

TRANSFI AGENT: BLOCKCHAIN-BASED CORRUPTION PREVENTION AND INTELLIGENT FUND MANAGEMENT SYSTEM**Pannala Karthik Reddy, Janga Vignyan Teja, Estrap Sreeja**

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ABSTRACT

TransFi Agent is a blockchain-based corruption prevention and intelligent fund management system developed to improve transparency, accountability, and security in public infrastructure financing and institutional fund management. Traditional fund management systems suffer from centralized control, limited auditability, delayed approvals, and high corruption risk. The proposed system addresses these challenges using Ethereum smart contracts for milestone-based automated fund release, ensuring that payments are executed only after verified completion of project milestones. A FastAPI backend integrated with Web3.py manages blockchain communication, while MongoDB stores audit records and user data.

The system also incorporates an Artificial Intelligence anomaly detection engine using the Isolation Forest algorithm to identify suspicious fund transactions in real time.

A React-based frontend provides role-based dashboards for administrators, contractors, finance officers, auditors, and public users. Experimental implementation demonstrates improved transparency, secure audit trails, automated verification, and proactive fraud detection compared with traditional systems.

Keywords:

Blockchain, Smart Contracts, Corruption Prevention, Fund Management, Artificial Intelligence, Isolation Forest, Ethereum, Financial Transparency

INTRODUCTION

In the modern digital era, financial transaction management plays a critical role in government organizations, institutions, and enterprises where transparency, accountability, and security are essential. Traditional fund management systems are predominantly centralized, relying heavily on manual approvals and intermediary authorities for transaction processing. These systems often suffer from issues such as lack of transparency, delayed fund disbursement, data manipulation, and increased opportunities for corruption or fraudulent activities. The absence of a reliable audit mechanism further reduces trust among stakeholders and makes monitoring fund utilization difficult.

Blockchain technology has emerged as a powerful solution to overcome these limitations by providing a decentralized, transparent, and tamper-proof platform for recording transactions. Smart contracts, a key feature of blockchain, enable automated execution of predefined financial rules without requiring human intervention. This ensures that funds are released only when specified conditions are satisfied, thereby reducing dependency on centralized authorities and improving transaction security.

The proposed system, **TransFi Agent**, is a blockchain-based corruption prevention and intelligent fund management system designed to improve transparency and efficiency in public and institutional fund management. The system uses Ethereum smart contracts for milestone-based automated fund release, ensuring that payments are disbursed only after verified completion of project tasks. A FastAPI backend and MongoDB database support user management and audit logging, while a React-based frontend provides role-based access for administrators, contractors, finance officers, auditors, and public users.

This AI component continuously analyses fund transaction patterns and identifies suspicious or abnormal activities in real time, enabling proactive fraud detection. By combining blockchain technology, smart contract automation, and AI-based monitoring, TransFi Agent offers a secure, transparent, and intelligent financial governance framework suitable for modern digital financial ecosystems

OBJECTIVES

The primary objectives of the project are

1. To design a blockchain-based transparent fund management system
2. To prevent corruption using immutable transaction records
3. To automate milestone-based fund release using smart contracts
4. To detect anomalous financial transactions using AI
5. To provide real-time auditability for stakeholders

METHODOLOGY

The proposed TransFi Agent system follows a structured methodology combining blockchain technology, artificial intelligence, and web application architecture for secure and transparent fund management.

