VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELGAUM -590 014

Project Report On

"BLOCK CHAIN BASED GOVERNMENT BUDGET TRACKING SYSTEM"

Submitted in partial fulfillment of the requirement for the award of

BACHELOR OF ENGINEERING
IN
COMPUTER SCIENCE & ENGINEERING

Submitted by

SANDHYA RANI A **4SM22CS408**

Project Guide
Prof. Thirumala N O B.E., M.Tech.
Asst. Prof., Dept. of CS&E,
SJMIT, CHITRADURGA

Project Coordinator
Prof. Ramesh B.E MCA., M.Tech.
Assoc. Prof., Dept. of CS&E,
SJMIT, CHITRADURGA

Head of the Department
Dr. Krishnareddy K R M.Tech., Ph.D.
Professor & Head, Dept. of CS&E,
S.J.M.I.T, CHITRADURGA

2024 - 2025

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CERTIFICATE

This is to certify that the project work entitled "**BLOCK CHAIN BASED GOVERNMENT BUDGET TRACKING SYATEM**" is a Bonafide work carried out by **SANDHYA RANI A (4SM22CS408),** in partial fulfillment for the **8th semester of Bachelor of Engineering in Computer Science & Engineering** of the **Visvesvaraya Technological University, Belagavi** during the academic year: 2024- 2025. It is certified that all corrections /suggestions indicated for the Internal Assessment have been approved as it is satisfying the academic requirements in respect of project work prescribed for the **Bachelor of Engineering Degree.**

…….	……..……	…..……..……
Signature of the Guide	***Signature of the HOD***	***Signature of the Principal***
Prof. Thirumala N O B.E., M.Tech.	**Dr. Krinhnareddy K R** M.Tech., Ph.D.	**Dr. Bharath P B** MTech., Ph.D.
Assoc. Prof., Dept. of CS&E,	Prof.& Head of Dept. of CS&E,	Principal.
S.J.M.I.T, CHITRADURGA.	S.J.M.I.T, CHITRADURGA.	S.J.M.I.T, CHITRADURGA.

External Viva

Name of the Examiners	**Signature with Date**
1. …….	……
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DECLARATION

I **SANDHYA RANI A (4SM22CS408),** student pursuing Bachelor of Engineering, in Department of Computer Science & Engineering at SJM Institute of Technology, Chitradurga, do hereby declare that the project work entitled **"BLOCK CHAIN BASED GOVERNMENT BUDGET TRACKING SYSTEM "** has been carried out by me under the supervision and guidance of department faculty, submitted in partial fulfillment for the award of **Bachelor of Engineering** degree in **Computer Science & Engineering** from Visvesvaraya Technology University, Belgaum during academic year **2024-25.** Further, I also declare that, this work has not been submitted previously for the award of any degree or diploma, by me, to any institution.

Place: Chitradurga **Signature**

Date:

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the completion of any task would be incomplete without the mention of the people who made it possible, whose constant guidance and encouragement ground our efforts with success.

We consider it as a privilege to express my gratitude and respect to all those who guided us in completion of this Project work.

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SANDHYA RANI A
4SM22CS408

ABSTRACT

Governments allocate significant funds for public welfare, but inefficiencies and corruption often hinder proper utilization. A blockchain-based government budget tracking system offers a transparent, immutable, and decentralized solution to monitor fund allocation and spending in real-time. This system leverages blockchain technology to ensure tamper-proof record-keeping, smart contracts for automated fund disbursement, and real-time public auditing to enhance accountability. By integrating AI-driven fraud detection and multi-stakeholder access, the system reduces financial mismanagement and fosters trust among citizens. Implementing a permissioned blockchain network (e.g., Hyperledger Fabric, Ethereum Quorum) ensures security while maintaining government control over sensitive financial data. This approach revolutionizes public finance management by promoting transparency, efficiency, and integrity in budget tracking and expenditure monitoring.

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CHAPTER 1

INTRODUCTION

Government budgets are essential for the development of a nation, funding key sectors such as healthcare, infrastructure, education, and social welfare. However, inefficient fund allocation, corruption, and lack of transparency often lead to mismanagement of public money. Traditional financial tracking systems rely on centralized databases, which are vulnerable to manipulation and fraud. As a result, citizens have limited visibility into how tax revenues are spent, leading to distrust in government financial practices. There is an urgent need for a system that ensures accountability and allows real-time monitoring of budget allocations and expenditures.

Blockchain technology offers a transformative solution to these challenges by providing an immutable, decentralized, and transparent financial tracking system. By utilizing distributed ledger technology (DLT), every transaction related to budget allocation and spending can be securely recorded and accessed by authorized stakeholders. Smart contracts further enhance efficiency by automating fund disbursement based on predefined conditions, ensuring that money is released only when specific milestones are met. Additionally, integrating AI-powered fraud detection can help identify anomalies in financial transactions, reducing the risks of mismanagement. Blockchain based government budget tracking system enhances public trust by enabling real-time access to financial data, fostering transparency, and reducing corruption. By implementing a permissioned blockchain (such as Hyperledger Fabric or Ethereum Quorum), governments can maintain control over sensitive data while allowing authorized entities, such as auditors and watchdog organizations, to monitor transactions. This innovative approach not only strengthens financial governance but also promotes efficiency and accountability in public sector spending, ultimately ensuring that taxpayer money is used effectively for national development.

1.1 Blockchain:

Blockchain is a decentralized and distributed digital ledger technology that records transactions across multiple nodes in a secure, transparent, and immutable manner. Each transaction is stored in a "block," which is linked to the previous block, forming a "chain" of records. This structure ensures that once data is recorded, it cannot be altered or deleted, making blockchain highly secure and resistant to fraud or tampering. Initially introduced as the underlying technology for Bitcoin, blockchain has evolved to support various applications beyond cryptocurrency, including finance, healthcare, supply chain management, and government systems.

The key features of blockchain include decentralization, transparency, immutability, and security. Unlike traditional centralized systems where a single authority controls the database, blockchain operates on a peer-to-peer (P2P) network, where each participant (or node) has a copy of the entire ledger. Transactions are validated through consensus mechanisms such as Proof of Work (PoW), Proof of Stake (PoS), or Practical Byzantine Fault Tolerance (PBFT). This eliminates the need for intermediaries, reducing costs and increasing efficiency. Furthermore, cryptographic hashing secures data, ensuring that each transaction remains tamper-proof.

Beyond financial transactions, blockchain technology is transforming industries by enabling smart contracts, which are self-executing agreements with predefined rules stored on the blockchain. These contracts automatically trigger actions when conditions are met, eliminating manual processing and enhancing trust. Governments and enterprises are adopting blockchain for applications such as identity management, voting systems, land registry, and budget tracking to improve transparency and accountability. As the technology continues to evolve, blockchain is expected to play a significant role in shaping secure and efficient digital ecosystems across various sectors.

1.2 Problem statement

Government budget management systems play a crucial role in ensuring efficient allocation and utilization of public funds. However, existing centralized financial tracking mechanisms suffer from lack of transparency, corruption, fund mismanagement, and inefficiencies in auditing and reporting. These systems rely on manual verification, delayed

audits, and multiple intermediaries, leading to data manipulation, fraud, and misallocation of resources. Additionally, citizens and stakeholders have limited access to realtime financial data, reducing public trust in government spending. The absence of a tamperproof, automated, and decentralized system makes it difficult to track fund disbursement, detect anomalies, and ensure accountability. To address these challenges, a blockchainbased government budget tracking system is required to provide real-time, immutable, and transparent financial records, ensuring efficiency, security, and public trust in financial governance

1.3 EXISTING SYSTEM:

The writer attempted to discover the ability of blockchain technology to decrease embezzlement which can also additionally arise for the duration of the fund's switch of government schemes. Also discovered 8 appropriate traits of any virtual fund switch method which incorporates a sequence of layers. To make certain equity on this form of the virtual method the writer has proposed to apply blockchain-based technology through the usage of mathematical model transaction traits to officially make certain equity at all levels. This system also can be audited through common human beings to trace the cash flow of any schemes, making the system absolutely obvious and fair.

1.3.1 DISADVANTAGES OF EXISTING SYSTEM:

- In the past, government funding has relied on traditional centralized systems, which are vulnerable to corruption and lack transparency.
- The drawbacks include difficulties in tracking funds, identifying a single source of truth, and ensuring secure and tamper-proof transactions.

1.4 PROPOSED SYSTEM:

To combat these issues, the project introduces blockchain technology. It leverages blockchain's inherent features like decentralization, transparency, and immutability to provide a more secure and accountable system for managing government funding and projects. A blockchain is a decentralized, distributed and public digital ledger that is used to record transactions across many computers so that

the record cannot be altered retroactively without the alteration of all subsequent blocks and the consensus of the network.

1.4.1 Advantages of proposed system:

- Consensus processes ensure that each transaction within the block is truthful and accurate by validating and agreeing on all transactions within the block.
- Blockchain technology provides decentralization by allowing members of a distributed network to participate.
- There seems to be no single point of failure, and an individual user cannot manipulate the transaction record

1.5 Objectives:

- **Enhance Transparency:** Provide a tamper-proof and publicly accessible ledger to track government budget allocations and expenditures in real-time.
- **Ensure Accountability:** Hold government agencies, departments, and contractors accountable by recording all financial transactions on an immutable blockchain.
- **Automate Fund Disbursement:** Use smart contracts to release funds only when predefined conditions or project milestones are met.
- **Improve Public Trust:** Enable citizens and watchdog organizations to verify budget spending, fostering trust in government financial operations.
- **Strengthen Security:** Protect financial records from unauthorized alterations using decentralized and cryptographic security measures.
- **Enable Real-time Monitoring:** Allow stakeholders, including government officials, auditors, and the public, to track budget utilization as it happens.
- **Optimize Resource Allocation:** Analyze spending patterns to improve decision-making and ensure funds are directed towards priority sectors.
- **Facilitate Efficient Auditing:** Reduce the time and effort required for financial audits by maintaining an accurate and verifiable transaction history.

