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Blockchain-Based Fund Management System For Indian Temples

1st Saurabh Vaidya
department of Computer Engineering
Government College of Enginnering
Yavatmal, India
svaidya.official@gmail.com

2nd Rajnandan Ray
department of Computer Engineering
Government College of Enginnering
Yavatmal, India
rajnandanraycse@gmail.com

3rd Shreya Shirbhate
department of Computer Engineering
Government College of Enginnering
Yavatmal, India
shreyashirbhatecse@gmail.com

4th Gaurav Rai
department of Computer Engineering
Government College of Enginnering
Yavatmal, India
gauravrai3133@gmail.com

Prof. Chetan Andhare
department of Computer Engineering
Government College of Enginnering
Yavatmal, India
chetan.andhare@gmail.com

Abstract* : *This study proposes a blockchain-enabled web application to address fund management challenges in temples, focusing on enhancing transparency, reducing corruption, and rebuilding trust between donors and temple authorities. The solution integrates a user-friendly interface with private blockchain technology, powered by smart contracts, to monitor donation flows in real time. The approach demonstrated increased accountability among temple authorities, reduced misuse of funds, and greater donor confidence. This innovation supports cultural heritage preservation by ensuring that donations are utilized effectively and transparently.

Keywords : Blockchain technology, Fund management, Temple donations, Transparency, Smart contracts, Donation tracking, Corruption reduction, Real-time monitoring, Donor trust, Accountability, Donation flows, Web application

I. INTRODUCTION

Blockchain is a decentralized, immutable digital ledger designed to securely store data and facilitate the recording of transactions across a distributed network [1]. This revolutionary technology, which relies on cryptographic techniques, enables tamper-proof data storage, reducing the need for intermediaries while ensuring transparency and security. Over the years, blockchain has evolved beyond its initial application in cryptocurrencies, finding utility across various domains, including healthcare, supply chain management, real estate, and financial services. Its ability to foster trust, ensure accountability, and provide secure and efficient solutions makes it a promising tool for addressing challenges in fund management systems.

In India, temples hold immense cultural, religious, and social significance, drawing millions of devotees annually. These institutions, revered as centers of faith and community, receive substantial financial contributions in the form of cash, cheques, gold, silver, and other valuables. However, managing these sizable donations poses significant challenges. Traditional fund management methods are predominantly offline and often involve manual processes and intermediaries, increasing the risk of fund mismanagement, lack of accountability, and even potential money laundering. These limitations not only jeopardize the integrity of temple administration but also erode donor trust and confidence in the system.

Blockchain technology, with its decentralized and transparent nature, presents a promising solution to these issues. By leveraging blockchain, temples can establish a secure, immutable, and auditable record of transactions, ensuring that donations are managed transparently and utilized effectively. The technology's cryptographic mechanisms safeguard sensitive financial information while providing real-time visibility to stakeholders, thereby fostering trust among devotees and reducing the scope for corruption or fund misuse.

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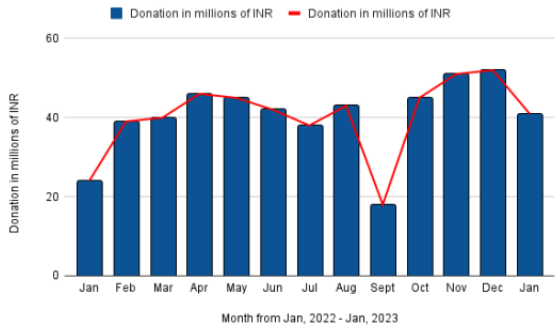
For instance, notable temples in India, such as the Tirumala Tirupati Devasthanams (TTD) and the Shree Ram Temple in Ayodhya, receive substantial donations, highlighting the pressing need for efficient fund management systems.

1. Tirumala Tirupati Devasthanams (TTD): TTD is one of the richest temples in the world, handling enormous donations every year. According to March 31, 2023, TTD had garnered a total income of INR 3,600 crore for the financial year mainly in the form of cash donations, gold offerings, and tickets for darshan [2]. On March 31, 2023, TTD took INR 30.1 million in donations in a single day. It also holds above 10.25 tons of gold reserves besides fixed deposits worth INR 15,938 crore. With such a robust financial position, there is also a problem regarding the regular manual process associated with money management, where transparency and accountability issues always crop up.

