secure crowd funding BC

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Secure crowdfunding using blockchain

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***Abstract*—Blockchain technology has emerged as a prominent trend in the te industry, offering a distributed database or ledger system. The power to update the blockchain is shared among th participants or nodes of a public or private network, utilizing distributed ledger technology (DLT). Nodes are incentivized with digl tokens or currency to perform updates on the blockchain. One of the key characteristics of blockchain is immutability, making it resistant to data manipulation. Each block in the blockchain has a unique hash value based on its content, allowing for identification of individual blocks. By relying on consensus protocols across the network of nodes, blockchain maintains a comprehensive record of past transactions. In the context of securities settlement, blockchain can offer advantages over existing systems by ensuring delivery versus payment, linking asset transfers with payments, and operating with a proof-of-work protocol. Notably, faster and more flexible settlement is a significant benefit, although challenges may arise in avoiding settlement failures when participants att t to fork the chain to evade trading losses. Furthermore, blockchain technology has the potential to address the challenges faced by traditional crowdfunding systems, including reliability, transparency, and commissions. Its decentralized architecture provides reliability by distributing the ledger among active participants, allowing users to track data with transparency. Additionally, commissions in blockchain are determined by various factors, but they are not awarded to any central authority; instead, they are given to miners who add blocks to the blockchain network.**

I. Introduction

Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. An asset can be tangible (a house, car, cash, land) or intangible (intellectual property, patents, copyrights, branding). Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved. The article aims to explore the n ways of transactional benefits and different ways how the Proposed stem is different from the existing traditional systems. There's a possibility to improve how blockchain is changing owdfunding just by enhancing the software's functionality. Online crowdfunding enables people to raise funds for their projects. People who are interested in a project can donate by making an online transaction. The donated money goes to the project manager, which he uses to complete the project or to make a product. This existing method of online crowdfunding has a major drawback. It does not allow contributors to have control over the money they have contributed. Since in the existing method, the project manager has all the control over the money contributed he can very easily perform malicious activities. Here we address this problem faced by the existing online crowdfunding platforms by using the Ethereum network and smart contract.

The development of Blockchain technology has allowed businesses to build decentralized models. It has derived new methods to conduc ransactions and make agreements. The main specialty of blockchain is its decentralized nature. It could influence crowdfunding initiatives by cutting down the processing fees. Blockchain doesn't need to engage intermediaries or third parties in financial transactions, so it can make crowdfunding much more affordable for creators.

There's also a possibility that crowdfunding won't have as many limitations as a decentralized network like blockchain. To launch a campaign now, a startup needs to have an audience before fundraising starts. Blockchain-based crowdfunding models could enable creators to start raising funds not on one but on many platforms creating profitable combinations. With blockchain implementation, B2B companies or those who produce servic instead of products will have a big chance for visibility. Bitcoin is a cryptocurrency operated on a peer-to-peer (blockchain) network. Unlike traditional banking and payment systems, Bitcoin is based on decentralized trust; there is no central trusted authority in the Bitcoin system. Trust emerges from the interactions of different participants in the ecosystem. Figure 1 gives an overview of the Bitcoin system. In the Bitcoin system, there is a distributed ledger that stores all Bitcoin transactions. The content of the ledger is replicated across many geographically-distributed processing nodes within the Bitcoin network. We described its operating principles in the sidebar on page 4 in an informal, non-technical way.

A blockchain is a decentralized, distributed ledger that records transactions in a secure and transparent manner. The ledger consists of a ch of blocks, where each block contains a list of transactions. The blockch n is maintained by a network of nodes, or computers, that validate and add new transactions to the ledger.

When a new transaction is initiated, it is broadcast to the network of nodes. Each node verifies the transaction by checking that the sender has suffic t funds and that the transaction adheres to the rules of the blockchain protocol. Once the transaction is validated, it is combined with other transactions to form a new block.

Before a block can be added to the blockchain, it must be verified by the network of node This is done through a process called consensus, where the nodes agree on the validity of the block n some blockchains, like Bitcoin, consensus is achieved through a process called mining, where

nodes compete to solve a complex mathematical problem. The first node to solve the problem gets to add the new block to the blockchain and is rewarded with a certain amount of cryptocurrency.