1.6 Scope

The scope of the Blockchain-Based Government Budget Tracking System is to design and develop a secure, transparent, and decentralized platform that enables real-time

monitoring of government budget allocation, fund disbursement, and expenditure tracking. The system will leverage blockchain technology to ensure immutability, transparency, and traceability of financial transactions, allowing citizens, auditors, and government authorities to verify the flow of funds across various departments and schemes. It will include features such as role-based access control, smart contracts for automated fund release based on milestones, and a public dashboard for visualizing budget utilization. By eliminating manual errors and reducing opportunities for corruption, the system aims to enhance public trust and accountability in the management of public finances.

CHAPTER 2
LITERATURE SURVEY

2.1 Academic & Research Papers

1. **Zhang, Y., & Wen, J. (2017). The IoT electric business model:**

Using blockchain technology for the internet of things. Peer-to-Peer Networking and Applications, 10(4),983-994 [http://doi.org/10.1007/s12083-016-0456-1] Explores blockchain application in real time and traceable systems. The paper by Zhang and Wen (2017) proposes a new business model that combines blockchain technology with the Internet of Things (IoT)**.** It focuses on how blockchain can help build real-time, traceable, and secure systems for managing IoT data and transactions. Blockchain provides a decentralized and tamper-proof ledger, which improves data security and transparency in IoT networks. It enables real-time monitoring and traceability of data, which is important for systems like smart grids or supply chains. The model helps eliminate the need for a central authority, reducing costs and increasing trust between devices and users. In essence, the paper highlights how blockchain can solve major challenges in IoT systems, such as trust, security, and data integrity.

2. **Cheang, k., etal. (2021). Blockchain for transparent public governance:**

AsystematicreviewGovernmentinformationQuarterly,38(2),101585.[http://doi.org/10.1016/j.giq.2021.101585]. Reviews blockchain use in enhancing public sector transparency. The paper by Cheang et al. (2021) is a systematic review that examines how blockchain technology can improve transparency in public governance**.** It explores how blockchain can make government operations more accountable, transparent, and efficient. Use cases include public records management**,** procurement**,** voting systems, and anti-corruption efforts**.** Blockchain's immutable and decentralized nature helps reduce fraud, ensures data integrity, and builds public trust. In summary, the study shows that blockchain has strong potential to enhance transparency and accountability in the public sector, though challenges like regulation and scalability still need to be addressed.

3. **Al-Jaroodi, J., & Mohamed, N. (2019). Blockchain in Industries:**

A Survey. IEEE Access, 7, 36500–36515. Discusses the implementation of blockchain across various industries including government. The paper by Al- Jaroodi and Mohamed (2019) is a comprehensive survey on the use of blockchain technology across multiple industries**,** including government. It highlights blockchain applications in sectors such as finance, healthcare, supply chain, manufacturing**,** and public services**.** In the government sector**,** blockchain is discussed in the context of secure data sharing, identity management**,** and transparent governance. The paper emphasizes blockchain's ability to provide security, decentralization, trust**,** and efficiency in various industrial processes. This survey provides an overview of how different industries are adopting blockchain to enhance operations, reduce fraud, and increase transparency, making it a key enabler of digital transformation.

2.2 Research gap

Despite the presence of various government financial management and budget tracking systems across countries, most of these platforms remain centralized, semi trans parent, and vulnerable to manipulation or delays in data updates. While systems like PFMS (India), USAspending.gov (USA), and other open budget portals provide public access to financial data, they often lack real-time fund tracking, tamper-proof audit trails, and automated validation mechanisms. Moreover, these systems do not actively leverage emerging technologies like blockchain to enhance transparency, decentralization, and citizen trust. There is a significant gap in integrating smart contract-based automation for mile stonebased fund disbursement, ensuring accountability, and enabling public participation in budget monitoring. Therefore, this project addresses the need for a blockchain-powered solution that provides an immutable, secure, and transparent framework for real-time government budget tracking and monitoring.

CHAPTER 3

SYSTEM REQUIREMENTS

3.1 FUNCTIONAL REQUIREMENTS

1. New Organization Signup
2. Organization Login
    - View Transaction
3. State Government Login
    - Add Amount
    - Allocate Fund
    - View Transaction
    - View Organization

3.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirement (NFR) specifies the quality attribute of a software system. They judge the software system based on Responsiveness, Usability, Security, Portability and other non-functional standards that are critical to the success of the software system. Example of non-functional requirement, "how fast does the website load?" Failing to meet non-functional requirements can result in systems that fail to satisfy user needs. Non- functional Requirements allows you to impose constraints or restrictions on the design of the system across the various agile backlogs. Example, the site should load in 3 seconds when the number of simultaneous users are > 10000. Description of non-functional requirements is just as critical as a functional requirement.

- Usability requirement
- Serviceability requirement

- Manageability requirement
- Recoverability requirement
- Security requirement
- Data Integrity requirement
- Capacity requirement
- Availability requirement
- Scalability requirement
- Interoperability requirement
- Reliability requirement
- Maintainability requirement

3.3 Feasibility study

A feasibility study evaluates a project's or system's practicality. As part of a feasibility study, the objective and rational analysis of a potential business or venture is conducted to determine its strengths and weaknesses, potential opportunities and threats, resources required to carry out, and ultimate success prospects. Two criteria should be considered when judging feasibility: the required cost and expected value.

3.3.1 Types Of Feasibility Study

A feasibility analysis evaluates the project's potential for success; therefore, perceived objectivity is an essential factor in the credibility of the study for potential investors and lending institutions. There are five types of feasibility study—separate areas that a feasibility study examines, described below.

- **Technical Feasibility:** This assessment focuses on the technical resources available to the organization. It helps organizations determine whether the technical resources meet capacity and whether the technical team is capable of converting the ideas into working systems. Technical feasibility also involves the evaluation of the hardware, software, and other technical requirements of the proposed system. As an exaggerated example, an organization wouldn't want to try to put Star Trek's transporters in their building—currently, this project is not technically feasible.

- **Economic Feasibility*:*** This assessment typically involves a cost/ benefits analysis of the project, helping organizations determine the viability, cost, and benefits associated with a project before financial resources are allocated. It also serves as an independent project assessment and enhances project credibility— helping decision-makers determine the positive economic benefits to the organization that the proposed project will provide.
- **Legal Feasibility*:*** This assessment investigates whether any aspect of the proposed project conflicts with legal requirements like zoning laws, data protection acts or social media laws. Let's say an organization wants to construct a new office building in a specific location. A feasibility study might reveal the organization's ideal location isn't zoned for that type of business. That organization has just saved considerable time and effort by learning that their project was not feasible right from the beginning.
- **Operational Feasibility:** This assessment involves undertaking a study to analyze and determine whether—and how well— the organization's needs can be met by completing the project. Operational feasibility studies also examine how a project plan satisfies the requirements identified in the requirements analysis phase of system development**.**

- **Scheduling Feasibility:** This assessment is the most important for project success; after all, a project will fail if not completed on time. In scheduling feasibility, an organization estimates how much time the project will take to complete. When these areas have all been examined, the feasibility analysis helps identify any constraints the proposed project may face, including:

  • Internal Project Constraints: Technical, Technology, Budget, Resource, etc.

  • Internal Corporate Constraints: Financial, Marketing, Export, etc.

  • External Constraints: Logistics, Environment, Laws, and Regulations, etc.

3.4 HARDWARE AND SOFTWARE REQUIREMENTS

3.4.1 HARDWARE:

- C.P.U: 10th Gen Intel(R) Core (TM) i5/i7-10810U or above
- Memory (Primary): 8GB
- Hard Disk: 40 GB, 80GB, 160GB or above
- Output Devices: Monitor

3.4.2 SOFTWARE:

- Programming languages: Python, JavaScript, Solidity
- Operating system: Windows 10/11
- Front-End: HTML, CSS, JavaScript
- Back-End: NodeJs, Django, Etherium
- IDE: Visual Studio Code

