A Synopsis of Project on

EtherFund - Transforming Crowdfunding through Blockchain

Submitted in partial fulfillment of the requirements for the award
of the degree of

Bachelor of Engineering

in

Computer Science and Engineering (Data Science)

by

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Academic Year 2024-2025

Approval Sheet

This Project Synopsis Report entitled ***"EtherFund - Transforming Crowdfunding through Blockchain"*** Submitted by ***"Sanskruti Chavan"(21107047),"Harshad Raurale"(22207002),"Saaras Gaikwad"(22207003)*** is approved for the partial fulfillment of the requirement for the award of the degree of ***Bachelor of Engineering*** in ***Computer Science and Engineering (Data Science)*** from ***University of Mumbai***.

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Acknowledgement

We have great pleasure in presenting the synopsis report on **EtherFund - Transforming Crowdfunding through Blockchain**. We take this opportunity to express our sincere thanks towards our guide **Ms. Ujwala Pagare** & Co-Guide **Ms. Aavani Nair** for providing the technical guidelines and suggestions regarding line of work. We would like to express our gratitude towards his constant encouragement, support and guidance through the development of project.

We thank **Prof. Anagha Aher** Head of Department for his encouragement during the progress meeting and for providing guidelines to write this report.

We express our gratitude towards BE project co-ordinator **Ms. Poonam Pangarkar and Ms. Ashwini Rahude** , for being encouraging throughout the course and for their guidance.

We also thank the entire staff of APSIT for their invaluable help rendered during the course of this work. We wish to express our deep gratitude towards all our colleagues of APSIT for their encouragement.

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Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, We have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

EtherFund is a cutting-edge crowdfunding platform that leverages Ethereum blockchain technology to offer a secure, transparent, and efficient solution for managing campaigns. By utilizing smart contracts written in Solidity, EtherFund automates campaign creation and fund management, ensuring trustless, tamper-proof transactions. The platform integrates MetaMask for seamless wallet connectivity and user authentication, simplifying the process for both campaign creators and supporters. With real-time updates, analytics, and receipt downloads, users can monitor progress effortlessly. EtherFund also optimizes gas fees, lowering transaction costs. Security is a priority, with end-to-end encryption (E2EE), email/phone verification, and robust privacy measures in place. Additionally, social media integration helps expand global access and visibility, making EtherFund a powerful alternative to traditional crowdfunding platforms, which often face issues like high fees, slow payments, and limited transparency.

Keywords - Blockchain, Ethereum, Crowdfunding, Solidity Smart Contracts, MetaMask, Decentralized Platform, Secure Transactions, Transparency, Data Privacy, End-to-End Encryption (E2EE), Analytics Dashboard, Social Media Integration, Campaign Management, Tokenization, Real-Time Updates.

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List of Abbreviations

E2EE:	End-to-end encryption
UI:	User Interface
JS:	JavaScript
IoT:	Internet Of Thing
SDK:	Software Development Kit
DFD:	Data Flow Diagram
API:	Application Programming Interface

Chapter 1

Introduction

In a world where transparency, security, and efficiency are crucial to financial transactions, traditional crowdfunding platforms often fall short in addressing key concerns such as mismanagement of funds, lack of accountability, and global accessibility. These platforms frequently face challenges including high fees, slow payments, and limited transparency, making it difficult for backers to trust that their contributions are being utilized as intended. To address these limitations, EtherFund - a next-generation, blockchain-based crowdfunding platform - was developed.

EtherFund stands for "Ethereum-based Fundraising Platform," and its primary goal is to create a decentralized, secure, and transparent ecosystem for managing crowdfunding campaigns. Leveraging the Ethereum blockchain, the system ensures automated and trustless transactions through smart contracts, reducing reliance on intermediaries. The platform integrates MetaMask for seamless wallet connectivity, enabling users to track their campaigns in real-time, download receipts, and engage in secure transactions with end-to-end encryption (E2EE).

This report delves into the core features of the EtherFund Project, focusing on how the platform addresses the key challenges faced by traditional crowdfunding models. The report highlights the innovative use of blockchain technology to enhance fund security, global access, and transparency in managing campaigns. By integrating advanced technology and data analytics, EtherFund revolutionizes the crowdfunding process, providing users with a more reliable, efficient, and secure fundraising experience.

In conclusion, EtherFund represents a significant step forward in transforming crowdfunding into a more accessible and trustworthy system. By combining the power of blockchain, smart contracts, and user-friendly features, EtherFund enhances the security and transparency of fundraising, empowering both campaign creators and contributors alike. This report outlines the various aspects of EtherFund, emphasizing its potential to revolutionize the crowdfunding landscape.

1.1 Motivation

Traditional crowdfunding platforms have become a popular way to raise funds for various projects, from creative endeavors to social causes. However, despite their wide usage, these platforms are plagued by several key challenges that limit their overall effectiveness. These issues create significant barriers for both campaign creators and contributors, ultimately hindering the potential of crowdfunding as a powerful tool for collective fundraising. To

overcome these limitations, EtherFund introduces a decentralized, blockchain-based solution that addresses each of these challenges, ensuring a more efficient, transparent, and secure platform for all users.

The motivation behind EtherFund stems from the need to tackle the following key issues that traditional crowdfunding platforms often face:

- **Transparency Issues**

  Traditional crowdfunding platforms often lack clear processes for fund management and tracking, creating a trust deficit between campaign creators and backers. Contributors are frequently left in the dark about how their funds are used, and whether the campaign goals are being met. EtherFund leverages blockchain technology to provide a transparent and immutable ledger of transactions, allowing contributors to track every movement of their funds in real-time [4], fostering trust and accountability.

- **High Fees**

  Many existing platforms charge substantial fees, which can significantly reduce the amount of money a campaign receives. Platform fees, payment gateway charges, and withdrawal fees can cut deeply into the funds raised, which is especially harmful for smaller campaigns. EtherFund minimizes these costs by eliminating intermediaries through the use of smart contracts, ensuring that more funds go directly to the campaign creators.

- **Delayed Transfers**

  The slow transfer of funds is another critical issue with traditional crowdfunding platforms. Campaign creators often face delays in accessing their funds, which can impede project timelines and cause frustration. Through the use of blockchain technology and Ethereum's smart contracts, EtherFund automates fund transfers, ensuring that funds are released as soon as predefined conditions are met, drastically reducing delays.

- **Limited Global Reach**

  Many traditional platforms are limited by geographic and banking restrictions, preventing people from various regions from participating in campaigns. This limitation restricts both the reach of the campaign and the diversity of its backers. EtherFund solves this by utilizing cryptocurrency, enabling global transactions without the need for banking intermediaries, thus expanding the platform's accessibility to contributors worldwide.

- **Complex Management**

  Managing campaigns on traditional platforms can be overly complicated, with numerous administrative tasks and manual oversight required to handle funds, backer communication, and goal tracking. EtherFund simplifies campaign management by automating much of the process through smart contracts. This not only reduces manual effort but also decreases the chance of errors, allowing campaign creators to focus more on their project and less on the logistics.

  The motivation for EtherFund is rooted in addressing the core inefficiencies of traditional crowdfunding platforms. By providing solutions to issues like transparency, high fees, delayed transfers, limited reach, and complex management, EtherFund offers a

more streamlined, secure, and global approach to crowdfunding. The platform empowers campaign creators and contributors alike, ensuring a seamless and trustworthy fundraising experience through the use of cutting-edge blockchain technology.

