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Blockchain Technology for Transparent SRC Financial Management in Ghanaian Universities

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ABSTRACT
Student Representative Councils (SRCs) in many higher education institutions manage financial resources intended to support student welfare and academic activities. However, limited transparency, weak audit mechanisms, and reliance on alterable financial records have raised concerns about accountability and trust in SRC financial management. This study presents CampusWatch, a blockchain-based financial oversight system designed to enhance transparency, accountability, and real-time financial visibility within SRC operations. The proposed system leverages blockchain technology and smart contracts to record and validate SRC financial transactions on an immutable distributed ledger. A three-layer architecture comprising React-based frontend, Node.js and MongoDB backend, and an Ethereum blockchain layer was adopted. To balance transparency and system efficiency, a hybrid on-chain/off-chain data model was implemented, where critical financial approvals are stored on-chain while detailed administrative metadata is managed off-chain. Role-based access control ensures that SRC administrators can initiate and approve transactions, while students are granted read-only access to verified financial records. Functional and performance evaluations demonstrate that CampusWatch effectively enforces budgetary rules, maintains real-time data synchronization, and provides reliable system performance with acceptable transaction confirmation times and API responsiveness. The results indicate that the system significantly improves financial traceability, reduces opportunities for misappropriation, and strengthens trust between SRC executives and the student body.

Keywords
Blockchain; Student Representative Council (SRC); Financial Transparency; Smart Contracts; Hybrid On-Chain/Off-Chain Model

1. INTRODUCTION
Students' Representative Councils (SRCs) in Ghanaian universities are entrusted with managing substantial financial resources earmarked for student welfare, academic development, and campus-related initiatives. These funds are meant to support a wide range of activities, from organizing educational programs and welfare schemes to funding infrastructural projects. Despite their importance, concerns have consistently been raised regarding how these funds are administered. Studies highlight recurring problems such as financial misappropriation, lack of accountability, and limited transparency in financial reporting [2]. In many instances, students are not given real-time insight into the use of their dues, and when financial reports are released, they are often infrequent, difficult to interpret, or impossible to independently verify. This opacity undermines trust in SRC governance and creates vulnerabilities for corruption, budget manipulation, and project cost inflation.

The weaknesses in existing financial governance can be summarized as follows: (i) absence of transparent and traceable tracking mechanisms for student dues; (ii) limited access to timely financial information for students; (iii) reliance on records that may be altered or lack permanence; and (iv) weak auditability, which reduces the ability of students and university authorities to confirm the accuracy of reported transactions. Collectively, these issues weaken student trust in leadership and limit accountability mechanisms within student governance structures.

Blockchain technology provides a promising avenue for addressing these challenges. As a decentralized, immutable, and transparent method of recording transactions, blockchain has already shown transformative potential in industries such as supply chain management, healthcare and financial services [13, 7, 8]. Its ability to prevent record tampering, enhance traceability and promote trust makes it suitable for contexts where accountability is paramount. In the context of SRC financial management, blockchain can serve as a secure platform for documenting budget allocations, expenditures and transactions on an open-access ledger. Students and stakeholders would be able to view verified, uneditable records in real time, ensuring both transparency and accountability. Furthermore, the use of smart contracts on platforms such as Ethereum can automate processes such as budget approvals and transaction validations, eliminate human bias and reduce opportunities for manipulation [12].

This study therefore advocates for the adoption of blockchain-based financial tracking as a means of improving financial governance in SRCs. Its ability to deliver real-time, transparent and auditable records of student dues positions blockchain as a powerful tool to build trust, curb corruption and provide a replicable framework for strengthening student governance across higher educational institutions.

The rest of the paper is organized as follows: Section 2 reviews relevant literature on blockchain technology and their applications in financial tracking systems. Section 3 outlines the methodology used in designing and developing the platform, including system architecture, system use cases and the development process. Section 4 presents the results and discussion of the implementation. Finally, Section 5 concludes the study with key findings and recommendations for future improvements and potential institutional adoption.