CHAPTER 4

SYSTEM DESIGN

4.1 System Architecture

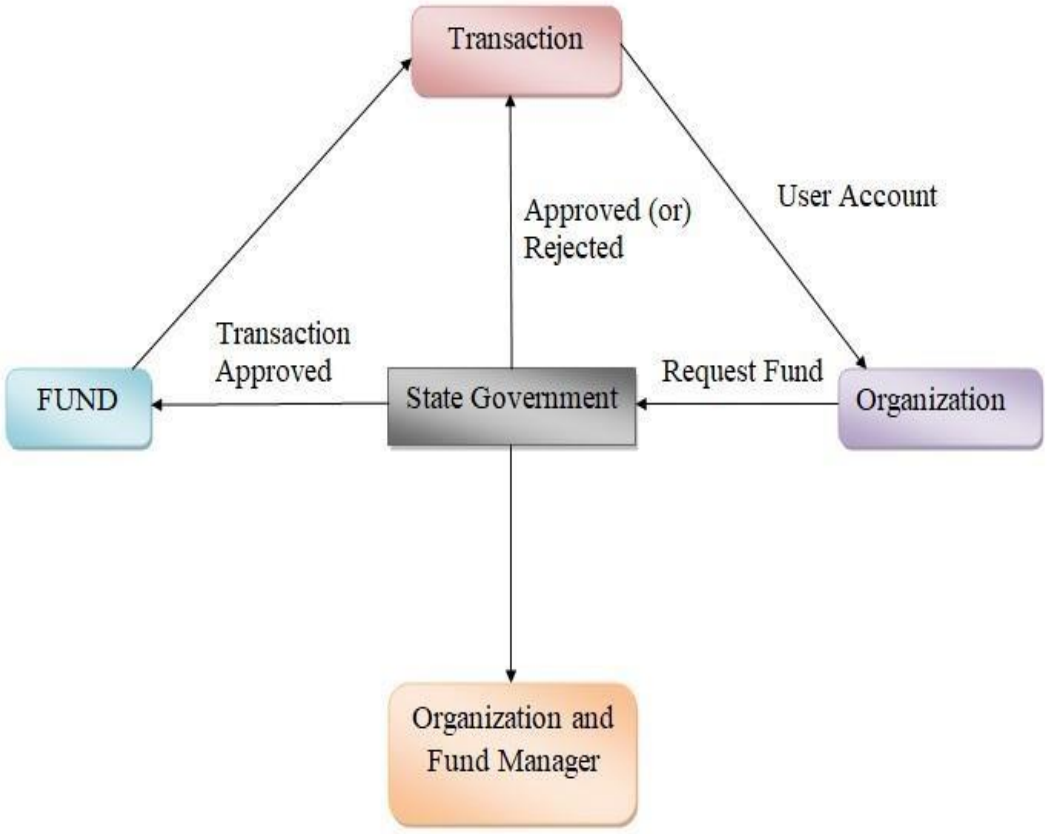


Fig 4.1 System Architecture

Fig 4.1 describes to understand the flow of funds and transactions involving a State Government, an organization, and a Fund.

- **Organization Requests Fund:** An "Organization" initiates the process by sending a "Request Fund" to the "State Government." This suggests the organization needs financial resources for some purpose.

- **State Government's Decision:** The "State Government" reviews the fund request. Based on its assessment, it can either approve or reject the "Transaction." This decision is communicated back to the "Transaction" entity.
- **Transaction Record:** The "Transaction" entity records the details of the request and the State Government's decision (Approved or Rejected).
- **Fund Allocation (if Approved):** If the "Transaction" is "Approved," the "State Government" then directs the "FUND" to release the "Transaction Approved" amount. The "FUND" then makes the necessary disbursement.
- **User Account and Transaction:** The "Transaction" also interacts with a "User Account" within the "Organization." This likely represents the specific account or entity within the organization that is involved in the transaction.
- **Oversight:** The "State Government" has a connection to an "Organization and Fund Manager." This suggests that the State Government oversees both the requesting organization and the management of the funds. In essence, the diagram illustrates a process where an organization applies for funds from the state government. The state government evaluates the request, and if approved, directs the fund to release the money, which is then reflected in the organization's user account, all under the oversight of the state government and a fund manager.

4.2 USE CASE DIAGRAM

A use case diagram in the Unified Modelling Language (UML) is a type of behavioural diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

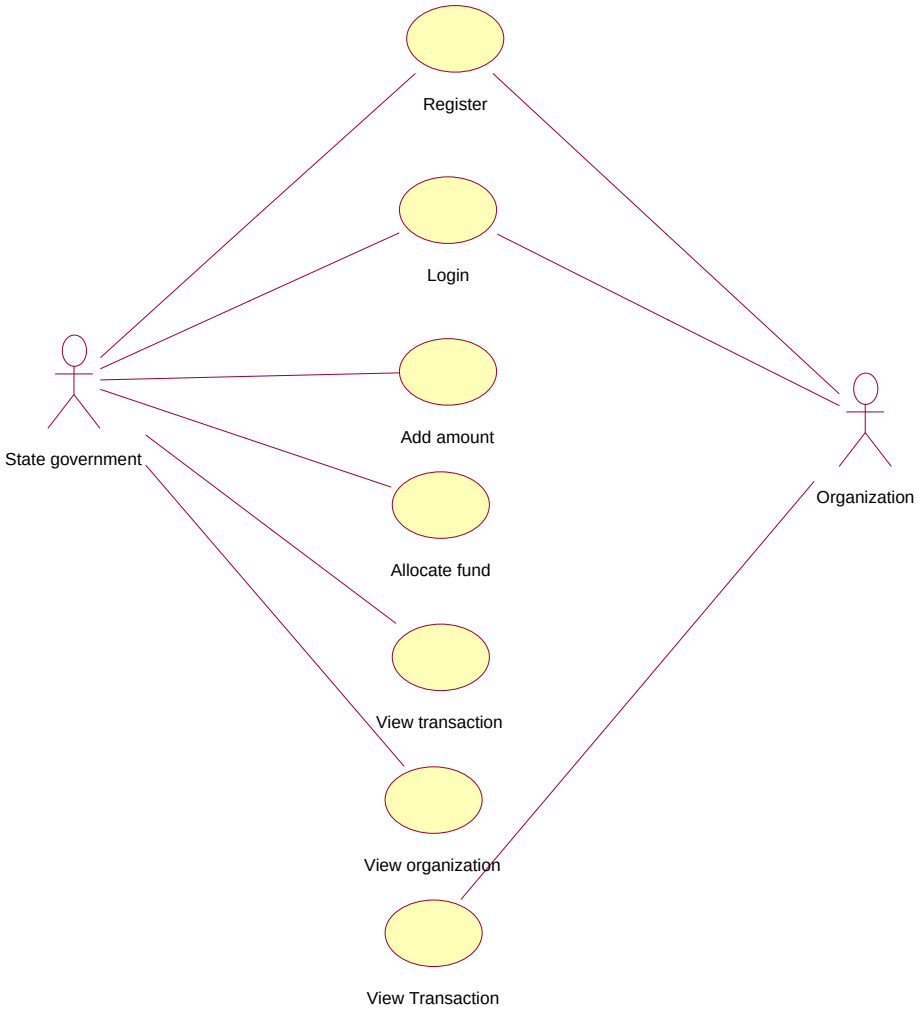


Fig 4.2 Use case

Fig 4.2 illustrates the different actions (use cases) that two actors, the "State government" and an "Organization," can perform within

- **ACTORS:**

  - **State government:** This stick figure on the left represents the State government as a user of the system.
  - **Organization:** This stick figure on the right represents an Organization as a user of the system.

- ## USE CASES (THE OVALS)

These represent specific functionalities or goals that the actors can achieve by interacting with the system.

- **Register:** This use case is connected only to the "Organization" actor. It implies that an organization can register itself within the system.
- **Login:** This use case is connected to both the "State government" and the "Organization." This means both entities need to log in to access the system's functionalities.
- **Add amount:** This use case is connected only to the "State government." It suggests that the State government has the ability to add funds into the system.
- **Allocate fund:** This use case is also connected only to the "State government." It indicates that the State government can allocate funds to different organizations or purposes within the system.
- **View transaction:** This use case is connected to both the "State government" and the "Organization." Both actors can view transaction details within the system.
- **View organization:** This use case is connected only to the "State government." It implies that the State government can view information about the registered organizations.
- **View Transaction:** Notice there are two "View Transaction" use cases. This might be a slight redundancy in the diagram, but it likely intends to emphasize that both actors can access transaction information.
- **Relationships (the lines):** The lines connecting the actors to the use cases indicate that the actor participates in or initiates that particular use case.

In summary, this Use Case diagram depicts a system where:

- Organizations can register and log in.
- The State government can log in, add funds, allocate funds, view transaction details, and view information about registered organizations.
- Both the State government and Organizations can view transaction details.
- This diagram provides a high-level overview of the system's functionalities from the perspective of the two main users.

4.3 DATA FLOW DIAGRAM

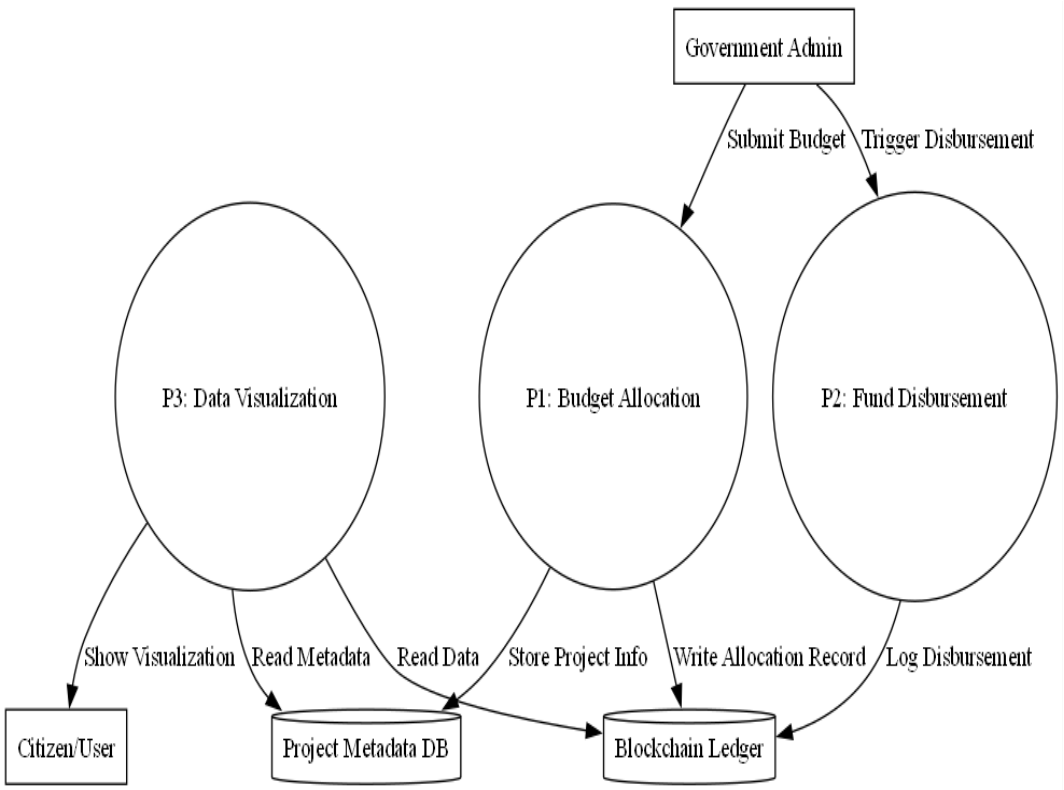


Fig 4.4 Flowchart

This diagram illustrates the high-level processes involved in a system likely related to government budgeting, fund disbursement, and data visualization, potentially leveraging blockchain technology for transparency. Let's break it down:

- **ACTORS:**
  - **Government Admin:** Represented by a rectangle, this actor is responsible for highlevel actions such as submitting the budget and triggering fund disbursement.
  - **Citizen User:** Represented by a rectangle, this actor interacts with the system to view data visualizations.

