

Decentralized Crowdfunding Platform for Startup Initiatives: Utilizing Blockchain for Transparent Fund Allocation

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I. INTRODUCTION

In today's world, as science and technology advance at an extraordinary pace, the needs of society have evolved significantly. There is a growing number of individuals with innovative ideas who aim to merge their deep expertise with these emerging needs. This trend has sparked the rise of startups.

Startups operate differently from traditional companies, with a strong focus on innovation and cutting-edge technologies. Even non-profit startups, which aren't primarily driven by profit, aim to lead in technological advancement. However, startups face similar challenges to large corporations in the global market, such as inflation. Unlike established companies that can rely on profit-oriented strategies for stability, startups often find themselves in more precarious positions.

This instability can hinder startups financially, in terms of resources, and in advertising efforts. To address these challenges, some solutions have emerged, such as community support and volunteer work.

To fulfill their advertising, funding, and organizational requirements, startups often leverage various online platforms such as websites and blogs. These platforms serve as channels to promote the products they plan to develop. Especially for innovative startups facing financial constraints, these channels also serve as avenues to raise donations. If the donations reach a sufficient amount within a reasonable timeframe, the startup can initiate product development, leading to the creation of real-life prototypes. Donors may be granted early access to and ownership of the product if it is successfully developed.

We should mention that such systems may come with several challenges. One of these challenges is ensuring that funds obtained from donations are used appropriately and in reasonable proportions for purposes related to the product. Ensuring this condition is critical for the effective functioning of the system.

Another issue is that the development phase may not commence actively until the funds raised by the campaign reach a certain minimum threshold. When this situation arises, participants may feel concerned that their donations or investments are left in limbo.

We've noted that startups pursue innovative projects. However, guaranteeing that every project developed will truly be innovative is challenging. In the early years of Kickstarter's development, as we are going to discuss Kickstarter in more details in the related works section, many projects were canceled due to these issues [1]. The possibility that a significant portion of projects may fail to deliver on their promised innovation can indicate that the collected donations do not effectively serve their intended purpose..

Blockchain is a technology that can continuously store records, present transactions transparently, and enable them to be approved by different parties. Due to its decentralized nature, it is widely used in fields such as finance and supply chain management. As mentioned in [2], blockchain can play a significant role in the operations of startups. This is because blockchain ensures transparent and immutable transactions, forming the basis of democratic activities. Detection of malicious transactions can be facilitated, and such occurrences can be prevented through smart contracts.

There are platforms used for traditional crowdfunding in today's world, however, a large portion of them suffer from the problems listed above. Traditional crowdfunding systems consist of centralized systems or networks. An error on a single node in the network structure affects the entire system, and they have vulnerabilities to DDoS attacks. On the other hand, it can be said that their structure is simpler compared to the blockchain structure, making it easier to develop and rid of errors. Despite the serious transparency and security issues that the traditional method needs to deal with, the choice between using blockchain or sticking with the traditional method is optional.

We believe that the problems outlined in the previous paragraphs can be addressed by designing a distributed system with blockchain. In this article, we will explore how blockchain can be utilized to design a system that addresses the aforementioned problems.

A. Related Works

Blockchain aims to ensure data consistency by creating a distributed database. It establishes a trust mechanism among participants through transaction transparency. The application areas of blockchain are expanding day by day. With the implementation of blockchain, crowdfunding has gained a new dimension for startups. [3] The study presents a comparison between traditional and blockchain-based crowdfunding tools, listing the advantages provided by blockchain.

There are many options that fulfill the task of crowdfunding.[4] Kickstarter was established to enable individuals to promote their projects and raise donations for them. This blockchain-based website allocates only 5% of the total donation amount to website providers and employees. On the other hand, another blockchain-based application serving the same purpose as Kickstarter is

FundRazr [5]. FundRazr charges a transaction fee of 2.9% plus \$0.3, and with the FundRazr Pro plan, a control mechanism is added to share this transaction fee among the donors. Additionally,[5,6] Patreon emerges for developing creative projects. Compared to others, Patreon is a more flexible blockchain-based application with additional features such as flexible payments, project management, and customer support. Since it's not feasible to describe and compare all similar platforms here, the necessary references for research have been added to the references section [7, 8, 9, 10, 11, 12, 13, 14, 15, 16,17].

