GOVERNANCE OF BANK'S USING BLOCKCHAIN TECHNOLOGY

A Project Report

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PARUL UNIVERSITY

CERTIFICATE

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"The single greatest cause of happiness is gratitude."

-Auliq-Ice

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Abstract

In recent years, the banking sector has witnessed a growing interest in harnessing blockchain technology to streamline operations and enhance security. One of the key areas where blockchain holds immense potential is in governance practices within banks. This paper proposes a novel framework for the governance of banks utilizing blockchain technology.

The framework is designed to address the challenges faced by traditional governance structures, such as opacity, inefficiency, and susceptibility to fraud. By leveraging blockchain's inherent properties of immutability, transparency, and decentralization, the proposed framework aims to foster greater trust among stakeholders while promoting efficiency and accountability.

Key components of the framework include the establishment of a distributed ledger system to record and validate transactions in real-time, smart contracts to automate governance processes, and consensus mechanisms to ensure the integrity of the network. Additionally, the framework incorporates identity management solutions to verify the authenticity of participants and regulatory compliance protocols to adhere to industry standards.

Through the implementation of this blockchain-based governance framework, banks can achieve several benefits, including enhanced transparency, reduced operational costs, mitigated risks of fraud and manipulation, and improved regulatory compliance. Moreover, the decentralized nature of blockchain technology empowers stakeholders to actively participate in decision-making processes, thereby promoting democratic governance practices within banks.

Overall, this paper highlights the transformative potential of blockchain technology in revolutionizing the governance of banks, paving the way for a more secure, transparent, and resilient financial ecosystem.

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Chapter 1

Introduction

1.1 Blockchain technology

Blockchain is a form of distributed digital ledger that allows different players in the network to share and validate transactions in a manner that is both secure and transparent without a mediating agent. Since it is decentralized, data in the system is stored in a network of computers rather than in a central database. As such, it is hard to hack or manipulate data as it ascertains integrity and security in the system.

The blockchain technology started gaining popularity after the emergence of Bitcoin, which was the first decentralized cryptocurrency. However, the technology has now been applied to most industries in finance, supply chain management, healthcare, and voting,among many others.

In this way, the blockchain builds blocks of data, but through hashing, links them to one another in the form of a chain, hence the name blockchain. In every block, there is an exclusive code known as a hash, generated depending on what the block contains. This hash is thereafter to be used as a point of connecting to the previous block.

Once incorporated into the blockchain, a block can no longer be removed or altered except by consensus of the network. This is one aspect that makes this technology virtually immutable, and data on the blockchain, therefore, tamper-proof and transparent.

Overall, the technology of blockchain has great potential to radically change data storage and sharing, thus making such data more secure, transparent, and accessible.

1.2 Governance of banks using blockchain technology

It is something of a multidisciplinary approach toward the management of banks, bringing in both operational as well as stakeholder engagement and regulatory compliance and risk management issues. This then forms a framework that serves as a guiding blueprint defining the principles,

policies, and procedures guiding adoption, implementation, and management of blockchain solutions within banking institutions. One of the purposes of the Governance of Banks Using Blockchain Technology project is to revitalize the traditional banking sector using the power of blockchain technology. This type of initiative would focus on improving the transparency, security, and efficiency of banking operations through the implementation of a blockchain-based governance framework.

It is the basic principle for which blockchain is more commonly referred to as DLT- distributed ledger technology. This makes it shared and tamper-proof; a progressively growing list of records or blocks kept in chronological order in a chain, for blocks, that contains a timestamp and a cryptographic hash of the previous block, thereby guaranteeing integrity and immutability of data. This decentralized and transparent nature of blockchain eliminates intermediaries, reduces the risk of fraud, and enhances trust among the participants.

Chapter 2

Literature Survey

2.1 introduction

The governance of banks is a critical aspect of ensuring the stability, transparency, and efficiency of financial systems worldwide. In recent years, the emergence of blockchain technology has offered new opportunities to enhance governance frameworks within the banking sector. Blockchain, a decentralized and immutable ledger technology, holds the potential to address challenges related to data security, transaction transparency, regulatory compliance, and operational efficiency faced by traditional banking systems.

Reference:

2.2 ”Implementation of Blockchain for Secure Bank Transactions”2020

- Authors: Akhilesh NS,Aniruddha MN,Sowmya K S

Block chain has a unique support of bit coin, This is a digital crypto currency with an ever rising circle of users. all over the globe. However, block chain is way more than just bit It is the new generation of security depicting coin . It is passed around among signatories or any target for transactions. The appeal lies in the fact that group is the process participant.