- **PROCESSES (REPRESENTED BY CIRCLES):**

  - **P1: Budget Allocation:** This process is central to the system. The "Government Admin" submits the budget, which likely initiates this process. This process also "Stores Project Info" into the "Project Metadata DB" and "Writes Allocation Record" onto the "Blockchain Ledger."
  - **P2: Fund Disbursement:** The "Government Admin" triggers this process. It "Logs Disbursement" onto the "Blockchain Ledger," indicating that fund transfers are recorded there.
  - **P3: Data Visualization:** This process is for the "Citizen User." It "Shows Visualization" to the user by "Reading Metadata" and "Reading Data" from the "Project Metadata DB."

- **DATA STORES (REPRESENTED BY CYLINDERS):**

  - **Project Metadata DB (Database):** This database stores information about projects, including metadata and raw data that are used for data visualization.
  - **Blockchain Ledger:** This distributed and immutable ledger is used to record "Allocation Records" from the budget allocation process and "Log Disbursements" from the fund disbursement process, ensuring transparency and auditability.

- **DATA FLOWS (REPRESENTED BY ARROWS WITH LABELS):**

  - **Submit Budget:** Flow from "Government Admin" to "P1: Budget Allocation."
  - **Trigger Disbursement:** Flow from "Government Admin" to "P2: Fund Disbursement."
  - **Store Project Info:** Flow from "P1: Budget Allocation" to "Project Metadata DB."
  - **Write Allocation Record:** Flow from "P1: Budget Allocation" to "Blockchain Ledger."

- **Log Disbursement:** Flow from "P2: Fund Disbursement" to "Blockchain Ledger."
- **Read Data:** Flow from "Project Metadata DB" to "P3: Data Visualization."
- **Read Metadata:** Flow from "Project Metadata DB" to "P3: Data Visualization."
- **Show Visualization:** Flow from "P3: Data Visualization" to "Citizen User."

- ## Data Flow Diagrams (DFD)

- The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.
- The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.
- DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.
- DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.

CHAPTER 5

SYSTEM IMPLEMENTATION

5.1 Technologies used

- **Blockchain Platform**
  - **Ethereum / Hyperledger Fabric** Used to implement decentralized, tamper-proof records of budget allocations, fund disbursements, and audits.
  - **Smart Contracts (Solidity/Chaincode)** Automate the release of funds based on milestones, and ensure transparent, rule-based governance.

- **Backend Development**
  - **Node.js / Python (Django)** Powers the server-side logic, APIs, and integration with the blockchain network and frontend.

- **Frontend Development**
  - **HTML5, CSS3, JavaScript** Used for building an intuitive and responsive user interface.

- **Security**
  - **JWT / OAuth2.0** For secure authentication and authorization of users like admins, citizens, and auditors.
  - **Cryptographic Hashing (SHA-256)** Ensures data integrity and tamper detection for all transactions and records.
  - **Ganache / Remix IDE** (for local testing) Simulates a personal Ethereum blockchain for rapid smart contract testing and debugging.

5.2 Development tools and environments

- **Smart Contract Development** 🔧
  - **Remix IDE** A web-based integrated development environment used to write, compile, and deploy Ethereum smart contracts using Solidity.
  - **Truffle Suite** Frameworks for smart contract development, testing, and deployment in a local or test blockchain network.

- **Backend Development**
  - **Visual Studio Code (VS Code)** A popular and lightweight code editor with extensions for smart contracts, web development, and blockchain integration.
  - **Python (Django)** or **Node.js (Express)** Used to build RESTful APIs that connect frontend apps to the blockchain network and database.

- **Frontend Development**
  - **HTML, CSS, JavaScript** Core web technologies for UI design and behavior.

- **Blockchain Interaction**
  - **Web3.js** JavaScript libraries to interact with the Ethereum blockchain from the frontend or backend.
  - **Ganache** A personal Ethereum blockchain for testing smart contracts locally before deploying them to testnets or mainnet.

CHAPTER 6

SYSTEM TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, subassemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

6.1 TYPES OF TESTS

6.1.1 Unit testing: Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

6.1.2 Integration testing: Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6.1.3 Functional test: Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

- Functional testing is centered on the following items:

- Valid Input: identified classes of valid input must be accepted.
- Invalid Input: identified classes of invalid input must be rejected.
- Functions: identified functions must be exercised.
- Output: identified classes of application outputs must be exercised.
- Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

6.1.4 System Test: System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

6.1.5 White Box Testing: White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

6.1.6 Black Box Testing: Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .you cannot “see” into it. The test provides inputs and responds to outputs without considering how the software works.

6.1.7 Test strategy and approach: Field testing will be performed manually and functional tests will be written in detail.

- **Test objectives**
  - All field entries must work properly.
  - Pages must be activated from the identified link.
  - The entry screen, messages and responses must not be delayed.

- **Features to be tested**
  - Verify that the entries are of the correct format
  - No duplicate entries should be allowed
  - All links should take the user to the correct page.

6.1.8 Acceptance Testing: User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

Test Results: All the test cases mentioned above passed successfully. No defects encountered.

6.2 Methodology:

The development of the Blockchain-Based Government Budget Tracking System will follow a structured methodology comprising the following key phases:

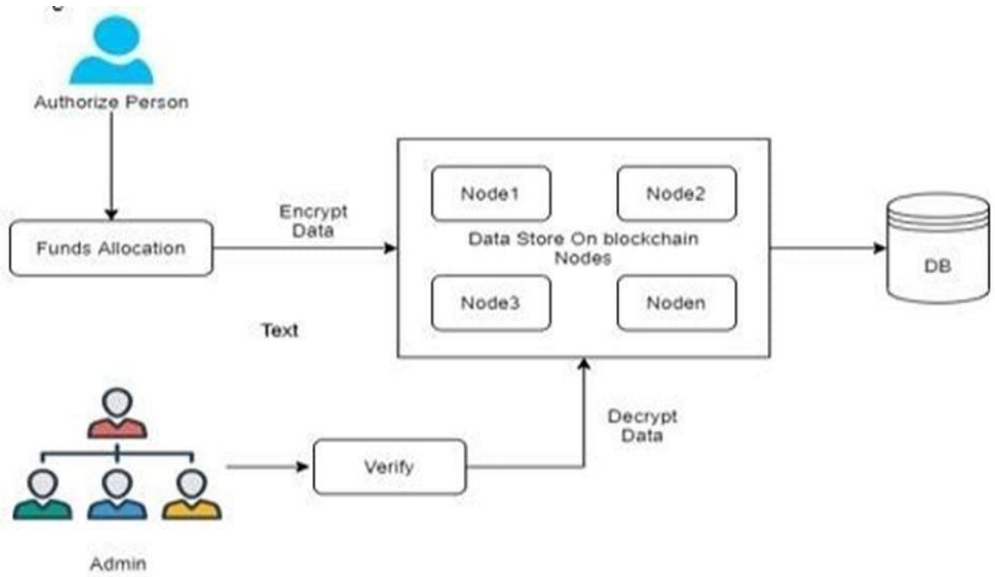


Fig 6.2: Methodology

1. **Requirement Analysis**
   - Identify stakeholders (government officials, citizens).
   - Gather functional and non-functional requirements.

- Define key use cases like budget allocation, fund disbursement.

2. System Design

- Design the architecture integrating frontend, backend, and blockchain layers.
- Create data flow diagrams, ER diagrams, and smart contract logic.
- Define user roles and permission levels (admin, public, auditor).

3. Blockchain Integration

- Choose an appropriate blockchain platform (e.g., Ethereum or Hyperledger).
- Design and develop smart contracts to handle budget allocation, milestone-base.
- Implement secure and immutable transaction recording.

4. Application Development

- Frontend: Develop a user-friendly dashboard for government and citizens to visualize budget data.
- Backend: Set up APIs to interact with smart contracts and manage user roles.
- Database: Use off-chain storage for non-sensitive data (e.g., project descriptions, metadata).

5. Testing and Validation

- Conduct unit testing for smart contracts and backend logic.
- Perform system testing to ensure proper integration.
- Validate transparency, accuracy, and immutability of transactions.

6. Deployment

- Deploy the smart contracts on a testnet/mainnet.
- Launch the web application for stakeholders.
- Ensure scalability and security in production.

