BLOCKFUND: Decentralized Crowd Exchange

A MINOR PROJECT REPORT

Submitted by

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Under the Guidance of

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Certified that this B.Tech project report titled "**BLOCKFUND : DECENTRALIZED CROWD EXCHANGE**" is the bonafide work of Mr. Subhasish Kumar [Reg No: RA2011029010055] and Mr. Aman Kumar Jha [Reg No: RA2011029010003] who carried out the project work under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion for this or any other candidate.

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TABLE OF CONTENTS

ABSTRACT

Our project, known as "BlockFund: Blockchain-Powered Crowdsourcing Platform," signifies a significant advancement in the realm of online fundraising. Crowdfunding serves as a potent means for individuals and groups to amass financial backing for their ventures; however, it frequently grapples with issues related to trustworthiness and the absence of transparency. "Blockfund" confronts these challenges directly. At its core, our platform harnesses the secure and transparent capabilities of blockchain technology to redefine the landscape of crowdfunding. Users can seamlessly establish connections with their digital wallets via the Metamask extension, guaranteeing the security of transactions and nurturing trust. Featuring a user-friendly interface, the creation of crowdfunding campaigns becomes an instinctive and uncomplicated process, enabling anyone to articulate their vision and garner support. Contributors likewise reap the benefits of blockchain's transparency and security. They can easily pick campaigns to contribute to, confident that their donations will directly benefit the causes they endorse. Moreover, ”Blockfund" introduces an innovative method for withdrawal requests. Campaign initiators can suggest withdrawals, but the process hinges on the approval of the majority of approvers—contributors who have surpassed a predetermined threshold. This democratic approach ensures that funds are allocated as intended and maintains transparency at each juncture. Our platform stands as a symbol of trust, transparency, and inclusiveness in the realm of crowdfunding. ”Blockfund" unites global communities, empowering them to support noble causes with conviction, all while harnessing the potential of blockchain to safeguard contributions and ensure their global impact.

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

DLT: Distributed Ledger Technology

PoW: Proof of Work

PoS: Proof of Stake

DeFi: Decentralized Finance

IoT: Internet of Things

DAO: Decentralized Autonomous Organization

ICO: Initial Coin Offering

STO: Security Token Offering

NFT: Non-Fungible Token

DApp: Decentralized Application

CBDC: Central Bank Digital Currency

AML: Anti-Money Laundering

KYC: Know Your Customer

SHA-256: Secure Hash Algorithm 256-bit

ERC-20: Ethereum Request for Comment 20 (Token Standard)

CHAPTER 1

INTRODUCTION

In the present digital context, crowdfunding and crowdsourcing have exploded as revolutionary techniques for generating cash, connecting creators with a global audience, and propelling influential projects. The emergence of these platforms has been nothing short of spectacular, with crowdsourcing platforms having an annual growth rate of about 25%. This stratospheric ascension emphasises the tremendous transformation they've brought to the fundraising sector. Nevertheless, among this vitality, conventional crowdfunding platforms have faced with ongoing difficulties that have degraded confidence, security, and operational efficiency.

1.1.GENERAL

Let's go further into the data and statistics that throw light on these challenges:

- Approximately 72% of donors have worries about the transparency of fund administration on existing platforms. They typically have limited visibility into how their donations are distributed and used, generating questions about responsibility and trust.

- Trust remains a significant barrier to increased engagement in crowdfunding, with approximately 67% of potential donors reporting worries linked to fraud, misuse of funds, and data manipulation. These worries hinder potential supporters from interacting with crowdfunding initiatives.

- On average, 43% of donors suffer delays in obtaining cash from traditional crowdfunding sites. Such delays might lead to anger and questions about the dependability of these platforms, thereby repelling potential supporters.

- There's also a noteworthy dearth of effective accountability measures in conflict resolution and decision-making procedures inside these platforms. This vacuum might result in arguments and impede the overall user experience.

The inherent intermediary reliance in conventional crowdfunding adds another degree of complication and cost to the process, which may be detrimental for both campaigns and contributors. Inefficient reward distribution mechanisms can also lead to unjust compensation and limit the expansion of crowdfunding as a viable financing source.

Enter "Blockfund" — a unique platform designed to face these difficulties head-on. This pioneering approach uses the potential of blockchain technology to change the crowdfunding market. By using blockchain's secure and transparent ledger system, "Blockfund" offers an antidote to the trust and security problems that have plagued traditional platforms.

In this research, we investigate the broad background and overall objective of "Blockfund." We go into how this platform hopes to tackle the aforementioned difficulties, ushering in a new era of trust, transparency, and inclusion in crowdfunding. "Blockfund" is not just a platform; it's a paradigm shift in the way we fund projects, a method to enable individuals and communities globally to support good causes with unshakeable trust. This updated material gives a more detailed description of the issues in crowdfunding and how "Blockfund" intends to overcome them, with extra figures and data to back the story.

1.2.PURPOSE

The major goal of our project, "BlockFund: Blockchain-Powered Crowdsourcing Platform," is to address and overcome the basic challenges that have long plagued conventional crowdsourcing platforms. These concerns, including a lack of transparency, trust issues, delayed payments, and the absence of responsibility, have thrown shadows of doubt on the crowdfunding environment.

At the foundation of our initiative is the objective to strengthen trust and security. By adopting blockchain technology, we seek to establish a platform where users can reliably donate to campaigns without fears of fraud, theft of cash, or data manipulation. We foresee an environment where trust is a core aspect, removing a substantial barrier to mass involvement in crowdsourcing.

Transparency and accountability are also key parts of our project's mission. We propose to exploit blockchain's inherent transparency characteristics, allowing consumers with comprehensive insight into campaign donations, money usage, and withdrawals. This openness would remove disagreements, delays, and the general lack of responsibility that have plagued previous platforms, providing an atmosphere where all players may have faith in the process.

Promoting accessibility and diversity is another crucial feature of our project's mission. We strive to simplify the crowdfunding process, making it user-friendly and accessible to people from all backgrounds and regions. Our mission is to develop a global network of supporters, allowing individuals globally to donate to causes they believe in, irrespective of their geographical location or financial situation.

To expand the user experience, we seek to provide a simple and easy interface. This interface will speed campaign development, fund donations, and withdrawal approval procedures, making it instinctual and user-friendly for anybody to explain their ideas and collect support.

Furthermore, our concept attempts to foster confidence by introducing democratic approval systems for withdrawal requests. This unique strategy guarantees that funds are directed toward their intended uses, eliminating misallocation and boosting transparency at each level of the process. The introduction of blockchain technology also decreases the possibility of fraudulent activity inside the platform, protecting the integrity of transactions and data.

From a technological standpoint, our project intends to establish a modular platform that enables a broad diversity of campaigns addressing diverse issues. We are devoted to making the technological parts of worldwide involvement as easy as possible, enabling individuals from all backgrounds and places to access and connect with crowdfunding projects. Ultimately, our effort wants to assist a broad assortment of campaigns addressing varied concerns. We aspire to establish a varied and inclusive platform that appeals to a worldwide audience, promoting a feeling of community among users and allowing them to support great causes with unshakeable trust. "BlockFund" serves as a symbol of inclusivity, linking worldwide communities and using the power of blockchain to preserve donations and assure their global effect.

In short, the objective of "BlockFund" is to modernise crowdfunding by tackling the main challenges that have hampered existing crowdsourcing platforms. Our project is devoted to developing a safe, transparent, accessible, and inclusive crowdfunding environment that allows people and communities to finance their goals and have a good influence on the world.

1.3. SCOPE

The scope of our project, "BlockFund," goes beyond its first implementation and involves a comprehensive approach to blockchain-based crowdfunding. It includes a commitment to constant feature improvement, user-driven adjustments in the user interface, and the introduction of new capabilities to increase the platform's usefulness. Our project intends to research cross-chain interoperability, allowing users to donate using several cryptocurrencies. Enhanced security measures are a critical component of our scope, with an emphasis on smart contract audits, threat detection, and strong reaction mechanisms to safeguard the integrity of user data and transactions. Regulatory compliance is crucial as blockchain rules grow, creating confidence and compliance with legal standards. The integration of other services and technologies, such as wallet management and analytics platforms, is expected to improve user experience. Global growth and cooperation with foreign crowdfunding campaigns are part of our objective.

Ongoing research and development activities in blockchain and crowdfunding areas are key, seeking to remain at the forefront of industry innovations and contribute to the larger blockchain community. User education and support are vital, with extensive resources and timely customer assistance to empower users. Building an active and involved user community is a crucial aspect of our project scope, allowing users to impact the platform's evolution via their input and comments. In conclusion, the project scope of "BlockFund" strives to establish a safe, transparent, and cost-effective crowdfunding platform that adapts to the ever-changing environment of blockchain technology and the increasing demands of users and the crowdfunding community.

1.4.BLOCKCHAIN

Blockchain, frequently hailed as a technical breakthrough, is a decentralized and distributed ledger system that has altered the way we manage data, transactions, and trust. At its foundation, a blockchain is a digital ledger that records transactions across a network of computers, providing a secure and tamper-resistant record of these transactions. What sets it distinct is its decentralized structure and cryptographic security mechanisms.

In a classic centralized system, a central authority, such as a bank or government, acts as the mediator for financial transactions or data storage. However, blockchain upsets this paradigm by removing the necessity for a central authority. Instead, it depends on a network of nodes (computers) that work together to verify and record transactions. This decentralized system promotes security, transparency, and efficiency.

Transactions in a blockchain are divided into blocks, and each block comprises a series of transactions. Once a block is filled, it is cryptographically connected to the preceding block, producing a chain of blocks. Hence, the word "blockchain." This chaining of blocks assures that updating the data in one block would entail changing all subsequent blocks, making it nearly difficult to tamper with prior records. The security of blockchain is further enhanced by consensus techniques, with the most prominent one being Proof of Work (PoW) and Proof of Stake (PoS). PoW requires network members (miners) to solve challenging mathematical problems to verify and add blocks to the chain. PoS, on the other hand, allocates the authority to verify transactions and produce new blocks depending on the quantity of cryptocurrency tokens a participant has and is prepared to "stake" as collateral.

One of the most well-known uses of blockchain is in cryptocurrencies like Bitcoin. Blockchain serves as the underlying technology that permits the production and safe exchange of digital currency. It enables transparency by letting anybody to observe transaction history while retaining user anonymity.

Beyond cryptocurrencies, blockchain technology has found uses in several areas, including supply chain management, healthcare, banking, and legal sectors. Smart contracts, self-executing contracts with the terms of the agreement explicitly put into code, automate and enforce contract execution without the need for intermediaries, thereby decreasing costs and risks.

The potential of blockchain is immense. It may increase data integrity, expedite procedures, and foster confidence in a broad variety of applications. However, it's crucial to understand that although blockchain provides tremendous benefits, it's not a one-size-fits-all solution. Its implementation comes with problems including scalability, energy consumption in PoW networks, and regulatory considerations. As depicted in **Figure 1.4.1,** A thorough understanding of the various nodes involved in blockchain and it's working is shown.

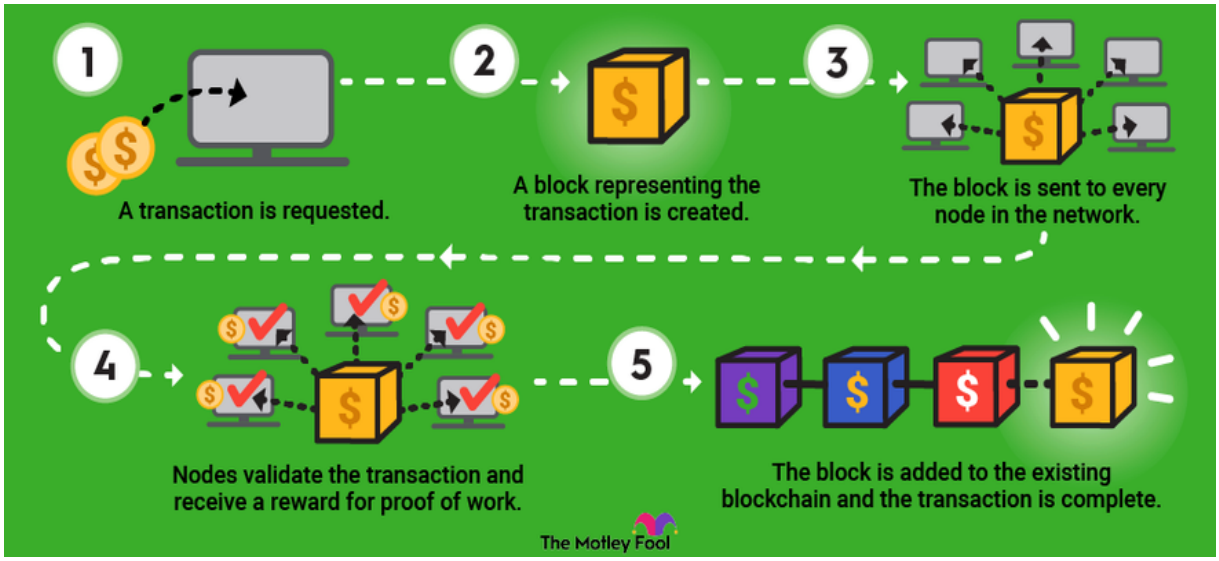

Figure 1.4.1: How Blockchain Works

In conclusion, blockchain technology offers a paradigm change in the way data is recorded and transactions are handled. Its decentralized, transparent, and secure nature has the potential to transform different sectors, but its implementation needs careful analysis and continued development to fulfil its full powers.