2. The Shree Ram Temple, Ayodhya: Since the consecration ceremony on 22 Jan 2024, the Shree Ram Temple has also received huge donations from every nook and corner of the country and the Indian diaspora. Donations have reached around INR 25 crore between January to February 2024, which includes 25 kg of gold and silver ornaments, among others, in cash, cheques, and demand drafts [3]. This influx of high-value donations creates a pressing need: namely the transparent and efficient use of funds.

3. Shirdi Sai Baba Temple: Shirdi Sai Baba Temple collects more than INR 500 crore as annual donations, and it is one of the biggest earner temple in India. The temple has gold reserves above 400 kg, and silver above 4,500 kg. These donations, though used for community orientated purposes, have always been coupled with some questionable money management practices that strengthens the demand for proper and transparent management systems.

4. Padmanabhaswamy Temple: Famous for the wealth amassment, which epitomizes vaults of gold and silver along with precious gemstones that carry an estimate over $20 billion. The Padmanabhaswamy Temple situated in Kerala has faced the groundswell of demands that centre around improvement transparencies for handling its funds as well as donations, and the absence of a digitized model has brought fears regarding accountability.



Based on the understanding of blockchain technology, a Decentralized Fund Management System has been proposed in this paper for Indian temples. This new initiative is made towards devising alternative conventional practices of temple fund management more transparent, accountable, and trustworthy. The present research objects are as follows:

1. Propose a feasible blockchain-based prototype for the handling of temple funds which would eliminate an intermediary. The following prototype illustrated a real-time tracking of donations, hence enabling full transparency regarding the movement of collected funds to being applied ultimate. Some features of the system should include an automatic update of the ledger, acknowledgement for donors, and secure processes for the identity validation of users who have access.

2. Assess the impact of the system on increased transparency and accountability in collection, recording, and utilization; Improve all collected and recorded donations, as well as expenditures. blockchain can reduce discrepancies between reported and actual donations and expenditure. For instance, through the automation of smart contracts used for any specified community welfare projects by being enabled only if some defined conditions are met..

3. Discuss the impact that the system will have on curbing misuse of funds, ensuring proper allocation, and building confidence among stakeholders: temple fund management is a common issue in India, with an epidemic of cases involving embezzlement or unapproved use of temple wealth. The blockchain system would allow for real-time monitoring and public access to that data when appropriate conditions are met, to obliterate opportunities for the misuse of funds immensely..

By achieving these goals, this research hopes to be able to revolutionize temple management, rebuild donors' confidence, and preserve the integrity of temple governance. The proposed decentralized system is aimed at providing a

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more efficient, secure, and more transparent structure of management over temple finances in order to improve trust between trustees and between trustees and devotees.