1.2 Problem Statement

The problem with traditional crowdfunding platforms lies in their reliance on central authorities, which often leads to issues like high fees, lack of transparency, delayed fund transfers, and security risks. Users must trust these platforms to manage their data and funds, leaving room for mismanagement and inefficiencies. Additionally, limited global reach and banking restrictions hinder wider participation. EtherFund addresses these challenges by leveraging Ethereum smart contracts and MetaMask integration to create a secure, transparent, and decentralized system. It ensures real-time fund tracking, eliminates the need for intermediaries, and provides global accessibility, ultimately solving the key problems of inefficiency, high costs, and lack of trust in traditional crowdfunding methods.

1.3 Objectives

The EtherFund project aims to revolutionize crowdfunding by leveraging blockchain technology, ensuring enhanced security, transparency, and user experience. These objectives are focused on creating a decentralized, user-friendly platform that empowers both campaign creators and contributors. The following listed points are the objectives of EtherFund :-

- **To deploy Solidity Smart Contracts**

  Automating the creation, funding, and management of campaigns, Solidity smart contracts eliminate intermediaries and facilitate trust less interactions, streamlining the crowdfunding process for users.

- **To integrate Ethereum Blockchain and MetaMask**

  This integration ensures secure, transparent transactions and real-time updates, providing seamless wallet connectivity for users while enhancing trust in the platform.

- **To develop an Analytics Dashboard**

  The dashboard offers detailed tracking of campaign performance, enabling users to make data-driven decisions and optimize contributions effectively throughout the crowdfunding life cycle.

- **To implement Social Media Integration and Feed Extraction**

  Enhancing user engagement, this feature allows for easy social sharing , provides access to social media feeds, and offers receipt downloads, creating a more interactive and rewarding experience for users.

- **To ensure Data Privacy and Security**

  With end-to-end encryption (E2EE) and email/phone verification, EtherFund prioritizes user data security, creating a safe environment for contributors and campaign creators alike.

  In conclusion, EtherFund's objectives aim to establish a robust, user-centric crowdfunding platform that leverages blockchain technology. By automating processes with smart contracts, ensuring secure transactions, and enhancing user engagement through analytics and social media integration, EtherFund addresses the challenges of traditional crowdfunding. The focus on data privacy and security reinforces trust and transparency, ultimately empowering users and creating a more accessible crowdfunding experience.

1.4 Scope

The scope of the EtherFund project encompasses a comprehensive range of features and functionalities designed to revolutionize crowdfunding through blockchain technology. By focusing on security, transparency, and user engagement, EtherFund aims to create a platform that not only meets the needs of modern crowdfunding but also addresses the limitations of traditional systems.

- **Develop a blockchain-based platform**

  The project aims to create a decentralized platform that eliminates intermediaries, ensuring secure and transparent transactions between campaign creators and backers.

- **Deploy Solidity smart contracts**

  Smart contracts will automate the processes of campaign creation, funding, and management, providing a trustless environment that enhances user interaction.

- **Integrate MetaMask**

  By incorporating MetaMask, EtherFund will facilitate secure user authentication, wallet management, and ensure end-to-end encryption (E2EE) [12] for all transactions.

- **Implement real-time updates and analytics dashboards**

  The platform will provide comprehensive campaign tracking through real-time updates and analytics dashboards, empowering users to make data-driven decisions.

- **Create social media integration**

  Features such as feed extraction [1] and receipt downloads will be implemented to boost user engagement and interaction, enabling campaigns to reach a wider audience.

- **Ensure data privacy and security**

  EtherFund will prioritize data privacy through robust encryption methods and email/phone verification [6], safeguarding user information and transactions.

- **Design a user-friendly interface**

  Utilizing React.js and Chakra UI, the platform will offer an accessible and intuitive interface, ensuring a seamless user experience across all devices.

In conclusion, the scope of EtherFund is strategically designed to address the challenges of traditional crowdfunding by harnessing the power of blockchain technology. By focusing on security, transparency, and user engagement, the project aims to create a reliable platform that not only enhances the crowdfunding experience but also empowers individuals and communities.

Chapter 2

Literature Review

The literature review explores the landscape of crowdfunding, emphasizing its transformative role in democratizing funding access for diverse projects. It examines traditional crowdfunding models and highlights the emergence of blockchain-based platforms, focusing on their potential to address challenges such as transparency, security, and inefficiency. This analysis aims to dissect key concepts, methodologies, and trends within the crowdfunding sphere while identifying gaps in research and opportunities for innovation, ultimately contributing to the advancement of more effective and equitable crowdfunding solutions.

2.1 Comparative Analysis of Recent Study

Both the EtherFund platform and the base reference paper emphasize leveraging blockchain technology to address issues inherent in traditional crowdfunding platforms, particularly fraud prevention, transparency, and efficiency. However, they differ in their approaches and focus areas. EtherFund stands out with its advanced feature set, incorporating Solidity-based smart contracts for campaign automation and MetaMask integration for user authentication and wallet connectivity. The platform prioritizes user experience with real-time updates, analytics, and receipt generation, along with gas fee optimization to reduce transaction costs. Security measures in EtherFund include end-to-end encryption (E2EE) and multi-layer verification, underscoring a commitment to privacy and security.

In contrast, the base reference paper concentrates more on solving the basic issues in traditional crowdfunding, such as fraud prevention and delayed project completion, by introducing Ethereum smart contracts to ensure automatic and trustworthy campaign execution. While it highlights the use of blockchain to ensure transparency and efficiency, it lacks the advanced features of EtherFund, such as gas fee optimization and real-time analytics. The base paper primarily focuses on using blockchain as a solution to eliminate fraud and ensure timely project delivery, while EtherFund expands its objectives to global access, social media integration, and a more user-centric design, making it a more comprehensive and modernized solution. Both studies, however, align in their core objective: improving the crowdfunding experience through decentralized, secure, and transparent mechanisms.

Alexandrescu, Adrian, and Cristian Nicolae Butincu (2023) [1] The paper proposes a decentralized system using blockchain to retrieve and verify news articles, separating webpage crawling from article scraping by allowing third-party actors to handle these tasks. A majority-rule mechanism ensures accuracy, while blockchain provides traceability. However, the system's complexity requires advanced skills, faces regulatory uncertainty, and raises privacy concerns due to blockchain's transparency. Integrating it with existing platforms also presents challenges.

Firmansyah Ashari, Tetuko Catonsukmoro, Wilyu Mahendra Bad, Sfenranto, Gunawan Wang (2020) [2] The authors conducted a literature review on fundraising processes and how blockchain and smart contracts can be applied. They explored three major crowdfunding schemes, highlighting how these technologies can increase trust and reduce reliance on intermediaries. However, challenges include high implementation costs and the reliance on cryptocurrency, which is not legally recognized in all regions.

Bafna, Bhavana Daigavane, Vedant Shaha, Shlok Shinde, Gaurav Shelke, Sachin (2023) [3] The methodology develops a decentralized crowdfunding system using Ethereum smart contracts, where investors vote on spending requests, and funds are transferred directly to vendors. Built with ReactJS (NextJS), Express.js, and MongoDB, it ensures secure transactions via ThirdWeb SDK and Solidity. This approach is technically complex, involving regulatory uncertainties, privacy concerns, and integration challenges. High Ethereum transaction fees may also deter smaller investors.