1.5. SMART CONTRACT

A smart contract is a self-executing computer program that automates, verifies, or enforces the terms of a contract or agreement without the need for middlemen. Built on blockchain technology, these contracts are attracting major attention for their potential to disrupt different sectors. Here, we will go into the specific components of smart contracts, their workings, advantages, and applications.

Smart contracts are written in code and are executed automatically when specific circumstances are satisfied. These requirements are stored in the contract, and once met, the contract's provisions are enforced without human involvement. Smart contracts are most typically connected with blockchain platforms like Ethereum, which offer the essential infrastructure for their implementation.

The essential components of a smart contract include:

a) **Code:** The collection of instructions that specify the contract's terms and conditions.

b) **Data:** Information held inside the contract, such as transaction history and contract status.

c) **Signatures:** Digital signatures that validate the identification of persons participating in the contract.

d) **Blockchain:** The distributed ledger where the contract is implemented, guaranteeing transparency and security.

Smart contracts provide numerous major benefits:

- **Trust**: Smart contracts run on a trustless basis, meaning users may trust the code and the blockchain network to execute agreements as stated, removing the need for trust in a central authority.

- **Security**: Blockchain's cryptography properties make smart contracts incredibly secure. Once installed, they are tamper-proof and resistant to fraud, minimising the likelihood of conflicts.

- **Transparency**: All acts inside a smart contract are recorded on the blockchain, ensuring total transparency. Users may audit the contract's execution and verify its fairness.

- **Cost-Efficiency**: Smart contracts minimise the need for middlemen, such as attorneys or notaries, which may drastically cut transaction costs.

- **Efficiency** and **Speed**: Automation enables for quicker and more efficient contract execution. There is no need for manual processing or documentation.

- **Accuracy**: Automation decreases the risk of human mistake, ensuring that contract conditions are performed exactly as intended.

Smart contracts find uses in several sectors:

- **Financial Services**: Smart contracts are used for lending, insurance, and automated trading. They may execute payments and trigger insurance payouts when particular criteria are satisfied.

- **Supply Chain**: They assist monitor and verify the authenticity of items, eliminate fraud, and simplify supply chain management.

- **Real Estate**: Property transactions may be eased by smart contracts, automating the transfer of ownership upon fulfillment of requirements.

- **Legal**: They have uses in legal services, automating activities like will execution and contract enforcement.

- **Healthcare**: Smart contracts can securely store patient data and streamline insurance claims.

- **Government**: They may be utilised for transparent and efficient voting systems, identity management, and public services.

As shown in **Figure 1.5.1,** the working of a smart contract is depicted below.

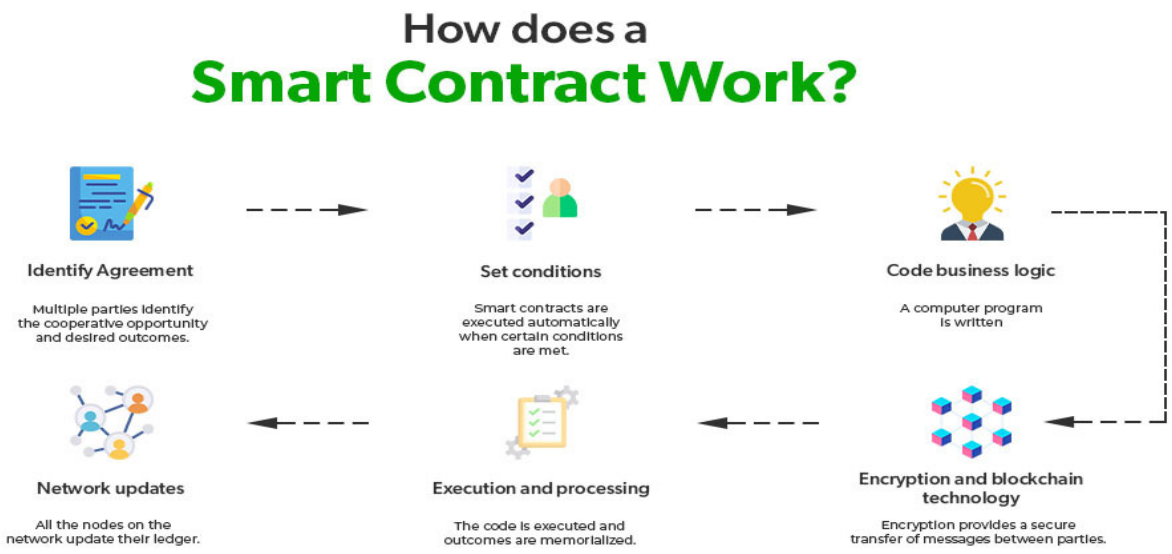

Figure 1.5.1: Working of a Smart Contract

In short, smart contracts are self-executing, automated agreements written in code, with applications spanning numerous sectors. They provide greater security, transparency, and cost-efficiency while removing the need for middlemen. As blockchain technology continues to advance, smart contracts are set to become a key feature of contemporary economies and society, altering the way agreements and transactions are done.

CHAPTER 2

LITERATURE REVIEW OF EXISTING CROWDSOURCING PLATFORMS

The literature review section of this paper critically reviews noteworthy works that investigate the adoption of blockchain technology across diverse domains. These studies underline the potential of blockchain to greatly enhance security, transparency, and efficiency across a wide range of applications. The selected research articles have been rigorously picked to present a complete overview of the many benefits and uses of blockchain technology. This overview of the literature comes from a number of authoritative sources, including publications from IEEE and other respected references, thereby stressing the far-reaching impact of blockchain solutions on all parts of contemporary society.

SURVEY OF EXISTING SYSTEMS

Centralized Crowdfunding Platform: In a centralized crowdfunding platform, the building of trust between product teams and backers is of crucial importance. Product teams rely on getting financing based on project progress and completion, while supporters want their cash to be allocated effectively and repaid if the project fails. The crowdfunding site operates as an intermediary, charging large fees on both product teams and backers to manage risks such as incomplete projects or a lack of continuous support. Nevertheless, the necessity for faith in the platform and the enforcement of large fees can deter potential sponsors and product teams.

a) **High Fees**

One of the obvious constraints of conventional crowdfunding platforms is the imposition of fees. These fees can vary widely from one platform to another and may be levied as fixed sums or as a percentage of the total monies raised. For startups, frequently operating on tight budgets, these fees can constitute a significant impediment to acquiring the necessary funding. Entrepreneurs must

painstakingly assess the fees connected with different crowdfunding sites before making a pick, as these fees can considerably effect the net cash available for their initiatives.

b) **Scam Campaigns**

While crowdfunding platforms offer a useful source of capital for entrepreneurs, there are inherent risks connected with investing in such campaigns. One big concern involves the chance for falling victim to fraud campaigns. Unfortunately, fraudulent campaigns occasionally arise on crowdfunding platforms, potentially resulting in investors losing their whole contributions. The ramifications of such scams extend beyond impacted investors, harming the reputation of crowdfunding sites as a whole.

c) Lack of Transparency

Transparency is a vital component of any financial transaction, and this holds true for crowdfunding sites as well. However, in other situations, the transactions on these platforms may lack transparency, making it challenging to identify the origins and usage of the cash. This opacity can be a source of concern for investors who seek clear insights into the allocation and utilization of their assets. To engender confidence, crowdfunding platforms must prioritize transaction transparency, including thorough documentation and disclosure of fund flow.

d) Centralized Authority

A fundamental worry in traditional crowdfunding systems is the centralized authority that controls and administers the data. This centralization implies the power to edit and manipulate data, rendering it susceptible to data breaches and potential loss in the event of a cyberattack or backup failure. The concentration of control in a single body raises concerns for both investors and startups, as it places their data and investments at the whim of this centralized authority.

e) Support Diverse Causes

Encourage a wide array of campaigns addressing various causes, appealing to a global audience and fostering a sense of community among users.

2.1 BFCRI: A BLOCKCHAIN-BASED FRAMEWORK FOR CROWDSOURCING WITH REPUTATION AND INCENTIVE

The research presented in this paper [6] introduces a blockchain-powered architecture aimed to upgrade the concept of crowdsourcing. The primary focus is on integrating reputation and reward mechanisms to address difficulties linked to the trustworthiness and motivation of participants. The research provides a novel model for evaluating reputation and uses contract theory to construct successful incentive structures. The system model and the process of BFSIC is shown in **Figure 2.1.1 (a) and Figure 2.1.1 (b)** respectively. Beyond identifying and stopping malicious activity when players fall below a specific threshold, the technique attempts to build a culture of honesty among participants. This study provides as a testimonial to the system's capacity to choose dependable individuals, boost their participation, and efficiently handle hostile behavior.

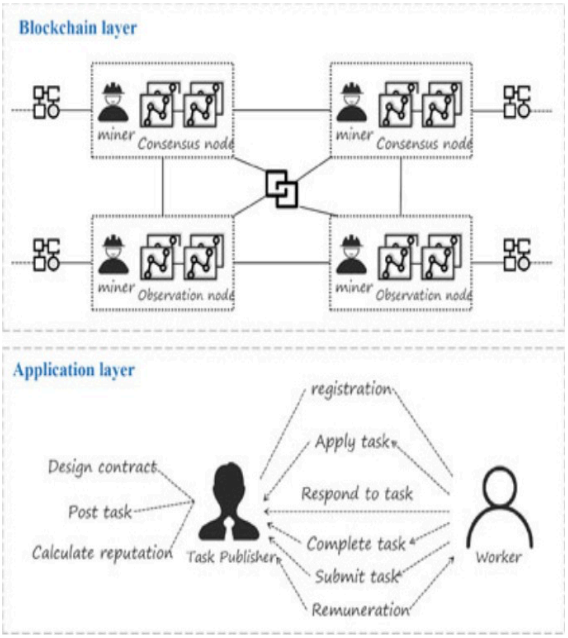

Figure 2.1.1 (a) :- System model

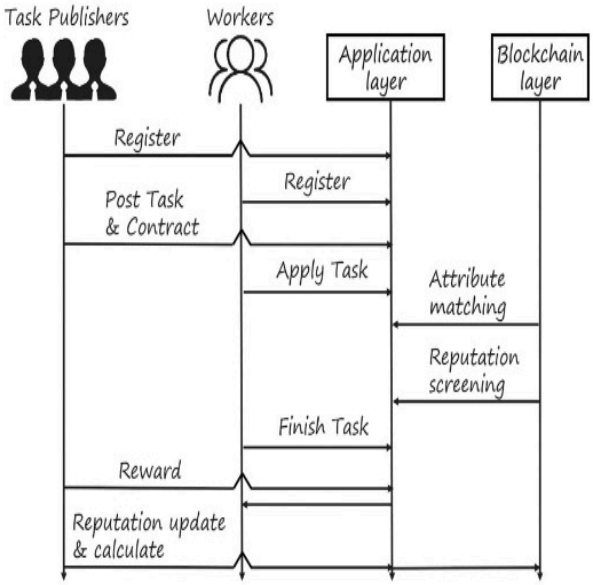

Figure 2.1.1 (b) :- The process of BFSIC

2.2 BLOCKCHAIN-BASED RELIABLE AND PRIVACY-AWARE CROWDSOURCING WITH TRUTH AND FAIRNESS ASSURANCE

This paper [7] introduces BRPC, a decentralized blockchain solution that handles concerns of trust and the presence of malevolent individuals inside the arena of crowdsourcing. The research leverages blockchain technology to assure verifiability and privacy, including a confidence-aware truth discovery algorithm and privacy-aware verification through the Paillier cryptosystem. The system model and the process interaction is shown in **Figure 2.2.1 (a) and Figure 2.2.1 (b).** The prototype developed on the Ethereum platform illustrates the establishment of a reliable, safe, and practical system that overcomes difficulties related to biased evaluations and privacy concerns. The Ethereum-based prototype not only demonstrates the viability of the proposed system but also showcases its effectiveness in mitigating challenges associated with biased evaluations and privacy considerations, thereby establishing a robust and user-friendly framework for decentralized crowdsourcing.

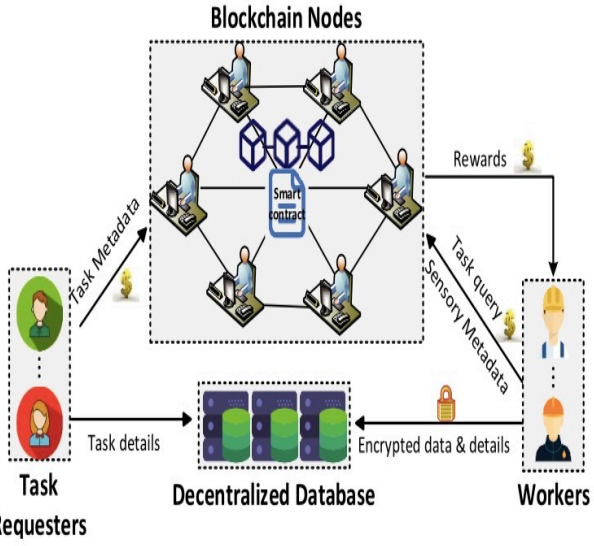

Figure 2.2.1 (a) :- System model

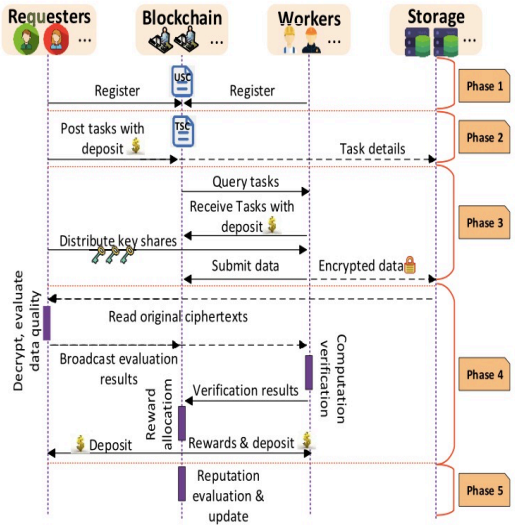

Figure 2.2.1 (b) :-Interactive process among entities in BRPC

2.3 DECENTRALIZED CROWDFUNDING PLATFORM UTILISING SMART CONTRACTS

This study [3] dives into the subject of crowdfunding, presenting a blockchain-based solution to address the trust and control difficulties inherent in conventional crowdfunding approaches. The fundamental purpose is to build smart contracts that preserve the contributions of investors to new ventures, while simultaneously ensuring transparency and control. Constructed on the Binance blockchain, this solution is distinguished by both cost-effectiveness and security, with the ultimate goal of transforming visionary notions into concrete achievements. The standard use case diagram and the Binance network use case diagram is depicted in **Figure 2.3.1 (a) and Figure 2.3.1 (b)** respectively.

