HIVEFUND – TRANSPARENT CROWDFUNDING PLATFORM POWERED BY BLOCKCHAIN AND AI

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***Abstract*—**This paper presents a prototype decentralized crowdfunding system to automate and secure fundraising using blockchain technology. Traditionally, crowdfunding platforms operate through centralized authorities, making them prone to trust issues and opaque fund management. The proposed system uses smart contracts deployed on the Ethereum blockchain to enforce transparent and immutable funding rules at the project level, enabling reliable and trustless transactions. The method supports flexible funding logic, allowing creators to withdraw raised funds even if the target goal is not fully met, while enforcing deadline constraints through on-chain validation. The system was evaluated using multiple crowdfunding scenarios, and it demonstrated effectiveness in ensuring transparency and secure fund flow. Its lightweight, modular design makes it suitable for integration into decentralized application.

***Index Terms*—**Decentralized Crowdfunding, Blockchain, Smart Contracts, Ethereum, Web3, Solidity, Trustless Systems

I. INTRODUCTION

In online fundraising ecosystems, crowdfunding platforms are necessary to support individuals and organizations in raising capital for projects every year. Many platforms operate under centralized authorities, tasked with managing campaigns, processing payments, and enforcing funding policies. This process involves controlling the flow of funds between contributors and creators for the same campaign. This process requires platform-level verification and approval mechanisms to identify successful funding and handle the release or retention of raised amounts. This task becomes burdensome for users who must rely on intermediaries while managing campaign activities alongside their other responsibilities of promotion and communication. Although platforms may provide digital payment systems or monitoring tools, these solutions are often not specifically designed to eliminate intermediaries or ensure transparent and trust less execution of funding rules.

The challenges of centralized crowdfunding are addressed in this project by utilizing blockchain-based smart contracts to perform decentralized fundraising operations. Rather than relying on manual approval or third-party control of transactions, the system encodes funding logic directly into smart contracts. The current version of this system has tested limited crowdfunding scenarios on the Ethereum network. This work serves as a foundational step towards developing a more advanced and scalable decentralized fundraising solution, and it also supports transparent and secure crowdfunding workflows.

II. RELATED WORKS

In recent years, blockchain technology has advanced significantly, especially with the emergence of smart contract platforms. These systems enable transparent and programmable financial transactions beyond traditional centralized infrastructures, which is useful for applications such as public funding, decentralized finance, and digital asset management.

Initial works in this domain showed how blockchain mechanisms can support public good funding models [1] and decentralized mechanism design [2].

Security-oriented research analysed smart contract vulnerabilities and proposed mitigation strategies [3]. Later studies applied blockchain systems to financial instruments such as stablecoins [4] and dispute resolution frameworks [5], improving reliability through secure and automated execution.

One foundational concept is strengthening trust using automated verification and fraud detection mechanisms. Techniques such as artificial intelligence-based document verification [6] and machine learning-based fraud detection models [7] have proven effective in enhancing reliability in digital financial systems.

Several studies have also investigated trust evaluation frameworks [8] and identity schemes based on cryptographic proofs [9] to support secure authentication in decentralized environments. Some works examined blockchain scalability and proposed layer-2 techniques to improve performance and efficiency [10].

However, despite this progress, limited research has focused specifically on developing flexible and decentralized crowdfunding platforms with automated fund management. Most existing platforms continue to rely on centralized control, which can reduce transparency. Our project addresses this gap by implementing a smart contract–based crowdfunding system with flexible funding logic to enable secure and transparent decentralized fundraising operations.

III. METHODOLOGY

The proposed methodology for HiveFund follows a decentralized application architecture that integrates a web-based frontend, a backend service layer, and Ethereum smart contracts for secure and transparent fund management. The system is

designed to eliminate centralized intermediaries by encoding all critical fundraising rules directly into blockchain-based smart contracts. This ensures deterministic execution, immutability, and tamper-resistant financial transactions.

The overall workflow begins when a project creator registers on the platform and submits campaign details such as funding goal, deadline, and descriptive information. These inputs are validated at the application layer before being forwarded for smart contract interaction. Upon validation, the backend communicates with the blockchain network to create or register the campaign parameters within the deployed contract.

Once a campaign is active, contributors can browse available projects through the frontend interface. Users connect their Web3-enabled wallet to the platform to initiate contributions. When a donation is made, the transaction is signed by the contributor and transmitted directly to the smart contract deployed on the Ethereum network.