II. PROBLEM FORMULATION

In the introduction, we present a solution to the problems mentioned using blockchain technology. This solution is realized through a distributed campaign funding system. The problem formulation consists of three main components: the organizer, the confirmator, and the platform. The organizer is the person who promotes the campaign, collects donations, and creates the campaign. They also determine the minimum threshold that each participant must pay and the deadline for the project to proceed to the development stage. Confirmators are individuals who have made payments equal to or greater than the minimum threshold required to participate in the campaign. Confirmators are not only donors but also actively contribute to the progress of the project. The platform is a structure where campaigns are presented and includes a database, typically referred to as a mobile application or website.

It's worth noting that implementing such systems can pose several challenges. One key challenge is ensuring the appropriate allocation of funds obtained through donations, ensuring they are used in line with the product's objectives. This is vital for the system's efficacy.

Additionally, the commencement of the development phase may be delayed until the campaign reaches a minimum funding threshold. This delay may leave participants feeling uncertain about the progress of their contributions.

While startups strive for innovation, ensuring that every project delivers true innovation presents its own set of challenges. Many projects faced cancellation due to this issue. This raises concerns that a significant portion of projects may not fulfill their promise of innovation, potentially undermining the intended purpose of the collected donations.

Blockchain technology, with its ability to securely record transactions and facilitate transparent approval processes, holds promise for addressing these challenges. Its decentralized nature lends itself well to ensuring transparency and preventing malicious activities. Incorporating blockchain can thus enhance the integrity and effectiveness of startup operations, providing a secure foundation for transparent and democratic transactions.

A. Security Model

In this section, we present explanations of security vulnerabilities that may arise due to active positions while designing our blockchain-based application,

along with how these can be addressed.

1. Against Malicious Organizers

Let's consider a scenario where a malicious organizer attempts to gain unfair profits through the platform. In this case, the organizer may create a fake campaign and intend to spend the received donations as they wish. However, blockchain technology can prevent this situation. With the use of smart contracts, each expenditure can be voted on by confirmators to determine its validity before execution. If the transaction does not receive enough approvals, it is considered invalid. If the transaction receives enough approvals, it is deemed valid, and the organizer can then send the cryptocurrency to the funding provider. This approach not only shifts decision-making power from the organizer to a more democratic process but also provides a more secure system.

2. Against Malicious Confirmators

Let's consider a malicious participant. In this case, it is crucial for each donor to remain independent because otherwise a malicious participant could manipulate the voting system by creating various accounts, leading to biased voting outcomes. In this scenario, the malicious participant could be the organizer of another campaign who aims to sabotage a competing campaign by exploiting this method. To prevent such situations, each participant can be encouraged to register on the platform using unique keys generated through cryptographic hash functions to protect their personal information while ensuring the integrity of the system. The registration process for the platform is public; each individual can register without the permission of another actor, but each member must be distinct from one another.

3. Against Non-Innovative Campaigns

Let's consider the scenario where non-innovative campaigns, or campaigns that are largely or entirely copied from other campaigns, are created. This situation is crucial because it might lead startups to deviate from their main objectives and serve the profit-driven visions of corporations. It could result in a departure from innovative vision and a decrease in innovation. To address this, a blockchain-based approach can be utilized. This approach has been discussed in [18], revealing that combining various sources such as data analysis, trend analysis, and patent data is essential to evaluate the development of a technology. It highlights the importance of hybrid or multi-hybrid approaches in assessing future perspectives and research areas more systematically.