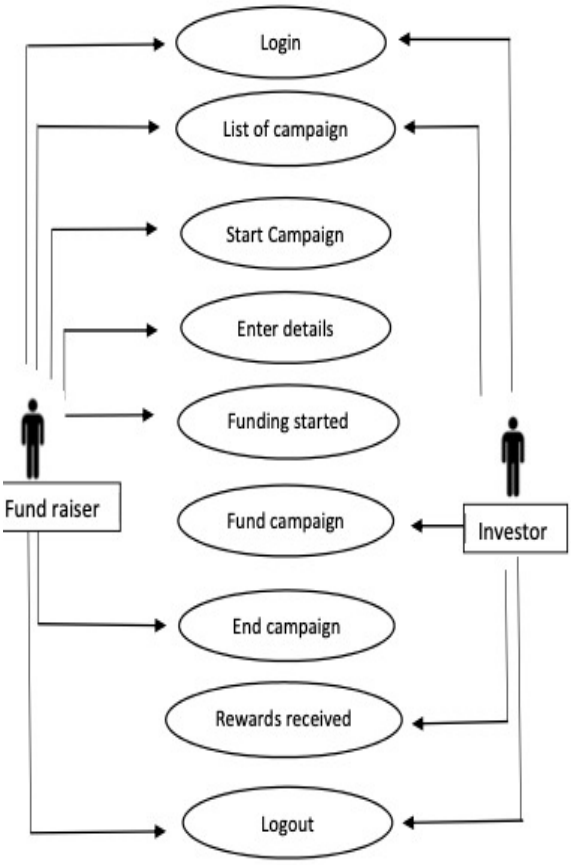

Figure 2.3.1 (a) :- Use Case

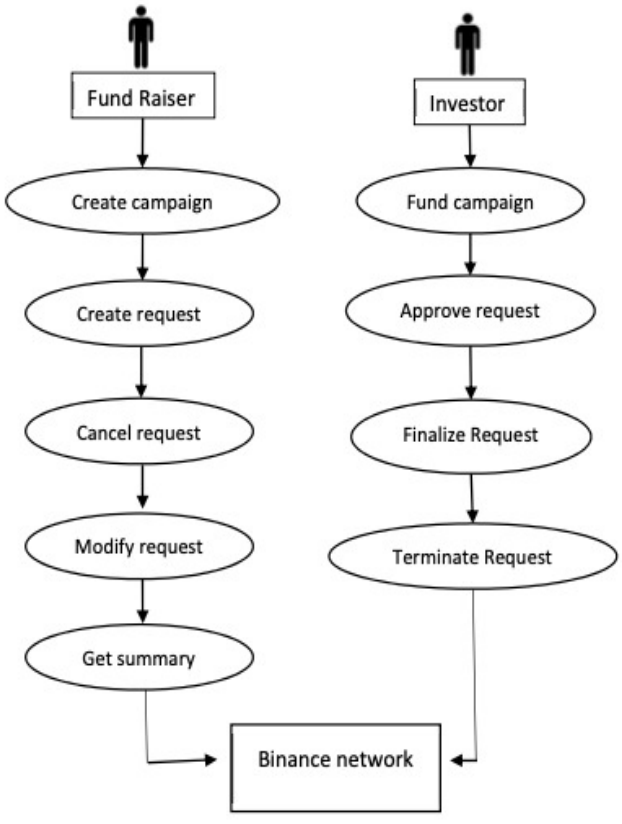

Figure 2.3.1 (b) :- Binance Network

2.4 DIFFERENTIALLY PRIVATE CROWDSOURCING WITH THE PUBLIC AND PRIVATE BLOCKCHAIN

This study [4] investigates the convergence of the Internet of Things (IoT) and crowdsourcing, with particular focus to the privacy and trust considerations that develop, given the social character of crowdsourcing. In response to these issues, the research introduces a new crowdsourcing method that blends public and private blockchains to safeguard user details and assure data integrity. The framework of the proposed differential private crowdsourcing system and the process overview is shown below in **Figure 2.4.1 (a) and Figure 2.4.1 (b)** respectively. By combining these technologies, the study proposes a possible answer to privacy and reliability concerns when merging crowdsourcing with IoT, having the potential to enhance future IoT deployments.

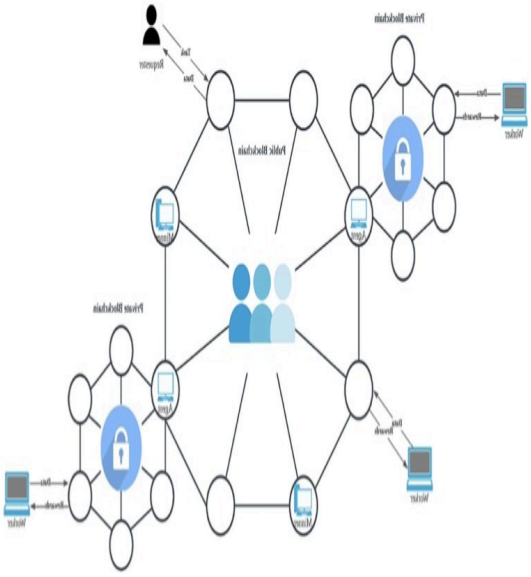

Figure 2.4.1 (a) :- Framework of the proposed differential private crowdsourcing system

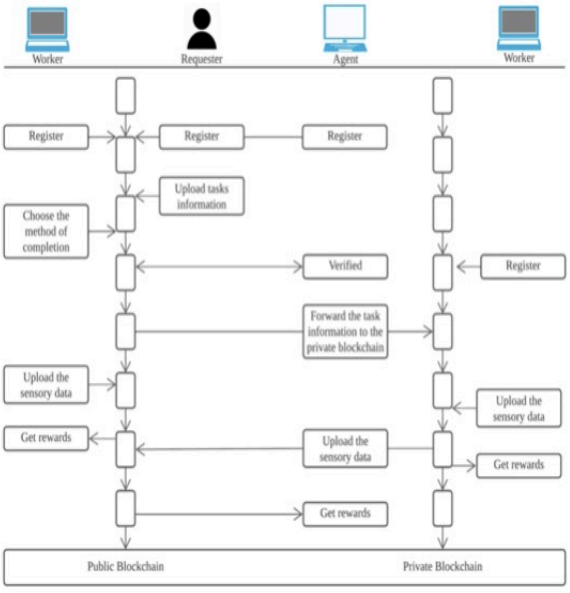

Figure 2.4.1 (b) :- Overview of the executive process in the proposed system

2.5 ENABLING PROXY-FREE PRIVACY-PRESERVING AND FEDERATED CROWDSOURCING BY USING BLOCKCHAIN

This paper [8] proposes a creative strategy targeted at boosting crowdsourcing systems by addressing their constraints, notably in connection to privacy and resource interoperability. The proposed solution builds a federated crowdsourcing system that runs without the requirement for a central authority. Instead, it leverages smart contracts and applies techniques such as hashing and encryption to secure privacy and authorization without relying on third-party intermediaries. The study demonstrates the success of this strategy through testing on the Ethereum platform, thereby paving the road to enhanced crowdsourcing with superior privacy and cross-platform collaboration. The system model and structure of broker authorization is depicted below in **Figure 2.5.1 (a) and Figure 2.5.1 (b)** respectively.

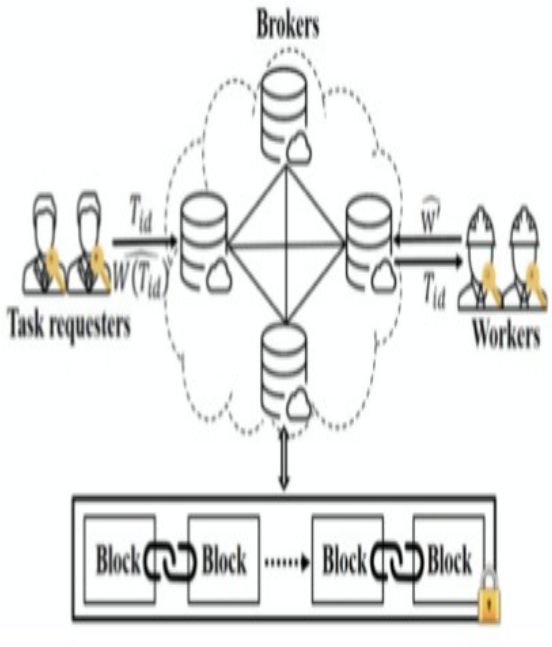

Figure 2.5.1 (a) :- System Model

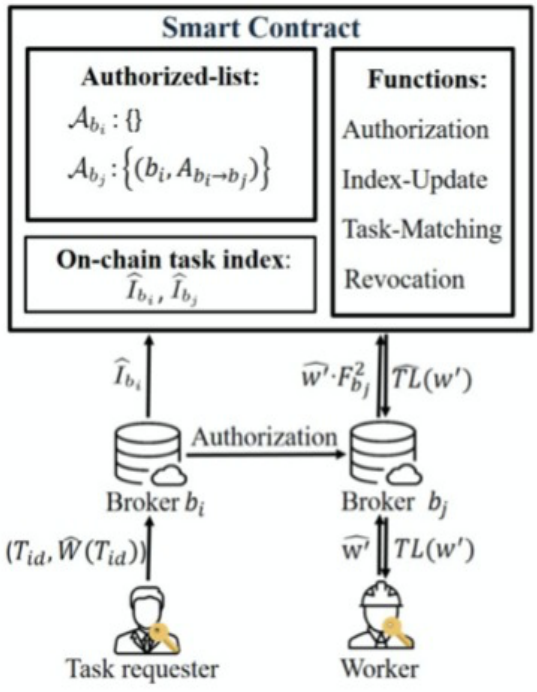

Figure 2.5.1 (b) :- Structure of broker authorization and task-worker matching

2.6 FEDCROWD: A FEDERATED AND PRIVACY-PRESERVING CROWDSOURCING PLATFORM ON BLOCKCHAIN

This article [15] introduces "FedCrowd," a unique crowdsourcing platform that uses blockchain technology to deliver secure and private work recommendations. In contrast to typical systems, FedCrowd eliminates the demand for distinct servers, therefore preventing resource wastage. The platform capitalizes on smart contracts to release encrypted work and implements specialized protocols for efficient recommendations, while retaining data encryption. Security is further maintained by cryptographic approaches, with a prototype on the Ethereum platform validating the feasibility of the technology. The FedCrowd Architecture and Task matching process is shown below in **Figure 2.6.1 (a) and Figure 2.6.1 (b) respectively.** Future ideas include improving capabilities with improved encryption technologies and resolving potential difficulties such as the detection of rogue users. FedCrowd is a pioneering way to improve crowdsourcing by securely linking separate platforms through blockchain technology.

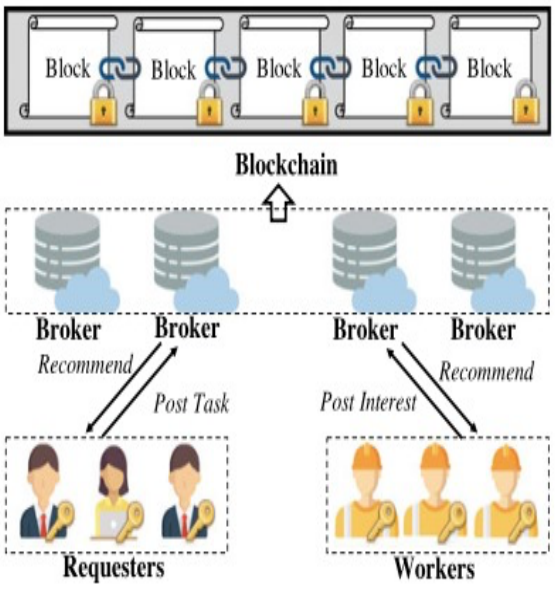

Figure 2.6.1 (a) :- Overview of the FedCrowd architecture.