The smart contract verifies the campaign status, checks whether the deadline is valid, and records the contribution amount. It automatically updates the total funds raised and stores transaction data on-chain. Because all financial operations are handled within the contract logic, transparency and data integrity are inherently maintained.

The platform implements flexible funding logic, allowing creators to withdraw accumulated funds even if the predefined funding goal is not fully achieved. Deadline enforcement is handled through timestamp validation within the contract, ensuring that withdrawals occur only under permitted conditions.

To enhance security, the smart contract incorporates reentrancy protection mechanisms and validation checks to prevent malicious attacks. Proper access control is implemented to ensure that only authorized creators can withdraw campaign funds. These measures improve the robustness and reliability of the decentralized fundraising process.

The backend server, developed using Node.js and Express, manages auxiliary operations such as user authentication, campaign metadata storage, and API routing. Off-chain data is stored in a structured database to improve performance and reduce blockchain storage costs. Blockchain interactions are facilitated using ethers.js for contract calls and transaction handling.

The frontend layer, developed using modern web technologies, provides an intuitive interface for campaign creation, contribution tracking, and transaction status monitoring. Real-time updates are fetched from the blockchain to display accurate funding information to users.

The modular separation between front-end, back-end, and smart contract components ensures scalability and maintainability. This layered architecture allows independent upgrades to user interfaces or server logic without modifying the on-chain contract structure.

Overall, the proposed methodology ensures secure, transparent, and automated crowdfunding operations by combining blockchain immutability with flexible funding logic. The architecture supports future enhancements such as multi-network deployment, governance mechanisms, and integration with decentralized identity systems.

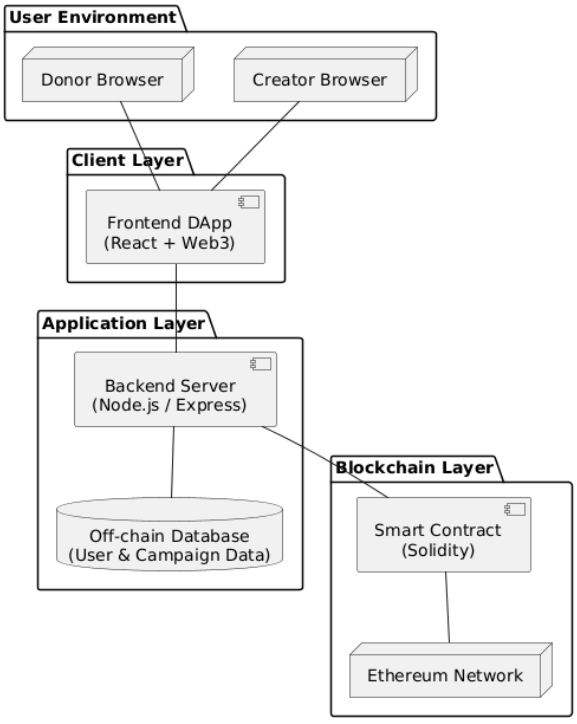

Figure 1. HiveFund Architecture

IV. IMPLEMENTATION AND FINDING

The proposed HiveFund platform was implemented as a decentralized application integrating a web-based frontend, backend server, and Ethereum smart contract. The frontend was developed using React to provide an interactive interface for campaign creation and contribution tracking. Wallet connectivity was enabled through Web3 integration, allowing users to interact directly with the blockchain network.

The backend server was implemented using Node.js and Express to handle API routing, campaign metadata management, and transaction monitoring. Off-chain data such as user information and campaign descriptions were stored in a structured database to

improve performance and reduce blockchain storage costs. The backend also facilitated communication between the frontend and the deployed smart contract using the ethers.js library.

The core crowdfunding logic was implemented in Solidity as a smart contract deployed on the Ethereum network. The contract includes mechanisms for campaign initialization, contribution handling, deadline enforcement, and flexible fund withdrawal. Reentrancy protection and access control modifiers were incorporated to enhance contract security and prevent common vulnerabilities.

The system was tested using multiple fundraising scenarios, including successful funding, partial funding, and deadline expiration cases. Transactions were validated on-chain, and state updates were reflected in real time on the frontend interface. Gas consumption and execution behavior were observed to evaluate operational efficiency.

The findings indicate that the decentralized architecture successfully eliminates reliance on centralized intermediaries while ensuring transparency and secure fund handling. Smart contract–based rule enforcement provided deterministic execution of funding logic. The modular system design also demonstrated scalability and ease of integration for future enhancements such as multi-network deployment or governance extensions.