1. **Requirement Analysis:** Identified major problems in traditional fund management systems such as corruption, lack of transparency, delayed approvals, centralized control, and absence of fraud detection mechanisms.
2. **System Design:** Designed a three-tier architecture consisting of frontend, backend, and blockchain layers to ensure modularity, scalability, and security.
3. **Frontend Development:** Developed a user-friendly web interface using React.js for different user roles including Administrator, Contractor, Finance Officer, Auditor, and Public User.
4. **Backend Development:** Implemented backend services using FastAPI (Python) to manage user authentication, API communication, audit logs, and interaction between frontend and blockchain.
5. **Blockchain Integration:** Developed Ethereum smart contracts using Solidity to automate milestone-based fund release and ensure immutable transaction records.
6. **Database Management:** Used MongoDB to store user credentials, audit logs, transaction details, and AI-generated risk scores.
7. **Artificial Intelligence Module:** Integrated Isolation Forest Algorithm for anomaly detection to identify suspicious financial transactions and assign risk levels.
8. **Role-Based Access Control:** Implemented separate dashboards and permissions for each user to ensure controlled access to system functionalities.
9. **Testing and Validation:** Conducted unit testing, integration testing, and system validation to verify correct functionality of blockchain transactions, APIs, and AI risk detection.

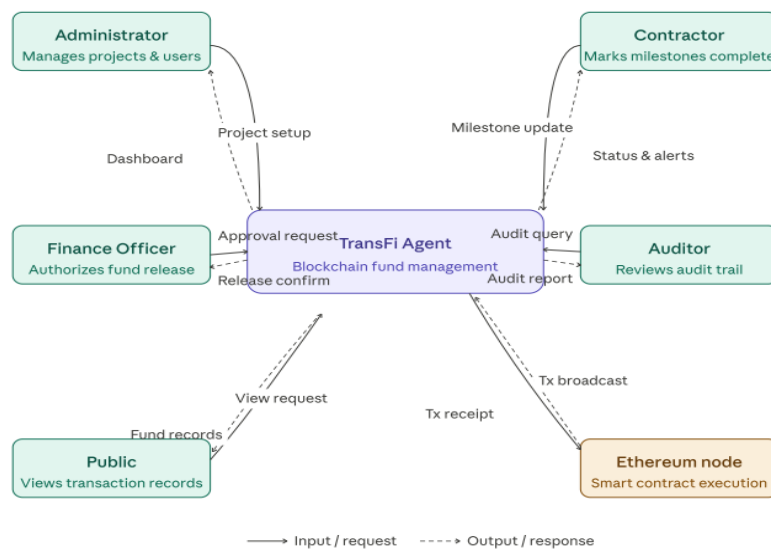


Figure 1: Project context diagram

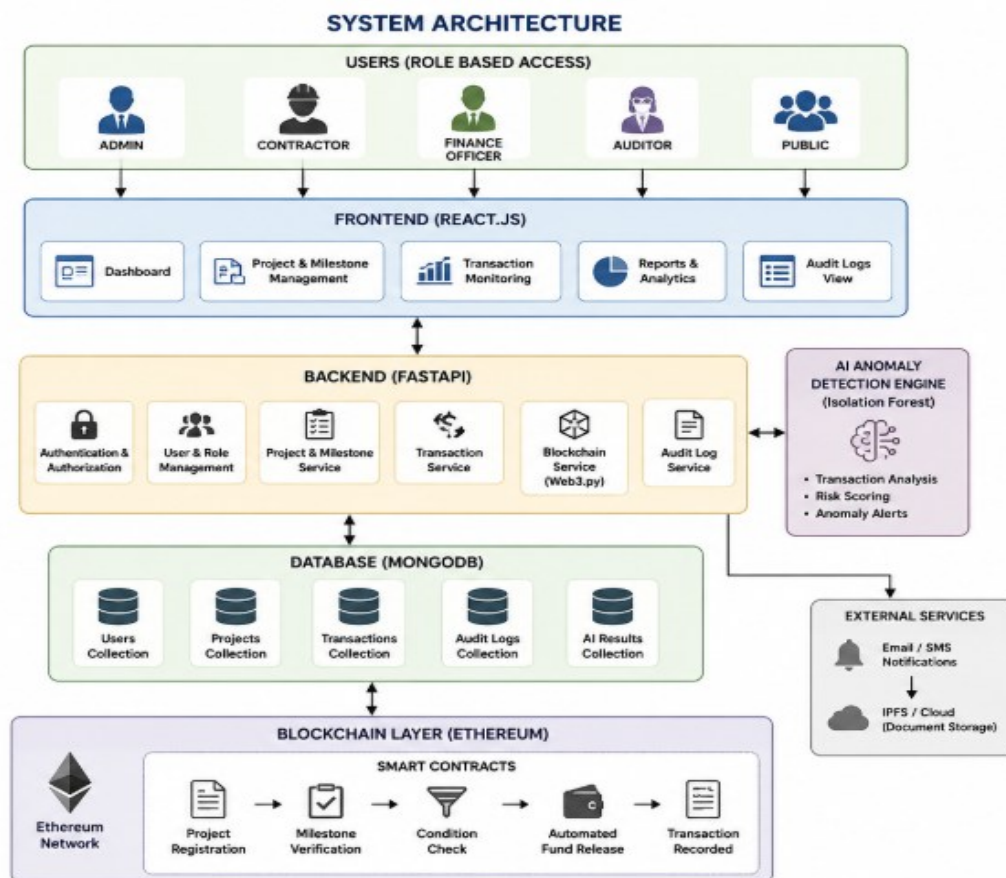


Figure 2: Proposed System Architecture of Transfi Agent

RESULTS AND DISCUSSION

