**“Preserving Integrity of fundraising using Blockchain”**

*A project report submitted for the partial fulfillment of academic*

*requirements for the award of Degree*

*in*

**BACHELOR OF ENGINEERING**

**in the Department of**

**INFORMATION SCIENCE & ENGINEERING**

Major Project Phase-2 (IS8C02)

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Certified that the project work entitled “Reserving Integrity of Fundraising using Blockchain” carried out by above bonafide students of 8th Semester is submitted in partial fulfillment as part of Major Project phase-2 for the award of Bachelor of Engineering Degree in Information Science and Engineering of The National Institute of Engineering, Mysuru, an autonomous institute under Visvesvaraya Technological University, Belagavi during the academic year 2021-2022. It is certified that all suggestions/ corrections suggested during Internal Assessment have been incorporated in the Report deposited in the departmental library.

The project report has been approved as it satisfies the academic requirements in respect of Project Work prescribed for the award of the said Degree.

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**DECLARATION**

We, Abhinandan M.S bearing USN: 4NI18IS003, B S Shrikara bearing USN: 4NI18IS018, Srinidhi G B bearing USN: 4NI18IS092, Suraksh NS bearing USN: 4NI18IS099 students of 8th semester of UG program, Department of Information Science and Engineering, The National Institute of Engineering, Mysuru hereby declare that the project work entitled “Reserving Integrity of Fundraising using Blockchain” has been carried out by us under the guidance of Mr. Suhaas K P, Assistant Professor, Department of I.S.&E.

This project work is submitted to **The National Institute of Engineering**, Mysuru, (An Autonomous institute under VTU, Belagavi) in partial fulfilment of the **Major Project phase-2** requirements for the award of degree in Information Science & Engineering during the academic year 2021-2022. This written submission represents a record of original work and We have adequately cited and referenced the original sources.

Further the matter embodied in this thesis has not been submitted to any other University or Institution for the award of any degree.

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**ABSTRACT**

Crowdfunding has disrupted the way of financing and allowed the startups to raise funds without much hustle and bureaucracy. In the existing model, Pool of people contribute small amounts of money towards a project or cause and expect some financial or non-financial returns. The crowdfunding forum takes the commission and meets the needs and expectations of sponsors and fundraisers.

Blockchain technology is a decentralized ledger, more efficient, safe, and tamper-proof system of nodes in connection. The introduction of blockchain in crowdfunding will make it more reliable, transparent, trustworthy, dedicated, less expensive and easier. The crowdfunding forum that used to act as a mediator in the past will only provide technology and the name of its crypto currency that will serve as a means of trading and trading. Fundraisers will generate their own currency and everyone on the network will be notified about the project. Funders will buy this crypto currency to claim its share in the project and can withdraw any time by selling the currency and losing the share in a project or transferring it to another project. Blockchain can further improve this unique and contemporary way of raising funds by making out more reliable and transparent.

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**CHAPTER 1**

**INTRODUCTION**

**1.1 Fundraising**

Fund-raising is the process of seeking and gathering voluntary financial contributions by engaging individuals, businesses, charitable foundations, or governmental agencies. Although fundraising typically refers to efforts to gather money for non-profit organizations, it is sometimes used to refer to the identification and solicitation of investors or other sources of capital for for-profit enterprises.

**1.2 Introduction to Blockchain**

Blockchain Technology is becoming increasingly evident in our day to day lives. Increased companies have started using blockchain as an underlying network for their daily transactions. When blockchain became popular, it was only used for handling payments using the cryptocurrency Bitcoin, but over the years, numerous studies have been carried upon and have started to suggest that blockchain can be used in many more areas. In blockchain, there is no need for a central authority to approve of these transactions or execute the operations. Blockchain is a peer-to-peer based network which is run by all the nodes that are participating. Because of this, not only Ethereum has a zero-trust network but also all the structural information is kept within the blockchain network. The devices connected to the network are called nodes and they keep a copy of the blockchain and all of the transaction history in the form of a distributed ledger. Devices and built-in sensors are connected to the Internet of Things item, which collects data from different devices and uses statistics to share the most important information with applications designed to address specific needs.