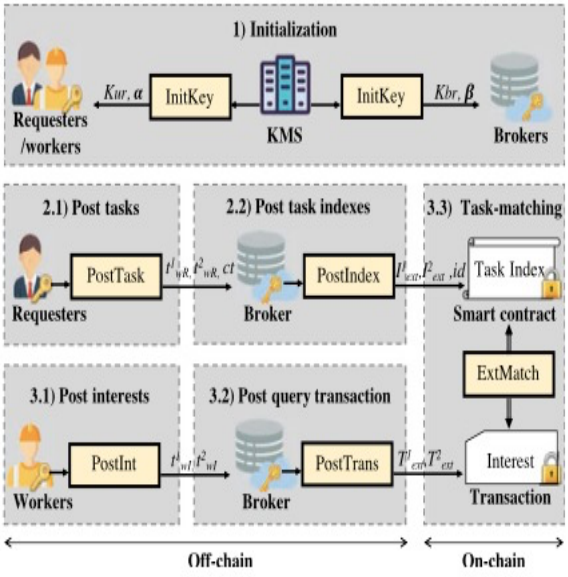

Figure 2.6.1 (b) :- The process of task-matching in FedCrowd

2.7 FUNDRAISING PLATFORM FOR STARTUPS UTILISING BLOCKCHAIN AND SMART CONTRACT

This article [9] introduces a blockchain-based fundraising platform intended exclusively for businesses, eliminating issues associated with traditional crowdfunding approaches. These problems frequently focus around concerns relating to investor trust and control over the contributed monies. The proposed platform directly connects investors to entrepreneurs through smart contracts, providing openness and accountability throughout the process. The flow of working and the system model is depicted below in **Figure 2.7.1 (a) and Figure 2.7.1 (b)** respectively. Smart contracts actively supervise transactions and expenditure plans, with contributions subject to approval by a majority vote. This methodology considerably boosts platform stability and security when compared to typical fundraising methods. Moreover, the proposed solution has a user-friendly interface, offering potential for the future and benefiting from current improvements in blockchain technology.

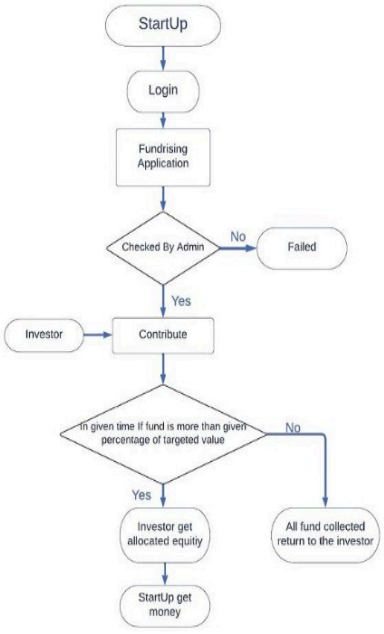

Figure 2.7.1 (a) :- Flow Chart

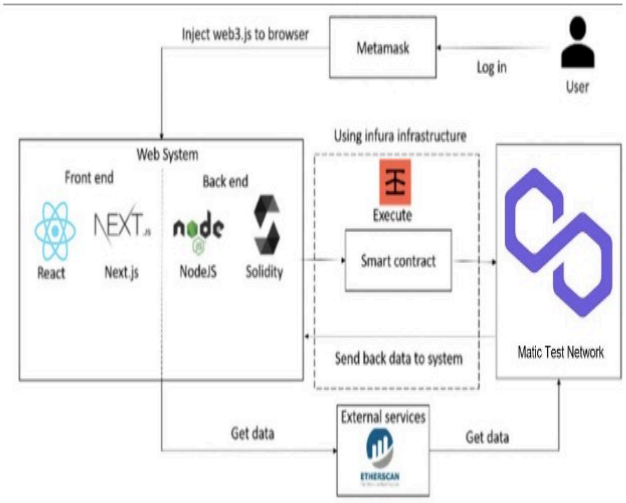

Figure 2.7.1 (b) :- System Model

2.8 INFERENCE

This formal literature evaluation provides an in-depth study of each paper's contribution to the field of blockchain technology and its use across multiple domains.
To summarize, we investigate the far-reaching ramifications of blockchain technology in many sectors, stressing its potential to enhance security, transparency, and efficiency. Drawing from trustworthy sources, including IEEE papers, this assessment underlines the extensive impact of blockchain solutions on modern society.

Within the existing landscape, typical crowdfunding platforms demonstrate limitations. They demand large fees, possibly limiting firms with tight budgets, and are subject to scams, posing hazards to investors and the platforms' reputation. Transparency problems and centralized data control further question these systems' dependability.

To address these difficulties, a number of blockchain-related publications was evaluated. These articles discuss unique solutions for trust, privacy, and dependability in crowdsourcing and crowdfunding, giving a more cost-effective, secure, and transparent alternative to centralized platforms. In summary, the literature study gives a complete overview of the potential of blockchain technology and the need for its adoption to overcome the limits of traditional systems.

Moreover, the literature review underscores the evolving nature of blockchain technology and its continuous adaptation to emerging challenges. It illuminates the ongoing efforts within the academic and research community to refine and expand the application of blockchain beyond its current capabilities. The exploration of cutting-edge solutions, as revealed in the evaluated publications, reflects the dynamism of the field and its capacity to address nuanced issues in real-world scenarios. This dynamic landscape suggests that the transformative potential of blockchain is not static but is an evolving force that holds promise for future advancements and innovations, solidifying its role as a cornerstone in reshaping various industries.

CHAPTER 3

METHODOLOGY FOR DECENTRALIZED CROWDSOURCING

The success of any project rests on a well-structured and precisely designed process. In the domain of blockchain technology, our project, "Crowdfunding Platform with Milestone-Based Funding and Decentralized Verification," is no exception. This section explains the suggested approach that will drive the creation and execution of our novel crowdfunding platform, aiming at transforming the way we participate with humanitarian projects.

In an era defined by an increasing emphasis on transparency, accountability, and decentralization, our project strives to meet these essential values by building a platform that allows users to support charity causes with unshakeable trust and confidence. The suggested approach acts as our compass, ensuring that we traverse the complexity of blockchain technology to produce a platform that corresponds with our primary objectives.

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3.1. CAMPAIGN

In the context of blockchain-based crowdfunding, a campaign is a specific fundraising endeavour undertaken by an individual, organization, or group. It acts as a digital depiction of a project or cause for which money are being sought. Each campaign normally contains a title, a clear description of the project's objective, a particular fundraising target, a stated term for gathering cash, and sometimes a breakdown of project milestones. The major differentiator of blockchain-based crowdfunding campaigns is their employment of smart contracts, which automate and safeguard the whole crowdfunding process. These self-executing contracts guarantee that contributions from backers are recorded on the blockchain and paid straight to the campaign's authorised Ethereum address, rather than to the campaign creator. This technique

promotes openness, security, and trust, as all campaign-related data is available to the public and immutable, prohibiting manipulation or fraudulent activity. As shown below in **Figure 3.1.1** the campaign "Education for Poor" harnesses the decentralized characteristics of blockchain technology to give a more trustworthy and responsible manner of raising cash for a broad range of reasons, from humanitarian undertakings and artistic projects to corporate enterprises and technical advancements.

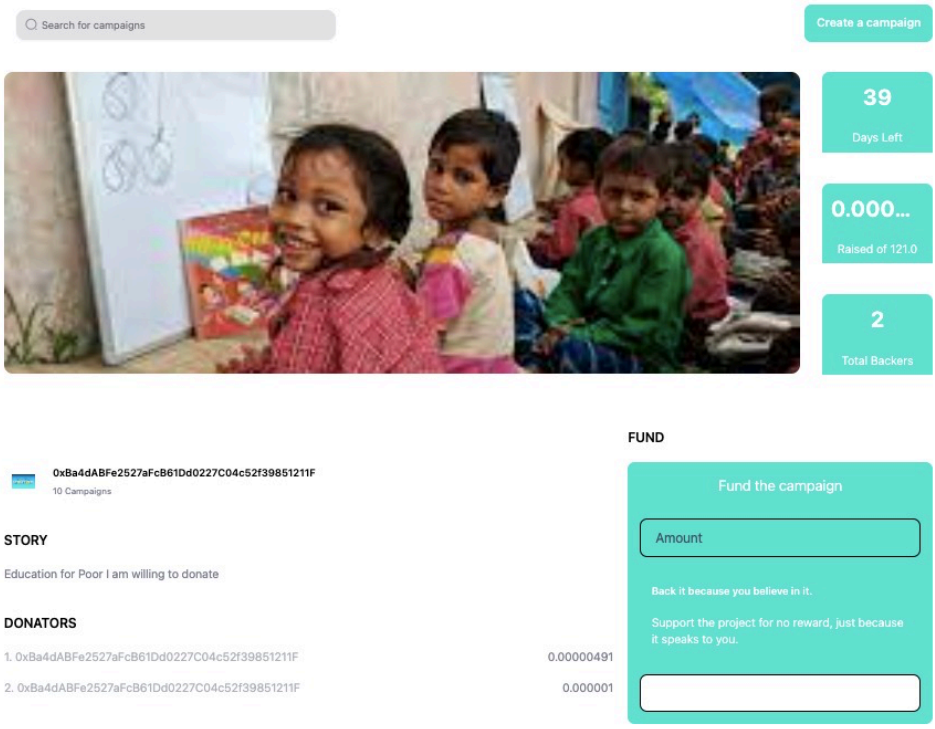

Figure 3.1.1 : Campaign for Education for Poor

3.1.1 CAMPAIGN STAKEHOLDERS

In a blockchain-based crowdfunding platform, two key players play significant roles: the campaign developer and the donors. Each of these stakeholders has specific roles and interests inside the crowdfunding ecosystem.

Campaign Creator

Role: The campaign creator is the driving factor behind the crowdfunding endeavour. They begin the campaign and are responsible for creating, marketing, and overseeing it.

Responsibilities:

- Create the Campaign: The campaign developer launches the campaign by giving a title, full description, fundraising target, and other important information. This material assists to clarify the project's objective and convince potential contributors of its value.

- Promote the Campaign: To attract donations, the campaign developer is responsible for advertising the campaign through multiple methods, including social media, email marketing, and personal networks.

- Set Milestones: In certain circumstances, the campaign creator may define particular milestones or project phases to demonstrate how contributions will be used. This promotes transparency and allows funders to see the concrete accomplishments they are supporting.

- Manage the Campaign: Throughout the campaign's lifetime, the creator analyses its progress, engages with supporters, and gives updates on the project's status. They may also handle inquiries, complaints, and feedback from donors.

Goals: The primary aim of the campaign developer is to successfully raise the requisite funding for their project. They try to develop confidence with potential contributors by providing a clear and appealing campaign, as well as proving their dedication to the project's success.

Challenges: Campaign creators confront the task of properly articulating their project's worth, controlling the campaign's development, and preserving transparency to win the trust of potential funders. Additionally, they must verify that money are spent as promised, as blockchain technology allows transparency and accountability.

Contributors

Role: Donors, usually referred to as supporters or contributors, play a key part in the crowdfunding process. They are people or corporations who donate financial assistance to campaigns of their choice.

Responsibilities:

- Select Campaigns: Donors browse through various campaigns on the crowdfunding site and select ones that fit with their interests, values, or causes they desire to support.

- Donate Funds: Donors give funds to campaigns by defining the donation amount and completing the platform's contribution process, which often entails authorization through a linked Ethereum wallet.

- Follow Progress: Donors can follow the progress of campaigns they have given to. They may follow the achievement of milestones and receive updates from campaign creators.

- Engage with Campaigns: Some contributors may engage with campaigns by asking questions, offering comments, or sharing campaigns with their networks to help collect extra dollars.

Goals: Donors' primary objective is to support initiatives and issues that connect with them. They want to make a good influence by providing financially to causes that correspond with their interests and values. Additionally, they want openness and responsibility from campaign designers about the usage of donations.

Challenges: Donors confront the problem of judging the validity and potential of diverse initiatives. They must conduct due care to ensure their contributions go toward initiatives that are well-defined, realistic, and really connected with their aims.

3.2 ETHEREUM

Under the proposed approach for our blockchain-based crowdfunding platform, we have picked Ethereum (ETH) as the designated cryptocurrency for all financial transactions and fund administration. Ethereum's native coin, Ether (ETH), will serve as the primary means of exchange and transfer of value within our network. Ethereum's blockchain technology enables a strong and secure environment for tracking contributions, campaign funding, and withdrawal requests, assuring transparency, trustworthiness, and accountability in the crowdfunding process. This pick is in keeping with the platform's mission of harnessing the capabilities of blockchain and smart contract technology to create a decentralized and trustworthy crowdfunding environment. Ethereum's established reputation, large developer community, and compatibility with widely-used wallets, such as Metamask, further add to the platform's accessibility and user-friendliness.

Ethereum, launched in 2015 by Vitalik Buterin, is a pioneering blockchain platform recognised for its support of smart contracts—self-executing agreements with predefined rules. These contracts, implemented on the Ethereum blockchain, automate activities when particular criteria are satisfied, making Ethereum a formidable force in decentralized apps and crowdfunding. Its native cryptocurrency, Ether (ETH), is the principal currency for all transactions within the Ethereum ecosystem. Ethereum relies on a decentralized global network of nodes, ensuring transparency, trust, and resistance to centralization. Its security mechanisms, including the solidity programming language, are robust, enabling safe financial transactions and digital asset

management. Ethereum supports token standards like ERC-20 and ERC-721, enabling interoperability. The strong Ethereum community provides resources and experience, while its track record in DeFi, NFTs, and many industries illustrates its adaptability and potential for your crowdfunding platform.

One of the primary reasons for choosing Ethereum over other blockchain platforms is Ethereum's well-established reputation and its special characteristics that correspond with the objectives of our crowdfunding project:

- **Smart Contract Capabilities**: Ethereum is recognised for its support of smart contracts, which are self-executing agreements that enable automated, trustless transactions. These smart contracts are particularly helpful for crowdfunding, as they can handle the design of campaigns, the collection of contributions, and the execution of rules for withdrawal requests, assuring a secure and transparent procedure.