Once a block is added to the blockchain, it becomes a permanent part of the ledger and cannot be altered or deleted. This creates an immutable record of all the transactions that have occurred on the blockchain. The ledger is also transparent, meaning that anyone can view the transactions on the blockchain, but the identities of the participants are usually anonymous.

Because the blockchain is decentralized, there is no need for a central authority to manage the ledger. This makes it more secure than traditional databases, as there is no single point of failure or vulnerability. Additionally, the blockchain is designed to be tamper-proof, since changing a single block in the chain would require altering every subsequent block, which is practically impossible.

Overall, blockchain technology has the potential to revolutionize many industries by enabling secure, transparent, and decentralized transactions

II. Related Work

In Blockchain-Enabled Equity Crowdfunding for Energy Storage Investments, the author UCali and others[1] conducted a study on blockchain-based crowdfunding energy storage systems the idea was to compare the traditional crowdfunding system with the blockchain-based system and identify what are the advantages of it some of them are, there's no intermediate between the investors and the fundraiser because of decentralization and because of the immutable ledger the investors can keep track of records.

In [6] the authors addressed the fraud activities carried out by the fundraiser so they implemented a system on the Ethereum network which enables the exchange of money transparently as discussed above[1] the blockchain enables transparency of transactions which can help investors track the fundraisers activity. In article [7] the authors extended the scope of the existing blockchain-based system by implementing a voting system for withdrawal of funds. The idea was whenever a fundraiser wants a fund they had to create a request and investors will vote for it and a percentage of the fund will be given to the fundraiser.

The authors from [11] article implemented a KYC system so that they can identify the business or person who owns the business which could help in preventing fraud activities on the platform. The KYC system helped in such a way that only verified business owners can only register to the platform and the investors can easily take legal action against the owners if any fraudulent activity takes place.

In[2] the authors proposed a system of securely sharing the file over IPFS and the hash was encrypted using a shared AES algorithm and stored on the smart contract and the file owner can easily share the file with the specific user. The IPFS file system has its own database which keeps a record of the user's Public Key with whom the file can be shared.

In the article [13] "Keep Your Promise: Mechanism Design Against Free-Riding and False-Reporting in Crowdsourcing, the author states about an important problem that arises in current crowdsourcing mechanisms on how to ensure that users pay or receive what they deserve. In this paper, the technological aspect is related to Free-riding and false reporting that makes the system vulnerable to dishonest users. If the payment is made before the provider starts to work, a provider always has the incentive to take the payment and devote no effort to complete the task, which is known as freeriding. If the payment is made after the provider completes its work, the requestor always has the incentive to refuse the payment by lying about the status of this task, which is known as false reporting. The author designs two schemes to tackle this problem i.e EFF and DFF.

EFF scheme which eliminates dishonest behavior with the help of a trusted third party for arbitration. Another mechanism DFF, without help from any third party, discourages dishonest behavior. The advantage of EFF is that dishonest behavior has been eliminated, while the only disadvantage is from DFF which is semi-truthful as it can be proved false sometimes.

In the article[14] "FarmFund - A Blockchain-based Crowdfunding App for Farmers", the author has represented its objective to develop a blockchain-based money lending system to improve the livelihood of Farmers. The system is designed in a way that the reputation system is based on a credit system for farmers, allowing investors to make correct and informed decisions. This type of implementation includes a front-end interface where users can interact with the blockchain and participate in transactions an Ethereum blockchain to run the application platform, a smart contracts that contain functions that can be called via the front end. The Web3 and Metamask are used for interaction with Ethereum nodes and performing transactions through a wallet.

Its usefulness or advantage is because of the Matic Network that uses the Plasma framework and Proof of Stake consensus. Here the Plasma framework is used to ensure asset security. A drawback here is that the farmers find it difficult to use cryptocurrency as a complex form of payment, and the lack of support for regional languages could result in fraud or scams.