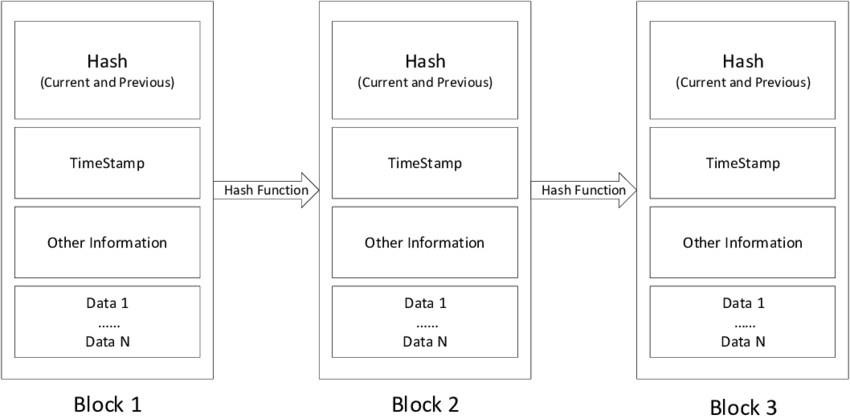
Blockchain is a system of recording information in a way that makes it difficult or impossible to change, hack, or cheat the system. A blockchain is essentially a digital ledger of transactions that is duplicated and distributed across the entire network of computer systems on the blockchain. The goal of blockchain is to allow digital information to be recorded and distributed, but not edited. Blockchain technology was first outlined in 1991 by Stuart Haber and W. Scott Stornetta, two researchers who wanted to implement a system where document timestamps could not be tampered with. Blockchain enables 100% transparency and ensures transactional integrity and non-repudiation across a distributed ledger.

Blockchain is being used in various walks of life, companies have started to use it in

various new ways such as personality identity, prevent fraud money laundering scams etc.

**1.3** **Structure of Blockchain**

A blockchain is a decentralized, distributed, and oftentimes public, digital ledger consisting of records called blocks that is used to record transactions across many computers so that any involved block cannot be altered retroactively, without the alteration of all subsequent blocks. This allows the participants to verify and audit transactions independently and relatively inexpensively. A blockchain database is managed autonomously using a peer- to-peer network and a distributed timestamping server. They are authenticated by mass collaboration powered by collective self-interests.

 The use of a blockchain removes the characteristic of infinite reproducibility from a digital asset. It confirms that each unit of value was transferred only once, solving the long- standing problem of double spending. A blockchain has been described as a value-exchange protocol. A blockchain can maintain title rights because, when properly set up to detail the exchange agreement, it provides a record that compels offer and acceptance.

**Fig 1.1:** Structure of Blockchain

**1.4 Blocks**

Blocks hold batches of valid transactions that are hashed and encoded into a Merkle tree. Each block includes the cryptographic hash of the prior block in the blockchain, linking the two. The linked blocks form a chain. This iterative process confirms the integrity of the previous block, all the way back to the initial block, which is known as the genesis block.

Sometimes separate blocks can be produced concurrently, creating a temporary fork. In addition to a secure hash-based history, any blockchain has a specified algorithm for scoring different versions of the history so that one with a higher score can be selected over others. Blocks not selected for inclusion in the chain are called orphan blocks. Peers supporting the database have different versions of the history from time to time. They keep only the highest- scoring version of the database known to them.

Whenever a peer receives a higher-scoring version (usually the old version with a single new block added) they extend or overwrite their own database and retransmit the improvement to their peers. Blockchains are typically built to add the score of new blocks onto old blocks and are given incentives to extend with new blocks rather than overwrite old blocks. Therefore, the probability of an entry becoming superseded decreases exponentially as more blocks are built on top of it, eventually becoming very low.



**Fig 1.2:** Blocks in Blockchain

**1.5 Block Time**

The block time is the average time it takes for the network to generate one extra block in the blockchain. Some blockchains create a new block as frequently as every five seconds. By the time of block completion, the included data becomes verifiable. In cryptocurrency, this is practically when the transaction takes place, so a shorter block time means faster transactions. The block time for Ethereum is set to between 14 and 15 seconds, while for bitcoin it is on average 10 minutes.