D. N. Dillenberger, P. Novotny, Q. Zhang, P. Jayachandran, H. Gupta, S. Hans, D. Verma, S. Chakraborty, J. J. Thomas, M. M. Walli, R. Vaculin, K. Sarpatwar (2019) [4] Blockchain provides improved security, transparency, and efficiency over traditional systems, but adoption remains slow due to limited knowledge and integration challenges. This paper emphasizes how blockchain can address issues like fraud and inefficiency, encouraging industries to explore its potential. However, blockchain systems struggle with large-scale data processing, and while off-chain analytics improve efficiency, they introduce privacy risks and added overhead when transferring data to external databases.

Barbara Guidi (2021) [5] The paper explores how blockchain can address privacy, censorship, and ownership issues in traditional social media by giving users control over their data through decentralized platforms. While offering a more secure and transparent alternative, challenges include high transaction fees, scalability issues, and the inefficiency of most blockchains—except Steem and Hive—for large-scale platforms like Facebook or YouTube.

Castillo, Diego Bermejo, Javier Machio, Francisco (2022) [6] The paper proposes a blockchain-based email solution to enhance security against viruses, spam, and phishing by ensuring integrity, confidentiality, and secure interactions between email components. However, integrating it with existing email systems, addressing scalability issues, and requiring user adaptation pose challenges. Additionally, the complexity and resource demands of blockchain could increase operational costs.

Mahamat Ali Hisseine , Deji Chen and Xiao Yang (2022) [7] The paper reviews 42 studies on how blockchain can improve social media by addressing misinformation and data privacy, leveraging features like smart contracts, consensus mechanisms, and decentralization for greater transparency and security. However, scalability and storage limitations hinder its integration with social media, as the vast data volume strains current blockchain models, requiring further research to address these challenges.

Siddhesh Jadye, Swarup Chattopadhyay, Yash Khodankar, Dr. Nita Patil (2021) [8] The paper compares traditional crowdfunding with blockchain-based platforms, highlighting how decentralization, smart contracts, and tokenization improve security, efficiency, and fraud prevention.

Loan T.Q. Nguyen, Thinh G. Hoang, Linh H. Do, Xuan T. Ngo, Phuong H.T. Nguyen, Giang D.L. Nguyen, and Giang N.T. Nguyen (2021) [9] The study used a qualitative approach with three case studies of blockchain crowdfunding platforms, analyzing data from 29 interviews and archival research to explore blockchain's role in social value. Conducted from mid-2019 to March 2020, the study highlights challenges such as the lack of regulations, cryptocurrency instability, and the non-enforceability of smart contracts, with human errors still posing risks.

The methodology combines 20 interviews, 3 workshops for practical insights, surveys of new data sources like IoT contracts, and a literature review on blockchain and the Metaverse.(2022) [10]While the initial search was limited, a broader review was necessary. Although integrating multiple methods provided depth, it added complexity and may have overlooked practical impacts. The interdisciplinary approach also risks gaps in specific areas.

Ayush Sharma, Prashant Sharma, Nitin Goel, Ramendra Singh (2022) [11] The paper explores a blockchain-based crowdfunding platform that ensures secure and fast transactions by leveraging a decentralized network to build trust and reduce fraud between investors and fundraisers. While blockchain and cryptocurrency enhance transparency and security, challenges include regulatory uncertainties, integration with traditional systems, and limited participation due to fluctuating cryptocurrency values and required technical knowledge.

Singh, Raman, Nandan, Ark Tewari, Hitesh (2022) [12] The paper introduces a blockchain-based E2EE system where users generate and store their own encryption keys on a public blockchain, enhancing privacy and decentralization by removing the need for service providers to manage keys. However, the system faces challenges with scalability, cross-platform integration, increased latency, and higher computational costs, making global implementation difficult.

Table 2.1: Summary of Literature Review

Sr. No	Title	Author(s)	Year	Methodology	Drawback
1	The rise and fall of cryptocurrencies: defining the economic and social values of blockchain technologies, assessing the opportunities, and defining the financial and cybersecurity risks of the Metaverse. [1]	Petar Radanliev	2024	The methodology employs a multi-faceted approach, the research combines 20 interviews and 3 workshops for practical insights, surveys of new data sources like IoT contracts, and a literature review of existing studies on blockchain and the Metaverse.	The drawback of the initial search was limited, requiring a broader review. Integrating multiple methods added complexity and might have missed practical impacts. The interdisciplinary approach could also lead to gaps in specific areas.
2	Decentralized Transaction System for Detection and Prevention of Fraud in Crowdfunding Platforms. [2]	Bafna Bhavana, Daigavane, Vedant Shaha, Shlok Shinde, Gaurav Shelke, Sachin.	2023	The methodology involves develops a decentralized crowdfunding system using Ethereum smart contracts. Investors vote to approve spending requests, with funds transferred directly to vendors. The system is built with ReactJS (NextJS), Express.js, and MongoDB, and ensures secure transactions using ThirdWeb SDK and Solidity smart contracts.	Creating a decentralized system with blockchain and smart contracts is technically complex and requires advanced expertise. Regulatory uncertainties and privacy concerns arise from blockchain's transparency, while integration with existing systems can be challenging. High transaction fees on networks like Ethereum may also deter smaller investors.
3	Decentralized News-Retrieval Architecture Using Blockchain Technology [3]	Alexandrescu, Adrian, and Cristian Nicolae Butincu	2023	The paper proposes a decentralized system using blockchain to retrieve and verify news articles. It separates the extraction of webpage links (crawling) from the extraction of article information (scraping), allowing third-party actors to perform these tasks. A majority-rule mechanism ensures the accuracy of information, and the blockchain network provides traceability.	Implementing such a system is complex and requires advanced technical skills. There's also regulatory uncertainty around blockchain technology, and potential privacy concerns due to blockchain's transparency. Additionally, integrating this system with existing platforms can be challenging.

Sr. No	Title	Author(s)	Year	Methodology	Drawback
4	A secure email solution based on Blockchain. [4]	Castillo, Diego and Bermejo, Javier and Machio, Francisco.	2022	The paper proposes a blockchain-based email solution to enhance security against viruses, spam, and phishing. It uses blockchain to ensure integrity, confidentiality, and secure interactions between email components.	The implementation of blockchain-based email security may face challenges in terms of integration with existing email systems, potential scalability issues, and the need for users to adapt to a new architecture. Additionally, the complexity and resource requirements of blockchain could lead to higher operational costs.
5	The Application of Blockchain in Social Media: A Systematic Literature Review [5]	Mahamat Ali Hisseine , Deji Chen and Xiao Yang	2022	The paper reviews 42 studies to explore how blockchain can improve social media by addressing issues like misinformation and data privacy. It focuses on blockchain features like smart contracts, consensus mechanisms, and decentralization to enhance transparency and security.	Key challenges include scalability and storage limitations, which hinder the integration of blockchain with social media. The vast data volume in social media strains current blockchain models, requiring further research to resolve these issues.
6	Block Chain - Based Crowd Funding Using Ethereum [6]	Ayush Sharma, Prashant Sharma, Nitin Goel, Ramendra Singh	2022	The paper explores a blockchain-based crowdfunding platform that ensures secure, fast transactions and reduces fraud. By leveraging a decentralized network, it enhances trust, transparency, and security between investors and fundraisers.	Despite its benefits, blockchain-based crowdfunding faces challenges such as regulatory uncertainties and the complexity of integrating blockchain with traditional systems. Additionally, using cryptocurrency may limit participation due to fluctuating values and the need for technical knowledge.
7	Blockchain-enabled End-to-End Encryption for Instant Messaging Applications [7]	Singh, Raman and Nandan, Ark and Tewari, Hitesh.	2022	The paper introduces a blockchain-based E2EE system where users generate their own encryption keys, stored on a public blockchain. This eliminates the need for service providers to manage keys, ensuring secure communication with forward encryption.	While the proposed system improves privacy and decentralization, it faces challenges with scalability and integration across different platforms. Additionally, the reliance on blockchain may lead to increased latency and higher computational costs, making it harder to implement on a global scale.