V. RESULT AND DISCUSSION

The implementation and testing of the HiveFund decentralized crowdfunding platform demonstrate that the system successfully integrates blockchain-based smart contracts with a web-based application layer to provide secure, transparent, and automated fundraising operations. The platform supports campaign creation, real-time donation tracking, AI-assisted verification, and administrative review within a modular architecture.

Functional testing confirmed that campaign initialization, contribution processing, and fund withdrawal logic operate correctly under various scenarios, including successful funding, partial funding, and deadline enforcement conditions. On-chain transactions were validated on the Ethereum network, and state updates were accurately reflected in the frontend interface, ensuring transparency and data consistency.

The AI-based trust analysis module effectively evaluated campaign authenticity by analysing uploaded documents and campaign content. Campaigns lacking supporting verification were correctly identified as high risk and subjected to administrative control. This hybrid approach combining decentralized fund management with centralized moderation enhances both security and platform integrity.

Overall, the results indicate that HiveFund achieves its primary objectives of eliminating centralized fund custody, enforcing transparent funding rules through smart contracts, and incorporating trust-enhancing mechanisms. The system demonstrates feasibility, reliability, and extensibility for real-world decentralized crowdfunding applications.

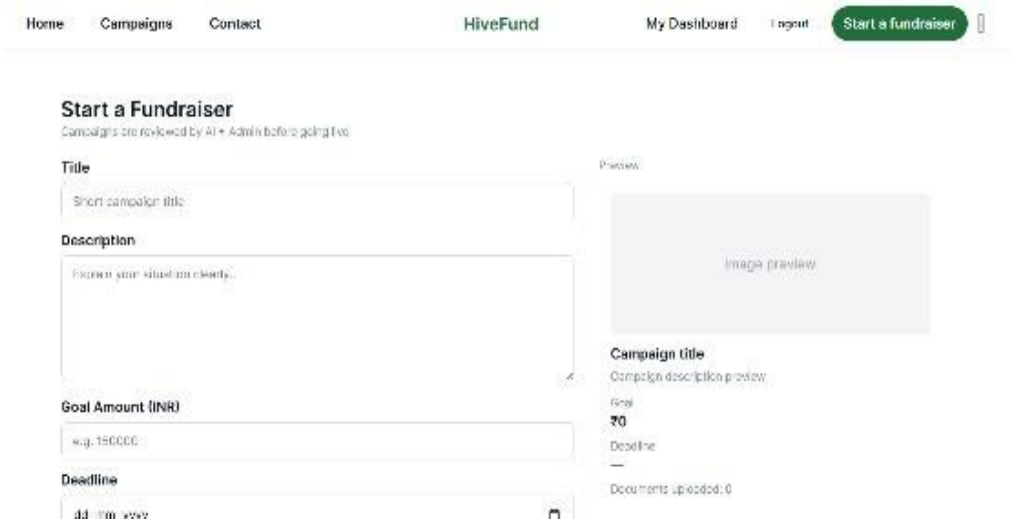

Figure 2. Start Fundraiser Page

The first screenshot shows the campaign creation module of the HiveFund platform. This interface allows project creators to submit essential campaign details including title, description, funding goal, and deadline. The form includes structured input validation to ensure completeness and correctness of data before submission.

A real-time preview panel is provided to display how the campaign will appear once published. This improves usability and reduces inconsistencies in campaign presentation. The system also indicates that campaigns are reviewed by AI and admin before going live, demonstrating the integration of automated trust analysis within the platform workflow.

This result confirms that the frontend layer successfully supports campaign initialization and integrates validation mechanisms before backend or blockchain interaction.