**1.6 Ethereum**

Ethereum blockchain allows us to execute code with the Ethereum Virtual Machine (EVM) on the blockchain with something called a smart contract. Smart contracts are where all the business logic of the application lives. Ethereum is a public blockchain which is decentralized framework and is completely independent and is not constrained by anybody by any means. Then it can be incorporated in the Ethereum blockchain which cannot be altered by any individual. A smart contract is a computer protocol that allows us to facilitate and verify the performance of a contract. These transactions are trackable and irreversible.

**1.7 Smart Contract**

Smart contracts are in charge of reading and writing data to the blockchain, as well as executing business logic. Smart contacts are written in a programming language called Solidity, which looks a lot like JavaScript. It is a full-blown programming language that will allow us to do many of the same types of things JavaScript is capable of, but it behaves a bit differently because of its use case.

Project will have a traditional front-end client that is written in HTML, CSS, and JavaScript. Instead of talking to a back-end server, this client will connect to a local Ethereum blockchain that need to be installed. The business logic about the Dapp is coded in a campaign smart contract with the Solidity programming language. Smart contract is deployed to the local Ethereum blockchain and allow accounts to start campaigning.

System architecture is a model that defines the behavior of a system in the conceptual model. The huge systems are decomposed into subordinate systems to provide a similar set of services. The beginning layout strategy of perceiving these sub-systems and building up a structure for sub-systems control and cooperation is called architecture design.

**1.8 Metamask Chrome Extension**

In order to use the blockchain, app must connect to it (block chain is a network). A special browser extension has to be installed in order to use the Ethereum block chain. That’s where metamask comes in. It will be able to connect to the local Ethereum blockchain with the personal account and interact with the smart contract.

**1.9 Rikeby Test Network**

The Rinkeby testnet is an Ethereum testnet that developers use to test and perfect their own decentralized applications. The network is run by pre-authorized nodes, which prevents spam attacks and increases performance. Developers can use a Rinkeby Faucet to get free testnet ETH and test their smart contracts without the risk of losing real financial assets. The Rinkeby testnet is mainly used for blockchain testing before deployment on the Ethereum mainnet. It is a fork of the Ethereum mainnet.

**1.10 Web3.js Library**

Digital assets such as cryptocurrencies (or programmable tokens) and smart contracts are a central component of decentralized applications (DApps), in that they are deployed on the blockchain. However, to interact with these on-chain components, transactions need to be created on the blockchain. For a user or off-chain software to create a transaction on the blockchain, a node needs to relay the transaction to the underlying peer-to-peer (P2P) network. Web3.js is a collection of libraries that allows programmers to interact with these on-chain components, by being able to facilitate a connection to Ethereum nodes.

**CHAPTER 2**

**LITERATURE SURVEY**

**2.1 Platform for tracking donations of charitable foundations based on Blockchain Technology (IEEE,2019)**

[1] Donors have distrust about how doegdfgdfgdfgdfgdfgdgdfgnated money is spent. Currently, blockchain technology is being implemented in different sectors. Blockchain technology allows you to make the process of donations and transactions of funds transparent. Single platform for tracking donations that will track all information about donations, transactions and donors need to be developed. The System offers transparent accounting of operations donors, charitable foundations and recipients based on blockchain technology, charitable platform should provide transparent donation route, enable public users and donors to track and monitor where, when and to whom went resources of charity funds.

**2.2 Proposed solution for trackable donations using blockchain**

**(IEEE,2019)**

[2] The lack of transparency has made people lose trust in charities. This paper proposes a system called Charity-Chain that is a decentralized network built on the Ethereum blockchain. It helps social organizations to run projects transparently, using smart contract-based incentives to ensure their impact is independently verified and accessible to everyone.