In this paper[15] "Toward a Blockchain-Enabled Crowdsourcing Platform", there are mentions of Blockchain's specific inherent characteristics, such as enhanced integrity and tamper-proof operation. These are embedded in

to study how they can increase the performance of a novel crowdsourcing platform. This paper addresses the weaknesses of crowdsourcing systems, this way boosting their attractiveness. The main features of these are decentralized and distributed ledger storage and integrity, the ledger is irreversible and immutable and also respects privacy. The main weakness or weaklings are crowdsourcing systems have been the victim of a number of cyber attacks, most of which aimed to compromise and steal data or render systems unavailable.

The article "NF-Crowd: Near-free Blockchain-based Crowdsourcing" [16] provides a reliable solution that decouples the cost of decentralizing crowdsourcing from the scale of the crowd. The objective is to support complex multi-participant multi-round smart contracts without losing the never abort property. Current implementations of decentralized crowdsourcing suffer from fundamental scalability limitations by requiring all participants to pay a small transaction fee every time they interact with the blockchain. In addition, the NF-Crowd protocols for CC-OCR projects have been implemented in Ethereum, so they are ready to use. NF-Crowd is a highly reliable solution for scaling decentralized crowdsourcing. We prove that as long as participants of a project powered by NF-Crowd are rational, the O(1) lower bound of cost could be reached regardless of the scale of the crowd. It is possible that a dishonest participant uploads data twice, the first time via off-chain aggregation and the second time via on-chain aggregation.

The paper "Tracking the Digital Evolution of Entrepreneurial Finance: The Interplay Between Crowdfunding, Blockchain Technologies, Cryptocurrencies, and Initial Coin Offerings" [17] aims to evaluate the relationship between crowdfunding, blockchain technologies, cryptocurrencies, and ICOs through the use of social media analytics (SMA). SMA is an innovative methodology that enables us to monitor public discussions about crowdfunding, blockchain, cryptocurrencies, and ICOs on social media. By employing SMA, this article aims to provide insight into the interplay between these topics in the social media landscape. By using social media analytics, a total of 197,770 captured posts across social media platforms have been collected and analyzed. The results illustrate that discussions on blockchain technologies dominated the interplay in the first analyzed time period, that discussions on cryptocurrencies and ICOs dominated the interplay in the second analyzed time period, while discussions concerning blockchain technologies, cryptocurrencies, and ICOs highly converge in the third time period. One of the features is that in this system one can get an idea of the ICO generation and can be identified if the group is interested in Blockchain, cryptocurrencies. Exploring their differences within 3 periods which is the least amount of time. The collected data sets solely contain user-generated content published in English. This means that the study is limited to the interplay among English-speaking users of social media. Discourses in other languages and in specific national settings might very well differ substantially from the English discourse.

In the paper [18]the author discusses The rapid growth of the Internet of Things (IoT) raises security and privacy concerns, and traditional access control mechanisms like DAC and MAC have limitations. Blockchain technology offers a decentralized and immutable solution for access control in IoT. This paper reviews different access control mechanisms, compares their scalability, distribution, security, user-centricity, privacy, and policy enforcing, and highlights future research directions and challenges for developing decentralized access control mechanisms for IoT.

In paper [19] the rise in popularity of blockchain, which followed the sudden surge of Bitcoin, has opened up a plethora of opportunities for its implementation in various sectors. One such area where blockchain can revolutionize the existing system is grievance redressal. In this system, the grievant would file a complaint, which would undergo multiple levels of hierarchical scrutiny by authorized personnel. Each screening level would have the power to either resolve the grievance, forward it to higher authorities or reject it altogether. As blockchain inherently provides data integrity, it minimizes the possibility of any misuse or abuse of power by the authorities. Additionally, the system's dynamic time threshold automatically escalates the grievance to the higher-ups, ensuring that it does not get ignored. Thus, blockchain-based grievance redressal systems have the potential to address the inadequacies of the current system.

III. Methodology

From the reference observed in one of the article, we saw that the problem lies in accurately time-stamping the data, rather than the storage medium. To address this issue, we have implemented a set of practical computational procedures for digital time-stamping that ensure it is virtually impossible for any user to manipulate the date either backward or forwards.