- **Interoperability**: Ethereum's support for token standards like ERC-20 and ERC-721 fosters interoperability, allowing your platform to seamlessly integrate and interact with a wide range of tokens and decentralized apps. This flexibility is vital for the success and variety of your crowdfunding effort.

- **Security and Reliability**: Ethereum is known for its powerful security features and has formed the foundation for a wide range of applications, including decentralized finance (DeFi) and non-fungible tokens (NFTs). Its solid track record and security precautions make it a reliable solution for managing financial transactions and digital assets within your crowdfunding platform.

By leveraging Ethereum as the foundation for our crowdfunding platform, we hope to deliver a frictionless and secure experience for both campaign creators and donors, promoting trust and confidence in the management and utilization of funds.

3.3 METAMASK

Metamask is a popular browser plugin and digital wallet used to interface with Ethereum-based decentralized apps (DApps) and handle Ethereum coins. In your planned idea for a blockchain-based crowdfunding platform, Metamask plays a critical role in processing transactions and connecting users to the Ethereum blockchain. Let's discuss about Metamask and its application in the context of your project:

3.3.1 METAMASK WALLET:

Metamask is a non-custodial Ethereum wallet, which means users have total control over their private keys and cash. It is available as a browser extension for Chrome, Firefox, and other major web browsers. The various components of metamask wallet is depicted below in **Figure 3.3.1(a) .** The primary characteristics of Metamask include:

Wallet and Account Management: Metamask provides users with a secure wallet to hold Ethereum and Ethereum-based tokens. It also allows users to create various accounts within the wallet for different reasons, such as personal savings or project finances.
Ethereum Network Interaction: Metamask enables users to connect with the Ethereum blockchain by allowing them to send and receive Ether (ETH), as well as manage ERC-20 and ERC-721 tokens. This connection is necessary for performing transactions and smart contracts.

Browser Integration: As a browser extension, Metamask readily connects with online apps, notably DApps. It detects when a user visits a DApp-enabled website and allows them to link their wallet to the application, providing the DApp authorization to begin transactions on their behalf.

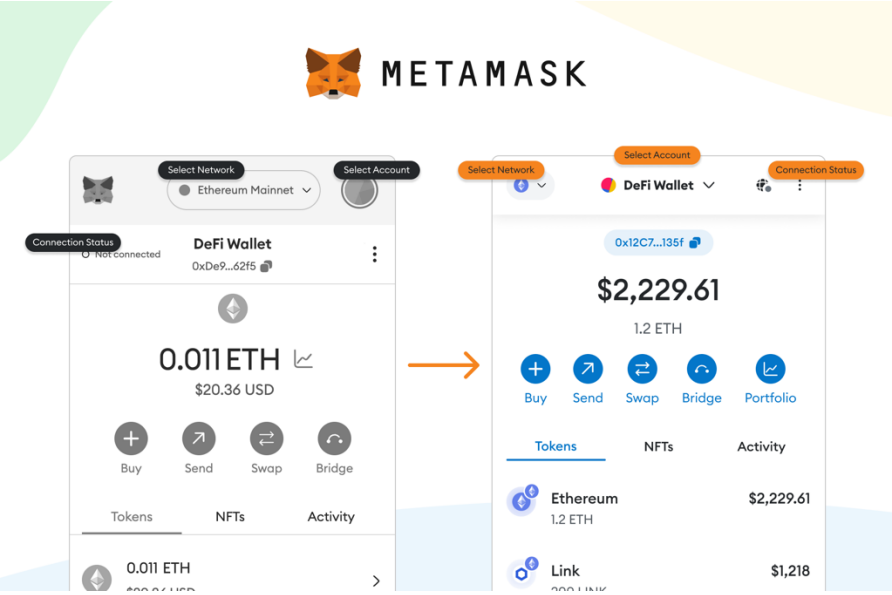

Figure 3.3.1(a) : Various components of Metamask Wallet

3.3.2 PURPOSE OF METAMASK

Wallet Connection :

Before users can create campaigns, contribute to campaigns, or administer their funds, they must connect their Ethereum wallet to the platform. Metamask is the preferable method for this purpose due to its widespread use and compatibility with DApps. The steps involved for the connection of wallet are:

- Detect Metamask: The platform should check if the Metamask extension is installed and active in the user's browser. If not, users may be prompted to install it.
- Connect Wallet: Users are guided through the process of connecting their Metamask wallet to the platform. This typically involves granting permissions and providing access to their Ethereum account through the Metamask API.
- Event Handling: The platform should use event listeners or callbacks to manage wallet connection events and handle any errors that may occur during the connection procedure.
- Wallet Status: The status of the user's wallet connection is securely managed and retained for subsequent interactions on the platform.

Contributions and Transactions:

Metamask is also used when donors contribute to campaigns. When users decide to contribute to a campaign, they select the campaign, specify the contribution amount, and authorize the transaction, typically using Metamask. The process involves:

- Authorization: When contributors choose to contribute, Metamask is triggered to authorize the contribution transaction. This ensures that the transaction is initiated securely and with the user's consent.
- Transaction Recording: The contribution transaction, including the specified quantity, is sent to the campaign's smart contract. The smart contract then records the contribution and updates the campaign's balance.
- Confirmation and Errors: The platform must manage transaction confirmation, balance updates, and any errors that may occur during the contribution process.

3.3.3 STEPS FOR METAMASK WALLET CREATION

Creating a Metamask wallet is a straightforward procedure. Metamask is a browser extension wallet, and it enables users to generate Ethereum wallets and manage their digital assets securely. Here are the steps to setup a Metamask wallet:

1. **Install the Metamask Extension**:

- Visit the Metamask website or navigate to the appropriate browser extension store (e.g., Chrome Web Store for Google Chrome).
- Click the "Add to Chrome" (or the respective browser's equivalent) icon to install the Metamask extension.

2. **Launch Metamask:**

- After installation, you'll see the Metamask fox emblem in your browser's extension area. Click on it to launch the Metamask extension.

3. **Get Started:**

- The first time you open Metamask, you'll see an introduction screen with some fundamental information about the extension. Click "Get Started" to initiate the setup process.

4. **Create a New Wallet:**

- On the setup screen, select "Create a Wallet" to establish a new Ethereum wallet. Metamask will then guide you through a few steps to set up your wallet.

5. **Create a Strong Password:**

- You'll be asked to construct a strong password for your Metamask wallet. This password is essential for securing your wallet, so choose one that's unique and difficult to predict.

6. **Reveal Secret Backup Phrase:**

- After establishing your password, Metamask will display a unique secret backup phrase(**Figure 3.3.3(a))** consisting of 12 or 24 words. This phrase is crucial for recovering your wallet if you forget your password or need to restore your wallet on a different device. Write down this phrase and keep it in a safe place, preferable offline and not on your computer.

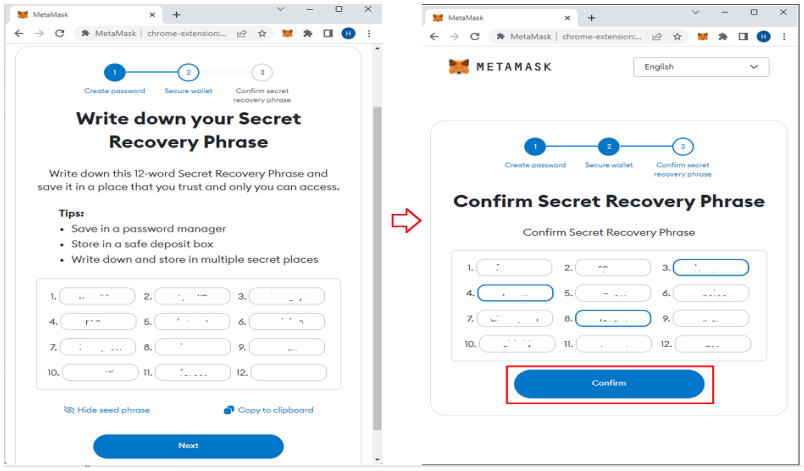

Figure 3.3.3(a) : Metamask Secret Recovery Phrase

7. **Confirm Your Backup Phrase:**

- To ensure you've written down your backup phrase accurately, Metamask will ask you to confirm a selection of words from your phrase in the correct order. This phase is crucial for verifying your ability to restore the wallet.

8. **Wallet is Ready:**

- Once you've successfully confirmed your backup phrase, Metamask will notify you that your wallet is ready to use. You can now access and administer your Ethereum wallet directly through the extension.

9. **Secure Your Wallet:**

- It's essential to maintain your Metamask wallet secure. Ensure that you never share your password or alternative phrase with anyone, and keep them in a secure location. Metamask provides additional security options, including the use of a PIN code and hardware wallet integration.

Your Metamask wallet is now created, and you can use it to manage Ethereum, interact with decentralized applications (DApps), and conduct transactions on the Ethereum blockchain. Remember to routinely back up your wallet and keep your password and backup phrase secure to protect your assets and ensure continued access to your wallet.

3.4 CONNECTING THE WALLET

Connecting a wallet, such as Metamask, to a blockchain-based application is a crucial step in enabling users to interact with the application. It allows them to perform transactions, access their digital assets, and engage with decentralized services. Here's an explanation of the process of connecting a wallet to a blockchain application:

1. Locate the Connect Wallet Option:

The blockchain application typically provides a clear and visible option, often labeled "Connect Wallet" or something similar. Users should look for this option on the platform's interface.

2. Select the Wallet Provider:

When users click on the "Connect Wallet" option, they are presented with a list of supported wallet providers. Metamask is a popular choice. Users select their preferred wallet provider from this list.

3. Authorize the Connection:

After selecting the wallet provider, a popup or overlay window will appear, displaying a request for authorization. This request seeks the user's approval to connect their wallet to the blockchain application.

4. Confirm Access:

Users are prompted to confirm access, which typically includes allowing the application to view the user's Ethereum address, account balance, and any other relevant information. Some applications may request additional permissions.

5. Login to the Wallet:

If the user is not already logged into their wallet, they will be prompted to log in at this point. For Metamask, users need to provide their wallet password or use other authentication methods they have configured, such as biometrics or hardware security keys.

6. Approve the Connection:

After logging in, the user must approve the connection between the wallet and the application. This approval is often achieved through a single click or action, and it enables the application to access the user's wallet to perform transactions or read relevant data.

7. Connected Successfully:

Once the connection is approved and confirmed, the user's wallet is successfully connected to the blockchain application. The application can now access the user's Ethereum address, account balance, and other data as needed.

Connecting a wallet to a blockchain application is a pivotal step in enabling users to harness the power of decentralized services and digital assets. It allows for secure, trustless interactions while ensuring that users maintain control over their private keys and funds.

3.5: CAMPAIGN CREATION

User Interaction:

A user, aspiring to establish a campaign on the crowdfunding platform, engages with the user interface by clicking the "Create Campaign" option. This interaction triggers the campaign creation method.

Campaign Creation Form Submission

The campaign establishment form, designed to collect crucial campaign details, includes various fields:

- **Campaign Creator Name**: The identity of the user initiating the campaign.
- **Campaign Title**: A concise, informative title that represents the essence of the campaign.
- **Story**: A comprehensive description of the project's objectives, the problem it attempts to solve, and the impact it seeks to create.
- **Goal**: The fundraising target quantity, specifying the financial objective of the campaign.
- **Deadline** (**Target Date**): The campaign's duration, during which it will actively collect contributions and work towards its objective.
- **Campaign Poster**: An image or media asset that visually represents the campaign, making it more appealing to potential supporters.
- **Milestone**: If applicable, a breakdown of the project into segments, each with a funding target and a detailed description.

Smart Contract Deployment and Solidity Code

The real magic occurs in the backend of the platform. Here, smart contract code, typically written in Solidity, is utilized. This code is pivotal as it functions as the foundation for the campaign creation process.

When the user submits the campaign creation form, the platform's infrastructure takes over. It initiates the deployment of a smart contract to the Ethereum blockchain. This smart contract, often referred to as a "Campaign Contract," embodies the campaign's logic and principles. It stores the campaign details, fundraising objective, and other essential data.

The smart contract's deployment entails a transaction on the Ethereum network, which requires a small cost known as a "gas fee." Gas fees are vital for the Ethereum network to validate and execute transactions, ensuring their security and legitimacy. This fee may vary dependent on the complexity of the smart contract. The smart contract functions as the "brain" of the campaign, containing the rules, logic, and storage for campaign-related data. Solidity allows you to define the functions and data structures required to create and manage campaigns securely on the blockchain.

Campaign-specific data, such as the campaign title, description, fundraising target, and milestone information, is collected through the frontend form. This data is then transmitted as parameters to the smart contract when it is deployed. The deployment procedure involves compiling the Solidity code and creating a new instance of the smart contract on the Ethereum blockchain. During this procedure, a new contract address is generated for the campaign, allowing users to interact with it.

The smart contract also manages interactions with the Ethereum network, including the calculation and payment of gas fees. These fees are essential for validating and conducting transactions on the blockchain.

Blockchain Confirmation and Immutability:

Once the transaction to deploy the smart contract is initiated, the Ethereum blockchain processes it. This confirmation typically occurs within seconds.

An essential characteristic of the blockchain is its immutability. The newly established campaign, now associated with a unique contract address on the blockchain, becomes a permanent part of the decentralized ledger. This immutability guarantees that the campaign's details are tamper-proof and publicly accessible to all network participants, nurturing transparency and trust.