**2.3 Venturing crowdfunding using smart contracts in blockchain (IEEE,2020)**

[3] Blockchain based crowdfunding by using which the platform can give a private, secure, and decentralized path for crowdfunding. The main objective of this paper is to let investors contribute to any project effectively by creating smart contracts through which the contributors can have a control over the invested money and also both the project creators and investors can effectively make and reserve funding for the project.

**2.4 Crowdfunding Fraud Prevention using Blockchain (IEEE,2019)**

[4] Online crowdfunding enables people to raise funds for their project. People who are interested in a project can donate by making an online transaction. The donated money goes to the project manager, which he uses to complete the project or to make a product. This existing method of online crowdfunding has a major drawback. It does not allow contributors to have control over the money they have contributed. Since in the existing method the project manager has all the control over the money contributed, he can very easily perform malicious activities. Here we address this problem faced by the existing online crowdfunding platforms by using Ethereum network and smart contract. The development of Blockchain technology has allowed businesses to build decentralized models. It has derived new methods to conduct transactions and make agreements.

**CHAPTER 3**

**SYSTEM REQUIREMENTS**

**3.1 Hardware Requirements**

The following are the Hardware Requirements for the running the system

Hard Disk : 50 GB or more

Ram : 8 GB Recommended

Processor : i3 / AMD Fx 4100 (or greater)

Processor Speed : 1.5 GHz or higher

**3.2 Software Requirements**

Operating System : Windows / Ubuntu / Mac

Languages : HTML, CSS, JavaScript, and Solidity

Tools : VS code, Web Browser (Google Chrome)

: Rinkeby Test Network

: Web3.js

: Metamask Chrome Extension

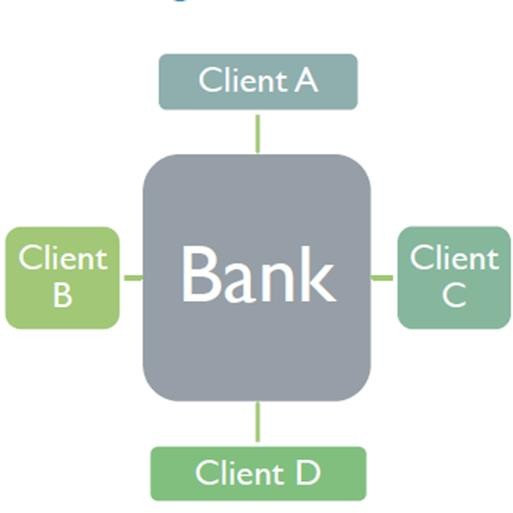
**CHAPTER 4**

**SYSTEM DESIGN**

**4.1 Existing System**

Traditionally, in the concept of fund raising the patrons do not have any knowledge about where their money is being used or for what purpose their money is used. They do not have control over their donated money once they contribute it. In this case the person who raised the campaign can use the funded money for his/her personal needs and thereby disobeying the fundraising idea.

Many of the fundraising platforms do not ensure that the promise will be met in regard to contributors, and it might be sometimes unfair to the contributors which makes them hesitate to invest in the venture due to which project managers face problems. Projects usually have to hit their funding goals to be successful, and a portion of the funding is usually taken by the website. Putting an innovative idea out to the masses might not be the best idea if funding isn’t guaranteed as others could take the idea and run with it themselves.



**Fig 4.1** Existing System of Fundraising

**4.1.1 Disadvantages of Existing system**

* **Fees:** Most crowdfunding platforms will take a percentage of the contributions raise. These fees are minimal but may still reduce the amount of money you’d otherwise get.
* **Platform risk**: Bankruptcy of a platform can directly adversely affect both entrepreneurs and investors.
* **Fraud by a crowdfunding platform**: Due to the relatively new and growing market, not many systems have yet been designed to prevent or compensate for such fraud.
* **Fraud by borrowers**: It is possible that borrowers set up a fraudulent campaign. This is because there is less strict control than with other financing methods. If you decide to invest in such projects, there are fewer safety nets to absorb your losses.