Sr. No	Title	Author(s)	Year	Methodology	Drawback
8	An Overview of Blockchain Online Social Media from the Technical Point of View [8]	Barbara Guidi	2021	The paper aims to explore how blockchain can address privacy, censorship, and ownership issues in traditional social media. By leveraging decentralized platforms, users can gain control over their data and content, offering a more secure and transparent alternative to current social networks.	Challenges include high transaction fees, scalability issues, and the fact that most blockchains, except Steem and Hive, are not optimized for social media environments. Current blockchains still lack the efficiency needed for large-scale platforms like Facebook or YouTube.
9	Decentralized Crowdfunding Platform Using Ethereum Blockchain Technology [9]	Siddhesh Jadye, Swarup Chattopadhyay, Yash Khodankar, Dr. Nita Patil	2021	The paper compares traditional crowdfunding with blockchain-based platforms, focusing on decentralization, smart contracts, and tokenization to enhance security, efficiency, and fraud prevention.	While blockchain offers increased security and transparency, its adoption is hindered by a lack of knowledge and understanding of the technology. High implementation costs and scalability challenges also slow down its integration across industries.
10	The role of blockchain technology-based social crowdfunding in advancing social value creation [10]	Loan T.Q. Nguyen, Thinh G. Hoang, Linh H. Do, Xuan T. Ngo, Phuong H.T. Nguyen, Giang D.L. Nguyen, and Giang N.T. Nguyen	2021	The study used a qualitative approach with three case studies of blockchain crowdfunding platforms. Data from 29 interviews and archival research were analyzed using thematic analysis to explore blockchain's role in social value. Data were collected from mid-2019 to March 2020.	A key drawback is the lack of regulations for blockchain and cryptocurrencies, making it difficult for platforms to operate. Cryptocurrency instability adds risk, and smart contracts aren't legally enforceable, with human errors still posing issues.

Sr. No	Title	Author(s)	Year	Methodology	Drawback
11	Smart Contract and Blockchain for Crowdfunding Platform [11]	Firmansyah Ashari, Tetuko Catonsukmoro, Wilyu Mahendra Bad, Sfenranto, Gunawan Wang	2020	The authors conducted a literature review, analyzing the processes typically involved in fundraising organizations and how blockchain technology and smart contracts could be applied. They discussed three dominant crowdfunding schemes and examined how blockchain and smart contracts could increase trust and reduce the reliance on third-party intermediaries	The implementation of blockchain and smart contract technology comes with several challenges. Firstly, it requires a high cost, particularly if an organization chooses to implement the technology using its own resources. Additionally, most smart contract service providers utilize cryptocurrency, which presents another challenge as not all governments legally recognize or permit the use of these currencies
12	Blockchain analytics and artificial intelligence [12]	D. N. Dillenberger, P. Novotny, Q. Zhang, P. Jayachandran, H. Gupta, S. Hans, D. Verma, S. Chakraborty, J. J. Thomas, M. M. Walli, R. Vaculin, K. Sarpatwar	2019	Blockchain offers enhanced security, transparency, and efficiency compared to traditional systems. Despite its benefits, adoption is slow due to limited knowledge and challenges in integration. This paper highlights how blockchain can solve issues like fraud, inefficiency, and lack of transparency, motivating industries to embrace its potential.	Blockchain systems face challenges with handling large-scale data processing workloads, particularly for complex analytics. Off-chain analytics, while efficient, introduces privacy risks and extra overhead in transferring data to external databases.

Chapter 3

Project Design

3.1 Proposed System Architecture

The project design chapter provides a structured framework that outlines the blueprint for implementing a project, detailing its architecture, components, and flow of operations. It involves defining the system's structure, key functionalities, and technical requirements, ensuring the project is built efficiently to meet its objectives. A well-crafted project design serves as a roadmap that guides development, reduces risks, and optimizes resource use.

For EtherFund, the project design revolves around creating a decentralized crowdfunding platform using blockchain technology. The design incorporates Ethereum for secure, transparent transactions and smart contracts for automating key operations like campaign creation and funding. Integration of MetaMask ensures secure user authentication and wallet management. A real-time analytics dashboard and social media integration further enhance the platform's user engagement, while advanced encryption mechanisms guarantee data privacy and security. The design is built with a user-centric approach, utilizing React.js and Chakra UI to offer an intuitive and accessible interface across devices.

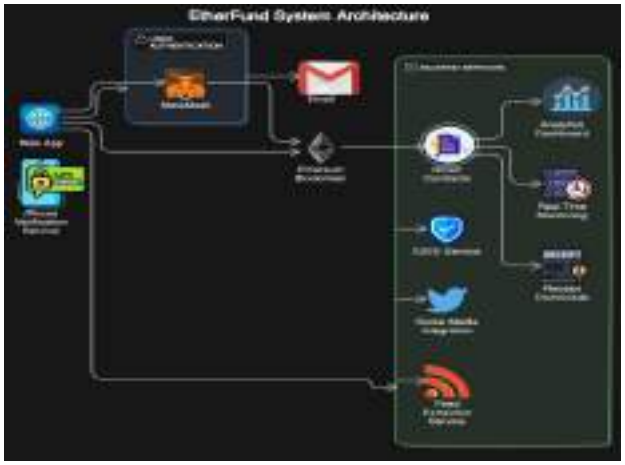

Figure 3.1: System Architecture of EtherFund

3.2 Data Flow Diagrams(DFD)

The Data Flow Diagrams (DFD) chapter provides a graphical representation of how data moves through a system, highlighting its processes, data stores, and interactions between entities. DFDs are essential in system design as they help visualize the flow of information, ensuring that each part of the system is logically structured and functions as intended. By breaking down complex systems into manageable components, DFDs offer a clear and concise view of how data is input, processed, and output within a system.

