stakeholders using smart contracts. The primary participants include users with startup ideas, students seeking educational support, donors, and charitable organizations. Users can submit their startup concepts or educational needs to the system, which are then verified and managed by an administrator. The admin creates a smart contract to govern the transactions and ensure transparency. Donors can view these proposals, assess their credibility, and contribute funds directly. Once a transaction is completed, it is recorded on the blockchain, providing an immutable and transparent ledger of activities. This system ensures secure, automated, and trustless funding, eliminating intermediaries and fostering a decentralized financial ecosystem.

The link between environmental factors and mental health is extensively explored by Abed Al Ahad et al. [6], who investigate the impact of pollution exposure on mental health hospital admissions, uncovering a significant correlation between air pollution and increased psychiatric disorders. In the field of neurodegenerative disease diagnosis, Bron et al. [7] and Gorji and Haddadnia [8] propose advanced machine learning algorithms, including support vector machine (SVM) models and pseudo Zernike moment-based methods, to facilitate early Alzheimer's detection using structural MRI data. Suk and Shen [9], Liu et al. [10], and Zu et al. [11] contribute further by leveraging clustering-induced multi-task learning and multi-template feature representation to enhance the accuracy of Alzheimer's Disease (AD) and mild cognitive impairment (MCI) classification. Zhu et al. [12] introduce a novel matrix-similarity-based loss function, offering a more effective approach for joint regression and classification tasks. Suk et al. [13] extend this work by employing deep sparse multi-task learning, ensuring improved feature selection and more precise diagnostic results.

Blood-based diagnostics also play a pivotal role in AD detection, as demonstrated by Burnham et al. [14], who identify blood biomarkers indicative of neocortical amyloid-beta burden using data from the AIBL study. This biomarker-based diagnostic approach is further enhanced by Nazeri et al. [15], who explore imaging proteomics for the diagnosis, monitoring, and prediction of Alzheimer's Disease. Chen et al. [16] complement this by proposing multiple kernel learning with random effects, enabling robust prediction of longitudinal outcomes and facilitating the integration of heterogeneous data sources. Additionally, Pang et al. [17] and Meng et al. [18] provide comprehensive reviews on the advancements in deep learning for anomaly detection and time series analysis, highlighting the effectiveness of these models in healthcare applications. Cakmak et al. [19] contribute further by conducting an in-depth survey on the use of autoencoders in time series analysis, showcasing their potential in mental health prediction.

Federated learning also emerges as a transformative solution for mental health monitoring, as highlighted by Wang et al. [20], who discuss its application in healthcare informatics to ensure data privacy while enabling collaborative model training across multiple institutions. Furthermore, Abed Al Ahad et al. [21] offer a global perspective on the detrimental effects of air pollution on mental health, emphasizing the urgent need for interdisciplinary research and policy interventions. Collectively, this body of work underscores the transformative potential of machine learning and blockchain technologies in enhancing mental health prediction, diagnosis, and management while addressing the challenges of data privacy, accuracy, and environmental impact.

## 3. PROPOSED SYSTEM:

The Proof of Stake (PoS) algorithm and blockchain technology are used in the proposed system, a decentralized financing platform, to ensure a secure, transparent, and efficient fundraising process. This system allows individuals with business ideas to submit proposals, charities to post their needs, and students to upload their financial or resource requirements. Then, donors can contribute directly, bypassing intermediaries. Blockchain securely records every transaction, ensuring data immutability and preventing unauthorized alterations. The use of Proof of Work (PoS) enhances security while significantly reducing energy usage, leading to quicker and more effective transaction validation than PoW. Contributions are public and verifiable, and the decentralized nature of the system fosters confidence between contributors and recipients. It guarantees that it speeds up the fundraising process by eliminating third parties.