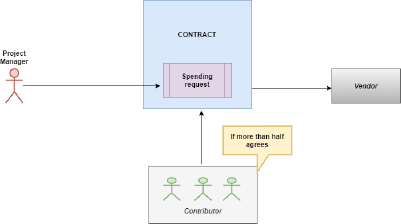
A major disadvantage of crowdfunding via crowdfunding platforms is that if you fail to collect the budget you have set in time, your project will be removed from the platform, and you will have to start again from scratch. In addition, in the event of bankruptcy, there may be a claim against your personal assets. Some platforms offer the option to re-promote a revised version of the campaign, but this is not a general right.

**4.2 Proposed System**

Blockchain in fundraising allows decentralization which means that no individual platform or group of platforms control the smart contracts which makes it transparent to everyone in the blockchain. It’s a peer-to-peer network, so no one can alter any block without approval of more than 50 percent nodes in the blockchain which makes it secure and safe. Anyone can create the project on the website with blockchain and anyone who has internet can donate to the project. The smart contracts will handle all the transactions so all the money will be stored in smart contracts rather than sending to the third party.

As crowd funding contains a lot of transactions, there is a need to handle and document the actions legally. Therefore, a smart contract is used which is a transaction protocol which automatically execute, control and document actions of the transactions according to the agreement on behalf of project creators and investors. So, two contracts one which stores all the projects and other one which handle the transactions for each project. In any crowdfunding platform, the main entities are project manager, contributors, vendors, smart contract, spending request and campaigning system. There are three stages included in the crowdfunding.

In the first stage a campaigner creates new project by mentioning the name of the project, the description of the project and the minimum contribution to that project. And the contributors then can view the all the open projects in crowd funding platform and can choose any project for which they want to contribute. To mark themselves as contributors, they have to invest minimum contribution for that project which campaigner has mentioned while creating the project.

 Spending request, in this stage, if a project manager wants to spend the money contributed by investors, then they have to create the spending request by giving the description about where they are going to spend the money, the total amount they are going to spend and the address of the vendor who will supply the things required by the campaigner.

**Fig 4.2:** Smart Contract system ensures money spent is in control of contributors

The campaign system is designed which ensures that the contributors who have invested in that specific project, only they can accept or reject the spending request sent by campaigner. And the campaign system also ensures that the contributor once voted cannot vote again for that spending request. So, if more than half of the contributors for that project agree for the spending request, then the money is sent to the vendor so that user can supply the utilities asked by campaigner. Smart contract is a program which is written in solidity language to handle all the transactions automatically.

**Diagram

Description automatically generatedFig 4.3:** Smart Contract

The campaigner has to first create the project by mentioning the name, description, and the minimum contribution for that project. Then user can create the spending request for spending the money contributed by the investors. For this project creators have to mention the description about where they are going to spend the money, the amount of money they are going to spend and the address of the vendor who will provide some service. If more than half of the investors agree for the spending request, then the project manager can send the money to vendor’s address. Then the vendor provides the service requested by the campaigner.

**4.2.1 Advantages of Proposed system**

* Startups are not going to rely on any platform or combination of platforms to enable creators to raise funds. Startups no longer be beholden to the rules, regulations, and whims of the most popular crowdfunding platforms on the internet.
* It also eliminates the problem of fees, while blockchain upkeep does cost a bit of money, it will cut back drastically on transaction fees. This makes crowdfunding less expensive for creators and investors.
* Any project using a blockchain based crowdfunding model can potentially get funded. Also, any person with an internet connection can contribute to those projects.
* Blockchain based crowd funders wouldn’t have to worry about the “Fraud” that have plagued modern day crowdfunding projects. Instead, contributors will immediately receive fractional enterprise or product ownership.

**4.3 Overview of the System**

Diagram

Description automatically generated For the implementation, Ethereum Blockchain is used because it is one of the widely used and open-source platforms for developing and deploying decentralized applications. Ethereum provides a wide range of services and solutions with its readily available development tools and smart contracts. A smart contract is a self-executing program that runs on the blockchain. In order for it to get compiled and deployed on the blockchain, each node on the network then executes the contract in exchange for some ether. The currency required to execute a contract is called gas amount and varies from contract to contract.