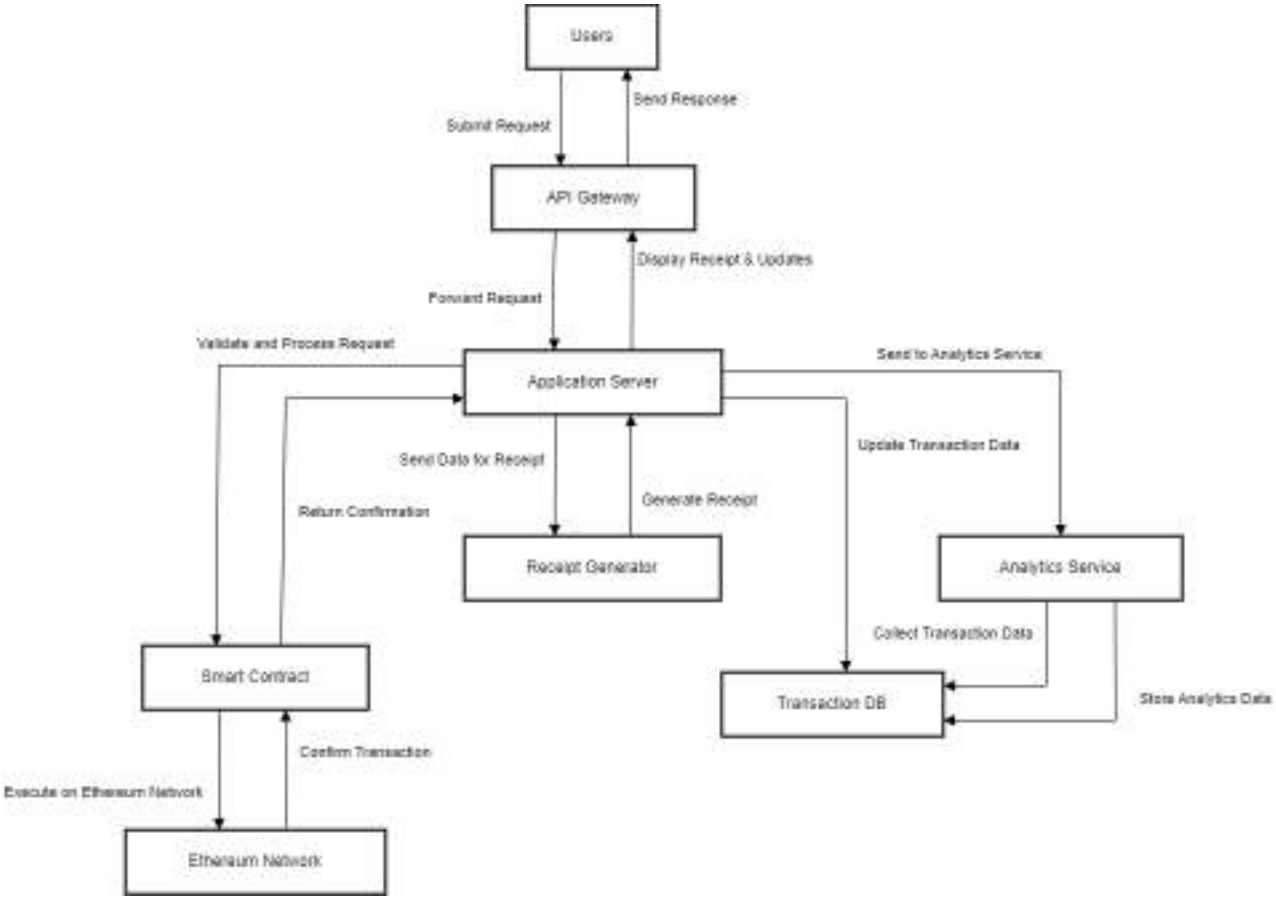

Figure 3.2: Data flow diagram for EtherFund

Users

- **Submit Request:**

  The interaction starts with the users, who can perform various actions, such as donating to campaigns or requesting updates. They submit a request (e.g., donate to a campaign) to the system.

- **Receive Response:**

  Once the request is processed, the user receives the corresponding response, such as confirmation of the transaction or updates on the campaign's progress.

- **API Gateway:**

  The API Gateway acts as an intermediary between the user and the backend of the system. It forwards requests from the users to the Application Server and returns responses back to the users.

  Display Receipt and Updates:

  The gateway is responsible for communicating with the application server and displaying the final receipts and any updates back to the users.

- **Application Server:**

  The Application Server is the core of the system, responsible for validating and processing the user requests.

  Forward Request:

  It receives the forwarded request from the API Gateway and processes it based on the action required.

  Interact with Smart Contract:

  For blockchain-related transactions, the application server communicates with the Smart Contracts to execute the required operation on the Ethereum Network.

  Generate Receipt:

  Once the transaction is processed, the application server interacts with the Receipt Generator to create a confirmation receipt.

  Send to Analytics Service:

  The transaction data is also sent to the Analytics Service for further monitoring and analysis.

- **Smart Contract:**

  The Smart Contract component executes the business logic on the Ethereum Network. For EtherFund, this would involve validating and recording donations, disbursing funds to campaigns, and ensuring that all actions adhere to the predefined rules.

  Execute on Ethereum Network:

  The smart contract is deployed and executed on the decentralized Ethereum blockchain, ensuring the security and transparency of the transactions.

  Return Confirmation:

  Once the transaction is confirmed on the blockchain, the smart contract sends a confirmation back to the application server.

- **Ethereum Network:**

  The Ethereum Network is where the smart contracts are deployed and transactions are recorded. It ensures that all operations are secure, immutable, and transparent, backed by blockchain technology.

- **Receipt Generator:**

  Once the transaction is confirmed by the smart contract, the Receipt Generator creates an official receipt for the user's transaction, whether it is a donation or any other financial action.

  Send Data for Receipt:

  The receipt generator pulls the relevant data from the transaction and uses it to generate a digital receipt, which is then displayed to the user through the API gateway.

- **Transaction DB:**

  The Transaction Database stores all transaction data, including donations, campaign statuses, and receipts. This data is crucial for keeping track of financial activity and ensuring transparency.

  Update Transaction Data:

  The application server sends the updated transaction data to the database after each user interaction.

- **Analytics Service:**

  The Analytics Service is responsible for collecting and analyzing data about user transactions, campaign performance, and other metrics. This data can be used to generate insights into user behavior and campaign success.

  Collect Transaction Data:

  The analytics service collects data from the application server and transaction database to provide insights and reports.

  Store Analytics Data:

  The analytics data is stored separately, allowing for analysis and report generation in the future.

  In EtherFund's DFD, the flow of data starts with user requests through the API Gateway, which passes them to the Application Server for validation and processing. The server interacts with Smart Contracts to execute transactions on the Ethereum Network and then generates receipts via the Receipt Generator. Meanwhile, all transaction data is stored in the Transaction Database and analyzed by the Analytics Service, ensuring comprehensive monitoring and reporting across the platform. The API Gateway serves as the user interface, providing feedback, receipts, and updates to users in real time.

3.3 Use Case Diagrams

The Use Case Diagrams presents a high-level overview of the interactions between users and a system, outlining the various roles and actions within a project. Use case diagrams are crucial in system design as they help identify the primary actors involved and the different functionalities they interact with, making it easier to visualize how the system meets user requirements. By mapping these interactions, use case diagrams serve as a blueprint for understanding the overall behavior of the system.