Then there is the traditional system where there was an intermediary between Fundraisers and Investors, which in our system because of immutable ledger the issue has been addressed.

We also have addressed the fraud activities carried out by the fundraisers in the traditional systems where they used to misuse the amount contributed by investors for personal uses instead of the Campaign/Project. Wherein we have implemented the area where we can know in what area the fundraiser is going to use the money after the approval from the Investors.

In traditional system the contributed amount was directly credited into the Fundraisers account without any proper information of where the funds will be use. Also after referring multiple article on implementation of blockchain

based crowdfunding system there issue with the Amount handling, Tracking progress of the project and some of them were created for NGOs as well which does not keep track of identity of NGO.

Keeping in mind all the drawbacks in other blockchain system we implemented a crowdfunding platform for organisation or startups to raise funds for their projects or product by implementing secure control over funded amount and keeping track of project and expenditure of the fundraiser.

To control the spendthrift we have kept the Funding Approval request, where more than 50 percent Investors are required to vote for that Campaigns Funding then only the Fundraiser will receive the Targeted amount he requested for. While requesting the fundraiser has to submit a consent from client or progress of project to create a new request.

The consent from client or we can say testimony to prove the progress will be shared in file and these files will be stored securely on IPFS. In our proposed system we have improvised the securely sharing the file over IPFS and the hash. The IPFS file system has its own database which keeps a record of the user's Public Key with whom the file can be shared.

Below we have explained each and every module of our implemented system in different parts

Campaign Creation:- In the first module, the fundraiser will create a campaign and provide basic details about the project. The fundraiser will also submit in-depth information about the campaign, including the minimum amount required to start the project, the targeted amount of funds the fundraiser is seeking, the final deadline to raise the funds, and the interval in which the fundraiser plans to withdraw the funds. These information will be stored in form of solidity events and all the data would be available on the data till the smart contract is present on the network. Each and every project will be assigned with a new address or contract with certain operations associated with them.

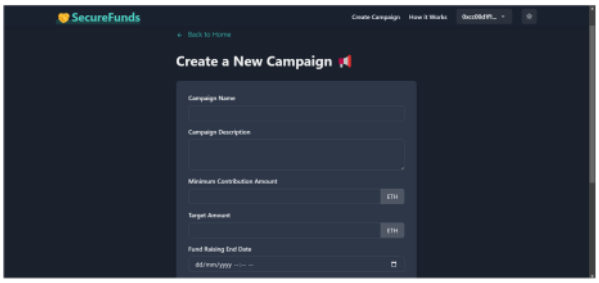

Fig. 1: Campaign Creation

Fund campaign:- All the data stored in events will be fetched and display to the everyone connected on the network,

Fig. 2: Campaign Details

investors who have expressed interest in the project can choose to fund it by sending their contributions to a smart contract wallet. We have restricted the fundraiser to contribute to the project because during time of voting the fundraiser can get votes in their favour by acting as a investor. In this we have kept 3 states to manage the fundraising process and these states are "Open Campaigns", "Successful Campaigns", and "Closed Campaigns". As the name suggest the open campaign is used for denoting that campaign is currently raising fund. Successful campaigns denote the target amount has been reached and now it will not raise any funds and user can only place withdraw request when it goes successful. Last Closed campaigns which means that target was not completed and the fundraising deadline has been passed and now it cannot raise any fund and if there's any investor invested in the project can request for the invested funds.