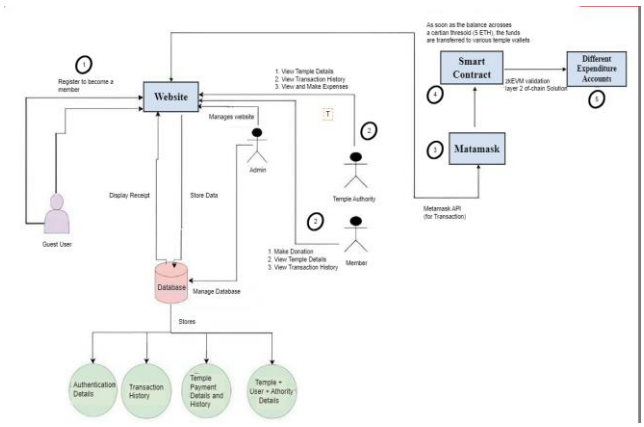
II. Related Work

Blockchain technology has been recognized for its efforts in addressing some of the challenges of managing funds in different types of industries. Its decentralization, transparency, and cryptographic security make it a vital tool for improving governance and accountability in operations involving funds. In a government's funds context, the distributed ledger and cryptographic nature of blockchain significantly enhances transparency and minimizes corruption due to its traceable and secure transactional capacity. The involvement of blockchain in such an industry allows efficiency and trust within their operations. For instance, Mangla [4] proposes that blockchain-based fund tracking systems have been integrated successfully to strengthen governance by availing real-time visibility of transactions and limiting grants of fund allocations without authority. In the construction sector, blockchain technology enhances the management of funds through its decentralised applications and smart contracts. The tools create a transparent, trackable, and secure space for financial transactions so as to avoid incorrect distribution, which in turn reduces disputes among the participants. A case study in Xiong'an New Area, China, exemplified that blockchain-based systems increase the collaboration of construction teams fully adhering to the budget and timeline of the project [5]. For NGOs, block-based fund management systems address issues concerning corruption and misuse of funds. The use of smart contracts helps to secure transactions, enabling contributors to track the contributions they make and also understand the history of transactions. Jain et al. [6] explain how frameworks like the Rinkeby Test Network have applied frameworks, showing better security and transparency than other traditional schemes. However, scalability and adoption become significant barriers to widespread adoption. For Ghana's fund management sector, the use of blockchain occurs through consensus mechanisms like Proof of Authority, which ensure secure and traceable management of funds. According to Fiergbor [7], this method ensures safety in data, increases users' trust in stakeholders, and eventually increases investment in mutual funds. Stakeholder feedback indicated that blockchain can innovate new methodologies in the management of funds in emerging markets. Its application extends to state project finance management, providing stakeholders with live-time improved visibility transactions. According to Rashid et al. [8], blockchain tools like Ethereum and MetaMask were researched in an attempt to reduce their response times and improve scalability using Layer 2 solutions. Roll-up methodologies' use also became inexpensive so that integration with the blockchain is sensible for governmental fund management systems. This research also laid significant focus on nurturing scalability and interoperability, which are, in turn, meant to inspire widespread adoption. The examples above demonstrate the flexibility of blockchain technology and its potential to revolutionize fund management in various sectors, thus offering a foundation for its adoption within the management of temple funds. Tackling sector-specific challenges, these systems further support the viability of using blockchain technology to ensure transparency, trust, and accountability in key financial transactions.

III. Methodology

A. *System Design and Architecture*

The proposed system incorporates a decentralized blockchain network that operates through smart contracts. These contracts automate transactions based on predefined conditions, ensuring transparency and efficiency. The system architecture includes front-end and back-end components, integrated with blockchain to enable secure and seamless transactions.



B. *Research Approach*

This study adopts an Exploratory Research Methodology. The data for this research has been gathered through a comprehensive review of existing literature, news articles, and publicly available statistics sourced from the internet.

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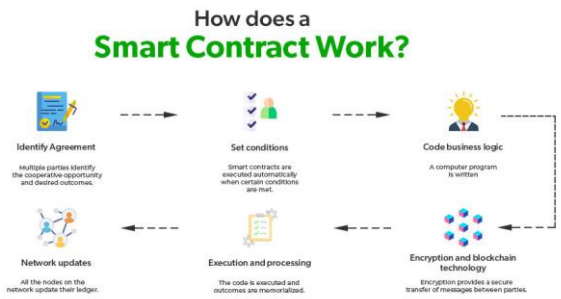
C. Research Validity and Consistency

This study ensures the credibility and consistency of the research on the implementation of a ‘’Blockchain-Based Fund Management System for Indian Temples’’. The research design minimizes potential biases and extraneous factors that could affect internal validity, allowing for a true reflection of the study's objectives. The applicability of the results beyond temple-specific contexts is also considered, with recognition of the potential scope and limitations in different industries or organizations. To maintain construct validity, key concepts such as transparency and fund management efficiency are clearly defined and operationalized. Additionally, efforts have been made to ensure data consistency and stability over time, enhancing the study's reliability.

