

Budget Tracking using Blockchain

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Abstract

In the modern digital age, personal and organizational finance management has become increasingly complex and vulnerable to data tampering, lack of transparency, and security breaches. Traditional budgeting systems rely heavily on centralized databases, making them prone to manipulation and cyber-attacks. To overcome these challenges, this project proposes a **Blockchain-based Budget Tracking System** that ensures secure, transparent, and tamper-proof financial record-keeping.

The system leverages the decentralized and immutable nature of blockchain to store and manage income and expense transactions. Through smart contracts, users can add, categorize, and retrieve financial data, which is permanently recorded on the blockchain. The application provides a user-friendly interface integrated with crypto wallets (e.g., MetaMask) to authenticate users and facilitate seamless interactions with the blockchain.

Key features include expense/income categorization, transaction history tracking, budget alerts, and visual analytics. By decentralizing financial tracking, the system promotes trust, accountability, and auditability, making it suitable for individuals, families, NGOs, and small businesses. This innovative approach not only enhances security but also empowers users with full control over their financial data.

This project demonstrates the potential of blockchain technology in transforming conventional budgeting systems into transparent and secure decentralized applications.

Introduction

In today's fast-paced world, managing finances efficiently has become a crucial aspect of both personal and organizational life. Individuals often struggle with keeping track of their income and expenses due to the lack of proper tools or reliance on manual methods. Similarly, businesses and institutions may face issues related to financial transparency and accountability. Traditional budget tracking systems typically depend on centralized databases, which are susceptible to errors, manipulation, and data breaches. These challenges highlight the need for a more secure, reliable, and transparent financial tracking solution.

Blockchain technology, known for its decentralized, transparent, and immutable nature, offers a promising alternative to conventional budget tracking systems. Originally developed to support digital currencies like Bitcoin and Ethereum, blockchain has evolved into a powerful tool for secure record-keeping across various domains. Its ability to record data in a distributed ledger, where each entry is cryptographically linked and verified by a network, makes it an ideal choice for maintaining tamper-proof financial records.

This project introduces a Blockchain-based Budget Tracking System that allows users to securely manage their financial transactions. By integrating smart contracts, users can add and categorize transactions such as expenses and income, which are then permanently stored on the blockchain. Wallet-based authentication ensures user security and ownership of data. Unlike traditional systems, the blockchain-based approach ensures that once a transaction is recorded, it cannot be modified or deleted, thus enhancing trust and data integrity.

The proposed system not only addresses the limitations of existing budget tracking tools but also paves the way for a more transparent and user-controlled financial management platform. It can be beneficial for a wide range of users including individuals, families, small businesses, and NGOs who seek clarity and trust in their financial operations. Through this project, we aim to demonstrate



how blockchain can revolutionize everyday financial management by offering a secure, decentralized, and user-friendly budgeting solution.

Literature Survey:

Title: *Blockchain Technology: Principles and Applications*

Author(s): M. Crosby, P. Pattanayak, S. Verma, V. Kalyanaraman

Description:

This paper provides a comprehensive overview of blockchain technology, including its architecture, key principles such as decentralization, immutability, and transparency, and its applications beyond cryptocurrencies. It lays the foundation for understanding how blockchain can be used in domains like finance, healthcare, and logistics. The paper supports the rationale behind using blockchain for secure and tamper-proof budget tracking.

Title: *Decentralized Finance (DeFi): Transforming Traditional Financial Systems* **Author(s):** Shermin Voshmgir

Description:

This work explores how blockchain is revolutionizing the financial world through Decentralized Finance (DeFi). It explains the potential of smart contracts to automate and secure financial transactions without intermediaries. This paper validates the use of smart contracts in our project to manage, automate, and store budgeting activities securely and transparently.

Title: A Blockchain-Based Personal Finance Management System

Author(s): R. Singh, P. Agarwal, M. Jain

Description:

The authors present a blockchain-based personal finance system where users can record their transactions using Ethereum smart contracts. Their work emphasizes transparency and user control. While the system focuses mainly on personal finance, it helps highlight real-world feasibility and user engagement in blockchain-powered budget management tools.