2. RELATED WORKS

2.1 Overview of Blockchain Technology

Blockchain is a decentralized digital ledger that records transactions over a peer-to-peer network without relying on a central authority. Each block contains a timestamp, transaction data and a cryptographic hash of the preceding block, thereby ensuring auditability and resistance to tampering [13]. Transactions are grouped into blocks and linked sequentially, forming an immutable chain. The inclusion of the cryptographic hash from the previous block safeguards the integrity of the entire chain: altering a single block would require modifications to all subsequent blocks, a process that is computationally impractical. This makes blockchain highly resistant to fraud and manipulation, providing a verifiable and permanent record of transactions, an essential characteristic for systems that demand trust and high integrity [13].

The key features of blockchain include decentralization, where the system operates on a distributed network of nodes rather than a single authority, thereby reducing the risk of failure and enhancing security; immutability, which ensures that once data is validated and added it cannot be altered or erased, making blockchain reliable for storing sensitive records; and transparency, as transactions are visible to participants in the network, fostering accountability and allowing stakeholders to independently audit activities. Together, these features differentiate blockchain from conventional record-keeping systems and explain its growing adoption across diverse sectors such as finance, supply chain management, healthcare and governance. Its ability to ensure data integrity, foster accountability and provide tamper-proof records makes blockchain particularly suitable for contexts that demand high transparency and verification.

In addition to these, blockchain supports smart contracts; self-executing agreements coded on the blockchain that automatically enforce rules and conditions without the need for intermediaries. On blockchain platforms such as Ethereum, smart contracts can automate budget approvals, restrict spending to allocated amounts and detect anomalies, making them well suited for financial governance. Their immutability and auditability ensure transparency, reduce costs and improve efficiency, with applications ranging from decentralized finance to supply chain management and digital identity systems [4, 12].

2.2 Blockchain in the Financial Sector

Blockchain has significantly transformed the financial sector, primarily through the development of cryptocurrencies such as Bitcoin and Ethereum. These decentralized systems remove the need for intermediaries, lower transaction costs and enhance transparency, making them attractive for applications such as the management of SRC funds. The blockchain ledger ensures that all transactions are visible, secure and immutable, thereby strengthening trust and accountability in financial governance [12].

Blockchain's financial applications extend across several areas, with cryptocurrencies and digital payments being the most prominent. Bitcoin, introduced in 2009 by the pseudonymous Satoshi Nakamoto, was the first cryptocurrency to implement blockchain technology. It relies on a decentralized ledger [9] verified through a Proof-of-Work consensus algorithm, ensuring the immutability and security of transaction records without the need for central banks or intermediaries [10]. Ethereum, on the other hand, was proposed by Vitalik Buterin in 2013 and launched in 2015, extending blockchain's capabilities through the introduction of smart contracts. These self-executing codes made it possible to build decentralized applications, thereby expanding blockchain's utility beyond simple payments into more complex financial services, particularly in the realm of Decentralized Finance (DeFi) [3].

Within DeFi, blockchain enables decentralized lending and borrowing, as demonstrated by platforms like Compound and Aave, which use smart contracts to manage collateral, interest rates and repayments automatically. This innovation eliminates the need for traditional intermediaries such as banks while reducing fraud and human error [11]. Similarly, decentralized exchanges (DEXs) like Uniswap and Sushiswap allow users to trade cryptocurrencies directly through liquidity pools and automated market makers. Unlike centralized exchanges, DEXs [1] enhance privacy, security and control since users retain custody of their funds throughout the transaction process.

Another significant use case involves stablecoins and tokenization. Stablecoins such as Tether and USD Coin are pegged to currencies like the U.S. dollar, combining blockchain's advantages of low fees and fast settlement with price stability. Their stability makes them suitable for a wide range of applications, including remittances, lending and trading [6]. Tokenization also allows real-world assets such as real estate, commodities and equities to be converted into digital tokens that can be easily traded on blockchain platforms. This process democratizes access to investments by enabling fractional ownership of high-value [5].

Blockchain also improves cross-border payments and remittances, which in traditional systems are often slow, costly, and dependent on intermediaries. Blockchain reduces costs and settlement times significantly by enabling peer-to-peer transactions.

2.3 Blockchain in the Non-Profit Sector

The use of blockchain in the non-profit sector has been exemplified by platforms such as BitLedger, which was developed to promote transparency in charitable donations. Through this system, all incoming funds and subsequent expenditures are recorded on a blockchain, giving donors real time visibility into how their contributions are used. This creates a verifiable audit trail that builds trust between donors and organizations. Although designed for NGOs, the principle of financial visibility and accountability is directly relevant to SRC governance, where student trust depends on transparent fund management.