7. Monitoring and Maintenance

- Continuously monitor system performance and transaction logs.
- Update smart contracts or UI as per feedback or policy changes.
- Provide regular audit trails and reports to concerned authorities.

6.3 PSUEDO CODE

```
<!DOCTYPE html>
<html lang="en">
  <!-- Basic -->
   <meta charset="utf-8">
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <!-- Mobile Metas -->
      <meta name="viewport" content="width=device-width, minimum-scale=1.0,
  maximum-scale=1.0, user-scalable=no">
   <!-- Site Metas -->
   <title>Home</title>
   <meta name="keywords" content="">
   <meta name="description" content="">
   <meta name="author" content="">
    <!-- Site Icons -->
   <link rel="shortcut icon" href="static/images/favicon.ico" type="image/x-      icon"
  />
   <link rel="apple-touch-icon" href="static/images/apple-touch-icon.png">

   <!-- Bootstrap CSS -->
   <link rel="stylesheet" href="static/css/bootstrap.min.css">
   <!-- Site CSS -->
   <link rel="stylesheet" href="static/style.css">
   <!-- Colors CSS -->
   <link rel="stylesheet" href="static/css/colors.css">
   <!-- ALL VERSION CSS -->
   <link rel="stylesheet" href="static/css/versions.css">
   <!-- Responsive CSS -->
   <link rel="stylesheet" href="static/css/responsive.css">
   <!-- Custom CSS -->
   <link rel="stylesheet" href="static/css/custom.css">
   <!-- Modernizer for Portfolio -->
   <script src="static/js/modernizer.js"></script>
```

```
    <!--[if lt IE 9]>
    <script src="https://oss.maxcdn.com/libs/html5shiv/3.7.0/html5shiv.js"></script>
  <script
   src="https://oss.maxcdn.com/libs/respond.static/js/1.4.2/respond.min.js"></script>
    <![endif]-->

</head>
<body class="host_version">
    <!-- LOADER -->
    <div id="preloader">
    <div class="loading">
        <div class="finger finger-1">
        <div class="finger-item">
    <span></span><i></i>
    </div>
    </div>
       <div class="finger finger-2">
   <div class="finger-item">
    <span></span><i></i>
    </div>
    </div>
    <div class="finger finger-3">
    <div class="finger-item">
    <span></span><i></i>
    </div>
    </div>
    <div class="finger finger-4">
    <div class="finger-item">
    <span></span><i></i>
    </div>
    </div>
    <div class="last-finger">
     <div class="last-finger-item"><i></i></div>
```

```
</div>
</div>
</div>

<!-- end loader -->
  <header class="header header_style_01">
<nav class="megamenu navbar navbar-default">

 <div class="container">
  <div class="navbar-header">
   <button type="button" class="navbar-toggle collapsed" data toggle="collapse"
data-target="#navbar" aria-expanded="false" aria-controls="navbar">
<span class="sr-only">Toggle navigation</span>
<span class="icon-bar"></span>
<span class="icon-bar"></span>
<span class="icon-bar"></span>
</button>
</div>
  <div id="navbar" class="navbar-collapse collapse">
<ul class="nav navbar-nav">
<li><a href="AdminScreen">State Government Screen</a></li>
<li><a href="index">Logout</a></li>
</ul>
</div>
</div>
</nav>
</header>
<div id="bootstrap-touch-slider" class="carousel bs-slider fade control-round
 indicators-line" data-ride="carousel" data-pause="hover" data-interval="false" >
<!-- Indicators -->
<ol class="carousel-indicators">
<li data-target="#bootstrap-touch-slider" data-slide-to="0"  class="active"></li>
<li data-target="#bootstrap-touch-slider" data-slide-to="1"></li>
```

```
<li data-target="#bootstrap-touch-slider" data-slide-to="2"></li>
</ol>
<div class="carousel-inner" role="listbox">
<div class="item active">
<divid="home"class="first-section"style="background-
image:url('static/uploads/slider-01.jpg');">
<div class="container">
<div class="row">
<div class="col-md-12 col-sm-12 text-center">
<div class="big-tagline">
<h2 data-animation="animated zoomInRight">State Government Fund Allocation
& Tracking System over Blockchain</h2>
</div>
</div>
</div><!-- end row -->
</div><!-- end container -->
</div><!-- end section -->
</div>
<div class="item">
<div id="home" class="first-section" style="background-
image:url('static/uploads/slider-02.jpg');">
<div class="container">
<div class="row">
<div class="col-md-12 col-sm-12 text-center">
<div class="big-tagline">
<h2 data-animation="animated zoom InRight">State Government Fund Allocation &
Tracking System over Blockchain</strong></h2>
</div>
</div>
</div><!-- end row -->
</div><!-- end container -->
</div><!-- end section -->
</div>
```

```
  <div class="item">
<divid="home"class="first-section"style="background-
image:url('static/uploads/slider-03.jpg');">
   <div class="container">
    <div class="row">
    <div class="col-md-12 col-sm-12 text-center">
    <div class="big-tagline">
   <h2 data-animation="animated zoomInRight">State Government Fund Allocation &
   Tracking System over Blockchain</h2>
    </div>
    </div>
  </div><!-- end row -->
     </div><!-- end container -->
  </div><!-- end section -->
  </div>
  <!-- Left Control -->
  <a class="left carousel-control" href="#bootstrap-touch-slider"   role="button" data-
  slide="prev">
  <span class="fa fa-angle-left" aria-hidden="true"></span>
  <span class="sr-only">Previous</span>
   </a>
     <!-- Right Control -->
   <a class="right carousel-control" href="#bootstrap-touch-slider"      role="button"
  data-slide="next">
  <span class="fa fa-angle-right" aria-hidden="true"></span>
     <span class="sr-only">Next</span>
   </a>
   </div>
   </div>
   <div class="ex-basic-1 pt-4">
   <div class="section no-pad-bot" id="index-banner">
   <div class="container">
   <div class="row">
```

```
<form action="/SendAmountAction" method="post" class="col s12">
<divclass="msg"><fontsize="3"color="red"><center>{{msg
 }}</center></font></div>
<!-- Age -->
<div class="input-field col s6">
  <label for="first_name"><b>Amount to be tranfered</b></label>
    <br>
 <input name="t1" id="first_name" type="text" class="validate">
  </div>
<div class="input-field col s6">
<label for="first_name"><b>Name of the Organization</b></label>
   <br>
<input name="t2" id="first_name" type="text" class="validate">
  </div>
 <div class="row center">
<button style="text-align: center;" type="submit" class="btn-large waves-effect
  waves-light orange">Submit</button>
  </div>
  </form>
  </div>
  </div>
  </div>
  </div>
<!-- ALL JS FILES -->
   <script src="static/js/all.js"></script>
   <!-- ALL PLUGINS -->
   <script src="static/js/custom.js"></script>
    </body>
</html>
<!DOCTYPE html>
<html lang="en">

   <!-- Basic -->
<meta charset="utf-8">
```

```
<meta http-equiv="X-UA-Compatible" content="IE=edge">
<!-- Mobile Metas -->
<meta name="viewport" content="width=device-width, minimum-scale=1.0, maximum-scale=1.0, user-scalable=no">
<!-- Site Metas -->
<title>Home</title>
<meta name="keywords" content="">
<meta name="description" content="">
<meta name="author" content="">
<!-- Site Icons -->
<link rel="shortcut icon" href="static/images/favicon.ico" type="image/x-icon" />
<link rel="apple-touch-icon" href="static/images/apple-touch-icon.png">
<!-- Bootstrap CSS -->
<link rel="stylesheet" href="static/css/bootstrap.min.css">
<!-- Site CSS -->
<link rel="stylesheet" href="static/style.css">
<!-- Colors CSS -->
<link rel="stylesheet" href="static/css/colors.css">
<!-- ALL VERSION CSS -->
<link rel="stylesheet" href="static/css/versions.css">
<!-- Responsive CSS -->
<link rel="stylesheet" href="static/css/responsive.css">
<!-- Custom CSS -->
<link rel="stylesheet" href="static/css/custom.css"
<!-- Modernizer for Portfolio -->
<script src="static/js/modernizer.js"></script>
<!--[if lt IE 9]>
<script src="https://oss.maxcdn.com/libs/html5shiv/3.7.0/html5shiv.js"></script>
<script src="https://oss.maxcdn.com/libs/respond.static/js/1.4.2/respond.min.js"></script>
<![endif]-->
<script language="javascript">
function validate(formObj)
```

```
{
if(formObj.t1.value.length==0)
{
alert("Please Enter username");
formObj.t1.focus();
return false;
}
if(formObj.t2.value.length==0)
{
alert("Please Enter password");
formObj.t2.focus();
return false;
}
if(formObj.t3.value.length==0)
{
alert("Please enter phone no");
formObj.t3.focus();
return false;
}
if(!formObj.t3.value.match(/^\d{10}$/)){
  window.alert("Valid phone no must be enter");
  formObj.t3.focus();
  return false;
}
if(formObj.t4.value.length==0)
{
alert("Please enter email id");
formObj.t4.focus();
return false;
}
var filter = /^([a-zA-Z0-9_\.\-])+\@([a-z]+\.)+(com)+$/;
 if (!filter.test(formObj.t4.value)) {
window.alert('Please enter valid email address');
```

```
  formObj.t4.focus();
  return false;
  }
  if(formObj.t5.value.length==0)
  {
  alert("Please enter address");
  formObj.t5.focus();
  return false;
  }
  return true;
}
</script>
</head>
<body class="host_version">
<!-- LOADER -->
<div id="preloader">
<div class="loading">
<div class="finger finger-1">
<div class="finger-item">
 <span></span><i></i>
 </div>
  </div>
  <div class="finger finger-2">
<div class="finger-item">
<span></span><i></i>
</div>
</div>
<div class="finger finger-3">
<div class="finger-item">
<span></span><i></i>
</div>
</div>
<div class="finger finger-4">
```

```
<div class="finger-item">
<span></span><i></i>
</div>
</div>
<div class="last-finger">
<div class="last-finger-item"><i></i></div>
  </div>
  </div>
  </div>
  <!-- END LOADER -->
  <header class="header header_style_01">
  <nav class="megamenu navbar navbar-default">
  <div class="container">
  <div class="navbar-header">
  <button type="button" class="navbar-toggle collapsed" data-toggle="collapse" data-
    target="#navbar" aria-expanded="false" aria-controls="navbar">
  <span class="sr-only">Toggle navigation</span>
  <span class="icon-bar"></span>
  <span class="icon-bar"></span>
  <span class="icon-bar"></span>
  </button>
  </div>
  <div id="navbar" class="navbar-collapse collapse">
  <ul class="nav navbar-nav">
  <li><a href="index">Home</a></li>
  <li><a href="AdminLogin">State Government Login</a></li>
  <li><a href="Login">Organization Login</a></li>
  <li><a href="Register">New Organization Signup</a></li>
  </ul>
  </div>
  </div>
  </nav>
  </header>
```

```
<div id="bootstrap-touch-slider" class="carousel bs-slider fade  control-round
indicators-line" data-ride="carousel" data-pause="hover" data-interval="false" >
 <!-- Indicators -->
 <ol class="carousel-indicators">
 <li data-target="#bootstrap-touch-slider" data-slide-to="0" class="active"></li>
 <li data-target="#bootstrap-touch-slider" data-slide-to="1"></li>
 <li data-target="#bootstrap-touch-slider" data-slide-to="2"></li>
 </ol>
 <div class="carousel-inner" role="listbox">
 <div class="item active">
 <div id="home" class="first-section"
   style="backgroundimage:url('static/uploads/slider-01.jpg');">
 <div class="container">
 <div class="row">
 <div class="col-md-12 col-sm-12 text-center">
 <div class="big-tagline">
 <h2 data-animation="animated zoomInRight">State Government Fund Allocation &
   Tracking System over Blockchain</h2>
 </div>
 </div>
 </div><!-- end row -->
 </div><!-- end container -->
 </div><!-- end section -->
 </div>
 <div class="item">
 <div id="home" class="first-section" style="background-
   image:url('static/uploads/slider-02.jpg');">
 <div class="container">
 <div class="row">
 <div class="col-md-12 col-sm-12 text-center">
 <div class="big-tagline">
 <h2 data-animation="animated zoomInRight">State Government Fund Allocation &
   Tracking System over Blockchain</strong></h2>
```

```
</div>
</div>
</div><!-- end row -->
</div><!-- end container -->
</div><!-- end section -->
</div>
<div class="item">
<div id="home" class="first-section" style="background-
  image:url('static/uploads/slider-03.jpg');">
<div class="container">
<div class="row">
<div class="col-md-12 col-sm-12 text-center">
<div class="big-tagline">
<h2 data-animation="animated zoomInRight">State Government Fund Allocation &
  Tracking System over Blockchain</h2>
</div>
</div>
</div><!-- end row -->
</div><!-- end container -->
</div><!-- end section -->
</div>
<!-- Left Control -->
<a class="left carousel-control" href="#bootstrap-touch-slider" role="button" data-
  slide="prev">
<span class="fa fa-angle-left" aria-hidden="true"></span>
<span class="sr-only">Previous</span>
</a>
<!-- Right Control -->
<a class="right carousel-control" href="#bootstrap-touch-slider" role="button" data-
  slide="next">
<span class="fa fa-angle-right" aria-hidden="true"></span>
<span class="sr-only">Next</span>
</a>
```

```
</div>
</div>
<div class="section about_section layout_padding padding_top_0">
<div class="container">
<div class="row">
<div class="col-md-12">
<div class="full">
</div>
</div>
</div>
</div>
<div class="row">
<br/>
<div class="msg"><font size="3" color="red"><center>{{ msg
  }}</center></font></div>
<br/>
<br>
<center><font size="4" color="black"><h3>Organization Signup
  Screen</font></center>
<form name ="f1" method="post" action="/RegisterAction" onsubmit="return
  validate(this);">
<br><br>
<TABLE align=center width="30%" class="notepad">
<TR><TH align="left"><font size="2" color="black">Organization
  Username</font>
<TD> <Input type=text name="t1" value=" >
<div id='nameid'></div>
</TD>
</TR>
<TR><TH align="left"><font size="2" color="black">Password</font>
<TD> <Input type='password' name="t2"  value="">
</TR>
<TR><TH align="left"><font size="2" color="black">Contact No</font>
<TD> <Input type='text' name="t3"  value=" size="15">
```