**Fig 4.4** Overview of System Architecture

**4.4 Use Case Diagram**

A use case diagram is a graphical depiction of a user's possible interactions with a system. A use case diagram shows various use cases and different types of users the system has. Here the use cases are represented by either circles or ellipses. The actors are shown as stick figures.

Use case diagrams are also called as high-level design diagrams. The use cases and actors in use-case diagrams describe what the system does and how the actors use it, but not how the system operates internally. Use-case diagrams illustrate and define the context and requirements of an entire system and the important parts of the system.

This UML Use case diagram shows the options or the interface available for the managers and the donors. Managers have the option to Create Campaign, Add Details, Create Spend Request. Donors have options to donate and vote for the campaign. Backing a project, Viewing the status of the project, Reviewing the available Project options are available for Diagram

Description automatically generatedboth the managers and the donors.

**Fig 4.5:** Use Case Diagram

**4.5 Sequence Interaction in a System**

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations in the logical view of the system under development. Sequence diagrams are sometimes called event diagrams or event scenarios.

Here the parallel vertical lines show different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur.

Here in the below Sequence diagram the event or a project starts by creation of the project, the create project request is sent from the beneficiary to the smart contract through the platform. Then the success from the smart contract is returned to the platform. After the creation the Project manager uploads the features and outcomes of the project based on that donor donate. The donated funds will be in the smart contract. When the manager wants to use the money, he has to request the money saying where it will be used. Now to allow the control over the donor’s money the donors have a voting chance to agree/not agree for the use Diagram

Description automatically generatedof money. If the votes are more than 50% funds are transferred.

**Fig 4.6** Sequence Diagram

**4.6 Data Flow Diagram**

A control-flow diagram can consist of a subdivision to show sequential steps, with if-then-else conditions, repetition, and/or case conditions. Suitably annotated geometrical figures are used to represent operations, data, or equipment, and arrows are used to indicate the sequential flow from one to another.

Project manager creates new project by mentioning the name of the project, the description of the project and the minimum contribution to that project. And the contributors then can view the all the open projects in crowd funding platform and can choose any project for which they want to contribute. To mark themselves as contributors, they have to invest minimum contribution for that project which project manager has mentioned while creating the project. And this money is added to the wallet which can be used by the project mangers

#### Diagram Description automatically generated

**Fig 4.7** Creating or Contributing to a campaign

It is a program which is written in solidity language to handle all the transactions automatically. As shown in Fig. 3, the project manager has to first create the project by mentioning the name, description, and the minimum contribution for that project. Then user can create the spending request for spending the money contributed by the investors. For this project creators have to mention the description about where they are going to spend the money, the amount of money they are going to spend and the address of the vendor who will provide some service. If more than half of the investors agree for the spending request, then the project manager can send the money to vendor’s address. Then the vendor provides the service requested by the project manager.

Diagram

Description automatically generated**Fig 4.8** Flowchart of Project Manager

**CHAPTER 5**

**SYSTEM IMPLEMENTATION**

**5.1 Connect Wallet**

In order to perform any transactions, be it creation 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 which is a software cryptocurrency wallet used to interact with the Ethereum blockchain. Allows users to access their Ethereum wallet via a browser extension or mobile application, which may be used to communicate with country-divided applications. MetaMask was developed by ConsenSys Software Inc., a blockchain software company focused on Ethereum-based tools and infrastructure.

Graphical user interface, application

Description automatically generated

**Fig 5.1** Connecting the Wallet

**5.2 Creating a Campaign**

**A screenshot of a computer

Description automatically generated**Just like Crowdfunding in the real world as well as on other crowdfunding platforms, anyone can create a campaign in a few minutes. The campaign information will be managed by the Ethereum-based smart contract and thus cannot be tampered with.

**Fig 5.2** Creating a New Campaign

**5.3 Algorithm to Create a New Campaign**

Step 1: Start

Step 2: Click on Connect Wallet Button

Step 3: Click on Create Campaign Button

Step 4: Enter the details of the Campaign

Step 5: Click on Create Button to create a new Campaign

Step 6: Approve the Campaign through the metamask Wallet

Step 7: Stop

**5.4 Contributing to a Campaign**

A screenshot of a computer

Description automatically generated with medium confidenceOnce a campaign has been created, users can share the campaign, and anybody can contribute to the campaign. The funds will go to the address of the campaign and not to the creator of the campaign, thus making the process more efficient and anti-fraudulent. The donors can donate their money if they are pleased with the campaigns and all the money will be present in the smart contract making the fundraising transparent.