2.4 Blockchain in Public Governance

In the public sector, initiatives like the GOVTECH Pilots have demonstrated the potential of blockchain for government budgeting and expenditure tracking. These pilots created immutable financial records that reduce corruption, prevent misappropriation of funds and enhance citizen oversight of public spending. Since SRCs similarly manage communal resources in the form of student dues, these initiatives provide a strong precedent for applying blockchain to student governance, where accountability and trust are equally critical.

2.5 Blockchain in Financial Management and Community Projects

Beyond government and NGOs, blockchain has also transformed community funding models. A notable example is FundRequest, which uses smart contracts to release funds only when specific, verifiable project milestones are met. Funds are held in escrow and disbursed automatically once conditions are satisfied, ensuring that resources are used as intended. This mechanism provides an important insight for SRCs, as it can prevent unauthorized or premature spending by locking student funds until official budget approvals are securely recorded on the blockchain.

2.6 Blockchain in the Educational Sector

Within education, platforms such as EduChain have demonstrated how blockchain can be used to secure academic credentials and manage institutional funding. By storing records like transcripts and degrees on a blockchain, EduChain ensures authenticity and prevents tampering, while also supporting the transparent distribution of scholarships and grants. Although its primary focus is academic records rather than student finances, EduChain validates the applicability of blockchain in university environments and illustrates its dual potential for both recordkeeping and financial accountability.

2.7 Blockchain in Student Governance

The Ghanaian government has made notable progress in its digital governance agenda, introducing platforms such as Ghana.gov for online service delivery and digital land records for improved asset management. These initiatives signal a broader commitment to leveraging technology to enhance efficiency, transparency and accessibility in public administration. Despite these advancements, however, issues of corruption, weak financial oversight and mismanagement of resources continue to pose significant challenges across various sectors. Student organizations, particularly the SRCs within higher education institutions, are not immune to these challenges. Cases of unaccounted funds, delays in reporting and limited financial transparency undermine trust in student leadership and weaken institutional governance structures. In many instances, SRC financial governance has been criticized for limited transparency, inadequate reporting mechanisms and poor accountability structures, resulting in declining student trust in leadership. Financial reports are often delayed, difficult to verify or incomplete, creating loopholes for mismanagement or corruption.

In this context, blockchain technology presents a transformative opportunity to strengthen financial accountability in student organizations. With its immutability, transparency and decentralization, blockchain can ensure that all SRC transactions are permanently recorded, accessible in real time and tamper-proof. Additionally, the integration of smart contracts on platforms like Ethereum can automate budget approvals, restrict spending to approved allocations and prevent fraudulent or duplicate transactions. Embedding these mechanisms into SRC financial processes allows blockchain to foster ethical leadership, enable real-time auditing and rebuild trust among students and administrators. The adoption of blockchain in SRC governance could also serve as a replicable model for wider institutional reforms across Ghanaian higher education, aligning with the broader national agenda of digital transformation and good governance.

3. SYSTEM DESIGN

3.1 System Architecture

System architecture represents the structured design and integration of both hardware and software components into a unified framework. It provides a blueprint that outlines how different elements interact, communicate, and collectively support the overall objectives of the system.

For the proposed blockchain-based financial oversight platform in SRC governance, the system architecture is designed in three primary layers: the Frontend Layer, the Backend Layer and the Blockchain Layer, as visually represented by Fig 1. Each layer plays a crucial role in ensuring usability, functionality, transparency and security.