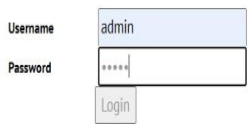
```
</TR>
<TR><TH align="left"><font size="2" color="black">Email ID</font>
<TD> <Input type='text' name="t4"  value='' size="30">
</TR>
<TR><TH align="left"><font size="2" color="black">Address</font>
<TD> <Input type='text' name="t5"  value='' size="45">
</TR>
<TR>
<TD></TD>
<TD>
<input type="submit" value="Submit">
</TABLE>
</div>
</div>
</div>
</div><!-- end section -->
<footer class="footer">
<div class="container">
<div class="row">
</div><!-- end row -->
</div><!-- end container -->
</footer><!-- end footer -->
<!-- ALL JS FILES -->
<script src="static/js/all.js"></script>
<!-- ALL PLUGINS -->
<script src="static/js/custom.js"></script>
</body>
</html>
```

CHAPTER 7

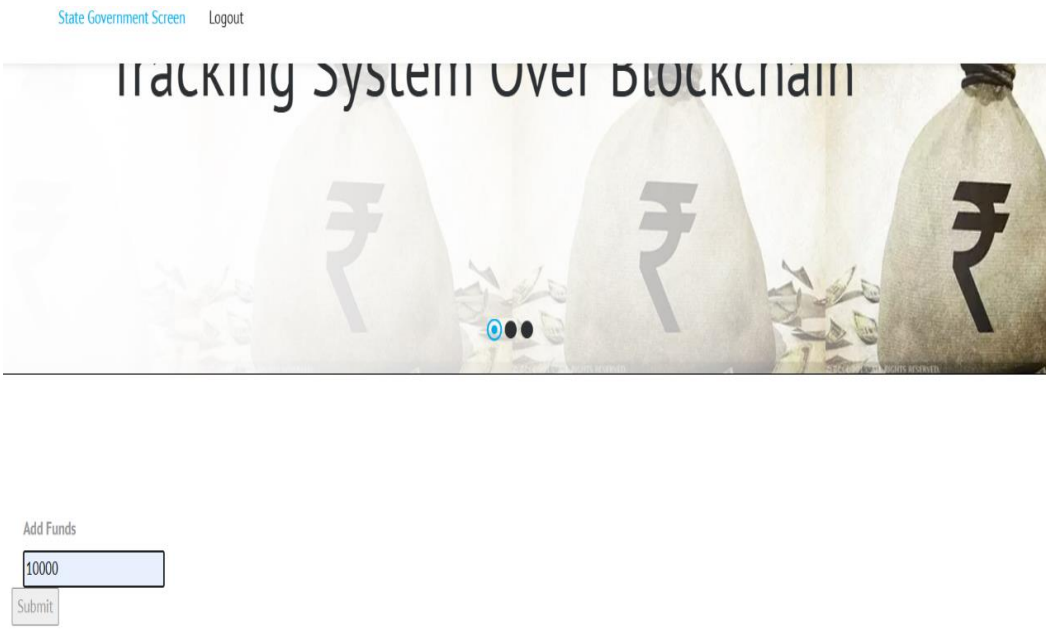