4. Time-over Voting Problem and Identity Privacy

Each campaign development stage has a time limit. Users may request to reclaim the amount they donated after this time limit has passed. Any participant can initiate a vote on this matter. When a sufficient number of votes are collected, users can reclaim their donated amount. However, if the votes are insufficient, the timeout vote is considered unsuccessful, and the campaign can continue to collect donations. Since users' private information is kept confidential, identity concerns are eliminated. This democratic approach, facilitated

through blockchain, liberates authority from being held by a single entity.

5. Against Biased Voting Due to High Donation Amounts

In a campaign, if a malicious donor makes a very high donation, it may lead to biased voting. In such a scenario, a smaller group of participants may still be able to meet the minimum donation requirement for the campaign. However, having fewer participants in this situation could mean that the malicious donor's influence in the voting process becomes disproportionately larger. This situation is crucial to prevent because having the organizer of another competing campaign participating as a voter in this campaign raises concerns about biased voting. To prevent such situations, a standard donation ratio could be established, or a maximum payment amount could be set.

6. Continuous Demand and Voting Problem

Presenting all actions to be carried out by the organizer for voting and waiting for everyone to complete the voting may not be an effective method in terms of process management. For the solution of this problem, we propose an approach that controls two situations. Firstly, if the amount of cryptocurrency to be sent is above a certain threshold, it should be presented for voting. Secondly, if similar individuals have been sent transactions before, it should be presented for voting. The system should be able to complete other transactions without creating a voting process. Utilizing the transparency of blockchain transactions can prevent this problem. This approach aims to prevent unnecessary delays in voting while focusing on ensuring community participation by presenting significant transactions for voting.

B. Transactions in Our System

In this section, we describe some key functions present in the prototype we have developed.

Create Campaign Function

The Organizer needs to utilize certain functions in the design to create a campaign. When wanting to create a campaign, you first access Campaign-Generator and create the desired number of campaigns with createCampaign. Once the campaigns are created, we need a function with access to them to list and classify them. We can also get the list of all created campaigns with the getCreatedCampaigns function. This flow visualizes, in Figure1, the flow diagram of campaign creation by the organizer and the listing of campaigns in memory.

Contribute Function

The organizer is the person who initiates and has access to the campaign. All confirmators except the organizer can contribute to the campaign with the contribute function. This flow is also conveyed in the visual, in Figure2, and the campaign is managed as a mutually beneficial relationship.

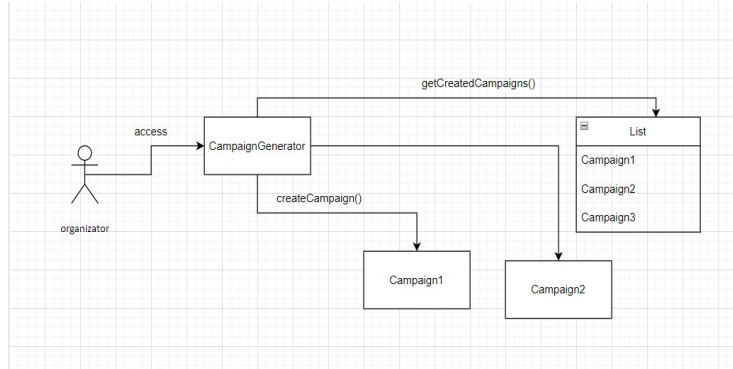


Figure 1: 'createCampaign' function.

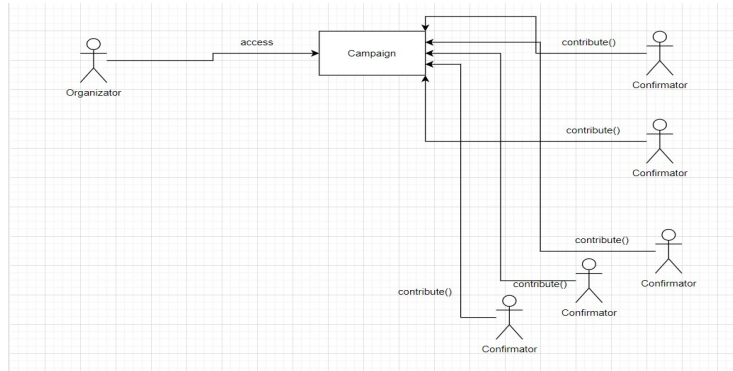


Figure 2: 'contribute' function.