**a. User Registration and Authentication:**

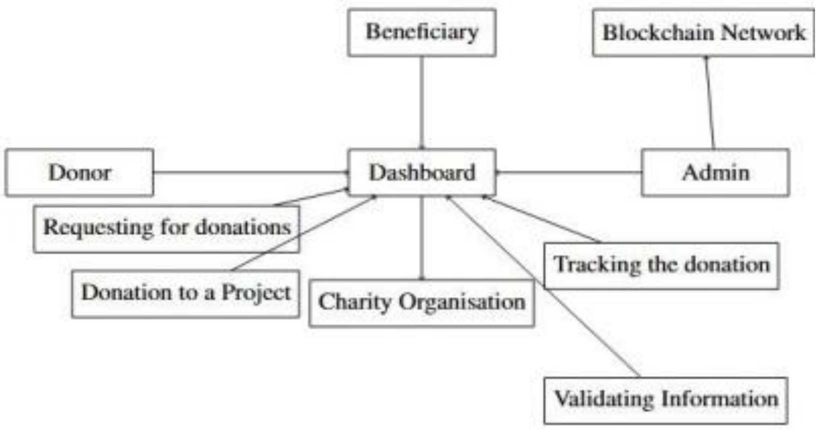


**Fig 2 :Block Diagram for User Registration and Authechtication**

The fig 2. illustrates the overall structure of a blockchain-based crowdfunding platform, showcasing the key participants and their interactions. The central component is the dashboard, which acts as the main interface for donors, beneficiaries, admins, and charity organizations. Donors can request or make donations, while charity organizations are responsible for managing these contributions. Admins play a crucial role in tracking donations, validating information, and ensuring transparency. Additionally, the blockchain network provides a secure and immutable record of transactions, ensuring accountability and preventing fraud.

Users can sign up as beneficiaries or givers (charities, students, startups). In order to be identified and verified, each user needs to register for an account on the site. The integrity of the registration process is guaranteed by robust authentication procedures. In order to engage in fundraising, donors must link their wallet addresses, while receivers can enter their financial requirements or suggestions. Users must go through a verification process to make sure that contributors and recipients are authentic organizations and to stop fraudulent activity.

**b. Campaign Creation and Submission:**

Recipients can launch campaigns to solicit funds or resources, including nonprofits, students, and startup founders. They must provide thorough proposals that specify the objectives, anticipated results, and use of the funding. The system enables the submission of financial plans, project schedules, and documentation. Then, to prevent tampering or alteration, these suggestions are safely saved on the blockchain. Because campaigns are openly listed, contributors can examine and evaluate them before contributing. Transparency in the proposal's specifics fosters trust.

**c. Donor Interaction and Contribution:**

Donors can peruse campaigns by category, including charity causes, education, and entrepreneurship. Before deciding to contribute, they can review the financial requirements and thorough project descriptions. The blockchain keeps track of each donation, guaranteeing total openness in the allocation of funds. Funds can be transferred straight from donors using supported cryptocurrencies to the campaign's blockchain wallet. The implementation of smart contracts ensures a fair and responsible financing process by securely processing donations and releasing monies to the beneficiary upon fulfillment of predetermined conditions.

**d. Transaction Recording and Immutability**

The blockchain keeps track of every donation made on the platform. The immutability of transaction data is guaranteed by this decentralized ledger, which means that once a gift is made, it cannot be changed or removed. Donors may be sure that their money is being spent for the correct purpose because to the blockchain's transparency and verifiability. Without jeopardizing the privacy of people, the ledger includes all donation data, including amounts, timestamps, and the donor's identity. Participants' confidence and accountability are increased by this transparency.

**e. Proof of Stake (PoS) Algorithm:**

The Proof of Stake (PoS) consensus technique is used by the platform to verify and log transactions. PoS is more environmentally friendly than Proof of Work (PoW) since it doesn't require as much energy to verify transactions. The quantity of tokens that validators own and are prepared to "stake" as collateral determines their selection in PoS. Faster transaction processing times are made possible by this, which is essential for the funding system to update in real time. Because validators' staked tokens could be forfeited, PoS makes it financially risky for them to act dishonestly, ensuring security.