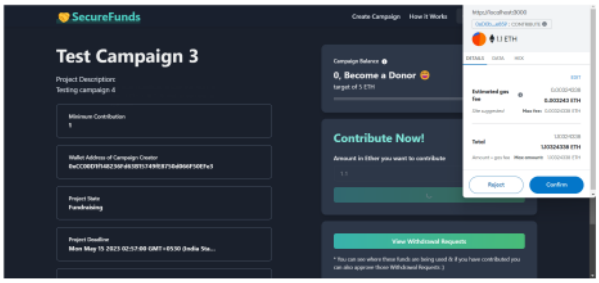

Fig. 3: Fund Campaign

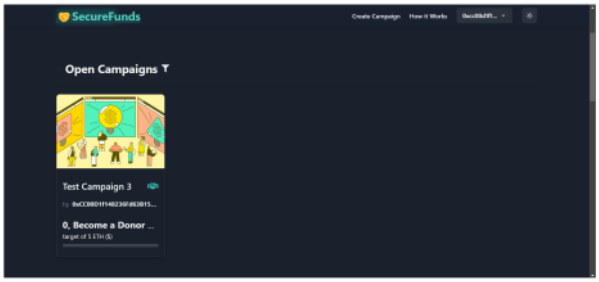

Fig. 4: Open Campaigns

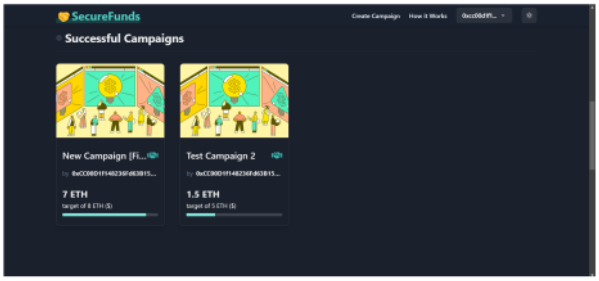

Fig. 5: Successful Campaign

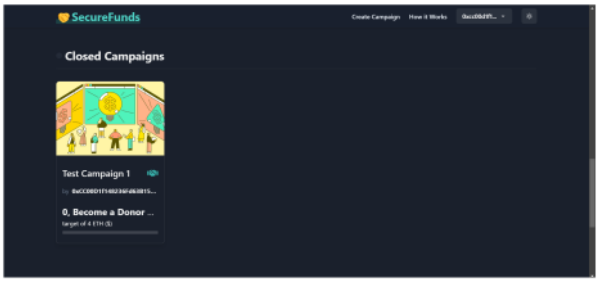

Fig. 6: Closed Campaign

Request for fund:- As explained above the user can only request for funds after the campaign successfully gathered the targeted amount. For creating a request the user will have to give details about why they want funds in detail. Then they have to enter the amount they want to withdraw and it should be less than 50% of the target target amount to avoid one time withdrawal of the amount. To easily trace the expenditure the use will have to enter the recipient wallet address where they want to withdraw the funds. At last the user will have to upload the testimony or the proof of project or the work done will be submitted on the IPFS. After successful upload of the testimony the user will be able to create request for funds. The created request will be stored in the form of solidity events and the data will be visible to everyone on the network.

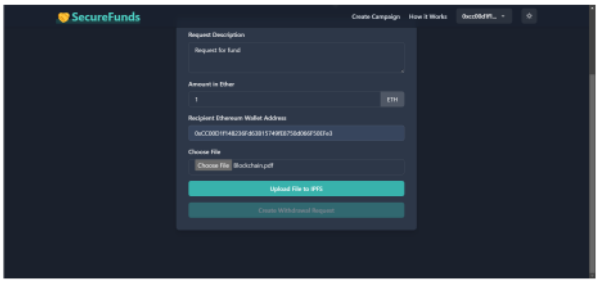

Fig. 7: Create Withdraw Request

Voting for withdrawal:- When a fundraiser has successfully reached their funding goal, they will need to initiate a withdrawal request to receive the funds they have raised.

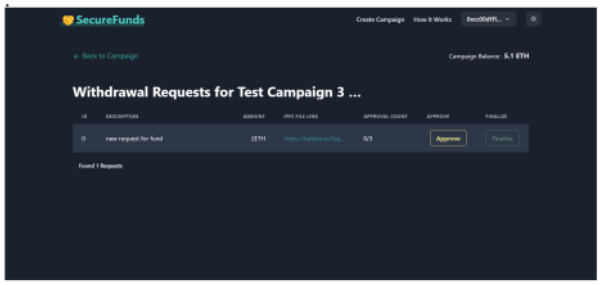

Fig. 8: View Withdraw Request

This is done through the platform's interface, which guides the fundraiser through the necessary steps. In the withdrawal request phase, the fundraiser must upload a file that serves as proof of their work and the funds they have raised. This file must be stored in IPFS, a decentralized file storage system that ensures the security and integrity of the data. The file should contain a detailed description of the fundraiser's work and the reasons why they need additional funding to complete their project. They should also provide a breakdown of how they have used the funds previously received, including any expenses incurred. To prevent duplicates, the platform generates a unique hash for each file uploaded. If the fundraiser attempts to upload the same file without making any changes, the system will detect the duplicate file and prevent the upload.