Create Demand, Confirm Demand and Finalize Demand Functions

A demand can be created for each campaign, but it must be approved by the confirmators community; otherwise, it cannot be processed. Confirmators can vote for demand only once with the confirmDemand function. If the result of this voting is not valid, it will not be processed. If it is valid, it will be forwarded to the organizer, who will have the right to apply this process to the campaign. This information is also shared with receivers. This flow helps to visualize ,in Figure3, and explain how the demand structure in a campaign works.

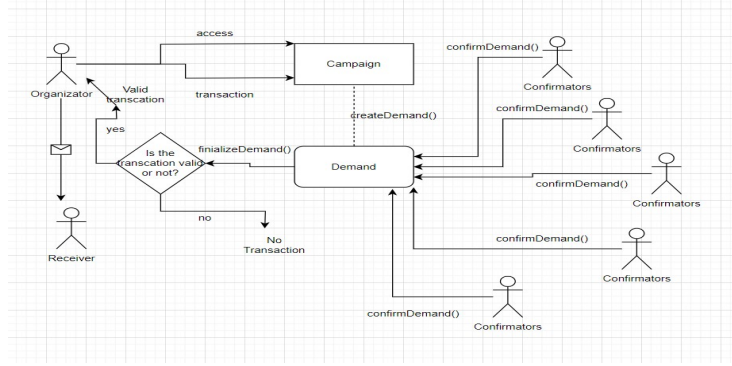


Figure 3: 'createDemand', 'confirmDemand' and 'finalizeDemand' functions.

III. CONCLUSION

In conclusion, the advent of startups in the modern era has brought forth a wave of innovation and creativity aimed at addressing evolving societal needs. However, startups often face significant challenges, including financial instability and the risk of project cancellation. Traditional fundraising methods and platforms have provided some relief but are not without their limitations, particularly regarding transparency, fund allocation, and security.

The proposal presented here introduces a decentralized crowdfunding platform for startup initiatives, leveraging blockchain technology to address these shortcomings. By harnessing the power of blockchain, we can establish a transparent, democratic, and secure ecosystem for crowdfunding campaigns. Blockchain's decentralized nature ensures transparency in transactions, fostering trust among participants and mitigating the risk of fraudulent activities.

One of the key advantages of incorporating blockchain into crowdfunding is the implementation of smart contracts. These contracts enable automated, transparent, and tamper-proof execution of transactions, ensuring that funds are allocated appropriately and in line with the project's objectives. Through smart contracts, the decision-making process is democratized, shifting power from centralized authorities to the community of campaign participants.

Moreover, blockchain provides robust security measures against malicious actors, both organizers and confirmators, safeguarding the integrity of the crowdfunding platform. By employing cryptographic techniques and consensus mechanisms, blockchain ensures the privacy and autonomy of participants while preventing manipulation and biased voting.

Furthermore, blockchain technology facilitates the evaluation of campaign authenticity and innovation, thereby minimizing the risk of non-innovative or fraudulent projects. By leveraging data analysis and trend tracking, blockchain-based crowdfunding platforms can foster genuine innovation and support projects aligned with their intended objectives.

In summary, the proposed decentralized crowdfunding platform offers a promising solution to the challenges faced by startups in raising funds and executing projects. By harnessing the transparency, security, and democratization capabilities of blockchain technology, this platform empowers entrepreneurs, investors, and the community at large to collaborate effectively in driving innovation and societal progress.

As we continue to explore and refine the application of blockchain in startup ecosystems, we move closer to a future where innovation knows no bounds, and opportunities are accessible to all.

IV. REFERENCES

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