**f. Smart Contract Implementation:**

Agreements between donors and recipients are automated and enforced through the use of smart contracts. Predetermined guidelines for money releases are included in these contracts; for example, they guarantee that funds will only be released upon the achievement of particular milestones. For example, a startup might not be able to get funding until they have proven that their product has advanced to a certain point.

Without the need for human interaction, the smart contracts carry out these transactions automatically, guaranteeing that both parties abide by the conditions. This lowers the possibility of fraud, guarantees equity, and boosts platform confidence in general.

**g. Reporting and Transparency Features:**

Both donors and recipients can use comprehensive reporting capabilities on the platform. Donors may monitor the real-time movement of their money, guaranteeing that the use of their contributions is transparent. In order for donors to know how their contribution has affected the initiative, recipients can provide campaign updates and progress reports. Additionally, the platform offers recurring audits, with documents kept publicly accessible on the blockchain. By guaranteeing that all parties involved are kept up to date on the progress of campaigns and the appropriate allocation of funds, this element improves the system's overall credibility.

**h. Architecture Diagram:**

Through a transparent, safe, and decentralized platform, the blockchain-based donation and funding system aims to link charities, companies, and students with possible contributors. The administrator receives suggestions from users with business ideas and educational requirements, verifies them, and develops a smart contract for each campaign. The entire funding process is controlled by this smart contract, which makes sure that money is disbursed automatically when certain requirements, like funding thresholds, are fulfilled. Additionally, charities can include their unique needs, which are handled by the same smart contract system, ensuring consistency and openness throughout all funding initiatives.

The functional flow of the crowdfunding system using blockchain and smart contracts is shown in Fig 3. Donors initiate contributions, which are processed through smart contracts to ensure automatic and transparent execution. When a case is created for a beneficiary in need, trustees evaluate and approve the case. Once approved, funds are allocated to the beneficiary, with the blockchain maintaining a secure record of all transactions. This decentralized approach eliminates intermediaries, enhances transparency,

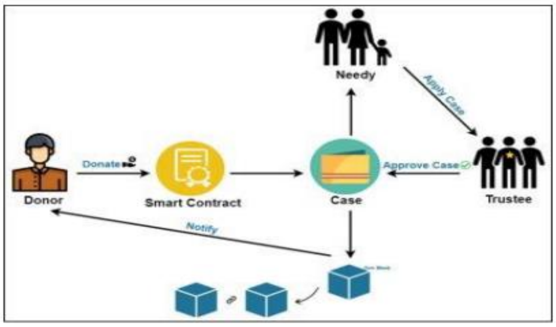


**Fig 3: Crowd Funding Architecture**

Fig. 3 ensures the efficient distribution of funds to those in need.The blockchain ledger, the system's central component, keeps track of every transaction and offers an unchangeable and visible record of all system activity. Each donation is safely recorded on the blockchain, and donors may quickly peruse the campaigns that are accessible and select where to make their contributions. Because both donors and recipients may check the status of transactions, this guarantees reliability. The system is a dependable option for crowdfunding and financial help in entrepreneurship, education, and charity causes since it eliminates middlemen and employs smart contracts to automate the entire fundraising process. This increases efficiency and fosters equity.