**Fig 5.3** Contributing Funds to the Campaign

**5.5 Algorithm to Donate to an Existing Campaign**

Step 1: Start

Step 2: Select an existing campaign on the home page

Step 3: If interested donate to the Campaign

Step 4: Input the donation greater than the minimum amount

Step 5: Click on Contribute

Step 6: Approve the donation through metamask Wallet

Step 7: Stop

**5.6 Making a Withdrawal Request**

If you are the creator of a fund, you might need to withdraw from the available funds for various reasons. You can create a Withdrawal Request by the flow given below, which must be approved by the majority of approvers.

If you are a Contributor who has contributed more than the Minimum Contribution (specified in the campaign), then you are an approver. You can vote on the Withdrawal requests made by the creator, and either approve or deny the request.

A screenshot of a computer

Description automatically generated with medium confidenceNo funds can be withdrawn without the approval of at least 50% of the approvers. This provides complete transparency in the process of withdrawing funds. Approvers can see where their money is going. The creator is not the intermediary of the transfer of funds.

**Fig 5.4** Withdrawal Request Page

**5.7 Algorithm to Create a withdrawal Request**

Step 1: Start

Step 2: Select an existing campaign on the home page

Step 3: Click on the view withdrawal request

Step 4: Enter the details for withdrawal

Step 5: Create a ticket to run through the smart contract to get approved

Step 6: Stop

**5.8 Algorithm to Approve the Withdrawal Request**

Step 1: Start

Step 2: Select an existing campaign on the home page

Step 3: Click on view withdrawal Request

Step 4: Click on Approve Button

Step 5: Stop

**CHAPTER 6**

**DEPLOYMENT**

Deployment encompasses all the processes involved in getting new software or hardware up and running properly in its environment, including installation, configuration, running, testing, and making necessary changes.

The below mentioned are the steps to deploy the application:

* First install all the required dependencies like Package manager, and create account in Infura, Metamask.
* Use the Metamask chrome extension to create accounts on rinkeby network
* Use the link <https://faucets.chain.link/>, to add test Ether to your account.
* Start writing the smart contract it contains all the business logic of dApp. It will be in charge reading from and writing to the Ethereum blockchain.
* Migrate smart contract to the rinkeby blockchain.
* Type the various input needed for the project like campaigners, managers, doners etc.
* Solidarity Mapping is used to store the approvers.
* Compile the Contract using the node compile.js
* Deploy Contract by going into smart-contract Directory and run. node deploy.js
* Copy the contract deploy address and replace it in factory.js file.
* Add your "infura end point link" in web3.js file
* Test the application, make sure that all the tests pass.
* Next, build the client-side application by using HTML and JavaScript. Set up JavaScript libraries, initialize contacts, lay out all the content on the page with the data from the smart contract.
* Cast the votes in the election and test the voting function if the function increments the vote count for the candidate and test that the voter is added to mapping whenever they vote.
* Finally, run the application.

**CHAPTER 7**

**TESTING**

Testing is an essential footstep in the development of a system. Testing is the course of action of verifying the correctness of the system that is already developed. After the system is developed, it needs to be verified with the functionalities that each functional specification is working in a correct manner. It also ensures the newly developed system meets the quality requirement and genuineness. Testing is performed at various levels of the system with the sole aim of making a secure and qualified system. In other words, the testing is performed to check whether the system is working as in the same way the system was designed and expected to work. The testing is mainly performed to achieve and affirm the quality of the project. The testing performs the quality assurance for the software. Testing involves writing test cases for each operation to check and verify the functionality of the module.