Title: Blockchain for Transparent and Secure Fund Management in NGOs

Author(s): D. Sharma, A. Mehta

Description:

This paper discusses how NGOs can benefit from blockchain to track and manage their funds transparently. It emphasizes how donors and stakeholders gain trust by seeing real-time, immutable transaction records. The idea directly aligns with the use case of applying our blockchain budget tracker in nonprofit and institutional environments.

Title: Smart Contracts: A Comprehensive Analysis and Use Case Implementation

Author(s): K. Christidis, M. Devetsikiotis

Description:

This paper deeply analyzes smart contracts and their practical implementations on platforms like Ethereum. It offers insights into how contracts can be designed, triggered, and executed for real-life applications, including financial workflows. It provides the technical foundation for designing the smart contract logic used in our budget tracking system.

Existing System:

Traditional budget tracking systems are primarily centralized applications or spreadsheet-based tools used by individuals and organizations to manage their finances. These systems typically allow users to manually input income and expenses, categorize transactions, set budget limits, and generate reports. Popular applications such as Microsoft Excel, Google Sheets, and tools like Mint, YNAB (You Need A Budget), and PocketGuard have been widely adopted for personal finance management.

However, these centralized systems come with several limitations. The most critical drawback is the **lack of transparency and trust**, especially in multi-user or organizational environments. Since all the data is stored on centralized servers, it is susceptible to unauthorized access, tampering, and data



breaches. Moreover, users have limited control over their own financial data, and there is no mechanism to independently verify the authenticity of records.

In collaborative environments like NGOs, families, or group projects, the existing systems do not provide verifiable and immutable transaction records. Trust is often based on manual audits or administrative oversight, which can be both time-consuming and prone to error or manipulation. Additionally, audit trails in conventional tools are either absent or can be easily altered without detection.

Furthermore, most existing applications operate on proprietary platforms, offering limited transparency into how data is managed or stored. They also rely on third-party authentication systems, which increases the dependency on external service providers. These limitations of the current budget tracking methods highlight the need for a decentralized, secure, and transparent system—one that can be achieved through the integration of blockchain technology.

Disadvantages of Existing Systems:

1. Lack of Transparency: Most traditional budget tracking tools operate in a centralized manner, which makes it difficult for multiple users to verify the accuracy of financial records. In shared or organizational use cases, this can lead to disputes and a lack of trust.

2. Data Tampering and Security Risks: Since data is stored on centralized servers, it is vulnerable to unauthorized access, hacking, and data manipulation. Users have limited assurance that their financial records are protected against alterations or cyber threats.

3. No Immutable Audit Trail: Centralized systems do not provide an unchangeable audit trail. Transactions can be edited or deleted without traceability, which is especially problematic in financial systems that require high accountability and compliance.

4. **Dependency on Third Parties:** These systems often rely on third-party platforms for data storage, authentication, and processing. This creates a single point of failure and raises concerns over data privacy and ownership.

5. Limited User Control: Users have minimal control over how their data is stored and managed. In many cases, if a service provider decides to shut down or restrict access, users may lose their financial data permanently.

6. Lack of Real-Time Verification: Transactions are not independently verified in real-time, making it easy for errors to go unnoticed. In contrast, blockchain systems provide immediate and verifiable recording of each transaction.

Proposed System:

The proposed system introduces a **Blockchain-Based Budget Tracking Application** that leverages the decentralized, secure, and immutable nature of blockchain technology to record and manage financial transactions. It is designed to overcome the limitations of traditional budgeting tools by ensuring transparency, trust, and tamper-proof data storage. This system allows users to log income and expenses in real-time through smart contracts that automatically store the transaction data on a public or private blockchain network.

In this system, each user connects to the platform via a blockchain wallet (such as MetaMask), ensuring secure and verified access. Once authenticated, the user can add transactions under various categories like food, rent, travel, etc. These entries are stored on the blockchain using smart contracts, which ensures that the data is immutable and cannot be modified or deleted after being recorded. This creates a permanent and verifiable audit trail for each financial entry.

The user interface is developed to be intuitive and responsive, enabling users to view their budget status, transaction history, and spending patterns through visual dashboards and charts. Alerts can be configured to notify users when they exceed specific budget limits. For organizations or families using shared accounts, the system supports collaborative budgeting with transparent record access for all stakeholders, fostering accountability and trust.