**4. RESULT AND DISCUSSION:**

The Proof of Stake (PoS) algorithm and blockchain technology are effectively used in the suggested decentralized funding system to guarantee efficiency, security, and transparency in financial transactions. By automating the allocation of funds, smart contracts make sure that contributions are only disbursed when certain requirements are satisfied. By doing this, the possibility of abuse is removed, and donor-recipient confidence is increased. Furthermore, because blockchain records are immutable, illegal changes cannot be made, guaranteeing total transparency in the distribution of funds. By allowing donors to make direct contributions and empowering businesses, students, and nonprofits to design funding campaigns, the system promotes an equitable and decentralized fundraising ecosystem. The PoS method improves efficiency over conventional Proof of Work (PoW) techniques by lowering energy usage and speeding up transaction validation. The technology offers a simplified and economical method of crowdsourcing by doing away with middlemen. Donors may trace their contributions in real time, and beneficiaries can obtain safe funding right away. Credibility is further increased by the transparency and reporting capabilities, which guarantee that money is spent as planned. The platform becomes more dependable when smart contracts and blockchain-based verification are used because they drastically lower the danger of fraud. The findings show that this system enhances accessibility and inclusivity in financing options in addition to offering a creative way to distribute financial aid. All things considered, this decentralized financing model provides a reliable, scalable, and sustainable method of contemporary crowdfunding.

**a. Stake Proportionality:**

A fundamental idea in the suggested system that makes use of the Proof of Stake (PoS) algorithm is stake proportionality. It guarantees that a participant's likelihood of getting chosen as a validator is directly proportional to the quantity of cryptocurrency they "stake." By providing more possibilities for validation to individuals with larger stakes, this method aligns incentives and incentivizes them to act in the best interests of the network.

$$P_i = \frac{S_i}{\sum_j S_j}$$

where ∑j Sj stands for the total stake in the network, Pi is the likelihood that participant I will be chosen, and Si is the stake that participant I holds. By guaranteeing that those with larger stakes have more sway over the network, this proportional selection technique encourages people to behave honorably in order to safeguard their capital.

Stake proportionality in the Proof of Stake (PoS) algorithm is used in the proposed decentralized financing system to guarantee safe and effective transaction validation. Because validators are chosen according to how much cryptocurrency they stake, individuals who stake more have a better chance of getting picked. Since validators are risking their own money, this approach aligns incentives and promotes integrity and precise verification of donations and fund disbursements. PoS makes the system scalable by enabling faster transaction processing and consuming less energy than Proof of Work (PoW). The platform creates a reliable crowdfunding ecosystem where contributors can trace their contributions clearly and beneficiaries can receive funds efficiently by adopting stake proportionality, which guarantees fairness, security, and decentralization.

**b. Weight-Based Selection:**

Weight-Based Selection in the Proof of Stake (PoS) algorithm is essential to the proposed decentralized finance system's security of ownership records and transaction validation. The method makes sure that long-term participants who have a stake in preserving financial integrity are given priority for validation by taking into account both the stake amount and the staking period. This guarantees an open and reliable funding process by stopping bad actors or transient stakeholders from influencing crowdfunding transactions.

$$P_i = \frac{S_i \times T_i}{\sum_{j=1}^{N} (S_j \times T_j)}$$

Where:

- $T_i$ = Time node $i$ has held the stake (staking duration)

This system prioritizes validators who have shown a sustained commitment, lowering the danger of fraudulent contributions, unlawful fund alterations, and phony campaigns. Furthermore, because committed validators are more likely to act honorably, Weight-Based Selection improves network stability and fortifies the crowdfunding platform's efficiency, security, and dependability.

**c. Reputation Score:**

The Selection Process Based on Weight with The Reputation Score method in the suggested decentralized funding system improves participant security, transparency, and trust. Based on their prior actions, transaction history, and compliance with system guidelines, each validator, contributor, and campaign creator is given a reputation score. Transaction validation is given preference to validators with higher reputation scores, guaranteeing that only dependable and trustworthy users preserve the system's integrity.