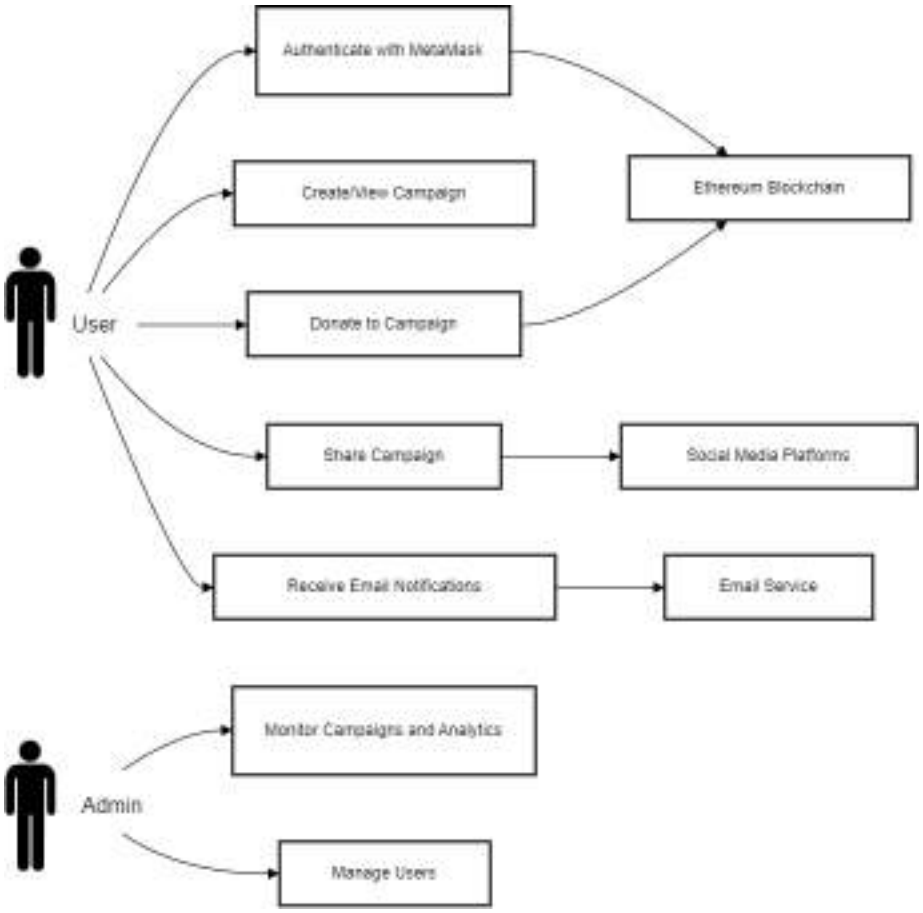

Figure 3.3: Use case diagram for EtherFund

The use case diagram (Figure 3.3)provided represents the interaction between different users (a User and an Admin) and various system components in the context of Etherfund, a blockchain-based crowdfunding platform. Below is a detailed explanation of each element in relation to Etherfund:

User Interactions:

- **Authenticate with MetaMask:**

  Description: The user needs to authenticate themselves using MetaMask, a popular cryptocurrency wallet that interacts with the Ethereum blockchain.

Relation to Etherfund: Before creating, viewing, or donating to campaigns, the user must log in through MetaMask to ensure a secure and decentralized authentication process. MetaMask handles the user's Ethereum address and digital assets for interaction with the Etherfund platform.

- **Create/View Campaign:**

  Description: The user can either create a new crowdfunding campaign or view existing campaigns.

  Relation to Etherfund: When a user creates a campaign, the campaign details, including the funding goal, description, and deadline, are stored on the Ethereum Blockchain for immutability and transparency. If a user is viewing a campaign, they can see these details, which are fetched from the blockchain.

- **Donate to Campaign:**

  Description: The user can donate funds (likely in cryptocurrency) to a specific crowdfunding campaign.

  Relation to Etherfund: Donations are facilitated through smart contracts on the Ethereum blockchain. When a user donates, the transaction is recorded on the blockchain, ensuring secure, transparent, and traceable contributions.

- **Share Campaign:**

  Description: The user has the ability to share a campaign on various social media platforms.

  Relation to Etherfund: Campaigns can be shared across different Social Media Platforms (such as Twitter, Facebook, etc.) to help spread awareness and attract more donors. This function helps campaigns gain visibility and potentially reach their funding goals.

- **Receive Email Notifications:**

  Description: Users receive updates and notifications about the campaigns they are following or have contributed to via email.

  Relation to Etherfund: An Email Service is integrated into the platform to send notifications about campaign progress, deadlines, or new updates. This keeps users engaged and informed.

Admin Interactions:

- **Monitor Campaigns and Analytics**

  Description: The admin has access to monitor ongoing campaigns and analyze campaign data.

  Relation to Etherfund: Admins can oversee all campaigns on the platform to ensure compliance with the platform's rules. Analytics tools may help the admin track campaign performance, including funds raised, user engagement, and blockchain activity.

- **Manage Users**

  Description: The admin can manage users, which includes adding, editing, or removing users from the platform, and handling user issues.

  Relation to Etherfund: Admins play a key role in user management to ensure platform security and resolve any issues related to user accounts, potentially including compliance with Etherfund's terms and conditions.

  System Components:

- **Ethereum Blockchain**

  Description: This is the decentralized ledger where all critical data, such as campaign details, donations, and user interactions, are recorded.

  Relation to Etherfund: The core functionality of Etherfund, including campaign creation, donations, and fund disbursement, is powered by smart contracts on the Ethereum blockchain, ensuring that all actions are transparent and tamper-proof.

- **Social Media Platforms:**

  Description: These platforms allow users to share campaigns for broader visibility.

  Relation to Etherfund: Campaigns can be shared externally to increase visibility and attract more donations through organic social media reach.

- **Email Service:**

  Description: The system sends automated email notifications to users for updates on the campaigns they follow.

  Relation to Etherfund: The email service helps keep users informed about key events like successful donations, campaign updates, or other notifications.

In this use case diagram, the User interacts with various Etherfund features, such as creating/viewing campaigns, donating, and sharing campaigns on social media, while also receiving email notifications. These interactions are securely authenticated through MetaMask, with transactions and campaign data stored on the Ethereum Blockchain. On the other hand, the Admin oversees the platform's operations, ensuring campaigns are running smoothly and users are managed effectively. The entire platform is designed to utilize blockchain technology for transparency, security, and decentralized control.

Chapter 4

Project Implementation

Design is the first step in the development phase for any engineering product (or) system. It may be defined as "the process of applying various techniques and principles for the purpose of defining a device, a process, or a system insufficient detail to permit its physical realization". Software design is an iterative process through which requirements are translated into a 'Blue print' for constructing the software.

The homepage of Etherfund (Figure 4.1) serves as the primary entry point for users looking to explore and contribute to crowdfunding campaigns powered by Ethereum. The image highlights the clean and intuitive design, featuring a prominent call-to-action for users to connect their MetaMask wallet. The interface showcases ongoing campaigns, key statistics, and user-friendly navigation options, making it easy for visitors to sign up, log in, and start supporting projects. Etherfund leverages the security and transparency of blockchain to build trust in the crowdfunding process.

Figure 4.1: Homepage

Figure 4.2, Illustrates the MetaMask wallet connection interface on Etherfund. Users are prompted to connect their MetaMask wallet to seamlessly interact with the platform. The interface provides a clear and secure gateway to Ethereum-based crowdfunding, ensuring that users can contribute, create campaigns, or manage funds directly from their wallet. With a simple, intuitive design, this connection step emphasizes both accessibility and security, allowing users to authorize transactions with ease.