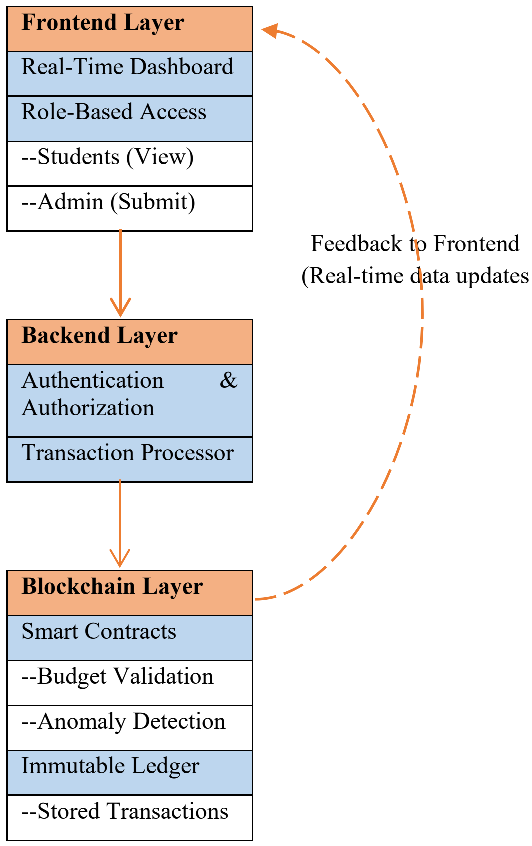

Fig. 1: Primary Layers of the Proposed System

The frontend layer serves as the interface between the system and its users, enabling both students and administrators to interact seamlessly with the platform. Built with React.js for dynamic user interfaces and Tailwind CSS for styling, this layer emphasizes accessibility and usability. Additionally, it provides a real-time dashboard that displays SRC budget allocations, expenditures and anomalies, supported by role-based access control where students have read-only access to financial records while administrators can initiate and approve transactions.

Complementing the frontend, the backend layer manages the system's business logic, data processing and API requests, serving as the bridge between the frontend interface and the blockchain. Developed with Node.js and Express.js, this layer ensures efficient handling of operations, including authentication and authorization for secure access. Additionally, it processes requests from the frontend and reliably relays validated transactions to the blockchain, thereby maintaining seamless data flow and system integrity.

At the core of the architecture lies the blockchain layer, which provides secure, transparent and immutable record-keeping for all SRC financial transactions. Built on the Ethereum Goerli Testnet, this layer leverages Solidity-based smart contracts to automate key processes such as transaction validation, budget approval and anomaly detection. To maintain efficiency and trust in a controlled university environment, it employs a Proof of Authority (PoA) consensus mechanism, ensuring that only authorized validators manage the network. By guaranteeing tamper-proof records and an auditable transaction history, this layer strengthens accountability, prevents unauthorized modifications and significantly reduces the risk of fraud.

3.2 Mode of Operation of the System

The proposed blockchain-based financial oversight system operates on the Ethereum Goerli testnet and follows a structured workflow that ensures secure, transparent and verifiable financial management for SRC activities. The process begins when an SRC administrator logs a financial transaction such as approving a budget or recording an expenditure through the secure platform interface. Once submitted, the transaction request is automatically routed to a Solidity-based smart contract, which serves as the central validation engine for the system.

Validation is achieved through a series of predefined rules embedded within the smart contract. These rules enforce core governance requirements, including role-based access control to ensure that only authorized personnel can initiate or approve financial actions; budgetary constraints that prevent transactions from exceeding allocated limits; and transaction type validation that restricts operations to approved financial categories. Each request is evaluated against these conditions without human intervention, thereby eliminating the possibility of unauthorized approvals or manual manipulation.

Transactions that successfully pass the validation checks are committed to the blockchain ledger, where they are stored in structured blocks containing a timestamp, a cryptographic hash of the current block, the hash of the preceding block, and the validated transaction details. This structure guarantees immutability and creates a continuous, tamper-resistant audit trail that can be referenced at any time.

To maintain efficiency and trust within the controlled environment of a university, the system adopts a Proof of Authority (PoA) consensus mechanism. Under PoA, a designated group of trusted validators authenticate each transaction. This approach significantly reduces computational overhead while ensuring fast and reliable block confirmation, making it ideal for permissioned institutional settings.

Once recorded on the blockchain, the transaction becomes visible on the student dashboard, allowing the wider student body to monitor budget allocations, expenditure, and updates in real time. This end-to-end workflow reinforces transparency, strengthens financial accountability and fosters greater trust in SRC governance.

3.3 System Use Case

The system's use case scenario illustrates how the different user groups such as SRC executives and students, interact with the platform and how the underlying blockchain infrastructure processes and secures each interaction.