The implementation of the **TransFi Agent** system successfully demonstrates the effectiveness of blockchain technology and artificial intelligence in creating a transparent, secure, and corruption-resistant fund management platform. The system was developed using **React.js** for the frontend, **FastAPI** for backend services, **MongoDB** for audit and user data storage, and **Ethereum smart contracts** for secure transaction execution. The milestone-based fund release mechanism ensured that funds were disbursed only after verified completion of project milestones, eliminating unauthorized or premature payments.

The blockchain integration provided an immutable and transparent transaction ledger, ensuring that every fund release event was permanently recorded and could not be modified or deleted. This significantly improved auditability compared to traditional centralized systems. The role-based access control mechanism successfully restricted system access according to user responsibilities, allowing administrators, contractors, finance officers, auditors, and public users to interact only with relevant functionalities. Public users were able to view project progress and fund utilization, thereby increasing transparency.

The Artificial Intelligence risk analysis module, implemented using the **Isolation Forest algorithm**, effectively detected anomalous transaction patterns and generated risk scores for suspicious fund releases. This enabled proactive fraud monitoring and early identification of unusual financial behavior. Compared with conventional financial management systems, the proposed system demonstrated superior transparency, automation, accountability, and fraud detection capability.

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Comparative Analysis

Feature	Traditional System	TransFi Agent
Transparency	Limited	High
Audit Trail	Editable Records	Immutable Blockchain Records
Fund Release	Manual Approval	Automated Smart Contract
Fraud Detection	Manual Monitoring	AI-Based Detection
Security	Centralized Vulnerability	Decentralized Security
Public Visibility	Low	Real-Time Access

Table 1: Comparing with tradition system

Overall, the results confirm that **TransFi Agent** provides a reliable and intelligent framework for secure digital fund management, significantly reducing corruption risks and improving operational efficiency.