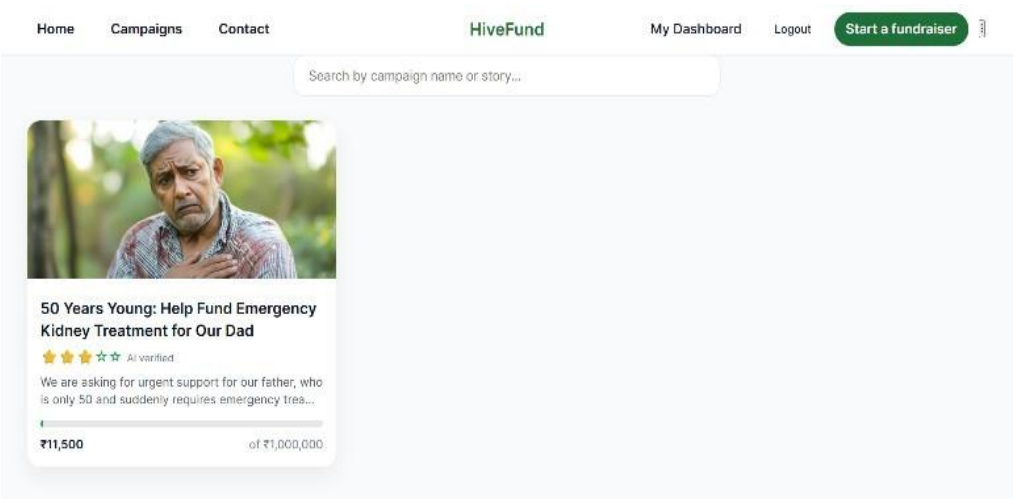

Figure 3. Campaigns Page

The second screenshot presents the live campaign listing page visible to donors. It displays:

- Campaign image
- Title and description preview
- AI trust rating indicator
- Progress bar showing funds raised
- Current amount vs goal

The real-time funding progress (₹11,500 of ₹1,000,000) demonstrates dynamic update capability based on transaction data. This confirms successful synchronization between on-chain contributions and frontend display.

The inclusion of an AI verification indicator enhances transparency and builds user trust. The structured campaign card layout ensures clarity in funding status and campaign authenticity.

This result validates that the decentralized system correctly reflects blockchain state changes in the user interface.

The third screenshot shows the administrative review module integrated with AI-based trust analysis. Before approval, campaigns are evaluated based on uploaded documents and content verification.

- No supporting documents were uploaded.
- The AI system assigned a low trust rating.
- The campaign was marked as “High Risk”.
- The system triggered auto-blocking due to low trust.

The admin panel provides:

- AI-generated summary
- Risk indicator
- Approval and rejection controls
- Document upload status

This confirms that HiveFund integrates both automated analysis and human oversight. The AI trust mechanism strengthens platform integrity by reducing fraudulent or unverifiable campaigns before public listing.

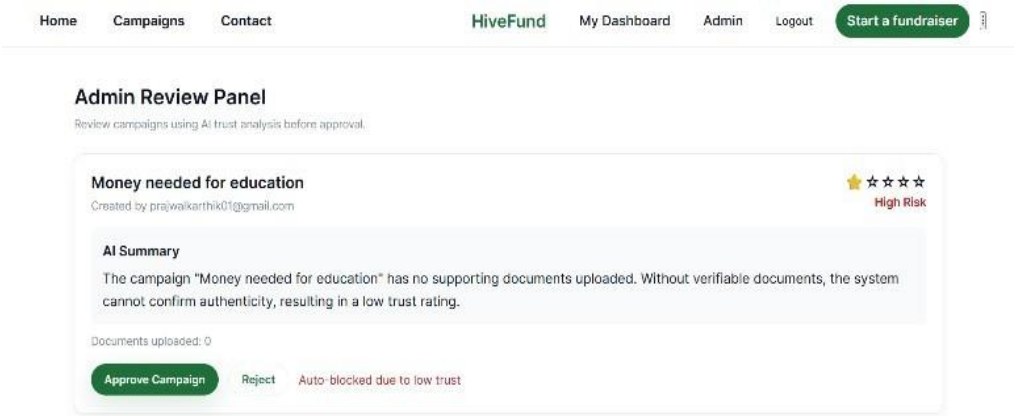

Figure 4. Admin Review Panel

VI. CONCLUSION

This paper presented HiveFund, a decentralized crowdfunding platform designed to enhance transparency, security, and automation in fundraising processes using blockchain technology. By leveraging Ethereum smart contracts, the system eliminates centralized fund custody and enforces funding rules through immutable on-chain logic. The implementation integrates a web-based frontend, backend server, and smart contract layer to provide a seamless user experience while maintaining decentralized financial control.

The platform successfully supports campaign creation, contribution tracking, flexible funding withdrawal, and deadline enforcement. Security mechanisms such as re-entrancy protection and access control were incorporated to mitigate common smart contract vulnerabilities. Additionally, an AI-assisted trust analysis module was integrated to strengthen campaign verification and administrative oversight.

Experimental evaluation demonstrated that the proposed architecture ensures deterministic execution of funding logic and real-time transparency of transactions. The modular design allows scalability and future integration with advanced features such as multi-network deployment, governance mechanisms, and enhanced identity verification systems.

Overall, HiveFund demonstrates the feasibility of combining decentralized blockchain infrastructure with intelligent moderation mechanisms to create a secure and transparent crowdfunding ecosystem.

VII. REFERENCES

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