2.3 ”Expeditious banking using Blockchain Technology” 2020

- Authors: Varsha Naik,Riya Pejawar,Rishabh Singh

Blockchain has an interesting background being the support of bit coin. new generation digital crypto currency that has more and more people using it as time goes on. worldwide. However, block chain itself is much more than just a bit, Bocharov et al[14] define block chain as a distributed interoperable transactional platform that is open yet controlled. Coin is a security system of the

newest generation taking into account Records created by processes in series of blocks are safe means of completing records effectively. transactions and distributed among the signatories, or the specific target. Group is the subjects of the process. It drags out absolutely attraction out This is quite a fact, as for all it does this, there is no one central organisation overseeing its numerous operations. The structure of banking is probably some of the most highly centralized and autocratic in the world.

2.4 ”Blockchain Technology Changing Landscape of Banking Industry” 2023

- Authors: Manjit Kour

Block chain has an interesting support of bit coin, digital crypto currency with a continuously growing number of users. worldwide. However, block chain itself is much more than just a bit Coin is a security system of the latest generation encapsulating Processes in series of blocks provide a safe and effective way of making records transactions and distributed among the signatories, or any target Group is the subjects of the process.

2.5 ”Blockchain Implementation in Financial Sector and Cyber Security System” 2023

- Authors: nita Gehlot,Dr. Shouvik Kumar Guha,Dr. Sukhavasi Santha kumari

Its first used block chain solutions for coins. Open digital ledger. Though, Cryptographic protocol has Lately, taken into account has been the wide range of additional applications because of its unique combination of decentralization, dependability, accessibility, and stridently anti features. Such characteristics are especially useful for a number. of major issues in the finance sector.

2.6 Shaliza Alwi,Irfah Najihah Basir Malan,Siti Hawa Yusof”Block Chain Technology Application to the Banking Sector ” 2023

Digital technology is a new technology around the world. A disruption factor changing business paradigms and becoming more important. In India, block chain technology is attracted much interest from a range of industries. As the number of uses for block chain technology grows, industry Leadership modifies and adapts the technology to suit a A whole range of use cases. The next development in decentralized method for designing applications is due to the Block chain technology.

2.7 ”Open Banking and APIs for Transformation in Banking ”2024

- Authors: Anshu Premchand,Anurag Choudhry

Open Banking and Open APIs are on the rise. .and have developed from purely technological competencies to being of business relevance. Open banking is an innovative model for the financial industry not only from both competition perspective but also customer engagement perspective. Banks will have to assist their companies with better and quicker products. Customers should be allowed by banks to manipulate their financial affairs, improve on the decisions, save money etc.

2.8 Analysis of Banking and Block Chain Technology In Supply Chain Management System

- Authors: Anita Gehlot ,Rajesh Singh ,Kailash Bisht

In order to identify their limitations and the best replacement from both that can service present and future Procurement business expectations, and this paper will compare supply chain banks and blockchain. Using both secondary Research, the study is carried out using a mixed method to analyze It and then will conclude the findings to complete the study purpose. Today, the purchasing field has wide use of use of banking. Despite being a familiar name, only a small number of multinational firms in the world Have used it in the industry of supply chains. However, the investigation showed that cryptocurrency has really cut the cost by 2

2.9 A System Build on Block chain technology to Identify and Fight Bogus check scams

- Authors:Banupriya N, A Soundarya,S Srudhi Priya

One of the most common forms of consumer fraud is. is the use of a bogus check.There should be no present methodology of swift check validation and detection fake ones. Rather, banks have to wait for a longer stretch of It is time to reveal the fraud. More precisely, our answer enables banks to communicate with their customers while Protecting the personal information of the clients of banks. There are various types and forms of counterfeit checks. They could And appear as firm or individual cheques, cashier’s cheques, Money orders or an electronic check. These operate Because bogus checks look like real checks even to bank workers.

2.10 A Way of Implementation of Block Chain Technology in The Field Finance With The Evidence of Result

- Authors: Ashvine Kumar, Pavana Kumari.H.

Bitcoin, a virtual money with growing worldwide User base- it has an exciting underlying basis for blockchain networks. The newest generation of security technology is that of block chain. They offer a safe means of recording transactions by closing operations in a sequence of blocks. That is dispersed to signatories or any intended audience that take involved in the system, and it extends far beyond bitcoin. It This appeals because it does it without the help of a centralized An authority, centralization of the existing financial system, makes it vulnerable to mass defaults and frauds. Global banking has It utilized blockchain technology, fundamentally needed for of such frauds, and governance.