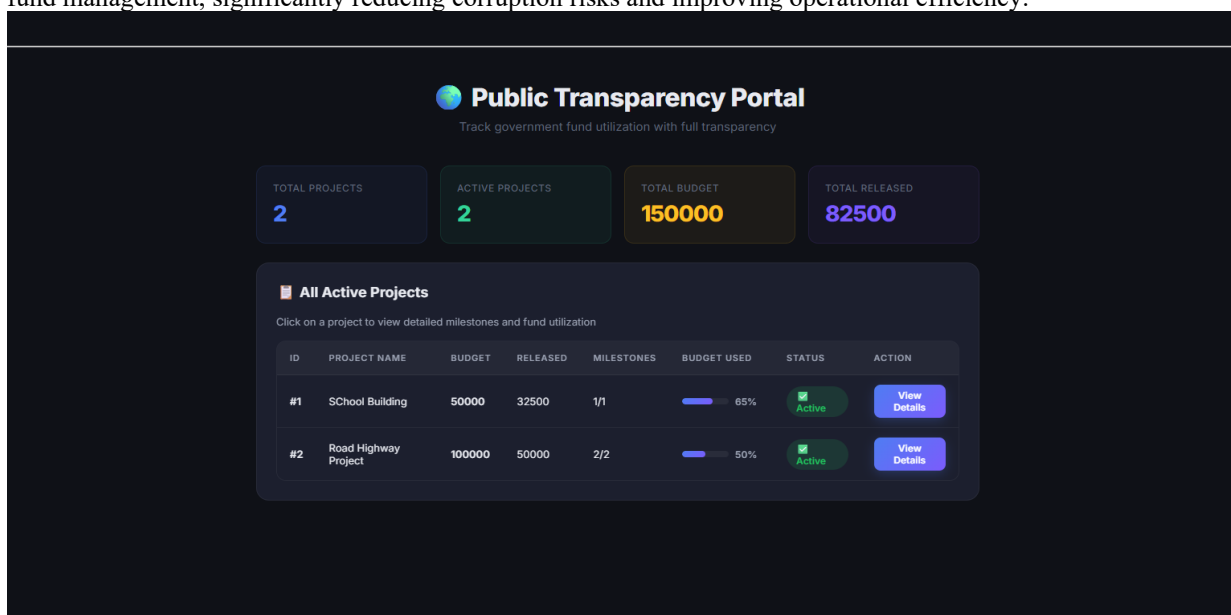


Fig 3: Public Dashboard

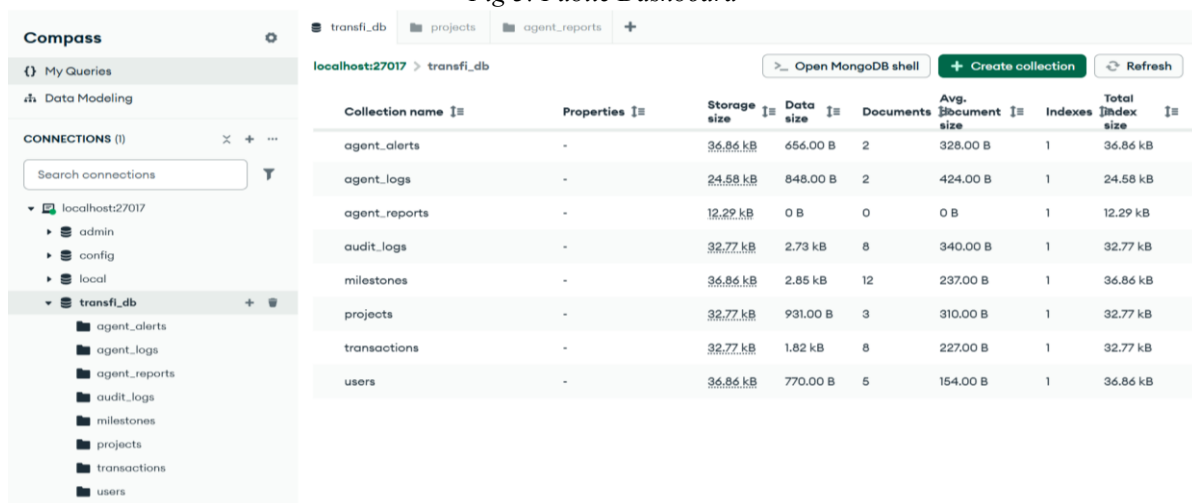


Fig 4: Database Dashboard

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CONCLUSION

TransFi Agent successfully demonstrates a blockchain-based corruption prevention and intelligent fund management framework that improves transparency, accountability, and transaction security. Smart contracts automate milestone-based fund disbursement, while AI-based anomaly detection enhances fraud monitoring. The proposed system offers a scalable foundation for secure digital governance and financial transparency.

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