**7.1 Levels of Testing**

**7.1.1 Unit Testing**

Unit testing is the method in which individual units of source code or modules are tested. These discrete units are assessed for their functionality. The unit testing is also called “Module Testing”. The unit testing makes use of specific paths in the control structure of the module that ensures complete testing of the module. The expected output is validated against the actual output and the module functionality is inferred.

**7.1.2 Integration Testing**

The integration testing involves integrating of several modules and testing for the functionality in the combined effort. The integration testing helps in systematic technique for constructing the program structure. When the modules are integrated, certain classes may lead to inconsistencies. These inconsistencies affect both the modules and their functionality. To deal with such issues, the integration testing is performed.

**7.1.3 System Testing**

The system testing involves ensuring the fully integrated system meets the desired requirements. It is used to check the system compliance to meet the requirements. The system testing does not require the knowledge of inner logic and its design.

**7.1.4 Acceptance Testing**

The acceptance testing is mainly carried out to find out whether the requirements and specifications are met. It involves performing tests on the system. The acceptance testing requires significant participation by the end user. It also determines whether the functional requirements are met or not.

**7.1.5 Performance Testing**

The performance testing is the testing performed to find out how the developed system reacts in ways of stability and responsiveness. The performance testing involves load test, stress testing, soak testing and isolation/segregation testing

**7.2 Test Cases**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Testcase name | Operation | Expected result | Actual Result | **Pass/Fail** |
| Run yarn package manager | Launches the website and then starts the server from the terminal | launch the website and start the server | Website successfully launched and server started | Pass |
| Links accessibility | Verify the links are clickable in the homepage | Successful if taken to the clicked link page | Successfully taken to the specified page | Pass |
| Form fields accept Data for entry | Verifying the form fields are accepting data from the user | Data should be entered in the form fields | Data can be successfully entered in the form fields | Pass |
| Submit the data button in the form | Form data should be submitted on the click and navigate to respective page | Successful if entry is valid show the respective details | Successfully takes to respective page | Pass |
| Accessing metamask through Chrome extension | Opens the Metamask application | Opens the Extension for chrome | Extension opened successfully | Pass |
| Job Module Import rinkeby account of user to Metamask | Importing the rinkeby account of the user to the metamask extension | Account added successfully to the metamask | Successfully added account to metamask | Pass |
| Job Module- Web3.js Deployment | Deploys the smart contract to rinkeby test network | Successful if deployed | Deployed the contract successfully | Pass |
| Testcase name | Operation | Expected result | Actual Result | Pass/Fail |
| Solidity Mapping | Place the actors’ details in the blockchain | Successful if store all the actor’s info | Successfully Stored | Pass |
| Addition of campaigns | Add the campaigns to blockchain using Ethereum | Successful if add the campaign | Successfully added | Pass |
| Addition of donors after donation | Add the doners to blockchain | Successful if add the doner | Successfully added | Pass |
| Doners Login | Enter the login credentials with respective metamask | Successful if verified and logged in | Successfully logged in | Pass |
| Metamask confirmation | Verify the account, gas limit, available balance, and perform the | Successful if respective verification is done | Successfully verified | Pass |
| Doners tracking the product | Doners tracking the campaigns and campaign related funds | Successful if the related information is found | Successfully verified | Pass |

**Table 7.1** Table of Test Cases

**CHAPTER 8**

**COST EFFECTIVENESS**

Our proposed system is a lot more cost effective than the traditional campaigning approach in the following ways:

* The cost per campaign which was more due to the presence of middlemen can be cut down.
* Distributed ledger technology can reduce the cost of financial services infrastructure, provide an opportunity to streamline the assets and infrastructure and significantly reduce IT costs.
* Saves time and money in search of donors which could be easily available on the platform

**CONCLUSION**

Finally, it is concluded that the crowdfunding using blockchain is a relatively new concept and it’s still in exploratory stage where numerous legal issues and specialized issues need to be handled.

Blockchain does have the potential to become an integral part of the operation of many businesses, offering scalability, security, and computing power at a lower CAPEX and OPEX. But of course, as is the case with most new technology service offerings, there are a number of risk-based issues that need to be carefully considered before business, particularly heavily regulated ones, can start to fully realize the potential benefit.

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