3.3.1 Use Case 1: Budget Approval

The budget approval process begins when an SRC administrator logs into the web interface and submits a proposed budget allocation. The smart contract immediately evaluates the submission against institutional guidelines and existing budget allocations. If the submission meets all predefined rules, it is automatically approved and permanently recorded on the blockchain. Once committed, the budget becomes visible to students, ensuring openness and transparency.

3.3.2 Use Case 2: Expense Logging

In the expense logging scenario, an administrator records a financial transaction such as procurement or event-related spending. The system checks whether the expense aligns with the approved budget and corresponds to the correct project or category. Valid entries are immutably written to the blockchain, ensuring that all financial activities remain tamper proof and publicly auditable.

3.3.3 Use Case 3: Student Verification

For student users, the system provides a read-only dashboard that displays real-time financial information retrieved directly from the blockchain. Students can verify the authenticity, order and accuracy of all recorded transactions but cannot modify any data. This mechanism strengthens accountability while fostering trust in SRC financial management.

3.3.4 Use Case 4: Budget Validation

Upon submission of a budget, an automated validation process, facilitated by a Solidity-based smart contract on the Ethereum blockchain, ensures compliance with established financial rules. The smart contract checks for key conditions, including budget limits, category validity, proper user authorization and alignment with the current academic term or project window.

During validation, the process branches into two possible outcomes. If the submission is valid, the smart contract automatically approves it and records it on the blockchain ledger. If irregularities such as overspending, duplicate claims, or unauthorized actions are detected, the transaction is flagged for further examination. Flagged transactions are displayed in an administrative review panel for evaluation by a designated auditor or oversight authority. After reviewing the details, the auditor may either approve the transaction, allowing it to be added to the blockchain, or reject it permanently if it is deemed fraudulent or unjustified. The process is visually represented in Fig 2.

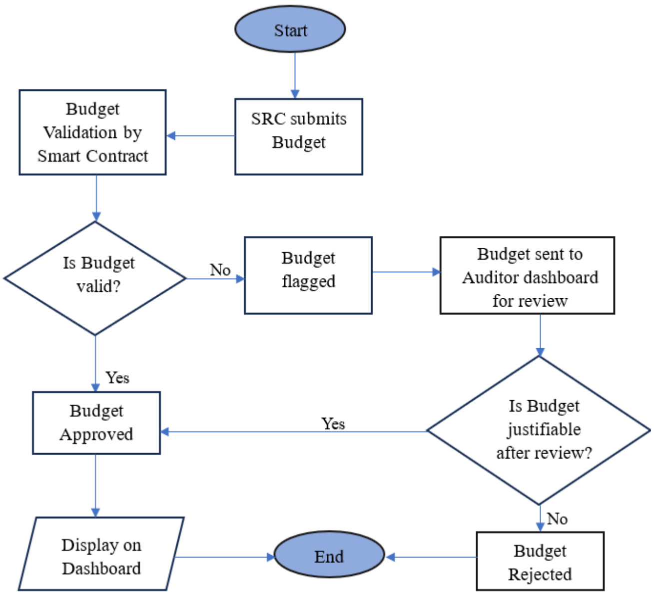

Fig. 2: Budget Validation Process

3.4 System Implementation

Implementation of the CampusWatch system involved the seamless integration of its three core architectural layers to produce a functional and secure prototype. The system was designed to deliver a transparent and user-friendly experience tailored to two primary administrative roles: the admin (Treasurer) and the Super Admin (Auditor/Patron). To achieve this, several key technologies were employed, including React with Tailwind CSS for the frontend interface, a Node.js server with an Express API and MongoDB for backend operations and an Ethereum smart contract written in Solidity to handle immutable financial records.

To balance efficiency with transparency, a hybrid on-chain/off-chain data model was adopted. The Solidity smart contract functions as the authoritative, tamper-proof ledger for critical and auditable financial actions, such as approving project budgets and recording finalized transactions. In contrast, the MongoDB database manages richer off-chain data, including detailed budget justifications, user profiles and administrative audit information such as reasons for rejection or flagging. Storing this supplementary information off-chain reduces blockchain storage costs while maintaining overall system integrity.

The frontend application was developed as a Single Page Application (SPA) using Vite, enabling fast rendering and smooth navigation. A robust role-based access control mechanism was implemented through a global AuthContext, which dynamically restricts system access and interface elements based on the authenticated user's role. As a result, Admins and Super Admins are presented only with features and navigation options relevant to their responsibilities.