2.11 Block chain technology for protecting the banking transaction without using tokens

- Authors: Niturkar Pallavi Pravin , Modhave Snehal Kundlik,Phalke Akshay Suhas

This has revolutionized the life of people. A large number of threats and frauds get detected in the banking system. The banking system makes use of a centralized database. Due to this centralized nature, an attacker is easily able to get access to data which makes the system insecure. The drawback of this centralized system can be reduced by reforming the system by implementing blockchain technology without using tokens.

2.12 Authentication of legitimate checks and detection of fake checks for reducing the Scams using Block chain based technology

- Authors: Vedanarayanan V , Sakthiprabha R , Rajinikanth E.

False frauds are one among the most commonly used attacks that thwart customer frauds. It is not possible to give an instant answer on test certification as well as detection of false tests. Instead, banks have to wait for a long period to detect frauds. In other words, our approach enables banks to serve percent of public and utilized test without revealing private information given by financial institution customers. False tests are carried out many forms.

2.13 A Fog Computing Architecture Integrating Blockchain and Internet of Things for Securing Bank Accounts

- Authors: Arunprathap S , Nithya R , Nivetha S .

Such as high data security levels, decentralization, open and transparent network infrastructure, and low costs of operation. Even in the enormously conservative world of finance, such excellent qualities make blockchain an extremely practical and demanded solution and also in the constrained banking business. All banking activities cannot be separated from the basic ones-primarily related to deposits and loans. Since the control of the deposits is not in the hands of one company, a distributed ledger-based system of lending and borrowing, has no central unit and can never declare bankruptcy.

2.14 Blockchain based Enhancement of Digital Revolution in Financial Sector

- Authors: Kuppani Sathish , Jayendra Gopal Thatipudi , Dr. P. Manikandan.

The rapid growth of newly introduced technology has a strong effect on the progress of the financial industry. The digitalization causes changes in the interactions between enterprises in the financial sector and the structural landscape of the sector, leading to new models of businesses, value chain transformation, new product delivery channels, and many more. Nevertheless, experts have yet to reach a consensus about what is driving the strategic shifts outlined above or about which of the above described directions the financial sector is likely to expand along in the future.

2.15 IMPLICATIONS OF BLOCKCHAIN IN INDUSTRY 4.O

- Authors: Anum Mushtaq , Irfan Ul Haq.

Rapid development in Information Technology and industrialization process has accelerated the emergence of 4th Industrial revolution also called integrated industry industrial internet or smart manufacturing. The concept of Industry 4.0 promises unrivaled growth in next generation of manufacturing technology by revolutionizing the manners of production and value generation with the support of digital transformation in product/service offerings and hori zontal/vertical value chains. Industry4.0 is based on a spectrum of emerging technologies such as internet of things, cloud computing, machine learning, adaptive robotics, cyber physical systems, artificial intelligence, Industrial Integration, and Service Oriented Computing

2.16 Management and Access Control Framework for Open Banking Eco System by using Block Chain Technology

- Authors: Dr.G.S.JAYESH , Dr Gurpreet Singh , Dr. Rinki Mishra.

Open banking is a new paradigm for data sharing that may enable new firms to get loans quickly and investment returns at higher rates. Most clients are still hesitant to embrace open banking due to fear of sharing data with third-party suppliers. This research paper has made available an architecture on blockchain-based self-sovereign identification for open banking. The proposed architecture offers a secure network environment between the users and third-party service providers for communication. Let people control their identities and information, and let providers Comparison of the BBM model with others compares advantages.

2.17 Navigating the Blockchain Landscape: Role, Challenges, Risks, and Issues in the Banking and Finance Sector

- Authors:Rajiv Kumar , Manisha Saini , Ajeet Kumar Vishwakarm.

This technology has recently been attracting much attention due to its potential for a thorough disruption of several sectors in the financial services industry. However, there are many impediments that prevent its wide adoption and application. The major problem with blockchain technology is scalability. Traditional block chains, such as those used in Bitcoin and Ethereum, come with capacity and processing-speed limitations. Their low makes them inappropriate for most applications at a large scale.

2.18 Online Digital Cheque Clearance and Verification System using Block Chain

- Authors: Bogahawatte W.W.M.K.A , Isuri Samanmali A.H.L , Perera K.D.M

Cheque Truncation System is an image based clearing system used in Sri Lanka. This semimanual process has specific constraints as well as takes up to 3 days working hours to clear the cheque of an inter-bank national cheques in Sri-Lanka. Cheque users as well as commercial banks, having been facing the incapabilities of this system would need an efficient and secured system, capable of clearing a cheque within less than 24 hours.