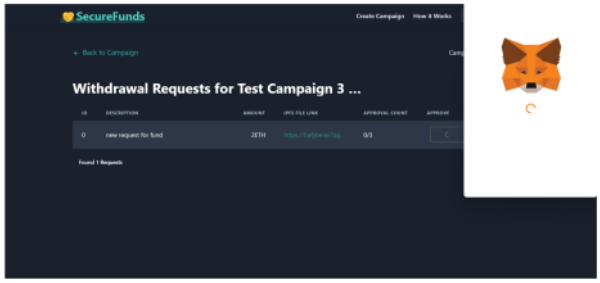

Fig. 9: Approve Withdrawal Request

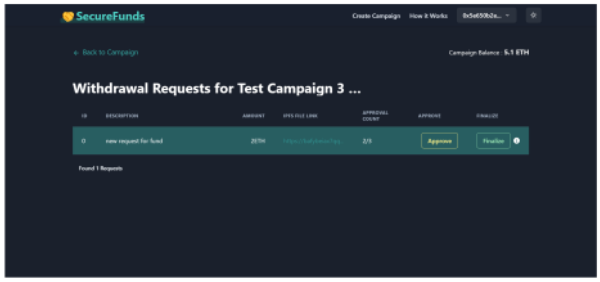

Fig. 10: Ready To Finalize Funds

The fourth module is the voting for withdrawal phase, which is the final step in the fundraising process. In this

phase, investors have the opportunity to review the fundraiser's proof of work and decide whether to approve or deny the withdrawal request. Investors can view the proof of work that the fundraiser has uploaded, which includes a detailed description of the work being done, the amount of funds requested, and how the funds will be used. Investors can review the proof of work to determine whether it is valid or not. They can also view the number of approvals and denials that have been made by other investors. This provides investors with an opportunity to consider the opinions of their peers before casting their own vote. Once investors have reviewed the proof of work and made their decision, they can vote to either approve or deny the withdrawal request. It is important to note that once investors have cast their vote, they cannot change it. All relevant information, including the request ID, recipient ID, and description of the withdrawal request, is provided to investors to help ensure that they are making an informed decision. If the fundraiser receives more than 50percent of the majority votes in favor of the withdrawal request, they are permitted to withdraw the funds. This ensures that there is a clear majority in favor of the request, helping to provide confidence that the funds are being used for their intended purpose.

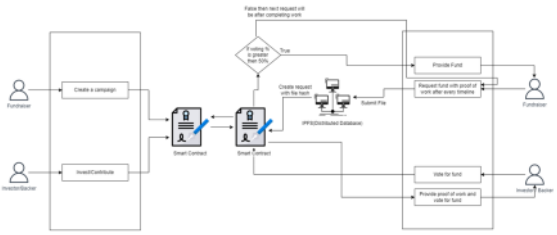

Fig. 11: implementation overview

IV. Results and Discussion

The integration of blockchain technology in crowdfunding has yielded notable improvements in terms of efficiency and transparency. The immutability and decentralized nature of blockchain ensure tamper-proof transaction records, minimizing the risk of fraud. Participants can track the progress of campaigns in real-time, facilitating transparency and trust among stakeholders. The elimination of intermediaries reduces transaction costs, enabling more funds to reach the projects or causes.

By leveraging blockchain, crowdfunding becomes more accessible to a global audience. Blockchain-based crowdfunding platforms remove geographical barriers and allow contributors from different parts of the world to participate in campaigns. This increased accessibility broadens the potential donor base and enhances the chances of project success.

The transaction cost user has to spent is in the form of gas to mine block on blockchain network. We had recorded the total gas spent and created charts with the average gas spent to perform an action on the network.