Additionally, a global FinancialContext was introduced to manage and synchronize the system's financial state in real time. This context periodically retrieves data from both the blockchain and the backend database, ensuring that all components including dashboards and transaction ledgers display a consistent and up-to-date view of SRC financial activities.

Fig 3 presents the main dashboard interface displayed to an administrative user upon successful login, highlighting the system's emphasis on clarity, accessibility and real-time financial oversight.

Fig 3: Main Administrative Dashboard of the CampusWatch System

4. RESULTS AND DISCUSSIONS

4.1 Functional and Performance Testing

Functional and performance testing was conducted to evaluate whether the proposed system satisfied its functional requirements and achieved acceptable levels of responsiveness, reliability and efficiency. Functional testing focused on the major system workflows, data synchronization and ledger integrity while performance testing evaluated transaction confirmation time, API response time, system reliability and smart contract gas consumption. The testing focused on the following core areas:

4.1.1 Admin (Treasurer) Workflow

This test evaluated the functionality of the admin role by verifying the submission of budget proposals through the Budget Proposals interface. Testers completed the required fields and submitted a proposal for approval. The system was confirmed to successfully transmit the transaction to the blockchain while simultaneously creating a corresponding Pending record in the off-chain database. The successful creation of both records demonstrates that the frontend, backend and blockchain components communicated correctly during the budget proposal process. It also indicates consistency between the on-chain transaction and the corresponding off-chain record. The test further confirms that submitted proposals can be tracked before a final approval or rejection decision is made.

4.1.2 Super Admin (Auditor) Workflow

The Super Admin workflow was tested by verifying the display, approval and rejection of pending budget proposals. The Approve Budgets interface was examined to ensure that only proposals awaiting a decision were displayed. It was seen that both approval and rejection operations were subsequently executed. For rejected proposals, the justification modal was tested to determine whether the rejection reason was captured and stored correctly. The successful execution of these operations demonstrate that the system supports the required budget oversight and decision-making processes. In particular, restricting the approval interface to pending proposals reduces the possibility of previously processed proposals being approved or rejected again.

4.1.3 Data Synchronization and State Management

Real-time data synchronization was verified by observing automatic status updates following approval or rejection operations. The admin interface reflected changes immediately without requiring manual page refresh, confirming effective state management. Dashboard summaries were also updated to reflect the new system state. This result demonstrates effective synchronization between the application components and indicates that the system can provide users with up-to-date financial information.

4.1.4 Expense Logging and Ledger Integrity

After budget approval, the admin successfully logged expenses against approved budgets. The newly recorded expenses were subsequently displayed in the Public Expense Ledger. The successful display of the recorded expenses demonstrates that expense transactions were correctly associated with approved budgets and reflected in the public ledger. This provides evidence of consistency between the expense-recording process and the ledger component and supports the transparency objective of the system.

4.1.5 Performance testing

Performance testing was conducted to evaluate the responsiveness, reliability and computational efficiency of the proposed system, particularly its interaction with the blockchain layer. The evaluation considered transaction confirmation time, API response time, system reliability and smart contract gas consumption.