Display of Campaign on the Platform:

Upon successful confirmation of the campaign's creation on the blockchain, the campaign contract is now active(**Figure 3.5.1)**. It is promptly displayed on the platform's homepage for all users to access and interact with. This display includes all the campaign details, such as the title, description, fundraising progress, and milestones. Other users can review this information and determine whether they want to support the campaign's objectives by contributing to it.

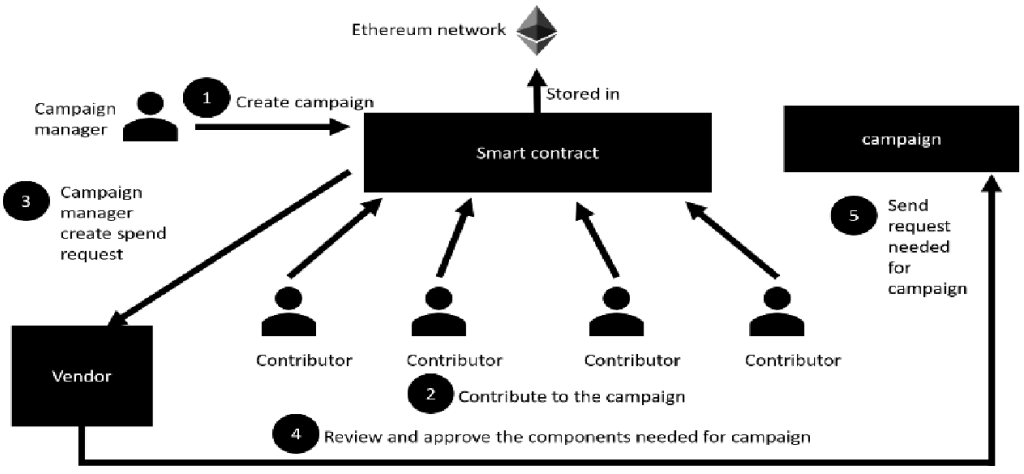

Figure 3.5.1 : Campaign Creation and it's flow

3.6: CONTRIBUTING TO A CAMPAIGN

When a user decides to contribute to a campaign on your crowdfunding platform, it's a voyage that combines user interaction and the underlying blockchain technology seamlessly.

Campaign Selection: Users begin by selecting a campaign that corresponds with their interests and values. They explore the campaign's details, including the title, description, current fundraising progress, and any milestones set by the campaign creator. This choice is the beginning point for their crowdfunding journey.

Wallet Integration: To participate in the crowdfunding process, users must have their Ethereum wallet, like Metamask, incorporated with the platform. This integration is not just a mere connection; it establishes a secure and direct link between the user's digital identity and the blockchain. It's this connection that ensures the security and immutability of the entire transaction.

Contribution Specification: After choosing a campaign, users specify the quantity they want to contribute. They can input this amount in Ether (ETH) or other supported tokens, offering them flexibility based on their preferences and available assets. The flexibility of the platform ensures that users can participate on their terms.

Transaction Authorization: Before affirming their contribution, users are prompted to authorize the transaction. This authorization typically takes place within their connected Ethereum wallet, such as Metamask. It's a pivotal stage, enabling users to review and approve the transaction details, including any associated gas fees. This confirmation ensures that users have control over their contributions and full transparency regarding the transaction costs.

Blockchain Transaction Creation: Once the user verifies their transaction, the crowdfunding platform generates a transaction. This transaction is subsequently submitted to the Ethereum blockchain. It carries crucial information, such as the user's specified contribution amount and

the destination address, which corresponds to the Ethereum address linked to the selected campaign. This is where the technical magic occurs.

Gas Fee Consideration: Every Ethereum blockchain transaction includes a gas fee, essential for processing and validation. The exact amount of this fee may fluctuate dependent on network conditions and the transaction's complexity. This fee ensures the transaction's security and integrity.

Blockchain Processing: The Ethereum blockchain takes over the processing of the transaction. The smart contract linked to the campaign becomes the arbiter here. It validates the contribution to ensure it complies with the campaign's predefined rules and objectives. Once validated, the smart contract updates the campaign's fundraising progress to reflect the newly received contribution. This is where the blockchain's automation and smart contract capabilities flourish.

Transaction Hash Generation

When a user contributes to a campaign and the Ethereum blockchain conducts the transaction, a unique transaction hash is generated as part of the confirmation process. This transaction hash serves as a digital identifier for the transaction, offering several critical functions:

- **Identifiable Reference**: The transaction hash is a lengthy alphanumeric string that uniquely identifies this specific transaction. It serves as a reference point for this contribution among the multitude of transactions on the blockchain. Users, campaign creators, and other stakeholders can readily refer to this hash to locate and verify the transaction.

- **Verification** and **Audit**: The transaction hash is an essential instrument for verifying the authenticity and integrity of a transaction. Users can use the hash to corroborate that their contribution was indeed recorded on the blockchain as intended. Campaign creators and platform administrators can also use it for auditing and accountability purposes.

- **Immutability**: Once a transaction is confirmed and the hash is generated, it cannot be altered or deleted. This immutability ensures that the transaction's details and existence are preserved on the blockchain permanently. It becomes an indisputable record of the contribution.

Blockchain Timestamp

Every transaction on the blockchain is timestamped, indicating that it is recorded with a precise date and time. This timestamp serves several crucial functions:

- **Historical Record:** The timestamp ensures that the transaction is not just a current event but part of the historical record of the blockchain. Users and other stakeholders can see exactly when the fund transfer occurred, providing a chronological context to the contribution.

- **Chronological Ordering:** The timestamp enables transactions to be arranged in chronological order, which is essential for comprehending the sequence of events on the blockchain. This is particularly essential in financial transactions, as it helps in tracking and auditing funds' movement.

- **Transparency and Accountability:** Timestamps contribute to the transparency and accountability of the blockchain. They enable users to verify the timing of their contributions and ensure that all transactions, including fund transfers, occur as expected and within specified timeframes.

Public Ledger Entry:

The fund transfer is securely and transparently documented on the public ledger of the Ethereum blockchain. This public ledger is disseminated across countless nodes on the network, making it virtually tamper-proof. Here's how this aspect works:

- **Distributed and Immutable:** The public ledger entry is distributed across a network of nodes, each of which maintains a copy of the entire blockchain. This distribution ensures that there's no central authority controlling the ledger, making it resistant to manipulation or interference.

- **Transparency:** The ledger entry is accessible to anyone with access to the blockchain, promoting transparency. Users, campaign creators, and auditors can view the ledger entry to verify the fund transfer's details, including the amount, source, and destination.

- **Security and Trust:** The tamper-proof nature of the ledger entry creates trust in the system. It's virtually impossible for anyone to alter the recorded fund transfer details without consensus from the network, augmenting the security and reliability of the crowdfunding platform.

Transaction Confirmation: Users receive a confirmation once the transaction is effectively processed and recorded on the blockchain. This confirmation includes essential details, including a unique transaction hash, functioning as an identifier for the contribution. It's a reassurance to the user that their contribution has been securely recorded on the immutable blockchain.

Fund Transfer: Behind the scenes, the smart contract guarantees the secure transfer of the contributed funds. It orchestrates the transfer of funds from the user's wallet to the campaign's Ethereum address, effectively increasing the total funds raised by the campaign. This phase guarantees that the user's contribution is securely and transparently delivered to the campaign

Transparency and Accountability: Contributions are now securely recorded on the blockchain's public ledger, ensuring transparency and accountability (**Figure 3.6.1)**. Both the user and other platform visitors can evaluate the contribution history and monitor the campaign's overall financial progress. This transparency fosters trust and confidence in the crowdfunding process, ensuring that contributions are verifiable and tamper-proof.

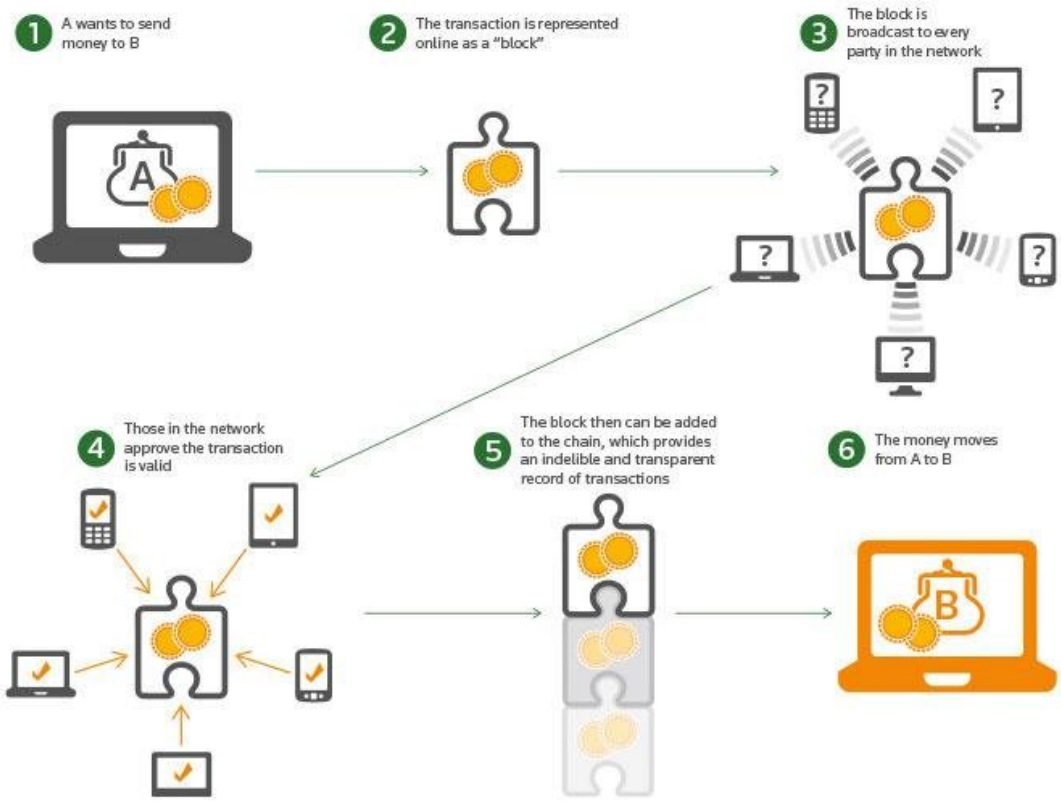

Figure 3.6.1 : Flow of money via Blockchain

3.7: CLASS DIAGRAM (Figure 3.7.1)

i) Campaign Class:

The Campaign class represents a crowdfunding campaign established by a user or an organization. It incorporates all the essential information and features related to a specific fundraising effort. Each instance of the Campaign class includes attributes such as the campaign's title, description, funding target, duration, and the current amount raised. Users can create campaigns to raise funds for their projects, causes, or initiatives. These campaigns can be thought of as individual fundraising initiatives within your platform.

ii) CampaignFactory Class:

The CampaignFactory class is responsible for constructing instances of Campaign. It functions as a factory or a smart contract on the blockchain that facilitates the creation of new crowdfunding campaigns. The relationship between CampaignFactory and Campaign is one-to-one, indicating that each instance of the CampaignFactory is associated with and can create multiple instances of the Campaign class. When a user wishes to launch a new campaign, they interact with the CampaignFactory to deploy a new Campaign smart contract on the blockchain.

iii) Requests Class:

The Requests class represents specific funding requests or milestones within a crowdfunding campaign. A campaign may have multiple Requests, each corresponding to a particular item, task, or objective that requires funding. For instance, in a tech project campaign, requests could represent various development phases. These requests outline the purpose of the funds, the amount required, and the status of each request (e.g., pending or completed). The relationship between Campaign and Requests is one-to-many, signifying that a single campaign can have multiple associated funding requests.

iv) connectWallet Class:

The connectWallet class is not explicitly defined as a class in your description but appears to represent a functional aspect of your platform. It involves the procedure by which users connect their digital wallets (e.g., Metamask) to the platform. Users attach their wallets to the platform to interact with smart contracts, make contributions to campaigns, and manage their cryptocurrency assets securely. This relationship is one-to-many, indicating that one user can connect their wallet to support multiple campaigns and contribute to various funding requests.

In summary, your platform enables users to create crowdfunding campaigns using the CampaignFactory class. Each campaign can have multiple funding requests, which are tracked by the Requests class. Users connect their funds to support these campaigns, with one user

potentially contributing to multiple campaigns and their associated requests. These relationships and classes work together to enable users to raise funds for their initiatives, monitor progress, and facilitate secure transactions on the blockchain.