By enabling contributors to evaluate the legitimacy of fundraising efforts, the reputation score aids in the reduction of fraud for both campaign producers and funders. This promotes a safe and open crowdfunding ecosystem by thwarting fraud and unlawful fund misuse. Reputation-based validation gradually improves the platform's dependability and efficiency while guaranteeing morally and fairly conducted financial transactions.

$$P_i = \frac{S_i \times T_i \times R_i}{\sum(S_j \times T_j \times R_j)}$$

Where:

- $P_i$ = Probability of selecting validator $i$
- $S_i$ = Stake amount held by validator $i$
- $T_i$ = Time duration the stake has been held
- $R_i$ = Reputation score of validator $i$ (based on past validations and accuracy)
- $\sum(S_j \times T_j \times R_j)$ = Sum of all weighted stakes, considering reputation

### d. Energy Efficiency:

Compared to conventional Proof of Work (PoW) systems, the suggested decentralized funding system greatly improves energy efficiency by utilizing the Proof of Stake (PoS) algorithm. PoS chooses validators according to their stake, removing the need for resource-intensive calculations that are necessary for PoW mining, which demands a significant amount of processing power. This significantly lowers electricity usage, improving the system's economic and environmental sustainability. The platform guarantees sustainable crowdfunding operations by reducing energy demands, enabling users to send and receive money effectively without leaving undue carbon footprints.

$$E_{PoS} \approx S$$

Where:

independent of computational effort.

- $S$ is the staked amount of cryptocurrency,

Additionally, energy-efficient consensus mechanisms enable the system to handle high transaction volumes with minimal delay. Traditional crowdfunding platforms rely on centralized servers, which require significant energy for maintenance and security. In contrast, PoS-based validation distributes workload across stakeholders, ensuring faster transaction processing while maintaining security. This enhances the scalability of the system, allowing it to support a large number of funding requests and contributions without excessive computational costs. By integrating energy-efficient blockchain technology, the system ensures that financial transactions remain secure, transparent, and environmentally responsible. Lower energy consumption translates into reduced operational costs, making crowdfunding more accessible to startups, students, and charities. Additionally, sustainability-focused donors are more likely to trust and engage with a platform that prioritizes eco-friendly blockchain practices. Overall, the PoS-based system strikes a balance between security, efficiency, and sustainability, offering a reliable and energy-conscious solution for decentralized crowdfunding. All things considered, the PoS-based system provides a dependable and energy-efficient decentralized crowdfunding solution by striking a balance between security, efficiency, and sustainability.

### e. Time Efficiency:

By using the Proof of Stake (PoS) algorithm, which drastically cuts down on transaction validation time when compared to Proof of Work (PoW), the suggested decentralized funding system improves time efficiency. PoS chooses validators according to their stake, allowing for fast verification of crowdfunding transactions, in contrast to PoW, which necessitates solving intricate cryptographic challenges. This minimizes the delays sometimes observed in conventional fundraising platforms by guaranteeing that fund contributions, approvals, and withdrawals happen quickly. Additionally, smart contracts remove the need for manual approvals by automating crucial procedures like campaign development, fund allocation, and milestone monitoring. Because of the reduction in processing time brought about by this automation, the funding process is smooth and effective for both donors and recipients. Real-time transaction completion guarantees charities, students, and businesses prompt access to funding.

The time efficiency of PoS can be represented as:

$$T = \frac{1}{\sum_{i=1}^{N} S_i}$$

The technology simplifies fundraising activities and increases accessibility and dependability by cutting down on processing delays and eliminating middlemen. Contributions are instantly reflected on the blockchain thanks to the quick validation and transaction speeds, which improve transparency and trust. In addition to improving user experience, this expedient method offers decentralized crowdfunding a viable and expandable financial help distribution alternative.

**f. Network Contribution (NC):**

Network Contribution (NC) is a key component in improving the security and effectiveness of the Proof of Stake (PoS) algorithm used for digital copyright protection. A validator's active involvement in preserving the blockchain network's integrity, especially with regard to copyright management, is referred to as "network contribution." In addition to validating transactions, validators with high NC also report copyright violations, verify the legitimacy of digital content, and advocate for equitable licensing practices. The PoS algorithm rewards validators who do more for the network than just stake tokens by accounting for NC. This motivates validators to take proactive measures to guarantee that copyright data is precise, open, and shielded from unwanted access.

$$P(\text{Validator}) = \frac{(S \times T) + (C \times NC)}{\sum(S_i \times T_i + C_i \times NC_i)}$$