i. **Transaction Confirmation Time**: Transaction confirmation time was evaluated to assess the responsiveness of the blockchain layer during key system operations. The test was conducted on a local Hardhat network and the elapsed time between transaction submission and confirmation was recorded for budget proposal submission, budget approval and expense submission. The measured confirmation times were 10ms, 15ms and 20ms, respectively. The results indicate that the expense submission operation required the longest confirmation time while the proposal submission operation was confirmed most quickly. These results provide an indication of the responsiveness of the blockchain layer under the local test environment.
ii. **API Response Time**: The response times of critical backend API endpoints, particularly those responsible for retrieving blockchain data were measured to evaluate backend performance.
iii. **System Reliability**: The system's ability to handle errors gracefully was tested by simulating fault scenarios, including invalid data submissions and temporary blockchain node unavailability, to ensure robustness and stability
iv. **Smart Contract Gas Efficiency**: The computational cost of smart contract functions was analyzed using the hardhat-gas-reporter tool, as detailed in Fig 4. The results show that the gas requirements vary across the contract functions according to the complexity of the operations performed. The proposeBudget function consumed an average of 70,754 gas while the submitExpense function consumed 188,996 gas. The higher gas consumption of submitExpense occured as a result of the additional state modifications and data processing required when recording an expense. The submitExpense function therefore consumed approximately 2.67 times more gas than the proposeBudget function. Although this represents a higher computational cost, both operations remained within the available block gas limit. The smart contract deployment consumed 2,800,329 gas which represents 9.3% of the block gas limit on the test network. This indicates that the smart contract can execute its core operations without approaching the network's block gas constraint.

```
| Solidity and Network Configuration                                              %
| Solidity: 0.8.28 · Optim: false · Runs: 200 · viaIR: false · Block: 30,000,000 gas %
| Methods                                                                         %
| Contracts / Methods   · Min      · Max      · Avg        · # calls · usd (avg) %
| SRCFinance            ·                                                         %
|   approveBudget       ·        - ·        - ·     73,728 ·       9 ·         - %
|   assignRole          ·   48,304 ·   48,316 ·     48,311 ·      27 ·         - %
|   cancelPendingBudget ·        - ·        - ·     27,193 ·       1 ·         - %
|   proposeBudget       ·   70,743 ·   70,755 ·     70,754 ·      12 ·         - %
|   rejectBudget        ·        - ·        - ·     29,142 ·       1 ·         - %
|   reviewExpense       ·   34,247 ·   60,968 ·     47,608 ·       2 ·         - %
|   setAnomalyThreshold ·        - ·        - ·     30,085 ·       1 ·         - %
|   submitExpense       ·  177,355 ·  197,798 ·    188,996 ·       7 ·         - %
| Deployments           ·                     · % of limit ·                      %
| SRCFinance            ·        - ·        - ·  2,800,329 ·   9.3 % ·         - %
| Key                                                                             %
| %ï  Execution gas for this method does not include intrinsic gas overhead       %
| %³  Cost was non-zero but below the precision setting for the currency display (see options) %
| Toolchain:  hardhat                                                             %
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Fig 4: Automated Gas Usage Report

5. CONCLUSION AND FUTURE WORK

This research presented the design, implementation and evaluation of CampusWatch, a blockchain-based financial oversight system developed to enhance transparency, accountability and trust in Student Representative Council (SRC) financial management. The study addressed long standing challenges related to financial mismanagement, limited auditability and restricted student access to financial information by leveraging the core properties of blockchain technology and smart contracts.

The proposed system employs a three-layer architecture consisting of a React-based frontend, a Node.js and MongoDB backend, and an Ethereum blockchain layer. This architecture enables seamless interaction between users and the underlying financial records while ensuring security and data integrity. The adoption of a hybrid on-chain/off-chain data model further balances transparency and efficiency by storing critical, auditable financial decisions on the blockchain and managing detailed administrative and audit-related data off-chain.

A functional and performance testing confirmed that CampusWatch effectively enforces role-based access control, automates budget validation through smart contracts, and maintains real-time synchronization of financial data across system components. The system demonstrated reliable performance, acceptable transaction confirmation times, efficient API responsiveness and resilience under fault conditions.

In conclusion, CampusWatch demonstrates the practical feasibility of applying blockchain technology to student governance and financial oversight. The system provides a scalable and adaptable framework that can strengthen ethical financial practices, improve institutional accountability, and rebuild trust between SRC executives and the student body. With further development and institutional adoption, CampusWatch has the potential to serve as a model for transparent financial governance across higher education institutions.

Future work will focus on the introduction of a multi-level approval workflow for expense requests. This would allow financial transactions to pass through different authorization stages, thereby improving accountability and reducing the risk of unauthorized expenditures. Another area will be the integration of real-time communication technologies such as Web Sockets. This would enable instant notifications for approvals, rejections and transaction updates, thereby improving user interaction and overall system responsiveness. Additionally, future work will deploy the system to a public Ethereum testnet or mainnet environment. Such deployment would provide a more realistic platform for evaluating the scalability, security and performance of the blockchain-based financial management system under real-world conditions. Furthermore, the system can be extended with advanced analytics and automated reporting functionalities. These features would help generate detailed financial insights, identify spending trends, and support data-driven decision making within the SRC.

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