RESULT AND SNAPSHOTS

6.1 Home Page

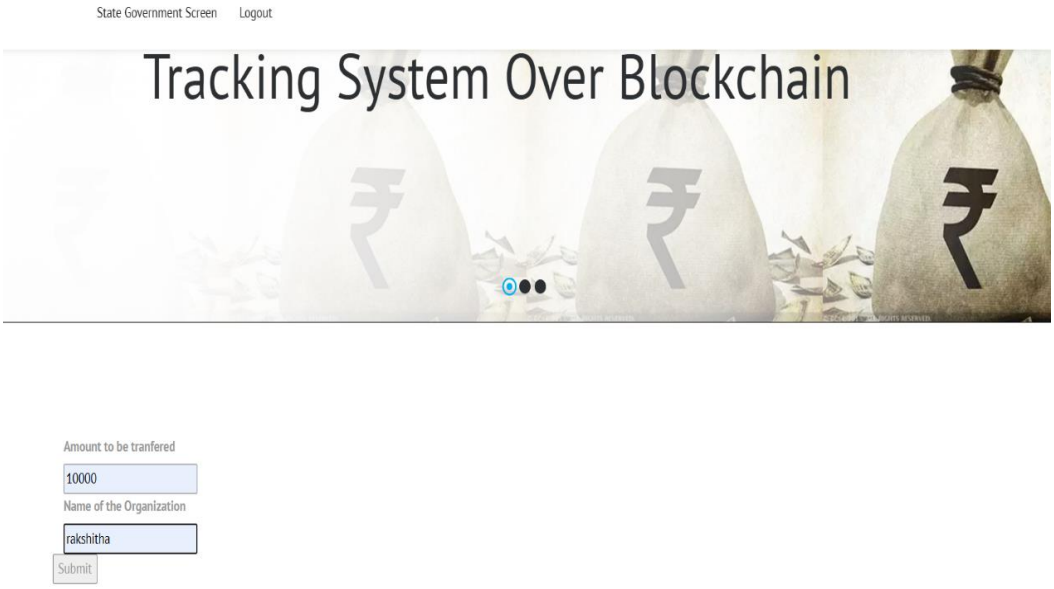
State Government Login Screen



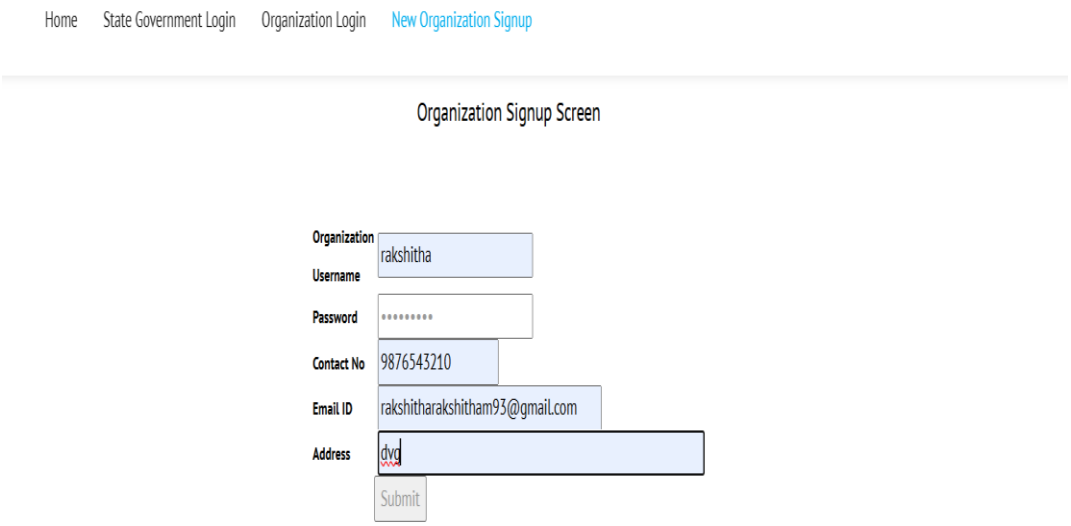
6.2 Government login



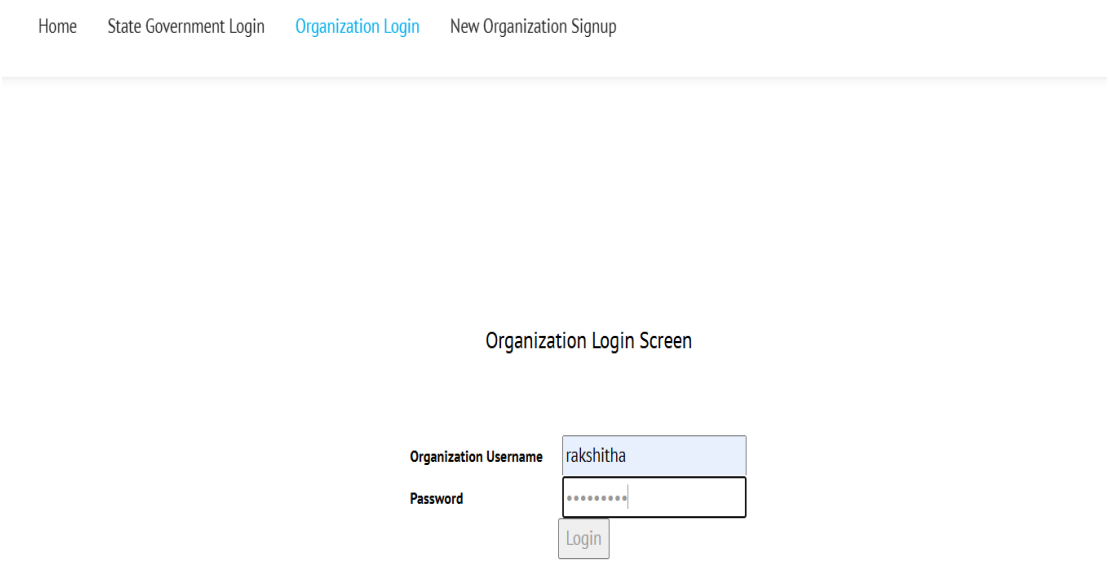
6.3 Adding amount



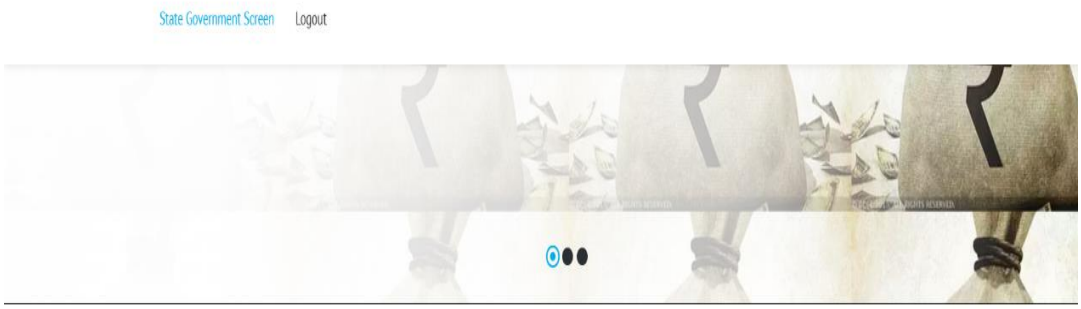
6.4 Transaction amount



6.5 Organization signup page

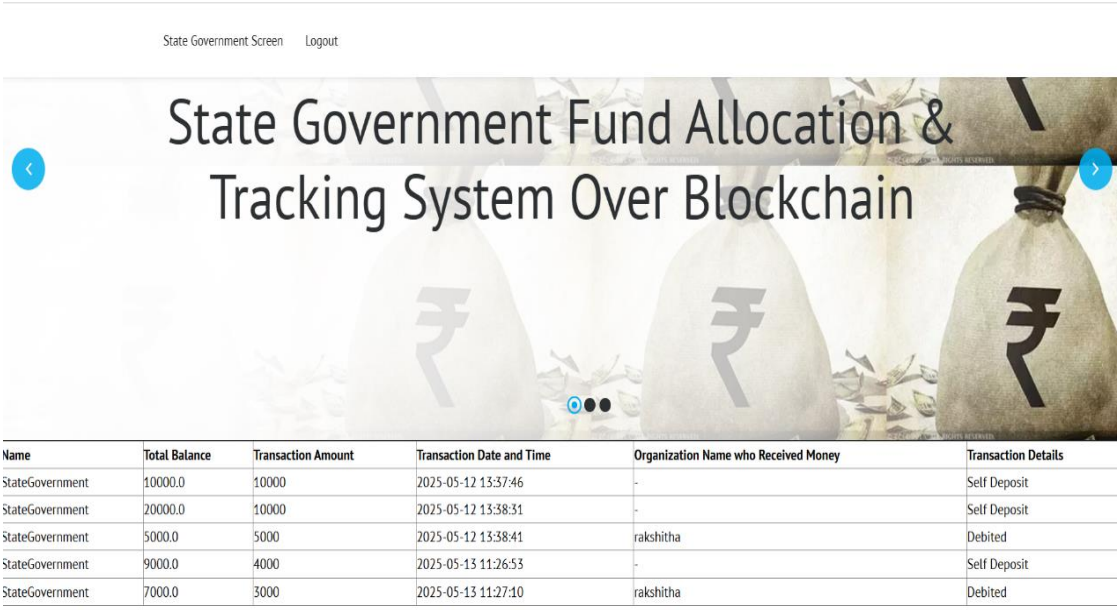


6.6 Organization login page



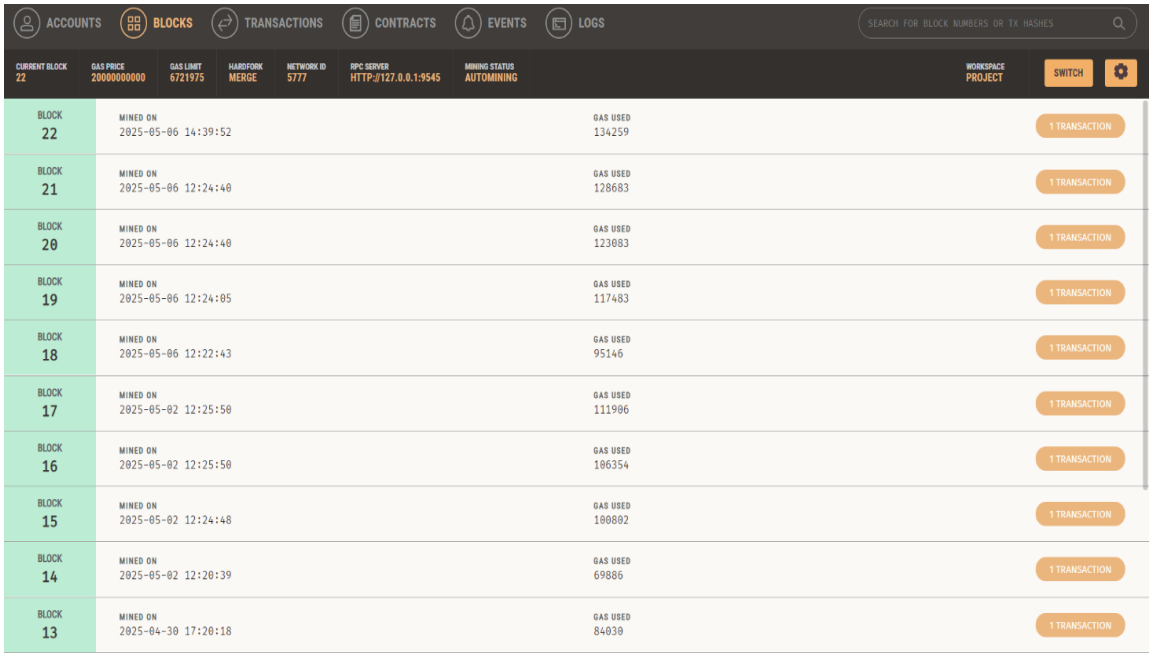
Organization Username	Password	Phone No	Email ID	Address
rakshitha	rakshitha	9876543210	rakshitharakshitham93@gmail.com	sjmit
latha	latha	6789054321	latha@gmail.com	dvg
thanu	thanu	9876543210	thanu@gmail.com	durga
bhumi	bhumi	8765432109	bhuimika2001c@gmail.com	cta
sandhya	sandhya	9876543201	sandhya@gmail.com	dkt