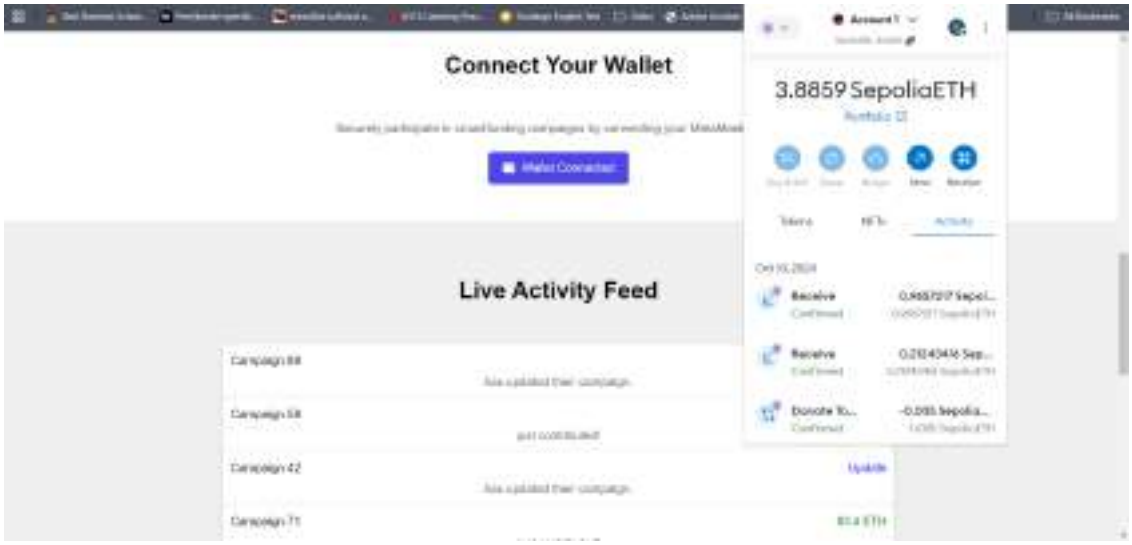

Figure 4.2: Wallet Connection

Figure 4.3, Showcases the analytical dashboard of Etherfund, displaying a dynamic graph that visualizes contributions made over time—daily, weekly, and monthly. The graph offers users insights into funding trends and patterns, allowing campaign creators and backers to track financial progress and engagement. By presenting contributions in an easy-to-read format, the dashboard empowers users to make informed decisions based on historical data, helping to enhance their crowdfunding strategies and optimize campaign performance.

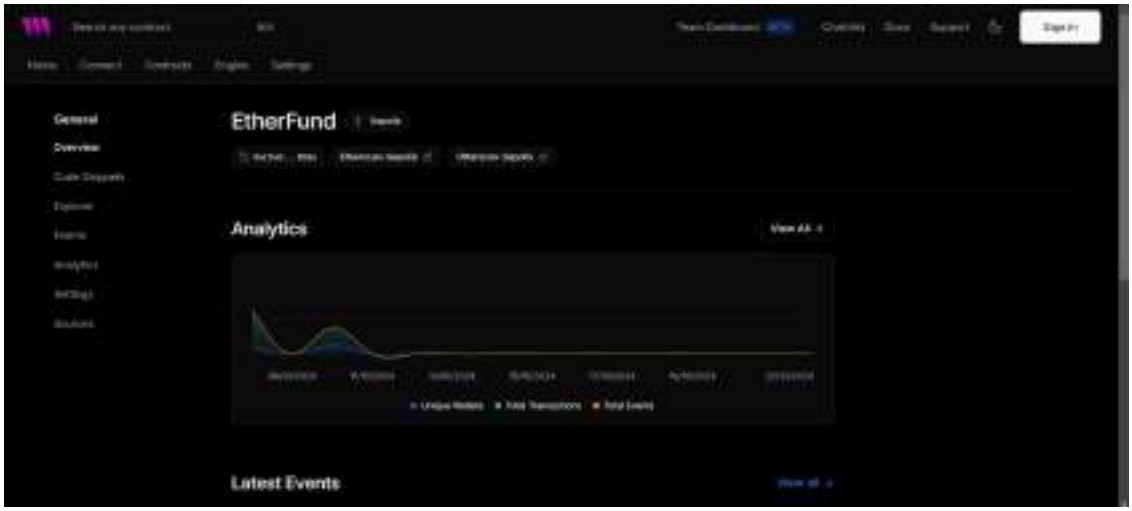

Figure 4.3: Analytical Dashboard

Figure 4.4, Depicts the EtherFund smart contract interface under the "Your Contracts" section. Utilizing Web3.js, it enables secure and transparent interactions for crowdfunding on the Ethereum blockchain. Users can view essential details such as contract address, balance, and transaction history, empowering them to effectively manage their crowdfund-

ing efforts and enhancing confidence in the funding process through decentralized technology.

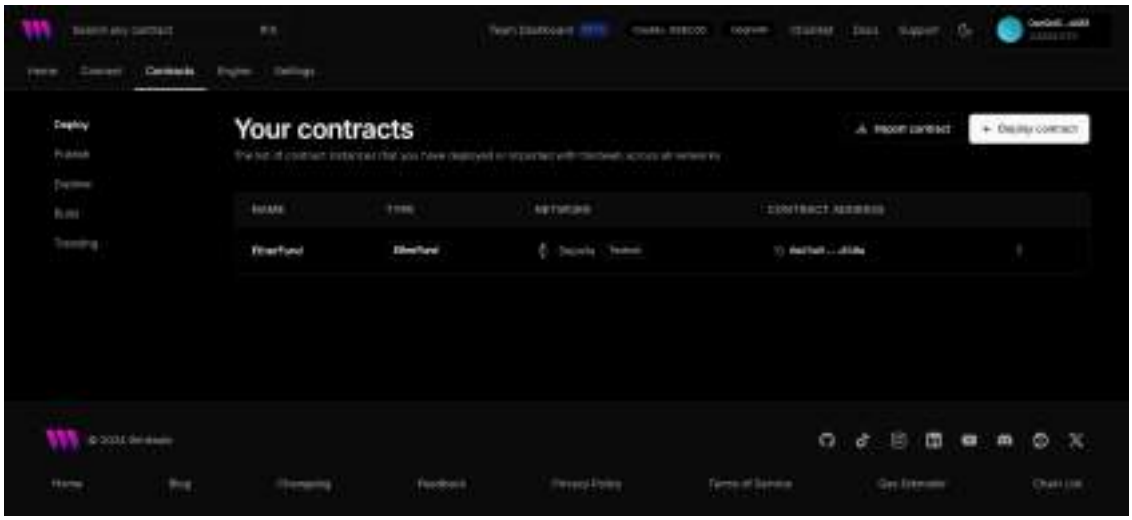

Figure 4.4: Contract

Figure 4.5, Illustrates the Web3.js interface for the createCampaign function within the EtherFund smart contract. Users can initiate the creation of a new crowdfunding campaign by entering essential details such as campaign title, description, funding goal, and duration. The interface is designed for user-friendliness, guiding users through the campaign setup process while ensuring all necessary data is collected for a successful launch. This feature empowers campaign creators to easily engage with the Ethereum blockchain, facilitating transparent and secure fundraising initiatives.

Figure 4.5: Create Campaign

Figure 4.6, Presents the Donate smart contract interface of EtherFund, displayed through Web3.js. This contract enables users to contribute directly to crowdfunding campaigns on the platform. The interface highlights the essential features, such as the ability to specify the donation amount and select the target campaign. By providing a straightforward and secure way to make contributions, this smart contract enhances user experience while ensuring that all transactions are transparently recorded on the Ethereum blockchain. The design emphasizes usability, making it easy for supporters to participate in funding initiatives they believe in.