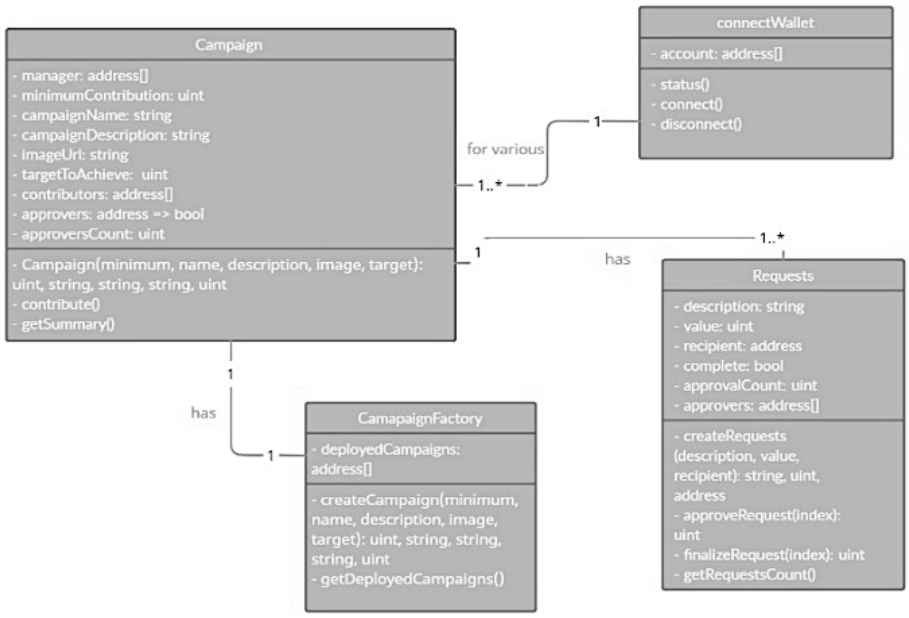

Figure 3.7.1 : Class Diagram

3.8 SYSTEM ARCHITECTURE

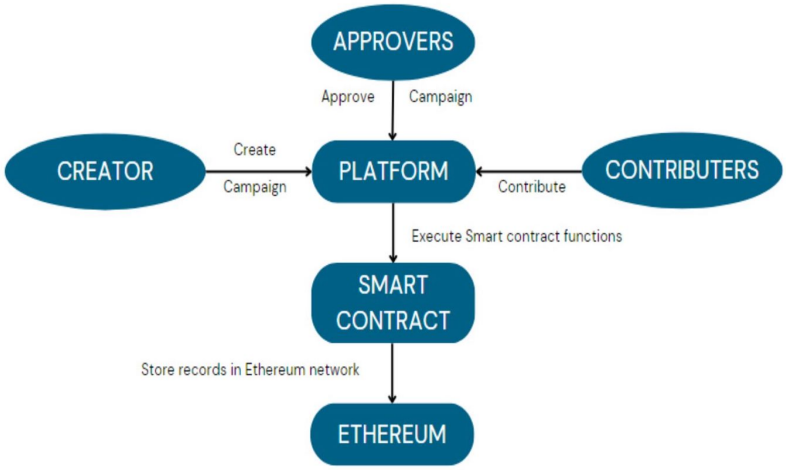

Figure 3.8.1 : Flow Chart of Smart Contract

CHAPTER 4

RESULTS FOR CROWDSOURCING PLATFORM

Our blockchain-based crowdsourcing platform streamlines user engagement. To initiate any transaction, users simply connect their Ethereum wallet through Metamask. Campaign creation is intuitive, with users submitting necessary data, while contributors authorize transactions seamlessly, choosing campaigns and confirming amounts with ease. The platform ensures a user-friendly and transparent experience throughout.

4.1. CONNECT WALLET

As shown in **Figure 4.1 ,** In order to complete any transactions, whether it establishment of a campaign or contributing to one, a user first needs to connect an Ethereum wallet to the site. We have made use of a browser extension called Metamask to connect the wallet, which may be used to authorize transactions for cryptocurrency.

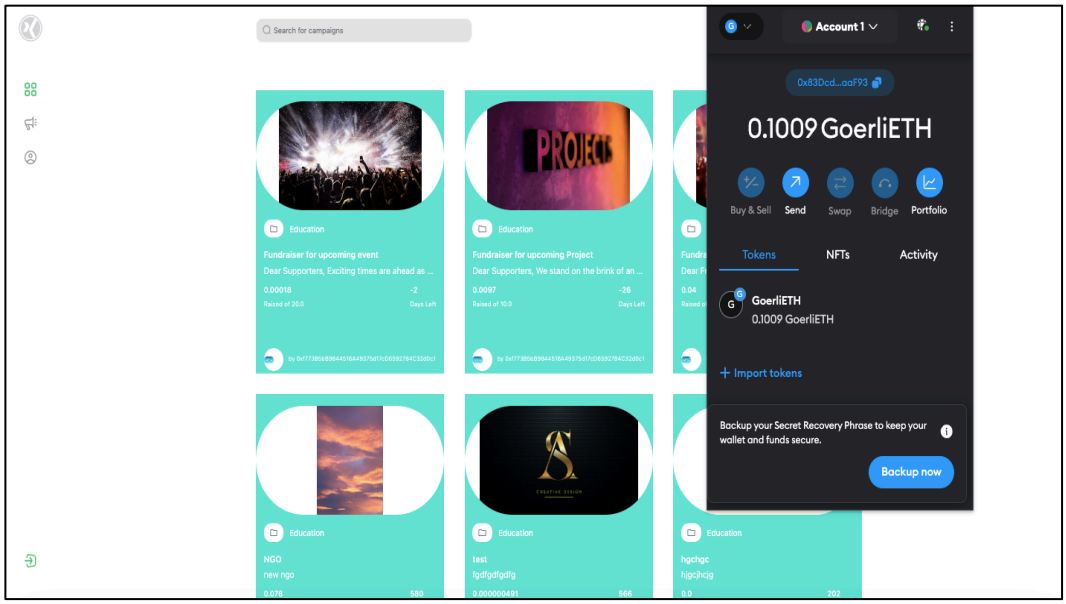

Figure 4.1 : Connect Metamask Wallet

4.2. CREATING A CAMPAIGN

Once a wallet has been connected, anyone can establish a crowdfunding campaign. The method is fairly intuitive and self-explanatory, and the user only has to submit the data as asked in the forms. A demo for creating a campaign is shown in **Figure 4.2(a).**

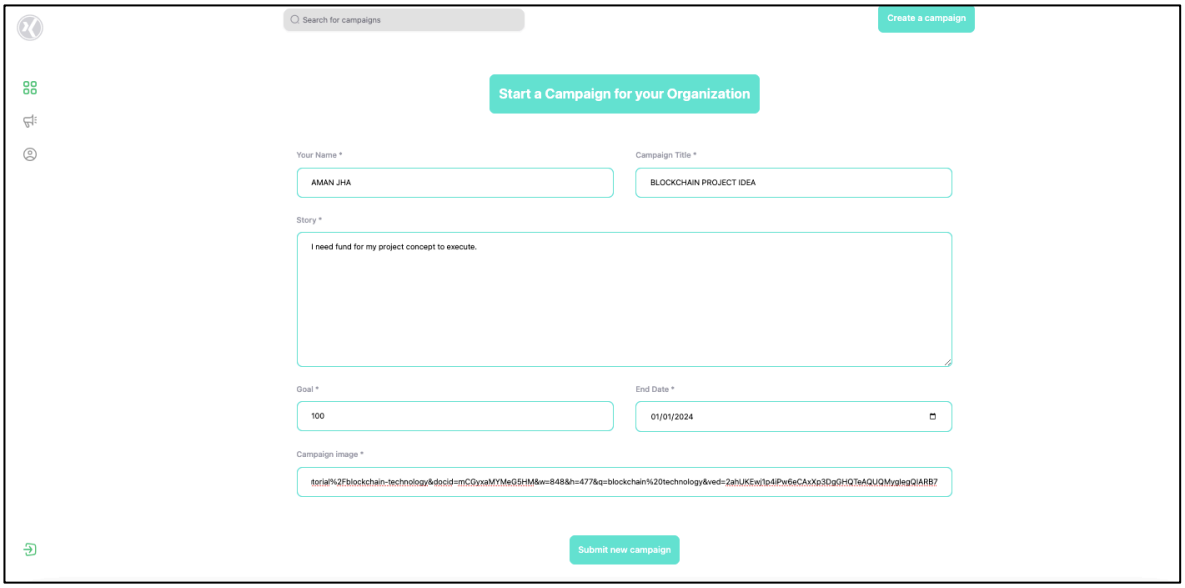

Figure 4.2(a) : Creating a Campaign

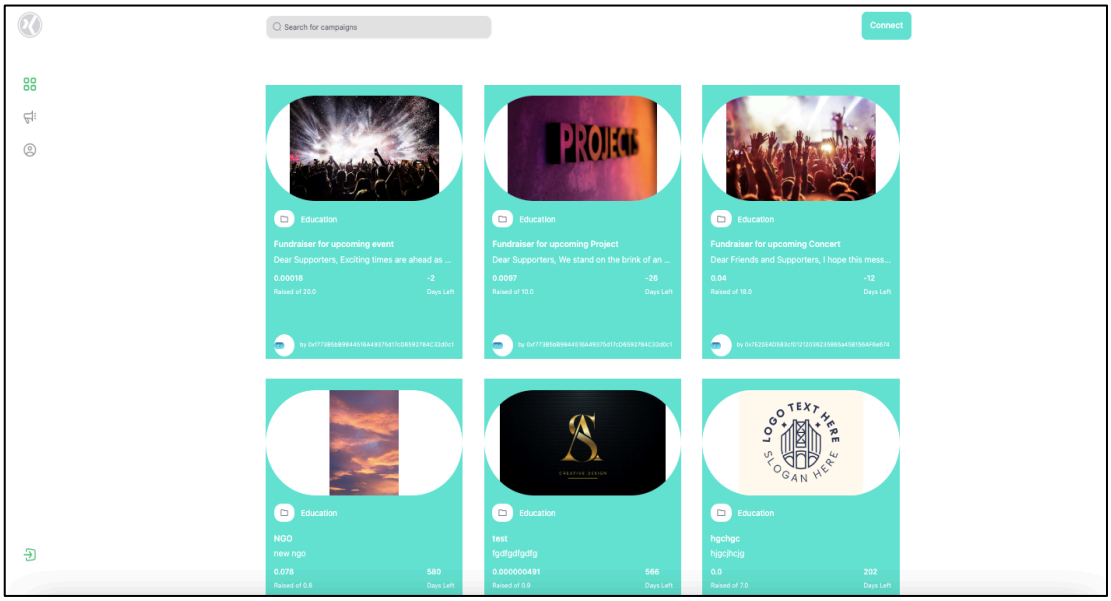

Figure 4.2(b) : Home Page

4.3. CONTRIBUTING TO A CAMPAIGN

Any user whose wallet has been connected to the app can contribute to a campaign. The technique is easy and outlined in the flow below **Figure 4.3(a)** . The user merely needs to select the campaign, input the amount he intends to contribute, and then authorize the transaction (in this example, with the Metamask plugin).

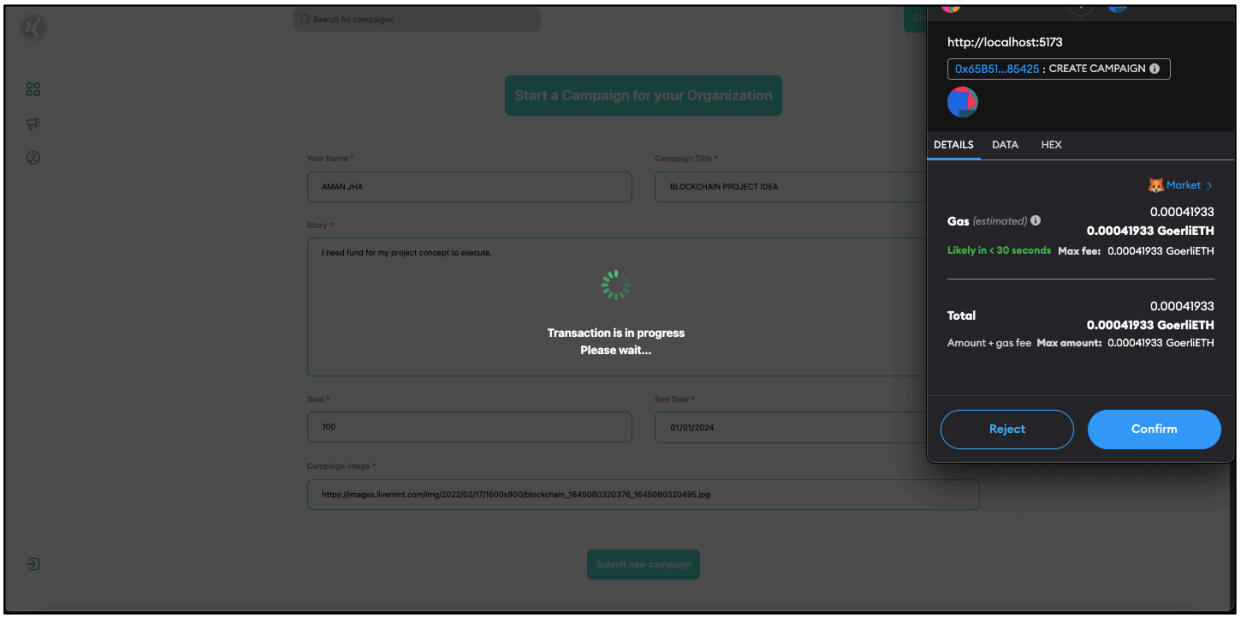

Figure 4.3(a) : Contributing a Campaign

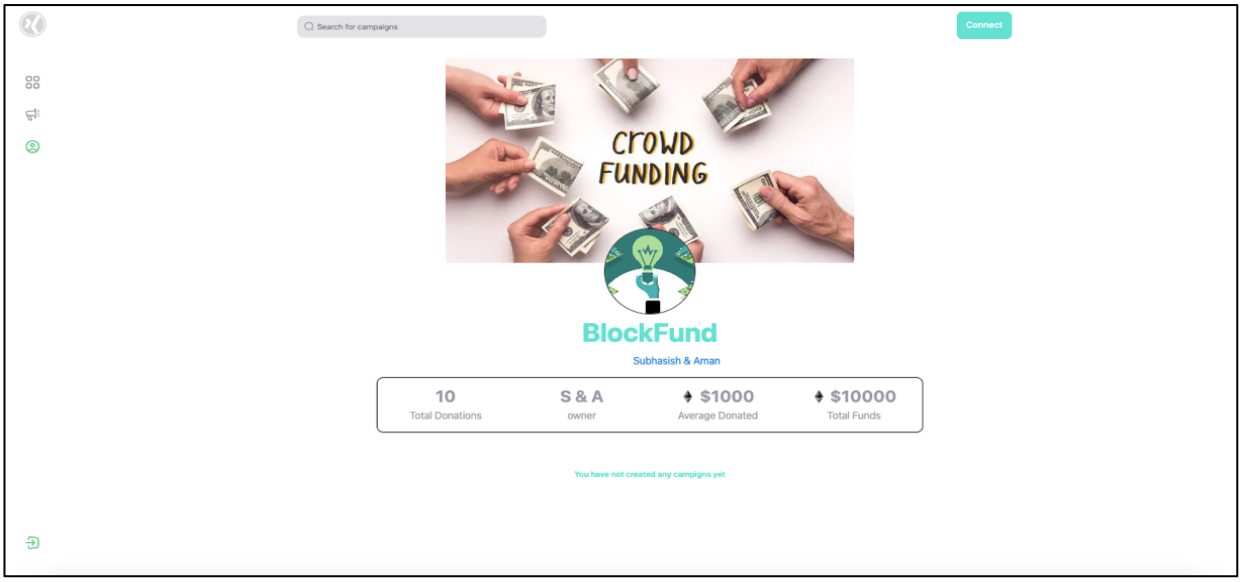

Figure 4.3(b) : Contribution details

CHAPTER 5

CONCLUSION

In this project, we began on a journey to examine the revolutionary possibilities of blockchain technology in the world of crowdfunding. We set out with a commitment to cultivate trust, transparency, and inclusivity, and we harnessed the possibilities of blockchain to develop "BlockFund," a platform that empowers individuals and organizations on a worldwide scale.