2.19 Quantum Resistant Cryptographic Systems for Blockchain Network

- Authors: Dharani D , Soorya R , Dr.K.Anitha Kumari.

This paper gives an in-depth survey of post-quantum cryptographic methods that are referred to as quantum cryptography and that resist quantum attacks. It discusses various approaches, such as hash-based cryptography and lattice-based cryptography, that can secure cryptographic hashing and encryption from the threats of the computer. The paper focuses particularly on the effects on blockchain technology, as it will be completely vulnerable to attack during quantum attacks.

2.20 The barriers of Implementation block chain technology in the field of Banking Industry

- Authors: Dr. Somanchi Hari Krishna , Sardar Parminder Singh , Gaurav Sethi.

The goal of a distributed ledger like a blockchain is to improve processes and create new business models for financial institutions by collating the blocks carrying transaction information chronologically to develop chains. This research seeks to look at some real-life scenarios. For purposes of creating an image of business model innovation in financial institutions, a case study methodology was adopted since there are no enough actual measurement data.

Chapter 3

Analysis / Software Requirements Specification (SRS)

3.1 Introduction

Purpose The purpose of this document is to outline the software requirements for implementing a blockchain-based governance system for banks to enhance transparency, security, and efficiency in their operations.

Scope This document covers the functional and non-functional requirements, system architecture, interfaces, data requirements, constraints, assumptions, and dependencies of the governance system.

Definitions, Acronyms, and Abbreviations - Provide a list of important terms and acronyms used throughout the document. **References** Include any relevant documents, standards, or resources that were used in developing the SRS. **Overview of the Document** Provide an overview of the structure and content of the SRS document.

3.2 System Description

Overview of the Governance System Describe the purpose and goals of the blockchain-based governance system for banks. **Goals and Objectives** List the specific goals and objectives that the system aims to achieve. **System Architecture** Provide an overview of the high-level system architecture, including components, modules, and interactions. **Stakeholders** Identify the stakeholders involved in the governance system, such as bank executives, regulators, auditors, and customers.

3.3 Functional Requirements

User Management Allow authorized users to register, authenticate, and manage their accounts securely. **Account Management** Enable users to create and manage their bank accounts, including viewing balances, making transactions, and setting permissions. **Transaction Management** Facilitate secure and transparent transactions using blockchain technology, ensuring immutability and traceability. **Smart Contracts** Implement smart contracts for automating and enforcing agreements between parties, such as loan contracts, asset transfers, and compliance checks. **Compliance and Regulation Management** Ensure compliance with banking regulations and industry standards, including Know Your Customer (KYC) and Anti-Money Laundering (AML) requirements. **Reporting and Analytics** Provide reporting and analytics tools for monitoring and analyzing transaction data, detecting anomalies, and generating insights.

3.4 Non-Functional Requirements

Performance Specify performance metrics such as response time, throughput, and scalability requirements. **Security,Reliability,Usability** Define security measures to protect sensitive data, prevent unauthorized access, and ensure the integrity of the system. **Scalability,Reliability,Usability** Address the system's ability to handle increasing workloads and user demands over time. Ensure high availability, fault tolerance, and data consistency to minimize downtime and disruptions. Design user-friendly interfaces and intuitive workflows to enhance user experience and adoption. **Compliance** Comply with legal and regulatory requirements, such as data protection laws and industry standards. **Interoperability** - Support interoperability with existing banking systems, external services, and blockchain networks.

3.5 System Interfaces

User Interfaces Describe the interfaces that users interact with, including web portals, mobile apps, and APIs. **External Interfaces** Specify interfaces with external systems, such as payment gateways, regulatory databases, and blockchain networks. **Hardware Interfaces** Define hardware requirements, if any, for running the governance system. **Software Interfaces** Identify software dependencies, integrations, and compatibility requirements with other systems.

3.6 Data Requirements

Data Sources List the sources of data used by the governance system, such as customer information, transaction records, and regulatory data. **Data Storage** Define the data storage mechanisms,

databases, and encryption methods used to store and protect data. **Data Security and Privacy** Address data security measures, access controls, encryption standards, and privacy policies to safeguard sensitive information.

3.7 Constraints

Regulatory Constraints Consider regulatory constraints related to banking laws, data protection regulations, and blockchain governance. **Compatibility Constraints** Identify compatibility constraints with existing systems, software platforms, and hardware devices. **Technology Constraints** Address limitations or dependencies on specific technologies, protocols, or blockchain frameworks.