By utilizing blockchain, the proposed system ensures data integrity, user autonomy, and complete transparency, making it suitable for both personal and group-based finance



management. It addresses the shortcomings of centralized systems and offers a future-proof solution for secure and decentralized budget tracking.

Advantages of the Proposed System:

□ **Transparency and Trust:** All transactions are recorded on the blockchain, which is publicly verifiable and cannot be tampered with. This builds trust among users, especially in collaborative environments like NGOs, families, or small businesses.

□ **Data Immutability:** Once a transaction is recorded on the blockchain, it cannot be modified or deleted. This ensures the integrity and authenticity of all financial records.

Decentralization: The system eliminates reliance on a central authority or server, reducing the risk of a single point of failure. Users have full control over their own data.

□ Secure User Authentication: Integration with crypto wallets like MetaMask provides a secure and decentralized method for user login and identity verification, eliminating the need for traditional usernames and passwords.

□ Automated Smart Contracts: Transactions are handled through smart contracts, which execute automatically based on predefined conditions, reducing manual intervention and potential human errors.

□ **Real-Time Tracking and Analytics:** Users can view their income, expenses, and budget performance through interactive dashboards and real-time visualizations, enabling better financial decisions.

□ Audit-Friendly: The immutable nature of blockchain records ensures that the financial data can be easily audited, making the system suitable for financial reporting and compliance.

 \Box Enhanced Data Privacy: Unlike traditional systems that store sensitive financial data on centralized servers, this system uses encryption and blockchain principles to keep user data secure and private.

Results

Now-a-days to ease user work many online applications are available which can track user daily activity and in all human the biggest activity is to monitor their expenditure and available budget limit so they can be in limit of expenditure to avoid unnecessary debt.

All existing applications are based on single centralized servers and this server's data can be easily tamper and there is no way to track such data tamper, sometime hackers can hack this server to crash and in such scenarios services will not be available. To overcome from above issues many applications are migrating to Decentralized Blockchain storage where data will be stored at multiple nodes in a decentralized way and if one node down then services can be access from any other working nodes.

Blockchain stored each record as block or transaction and associate each block with unique hash code, while storing new record Blockchain will verify hash code of all previous blocks and if data not tamper then all blocks will generate same hash code and verification get successful and if block data alter then it will result into incorrect hash code and data alteration will get detected. Hash code verification of Blockchain make it tamper proof and impossible for data alteration.

Data can be store in Blockchain using smart contract and this smart contract can be designed using SOLIDITY code. Smart contract contains functions to store and get data from Blockchain and to store Budget data we have designed following smart contract



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In above contract we have defined functions to save budget and user details .



While tracking in above screen in red colour text user can see max budget and then can see month wise total expenditure/budget in red colour text and then in remaining rows can see each



expenditure with all details. So by using above screen user can easily track or understand his budget with all his expenditure monthwise.

Conclusion

The **Blockchain-Based Budget Tracking System** proposed in this project effectively addresses the challenges faced by traditional financial tracking methods, such as lack of transparency, data manipulation, and centralized control. By utilizing the inherent features of blockchain— decentralization, immutability, and security—the system provides a robust, transparent, and trustworthy solution for managing personal and organizational finances. It empowers users with greater control over their financial data, ensuring that every transaction is securely recorded, verifiable, and tamper-proof.

This system significantly improves transparency, especially in environments where multiple users collaborate, such as families, small businesses, or NGOs. Through the use of smart contracts, the system automates transaction recording and categorization, reducing the possibility of human error and making the budgeting process more efficient. Additionally, the user-friendly interface and real-time analytics provide valuable insights into financial status, helping users make better-informed decisions.

While the project highlights the immense potential of blockchain for financial management, it also presents opportunities for further enhancement. Future work could involve integrating machine learning for predictive budgeting, adding support for multiple blockchain platforms, or incorporating advanced security measures for protecting user privacy. The scalability and adaptability of the proposed system ensure that it can be expanded to cater to a wide range of use cases, from individual budgeting to large-scale organizational financial management.

In conclusion, the Blockchain-Based Budget Tracking System offers a modern solution to outdated financial management tools. By providing enhanced security, transparency, and control, this system lays the groundwork for a new era of decentralized, secure financial tracking that can empower users across different sectors to manage their finances more effectively

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