Conventional crowdfunding systems have long faced with chronic difficulties, including transparency challenges and the impending possibility of fraudulent activity. Our purpose was to proactively solve these difficulties, and via the development and execution of "BlockFund," we have taken considerable efforts in attaining this objective.

The concept of a crowdfunding platform that is transparent, resilient against fraud, and decentralized has been realized to a large degree. This project thoroughly targeted the risks inherent in traditional crowdfunding systems, providing transparency throughout the crowdfunding process and fostering confidence among contributors. As a result, individuals can now offer their resources to many great causes without the nagging concern of fraudulent actions.

We can certainly state that "BlockFund" represents a major shift in the crowdfunding scene. By utilising the promise of blockchain technology, we have built a platform that gives greater trust, transparency, and control over the fundraising process. Traditional systems have struggled to solve these concerns effectively, but "BlockFund" offers a viable alternative.

In the course of our study, we have decisively proved that our web-based crowdfunding system, developed utilising blockchain technology, addresses significant challenges experienced by traditional crowdfunding platforms. Utilizing Ethereum smart contracts and the Solidity

programming language, we have created a system that ensures greater trust, transparency, control over funds, and secure storage of transactions. The use of Infura as a dependable connection between the web system and the Ethereum network guarantees that all transactions are logged safely and reliably.

Our novel method to crowdfunding eliminates the need for charging fees, enabling a more safe and trustworthy alternative for entrepreneurs to obtain capital. The consequences of our work extend well beyond this research. "BlockFund" promises a possible answer to the long-standing issues experienced by traditional crowdfunding systems. It has the potential to alter the way startups are funded and contribute to the greater use of blockchain technology in numerous industries.

In summary, "BlockFund" stands as a significant advancement in the crowdfunding arena, tapping on the potential of blockchain technology. Conventional platforms have long dealt with challenges relating to trust, transparency, and accessibility, all of which "BlockFund" efficiently overcomes. By embracing blockchain technology, "BlockFund" assures secure and transparent fundraising.

The employment of Ethereum-based smart contracts accelerates campaign creation, assuring both security and transparency in campaign administration. Our innovative withdrawal mechanism, depending on the consensus of the majority of approvers, instills trust among donors. "BlockFund" serves as a symbol of trust, transparency, and inclusivity in the world of crowdfunding, linking worldwide communities via the powerful potential of blockchain.

This research emphasises the transformational potential of blockchain technology in altering crowdfunding by addressing existing obstacles and promoting trust and transparency. As blockchain technology continues to evolve, more exploration promises unique solutions, marking a new era in the future of crowdfunding.

CHAPTER 6

FUTURE SCOPE

The "BlockFund" project has provided a solid platform for revolutionising crowdfunding through blockchain technology. As we look ahead, there are several promising avenues for future development and expansion:

Scaling and usage: The immediate future involves scaling the "BlockFund" platform and encouraging widespread usage. This means reaching out to additional users, both campaign designers and contributors, and broadening the scope to cover a diverse range of fundraising activities, from creative initiatives to social concerns.

Enhanced Security: As blockchain technology continues to evolve, it offers increased security features. Future iterations of "BlockFund" can harness these improvements to further harden the platform against any potential threats, ensuring the safety of contributions and data.

Smart Contract Innovation: Smart contracts are at the foundation of "BlockFund." Future development can explore more complicated and configurable smart contract templates, allowing campaign creators greater flexibility and contributors enhanced faith in the execution of contracts.

Integration with developing Technologies: The integration of blockchain with developing technologies, such as artificial intelligence and IoT, holds immense promise. "BlockFund" can study how these technologies can be combined to enhance campaign management, automate operations, and deliver more data-driven insights.

User Experience Improvements: A user-friendly interface is crucial for platform adoption. Continuous user experience advancements, including improved design, mobile compatibility, and accessibility features, can make "BlockFund" more appealing to a wider audience.

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APPENDIX 1

This section contains details on the language, software and packages used in our project.

REACT.JS

React.js, a JavaScript library for creating user interfaces, is a powerful choice for the front end of your blockchain-based crowdfunding platform. It excels at constructing dynamic, responsive, and interactive web applications. React's component-based architecture simplifies UI development, making it simpler to manage complex user interfaces. With a rich ecosystem of libraries and tools, React enables you to construct a visually appealing and highly responsive platform. Its virtual DOM system optimizes performance by efficiently updating only the portions of the interface that have changed, ensuring a smooth user experience.

TAILWIND CSS

Tailwind CSS is a utility-first CSS framework, and it's an excellent choice for designing your crowdfunding platform's front end. It streamlines the design process by providing a set of pre-defined utility classes, allowing you to rapidly construct consistent and visually appealing layouts. By employing these utility classes directly in your HTML, you can easily manage styling, responsive design, and layout composition.

This approach makes Tailwind CSS a flexible and developer-friendly choice. It simplifies the creation of a user interface that is both visually appealing and responsive, crucial for attracting and retaining contributors.

NODE.JS AND EXPRESS.JS

For the back end of your platform, Node.js and Express.js compose a robust combination. Node.js, a JavaScript runtime environment, is well-suited for server-side development. It excels in handling asynchronous operations, making it ideal for blockchain-related duties. Express.js, a minimal and flexible web application framework, facilitates routing, request handling, and middleware creation. Together, they provide an effective and scalable server environment. Node.js and Express.js enable your platform to respond to user requests, handle database interactions, and manage the fundamental functionalities of your crowdfunding platform seamlessly. Their versatility makes them an excellent choice for the back end of your application.

SOLIDITY AND THIRDWEB

Solidity is the language of preference for developing smart contracts on the Ethereum blockchain. It's designed to establish self-executing contracts that govern crowdfunding processes, ensuring transparency and trust. With its syntax and structure, Solidity facilitates the development of secure and transparent smart contracts that are essential for your crowdfunding platform. In addition, the reference to ThirdWeb likely points to technologies or protocols that facilitate cross-chain interactions, ensuring your platform's smart contracts can interact with multiple blockchains, extending their capabilities beyond a single network.

METAMASK

Metamask functions as the wallet solution for your platform, allowing users to securely manage their cryptocurrency holdings and interact with smart contracts. Metamask is a popular browser extension that functions as a gateway to the blockchain, making it easy for users to connect to the network. It simplifies duties like managing digital assets, interacting with your crowdfunding platform's smart contracts, and securely conducting transactions. By integrating Metamask, you provide a seamless and secure user experience, as it simplifies the process of connecting users to the blockchain network, managing their digital assets, and facilitating secure transactions on your platform

APPENDIX 2

FUNCTIONS OF SMART CONTRACT

```
function createCampaign(address _owner, string memory _title, string memory _description, uint256 _target, uint256 _deadline,
string memory _image) public returns (uint256) {
    Campaign storage campaign = campaigns[numberOfCampaigns];

    require(campaign.deadline < block.timestamp, "The deadline should be a date in the future.");

    campaign.owner = _owner;
    campaign.title = _title;
    campaign.description = _description;
    campaign.target = _target;
    campaign.deadline = _deadline;
    campaign.amountCollected = 0;
    campaign.image = _image;

    numberOfCampaigns++;

    return numberOfCampaigns - 1;
}

function donateToCampaign(uint256 _id) public payable {
    uint256 amount = msg.value;

    Campaign storage campaign = campaigns[_id];

    campaign.donators.push(msg.sender);
    campaign.donations.push(amount);

    (bool sent,) = payable(campaign.owner).call{value: amount}("");

    if(sent) {
        campaign.amountCollected = campaign.amountCollected + amount;
    }
```

```
function getDonators(uint256 _id) view public returns (address[] memory, uint256[] memory) {
    return (campaigns[_id].donators, campaigns[_id].donations);
}

function getCampaigns() public view returns (Campaign[] memory) {
    Campaign[] memory allCampaigns = new Campaign[](numberOfCampaigns);

    for(uint i = 0; i < numberOfCampaigns; i++) {
        Campaign storage item = campaigns[i];

        allCampaigns[i] = item;
    }
    return allCampaigns;
}

function myDonations() public view returns (Campaign[] memory){
    return donatedCampaigns[msg.sender];
}
```

```
function myDonations() public view returns (Campaign[] memory){
    return donatedCampaigns[msg.sender];
}

function getCampaignsByOwner(address ownerAddress) public view returns (Campaign[] memory) {
    uint256 ownedCampaignsCount = 0;

    for (uint256 i = 0; i < numberOfCampaigns; i++) {
        if (campaigns[i].owner == ownerAddress) {
            ownedCampaignsCount++;
        }
    }
    Campaign[] memory ownedCampaigns = new Campaign[](ownedCampaignsCount);
    uint256 currentIndex = 0;

    for (uint256 i = 0; i < numberOfCampaigns; i++) {
        if (campaigns[i].owner == ownerAddress) {
            ownedCampaigns[currentIndex] = campaigns[i];
            currentIndex++;
        }
    }
    return ownedCampaigns;
}
```

SERVER

CrowdFunding.sol ● | stripeRoute.js ×

server > routes > stripeRoute.js > ...

```
1  const express = require("express");
2  const stripe = require("stripe")(process.env.STRIPE);
3
4
5  const { v4: uuidv4 } = require("uuid");
6
7  const router = express.Router();
8
9  router.get('/', (req, res, next) => {
10     console.log("Get request");
11     res.json({ message: "Hello from the other side" });
12 })
13
14 router.post('/pay', (req, res, next) => {
15     console.log(req.body.token);
16     const { token, amount } = req.body;
17     const key = uuidv4();
18
19     return stripe.customers.create({
20         email: token.email,
21         source:token
22     }).then(customer => {
23         stripe.charges.create({
24             amount: amount * 100,
25             currency: 'usd',
26             customer: customer.id,
27             recipt_email:token.email
28         }, {key})
29     }).then(result => {
30         res.status(200).json(result)
31     }).catch(err => {
32         console.log(err.message);
33         res.status(400).json(err.message);
34     })
35 })
36
37 module.exports = router;
```

CrowdFunding.sol ● index.js ×

server > index.js > ...

```
1  const express = require("express");
2  const cors = require("cors");
3  const dotenv = require("dotenv");
4  dotenv.config();
5  const sroutes = require('./routes/stripeRoute');
6  const app = express();
7
8  app.use(cors());
9  app.use(express.json());
10 app.use(express.urlencoded({ extended: true }));
11
12 app.use('/api/stripe', sroutes);
13
14 app.listen(5000, () => {
15     console.log("Server listening on port 5000")
16 })
```

SERVER PACKAGES

CrowdFunding.sol ● package.json M ×

server > package.json > dependencies > express

```
1  {
2    "name": "server",
3    "version": "1.0.0",
4    "description": "",
5    "main": "index.js",
       ▷ Debug
6    "scripts": {
7      "dev": "nodemon index.js",
8      "test": "echo \"Error: no test specified\" && exit 1"
9    },
10   "keywords": [],
11   "author": "",
12   "license": "ISC",
13   "dependencies": {
14     "cors": "^2.8.5",
15     "dotenv": "^16.3.1",
16     "express": "^4.18.2",
17     "nodemon": "^3.0.1",
18     "stripe": "^13.9.0",
19     "uuid": "^9.0.1"
20   }
21 }
22
```

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Dear Author,

This is to inform you that your presentation proposal titled " **Blockchain-Enabled Crowdsourcing: A Path to Transparency and Equity in Contributions and Compensation**" (PAPER ID:**ICCBI-486**) authored by " **Subhasish Kumar, Aman Kumar Jha**" which was submitted for the 5th International Conference on Computer Networks, Big Data, and IoT (ICCBI 2023) scheduled to be held on December 14-15, 2023, at Care College of Engineering in Trichy, Tamil Nadu, India, has been accepted.

On behalf of the organizing committee, I extend my congratulations to you.

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We are confident that your presentation will make a significant impact on our conference attendees.

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BlockFund

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