Where:

- **P(Validator)** is the probability of a validator being selected.
- **S** is the stake amount of the validator.
- **T** is the duration of the validator’s stake.
- **C** is the weight factor assigned to the validator’s Network Contribution.
- **NC** is the Network Contribution, which reflects the validator’s active participation in

The system encourages decentralization and security by implementing NC-based priority, which rewards validators who continuously support network stability with additional validation opportunities. By preventing malevolent actors or dormant stakeholders from affecting the funding process, this technique ensures crowdfunding campaigns are transparent and trustworthy. In the end, NC improves the decentralized finance ecosystem's effectiveness, dependability, and equity.

g. **Geographical Distribution (G):**

The geographical diversity of validators inside the blockchain network is referred to as Geographical Distribution (G) in a Proof of Stake (PoS) algorithm for digital copyright protection. Ensuring that validators are dispersed over various geographic regions improves the network's decentralization and fortifies its security in the context of copyright protection. The approach can lessen the risk of centralization—a situation in which a few entities from particular locations control an excessive lot of the network's validation power—by taking regional dispersion into account.

$$G = \frac{\sum_{i=1}^{n} W_i \cdot D_i}{\sum_{i=1}^{n} W_i}$$

**Where:**

- **G** = Geographical Distribution factor (the overall geographical spread of validators).
- **Wi** = Weight assigned to validator iii, which could be based on the amount of stake, duration of staking, or any other network-specific metric.
- **Di** = Geographical factor for validator iii, which reflects the geographical location of the validator (e.g., distance from the center of the network, or a scoring mechanism based on the diversity of validators’ locations).
- **n** = Total number of validators.

This strategy aids in creating a reliable and effective crowdfunding platform that promotes involvement from a variety of geographical areas while upholding a high standard of security, openness, and equity. Because the crowdfunding platform is decentralized, it is immune to censorship, manipulation, and attacks, creating a reliable environment where backers and campaign creators can trust the system's integrity. As a result, the platform may help with global fundraising initiatives, guaranteeing that users from all over the world can support causes and projects without being concerned about the centralization issues that come with more conventional financing platforms. A global, reliable, and effective crowdfunding ecosystem is eventually achieved by the decentralized crowdfunding system's geographically diverse validators, which not only guarantee fairness in transaction validation but also foster a safe and welcoming environment for managing and confirming contributions.

**h. Latency (L):**

In the context of blockchain-based copyright protection, latency (L) is the interval of time between the start of a copyright-related transaction (such ownership updates, transfers, or registrations) and its ultimate confirmation inside the blockchain network. Reducing latency is essential to guaranteeing the prompt and effective processing of ownership information for digital content in a blockchain-based copyright protection system. Delays in verifying copyright claims due to high latency might expose digital work to plagiarism or illegal usage while it is being validated.

$$L = \frac{T_{\text{block}} + T_{\text{validation}} + T_{\text{propagation}}}{N}$$

Where:

- $T_{\text{block}}$ = Time taken to form a block of transactions (block creation time).
- $T_{\text{validation}}$ = Time taken to validate each transaction or a block of transactions.
- $T_{\text{propagation}}$ = Time taken for the transaction or block to propagate across the network.
- $N$ = Number of validators in the network.

The Proof of Stake (PoS) algorithm and blockchain technology are used in the proposed decentralized crowdfunding system to offer a safe, open, and effective platform for fundraising. Fair and quick transaction validation is ensured by validators who are chosen according to their stake and network contributions. By avoiding regional domination or manipulation, the system promotes geographic variety among validators, improving resilience, security, and global inclusivity. By automating procedures like fund distribution and campaign design, smart contracts save down on operating time. This system provides a reliable and sustainable solution for international crowdfunding projects, guaranteeing equity for all participants with its energy efficiency and stake-based compensation.