IV. PROPOSED SOLUTION

The solution utilizes blockchain technology to enable transparent and accountable fund management for temples. Key features include:

- User Dashboard**:** Allows donors to make and track donations.
- Smart Contracts: Automate fund allocation to temple accounts, ensuring integrity and accountability.



- Temple Dashboard: Provides administrators real-time visibility into transactions and total donations.
- Receipts and Audit Logs: Enables users to access transaction details and maintain records.
- Multi-Currency Supports:Accepts multiple payment methods, including fiat currencies, cryptocurrencies, and digital payment platforms, broadening donor accessibility.

V. LIMITATIONS AND FUTURE SCOPE

The proposed temple fund management system, designed with use of web technology and blockchain, has significant promise in resolving problems associated with the current difficulties related to running temple donations. However, there are some limitations and scope for potential enhancements that can expand its functionalities and range of application. One key limitation is that the current design is available only as a website application. Although functional, this limitation affects the user availability relying on mobile or desktop applications for convenience. Future improvements may address this limitation by providing specific mobile applications for both Android and iOS as well as desktop applications. In that multi-platform approach, better access would be realized and increased user interaction and engagement would take place as fans, administrators, and stakeholders work their way through the system conveniently on different devices. Another good thing about this system is its scalability. This leads to scalability becoming a limiting factor as the number of transactions increases over time. Overcoming this could be achieved by hosting the system over the cloud platforms like AWS or Microsoft Azure, providing the required scale of computation power and storage for bigger operations. Further improvement in the scalability of the system could also be met through the integration of Layer 2 solutions such as Polygon CDK, which make use of rollup mechanisms. These would decrease transaction costs and enhance system responsiveness, therefore making the platform more efficient and able to cater to more widespread adoption. Future improvements could even include event management and membership handling. These would enable temples to manage ceremonies, festivals, and special events all while keeping an organized database of devotees and members. This project would not just improve the administrative efficiency but also create a sense of community engagement while offering catered services to frequent visitors and donators of the temple. Yet another exciting opportunity for expanding into the future is the creation of a specific cryptocurrency compliant with the ERC20 token standard. This temple-specific digital currency can potentially be used for initiating financial transactions across the temple's system, ensuring safe, transparent, and efficient transaction procedures for donations, purchases, and more. The donors can use such tokens to make monetary donations, and temple managers will utilize similar tokens for payment execution or resource management in a clearer manner. Further, the ecosystem can also explore the NFT (Non Fungible Token) space which allows temples to mint unique, temple-specific NFTs. Those NFTs could be virtual depictions of blessings, memorial artwork, or exclusive access to events, thus offering followers a new way of relating with the temple while earning extra income. Such NFTs could attract the younger, tech-savvy donors towards the temples thus increasing the donor base. The system could become a fully-fledged, modernized temple fund management platform if the above drawbacks are met through the proposed improvements. It would then provide greater access, scalability and functionality, which would

label it as a pioneer solution that combines traditional values with the leading-edge technical usability.

VI. CONCLUSION

The investigators have successfully developed a temple fund management system accessible by using web technology and catering to two prime user groups: temple administrators and devotees. Using blockchain technology, the said system avoids the main issues with inconsistencies that usually plague conventional approaches in fund management. The added advent of the blockchain has improved the transparency of the system and removed intermediaries between the temple and its users. Contributions are assigned to a smart contract, that independently executes a mechanism for distributing funds to five targeted accounts. Every transaction is recorded on a decentralized ledger, ensuring full transparency and accessibility to the parties involved. Since every single transaction is in a way controlled by a smart contract, it becomes immutable, and therefore integrity of the whole process is preserved. Of course, this research also emphasizes the need for a more user-friendly user interface wherein the needs should be presented to the users through an efficient frontend. An audit trail has also been integrated in order to ensure accountability so that administrators and users alike can trace the flow of the funds in real time. Such an exercise instills much more confidence in donors and helps temple authorities maintain tight checks on financial operations. With blockchain integration with its decentralized structure, the platform provides for enhanced security measures against fraud- making it quite reliable and efficient to manage temple donations.

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