6.7 Organization View Page

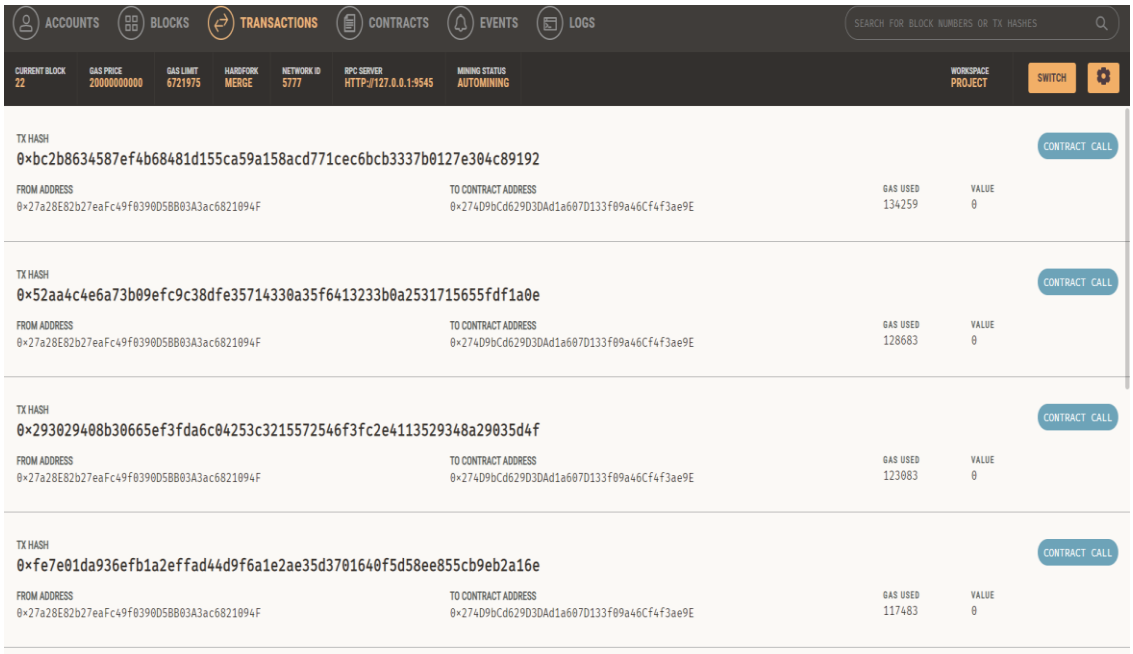


Name	Total Balance	Transaction Amount	Transaction Date and Time	Organization Name who Received Money	Transaction Details
StateGovernment	10000.0	10000	2025-05-12 13:37:46	-	Self Deposit
StateGovernment	20000.0	10000	2025-05-12 13:38:31	-	Self Deposit
StateGovernment	5000.0	5000	2025-05-12 13:38:41	rakshitha	Debited
StateGovernment	9000.0	4000	2025-05-13 11:26:53	-	Self Deposit
StateGovernment	7000.0	3000	2025-05-13 11:27:10	rakshitha	Debited

6.8 Fund Allocation



6.9 Blocks



6.10 Contract

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BLOCK CHAIN-BASED GOVERNMENT BUDGET ALLOCATION TRACKING SYSTEM

Sandhya Rani A*1, Bhumika C*2, Thanushree M*3, Rakshitha M*4, Thirumala NO*5, Ambika S*6

*1,2,3,4Computer Science, Department, Sjmit, Chitrudurga, Karnataka, India.

*5,6Professor, Department Of Computer Science Engineering, Sjmit, Chitrudurga, Karnataka, India.

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ABSTRACT

Governments allocate significant funds for public welfare, but inefficiencies and corruption often hinder proper utilization. A blockchain-based government budget tracking system offers a transparent, immutable, and decentralized solution to monitor fund allocation and spending in real-time. This system leverages blockchain technology to ensure tamper-proof record-keeping, smart contracts for automated fund disbursement, and real-time public auditing to enhance accountability. By integrating AI-driven fraud detection and multi-stakeholder access, the system reduces financial mismanagement and fosters trust among citizens. Implementing a permissioned blockchain network (e.g., Hyperledger Fabric, Ethereum Quorum) ensures security while maintaining government control over sensitive financial data. This approach revolutionizes public finance management by promoting transparency, efficiency, and integrity in budget tracking and expenditure monitoring.

Keywords: Block Chain,Transactions, Security, Tracking, Transparency, Encryption.

I. INTRODUCTION

Government budgets are essential for the development of a nation, funding key sectors such as healthcare, infrastructure, education, and social welfare. However, inefficient fund allocation, corruption, and lack of transparency often lead to mismanagement of public money. Traditional financial tracking systems rely on centralized databases, which are vulnerable to manipulation and fraud. As a result, citizens have limited visibility into how tax revenues are spent, leading to distrust in government financial practices. There is an urgent need for a system that ensures accountability and allows real-time monitoring of budget allocations and expenditures.

Blockchain technology offers a transformative solution to these challenges by providing an immutable, decentralized, and transparent financial tracking system. By utilizing distributed ledger technology (DLT), every transaction related to budget allocation and spending can be securely recorded and accessed by authorized stakeholders. Smart contracts further enhance efficiency by automating fund disbursement based on predefined conditions, ensuring that money is released only when specific milestones are met. Additionally, integrating AI-powered fraud detection can help identify anomalies in financial transactions, reducing the risks of mismanagement.

II. METHODOLOGY

The development of the Blockchain-Based Government Budget Tracking System will follow a structured methodology comprising the following key phases:

Requirement Analysis

System Design

Blockchain Integration

Application Development

Testing and Validation

Deployment

Monitoring and Maintenance

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III. MODELING AND ANALYSIS

Model and Material which are used is presented in this section. Table and model should be in prescribed format.

Figure 1: Government fund management.

IV. RESULTS AND DISCUSSION

Table 1. Comparison of displacement of all phase

Phase	Duration	Milestones
Planning & Requirement Analysis	2 weeks	Milestone 1
Blockchain & Smart Contract Design	4 weeks	Milestones 2 & 3
Backend & Database Development	6 weeks	Milestones 4 & 5
Frontend Development	6 weeks	Milestones 6 & 7
Security Implementation	3 weeks	Milestone 8
Testing & Quality Assurance	On going	Milestones 9 & 10
Deployment & Go Live	Not started	Milestones 11 & 12

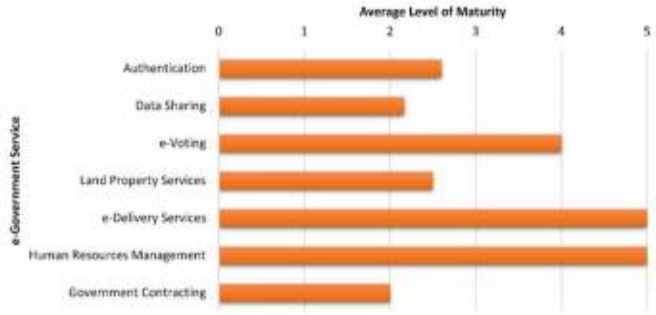

Figure 2: Fund allocation

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V. CONCLUSION

The Blockchain-Based Government Budget Tracking System has successfully addressed the critical need for transparency, accountability, and efficiency in government financial management. By leveraging blockchain technology, the system ensures that budget allocations, disbursements, and audits are immutable, tamper-proof, and easily accessible to stakeholders like citizens, auditors, and administrators. The use of smart contracts automates processes and enforces rules, reducing the chances of fraud or mismanagement. Through secure authentication mechanisms, the system guarantees that only authorized individuals can access sensitive data, while real-time tracking ensures that all parties have up-to-date insights into how government funds are utilized. The integration of both on-chain and off-chain data storage solutions further optimizes the system by balancing decentralization with privacy requirements.

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CONCLUSION

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The system's user-friendly interface, built with modern frontend technologies like React.js and data visualization tools like Chart.js, empowers users to easily track and audit budget flow, ensuring full visibility into the government's financial activities. By adopting Layer 2 solutions and off-chain storage, the system not only addresses scalability and cost issues associated with blockchain but also creates a sustainable framework for large-scale deployment. Ultimately, this system lays a solid foundation for future government financial systems by promoting transparency, efficiency, and security in public fund management. As governments increasingly turn to blockchain to address corruption and inefficiency, this project represents a significant step forward in modernizing the way public finances are managed and tracked.

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