## I. IMPLEMENTATION

This project focuses on the implementation of a web-based crowdfunding platform that facilitates transparent and organized fundraising for various causes. The system allows users to submit fundraising campaigns through a structured submission form, including details such as campaign title, duration, target amount, and category. To ensure platform security and trust, an admin panel is integrated to manage user approvals, verifying each registrant before granting access to campaign functionalities. Approved campaigns are displayed in a categorized manner, enabling users to easily browse and support initiatives aligned with their interests. The platform is designed with a user-friendly interface and incorporates basic administrative controls to maintain authenticity and streamline campaign management. This project demonstrates a practical implementation of modern web technologies to address real-world fundraising challenges in an efficient and scalable manner.


**Fig. 4: Campaign submission form**

Fig. 4 showcases the user interface used to submit a crowdfunding campaign. It contains a structured form that allows users to enter key information necessary for initiating a fundraising campaign. The fields include the campaign's title, start and end dates, category selection (such as education, business, health, etc.), a detailed description, and the target amount of funds to be raised. These fields help ensure that each campaign is clearly defined and well-documented before being published on the platform. At the bottom of the form is a submit button, which, when clicked, sends the entered data to the backend for storage and potentially for review or approval. This form is an essential feature, serving as the gateway for campaign creators to engage with potential donors and make their causes visible on the platform.

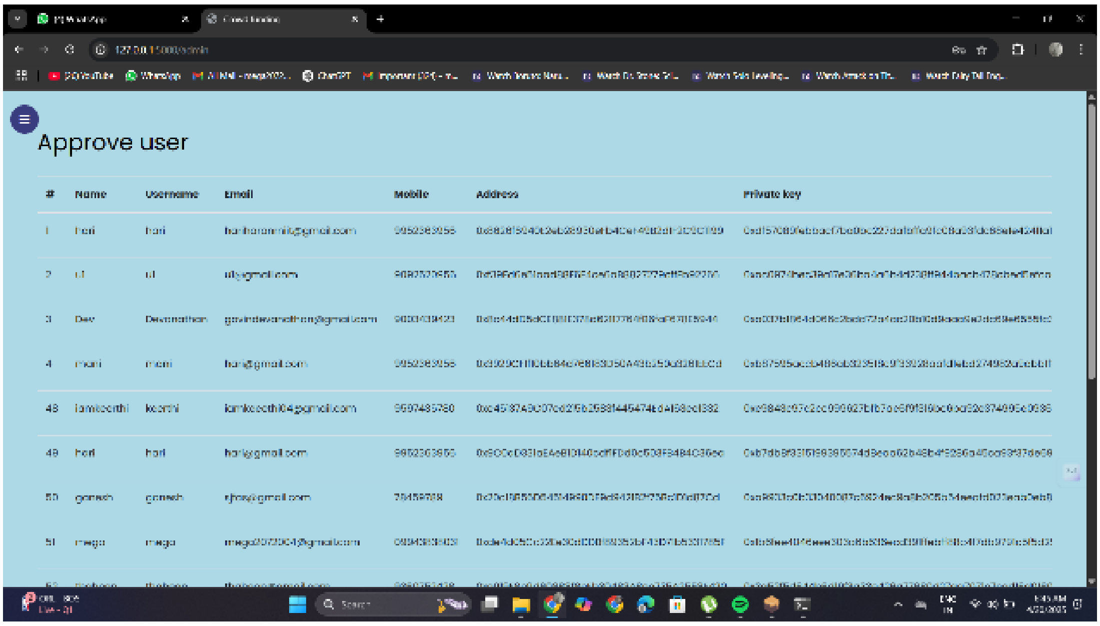


**Fig. 5: Admin user approval panel**

Fig. 5 illustrates the admin interface used for user management and approval. It displays a tabular list of registered users, each row representing a different user along with their details, such as name, surname, email, mobile number, address, and a private key. The private key suggests that the system may be blockchain-integrated, where user identification and secure access are managed using cryptographic keys. This panel allows the admin to verify and approve users before granting them full access to the platform's features. Such a step is crucial for maintaining platform integrity and security, preventing unauthorized or malicious users from submitting fraudulent campaigns or transactions. Though not shown in the figure, the admin likely has action buttons for approving or rejecting user requests directly within the table.