The Below given chart shows the average gas spent for creating campaign, Average gas spent for creating a withdraw request and gas used for withdrawing the requested amount.

After Comparing it with traditional commission based model we can say that the blockchain based crowdfunding is more helpful for startups and organization. Also we recorded the

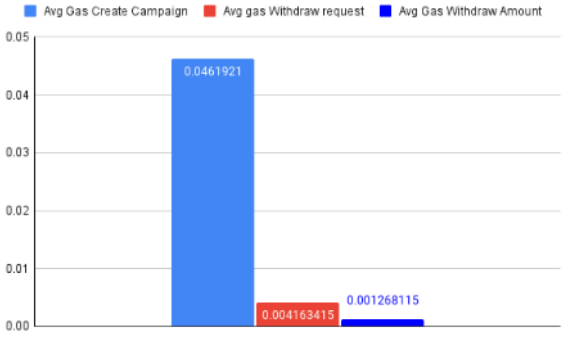

Fig. 12: Average Gas Spent by Fundraiser

total gas spent from investor side to get a precise result of how much gas is actually required to go through the life cycle of the crowdfunding. The average gas spent from investor side is for funding campaign and approving request for funds.

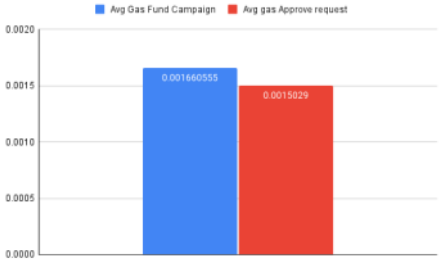

Fig. 13: Average Gas Spent by Investor

After checki the complete life cycle and recording entire amount spent the main aim of our project to increase the success of campaign. All data was fetched from the system and a chart was created to get the proper success rate of the campaigns in our system.

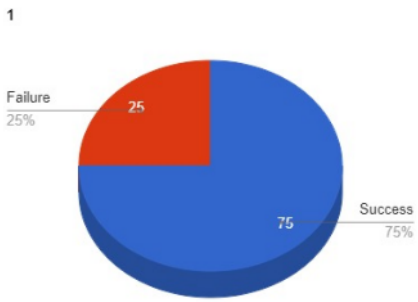

Fig. 14: Success Rate of Campaigns

V. Conclusion

In conclusion, our proposed system of "Secure Crowdfunding Using Blockchain" leverages the power of blockchain technology to address the challenges of fraudulent activities in crowdfunding campaigns. By utilizing the decentralized and transparent nature of blockchain, we have developed a system that enhances security, accountability, and trust in the crowdfunding process.

Through the implementation of smart contracts and the utilization of IPFS for secure file storage, our system ensures that funds raised for campaigns are managed and allocated in a transparent manner. The use of blockchain technology provides a tamper-proof and immutable ledger of transactions, reducing the risk of fraud and manipulation.

By incorporating a voting mechanism for withdrawal requests, our system enables investors to participate in the decision-making process and ensures that funds are being utilized for their intended purpose. This democratic approach enhances transparency and accountability, instilling confidence among participants.

The introduction of unique file hashing and duplicate detection mechanisms prevents the submission of duplicate files, further enhancing the integrity and authenticity of the proof of work provided by fundraisers. This feature adds an additional layer of security to the system.

Overall, our system offers a reliable and secure platform for crowdfunding campaigns, mitigating the risks associated with fraudulent activities. It promotes transparency, accountability, and trust, creating a conducive environment for both fundraisers and investors.

While our proposed system focuses specifically on addressing fraudulent activities in crowdfunding campaigns, the underlying principles of blockchain technology can be extended to various other domains and industries. The decentralized and transparent nature of blockchain has the potential to disrupt traditional systems and provide innovative solutions to complex problems.

In conclusion, "Secure Crowdfunding Using Blockchain" presents a promising approach to enhancing the security and transparency of crowdfunding. By leveraging the capabilities of blockchain technology, we have created a system that not only addresses the challenges of fraud but also promotes trust and accountability. The successful implementation of our system can contribute to the growth and development of the crowdfunding ecosystem, benefiting fundraisers, investors, and the overall economy.

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