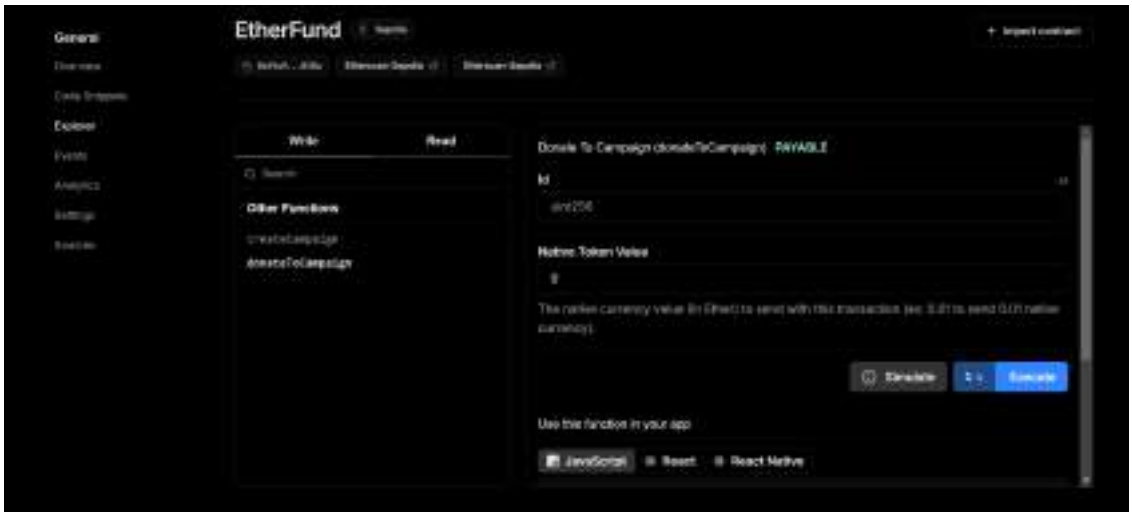

Figure 4.6: Donate-Contract

4.1 Timeline Sem VII

In project management, a schedule is a listing of a project's milestones, activities, and deliverables. Usually, dependencies and resources are defined for each task, then start and finish dates are estimated from the resource allocation, budget, task duration, and scheduled events. A schedule is commonly used in the project planning and project portfolio management parts of project management. The development and maintenance of the project schedule is the responsibility of a full-time scheduler or team of schedulers, depending on the size and the scope of the project. The project schedule is a calendar that links the tasks to be done with the resources that will do them. It is the core of the project plan used to show the organization how the work will be done, commit people to the project, determine resource needs, and used as a kind of checklist to make sure that every task necessary is performed.

A Gantt chart is a type of bar chart that illustrates a project schedule. Modern Gantt charts also show the dependency relationships between activities and the current schedule status. This chart lists the tasks to be performed on the vertical axis, and time intervals on the horizontal axis. The width of the horizontal bars in the graph shows the duration of each activity. Gantt charts illustrate the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements constitute the work breakdown structure of the project. Modern Gantt charts also show the dependency (i.e., precedence network) relationships between activities. Gantt charts can be used to show current schedule status using percent-complete shadings.

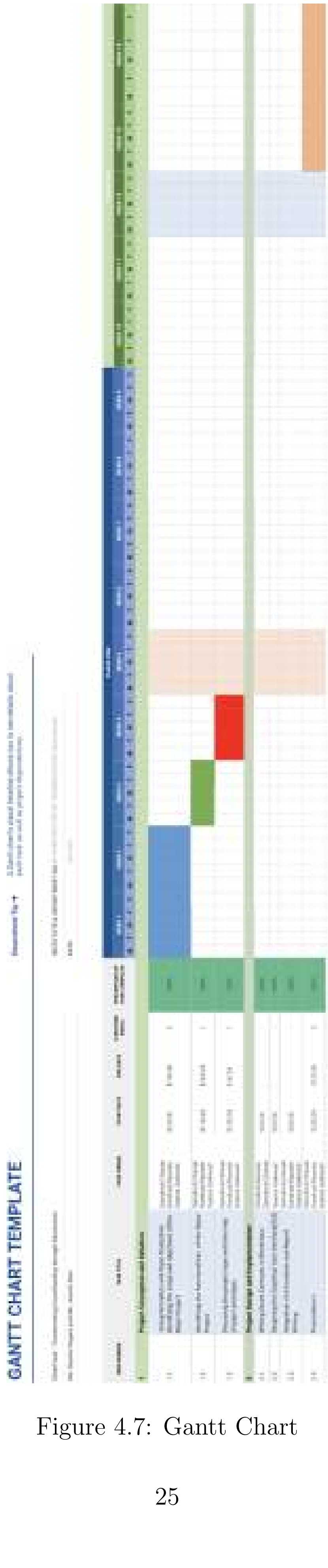

Figure 4.7: Gantt Chart

Chapter 5

Summary

In this project, EtherFund, we aimed to transform the landscape of crowdfunding by leveraging blockchain technology. The work carried out focused on developing a decentralized platform that enhances transparency, security, and efficiency in campaign management through the deployment of Ethereum smart contracts and MetaMask integration. Key features, such as real-time updates, analytics dashboards, social media integration, and strong data security protocols, were implemented to address the limitations of traditional crowdfunding platforms. The platform successfully eliminates intermediaries, reduces fees, and offers global accessibility, making the crowdfunding process more seamless and trustworthy.

Based on the results and discussions from our development and testing, the following conclusions were drawn:

- **Enhanced Transparency**

  EtherFund successfully addresses the transparency issues inherent in traditional crowdfunding platforms through the use of Ethereum smart contracts.

- **Improved Security**

  The integration of blockchain ensures that all transactions are secure, immutable, and traceable, providing users with a trustworthy environment.

- **Global Accessibility**

  By removing geographic and banking limitations, EtherFund opens up campaigns to a global audience, making it easier for contributors from any region to participate.

- **Reduced Costs**

  EtherFund's decentralized nature eliminates the need for intermediaries, lowering transaction costs and allowing more funds to go directly to campaign creators.

- **User-Friendly Interface**

  Through the use of React.js and Chakra UI, the platform offers a seamless and accessible user experience, ensuring ease of use across different devices.

While EtherFund has made significant strides, there are still opportunities for further enhancement. Future work could focus on:

- **Expanding Blockchain Integration**

  Integrating with other blockchains, such as Binance Smart Chain or Solana, to offer users more flexibility and choice in using the platform.

- **Advanced Analytics**

  Enhancing the analytics dashboard with predictive tools that use machine learning to provide deeper insights into campaign performance and funding trends.

- **Mobile Application**

  Developing a dedicated mobile app for EtherFund to ensure a smoother experience for users on mobile devices.

- **Enhanced Community Features**

  Adding features that encourage collaboration and engagement among campaign backers, such as forums, discussions, and community voting systems.

- **Regulatory Compliance**

  Exploring ways to comply with evolving global regulations on cryptocurrencies and crowdfunding to ensure the platform's sustainability in different legal jurisdictions.

EtherFund has set the foundation for a next-generation crowdfunding solution, and with further developments, it has the potential to revolutionize the way campaigns are managed and supported globally. By harnessing the power of blockchain technology, EtherFund addresses key issues such as transparency, security, and accessibility, offering a robust alternative to traditional platforms. As the platform evolves, incorporating more advanced features and expanding its reach, EtherFund could significantly transform the crowdfunding landscape, empowering individuals and organizations worldwide to raise funds more efficiently, securely, and inclusively, ultimately fostering innovation and social impact on a global scale.

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