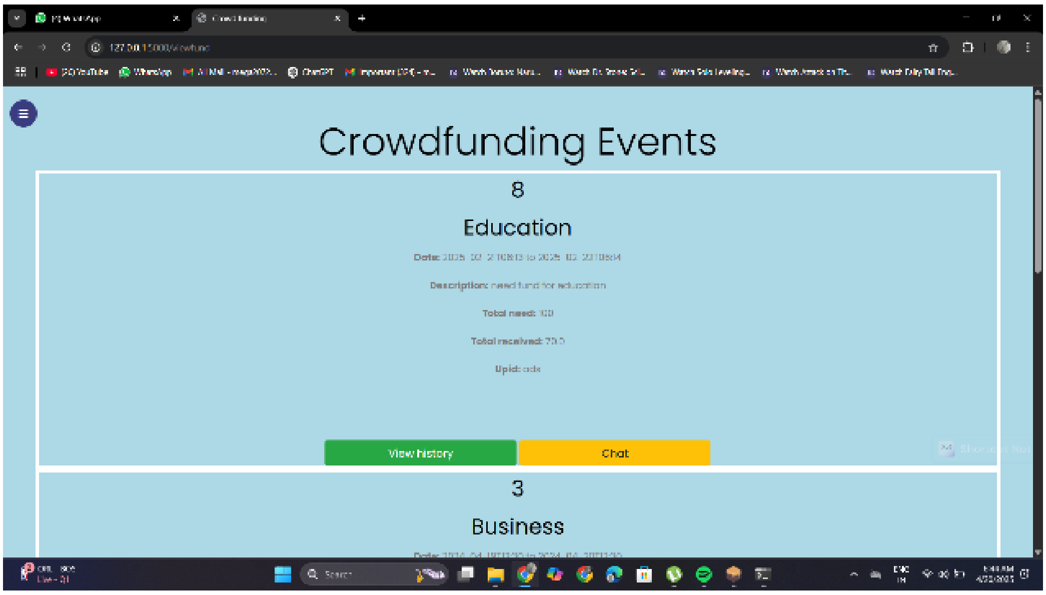


**Fig. 6: Category-wise crowdfunding events display**

Fig. 6 displays how the system organizes and presents crowdfunding events based on their categories. In this example, events under the categories "Education" and "Business" are shown. Each category section includes individual event cards that summarize campaign details such as the event title, description, target fund amount, the amount raised, and the most recent update time. Additionally, each card features action buttons like "View History," which might display a timeline of donations and updates, and "Chat," enabling real-time communication between donors and campaign creators or administrators. This organized view enhances user experience by allowing visitors to explore campaigns relevant to their interests, promoting transparency and encouraging informed donations.

## 5. CONCLUSION

To sum up, the Proof of Stake (PoS) algorithm and blockchain technology in the suggested decentralized funding system solve the main issues with conventional funding methods, including their high energy consumption, inefficiency, and lack of transparency. This method enables charities, entrepreneurs, and students to directly communicate their financial requirements by offering a safe, open, and effective platform, which encourages donor participation and confidence. The PoS method enables faster, more secure transaction validation, while blockchain assures data immutability, prohibiting unwanted adjustments. This approach removes intermediaries, accelerates the funding process, and promotes global accessibility, making it a reliable and sustainable alternative for raising and distributing cash.Future research might concentrate on improving smart contract features for more flexible fundraising channels, using AI-driven analytics to evaluate the likelihood of campaign success, and investigating cross-border compatibility to facilitate international transactions. To further enhance decentralization, the system might also add more diverse validators and sophisticated security features like multi-signature authentication. Finally, for increased usability and scalability, the platform might look into forming alliances with current payment systems

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