3.8 Assumptions and Dependencies

Document any assumptions made during the

3.9 Other Requirements

specific database requirements to support the secure, transparent, and efficient functioning of the system. Here are key database requirements for the governance of banks using blockchain technology: **Distributed Ledger Database:** Requirement: Implement a distributed ledger database that stores a secure and tamper-resistant record of all transactions across the blockchain network. **Identity Management Database:** Requirement: Maintain a secure identity management database to store verified participant information, facilitating Know Your Customer (KYC) compliance and ensuring authorized access to the blockchain network. **Consensus Data Storage:** Requirement: Ensure that consensus data, including validated transactions and blocks, is stored in a manner that is resistant to tampering and provides an immutable record of the blockchain's history. **Appendix A: Glossary** Blockchain Technology: Definition: A decentralized and distributed ledger technology that records transactions across multiple computers in a secure and tamper-resistant manner. Governance: Definition: The establishment and enforcement of policies, processes, and decision-making structures to guide the operations and behavior of banks within the blockchain network. Identity Management: Definition: The process of securely and compliantly verifying and managing the identities of participants within the blockchain network, often involving Know Your Customer (KYC) procedures. Immutable: Definition: The quality of data stored on the blockchain, indicating that once recorded, it cannot be altered or deleted, ensuring data integrity. Encryption: Definition: The process of encoding information to protect it from unauthorized access, ensuring

secure storage and transmission of sensitive data. Consensus Node: Definition: A participant in the blockchain network responsible for validating and agreeing upon transactions through the consensus mechanism. Smart Contract: Definition: Self-executing contracts with coded terms and conditions that automatically execute and enforce contractual agreements when predefined conditions are met. Consensus Mechanism: Definition: A protocol or algorithm used to achieve agreement on a single version of the blockchain among nodes in the network. Regulatory Compliance: Definition: Adherence to laws, regulations, and standards governing the financial industry to ensure that the blockchain-based governance system complies with legal requirements. Non-Functional Requirements: Definition: Aspects of the system that describe its qualities, such as performance, security, and usability, rather than specific functionalities. **Appendix B: Analysis Models** Software Requirements Specification for ¡Project¿ **Appendix C: To Be Determined List** Determined List: Governance of Banks using Blockchain Technology This list approaches governance from different angles, highlighting key areas and considerations. Remember, this is not an exhaustive list, and specific points might need adjustment based on your specific focus.

1. Transparency and Accountability:
2. Regulatory Frameworks
3. Data Security and Privacy:
4. Governance Models:
5. Dispute Resolution:
6. Stakeholder Engagement:

Chapter 4

System Design

In order to effectively design and develop a system, it is important to understand and document the requirements of the system. The process of gathering and documenting the requirements of a system is known as requirement analysis. It helps to identify the goals of the system, the stakeholders, and the constraints within which the system will be developed. The requirements serve as a blueprint for the development of the system and provide a reference point for testing and validation.

4.1 Hardware Requirements

- Processor – 2 GHz or more
- RAM – 4 GB or more
- Disk Space – 100 GB or more

4.2 Software Requirements

- Node.js (version – 20.5.0)
- Web3.js (version – 1.9.2)
- Truffle (version – 5.11.5)
- Solidity (version – 0.8.20)
- Ganache (version – 7.9.0)
- Metamask
- MySQL Database (port – 3306)

4.3 Data Flow Diagrams

4.3.1 Level 0 Data Flow Diagram

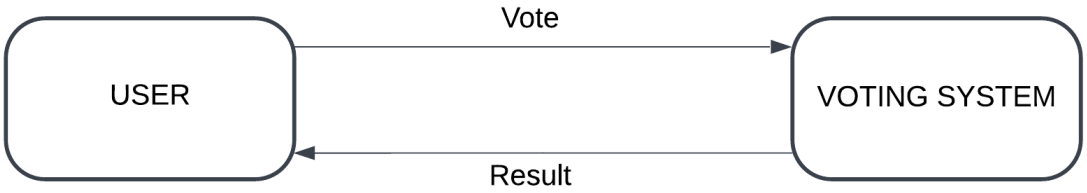

Figure 4.1: Level 0 Data Flow Diagram

4.3.2 Level 1 Data Flow Diagram

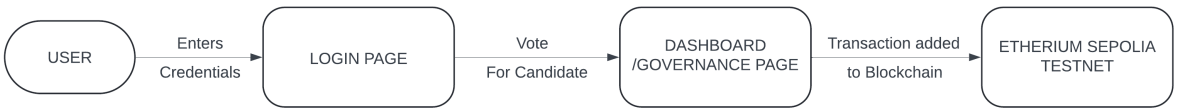

Figure 4.2: Level 1 Data Flow Diagram (Ref : Technical Research Papers)

4.3.3 Level 2 Data Flow Diagram

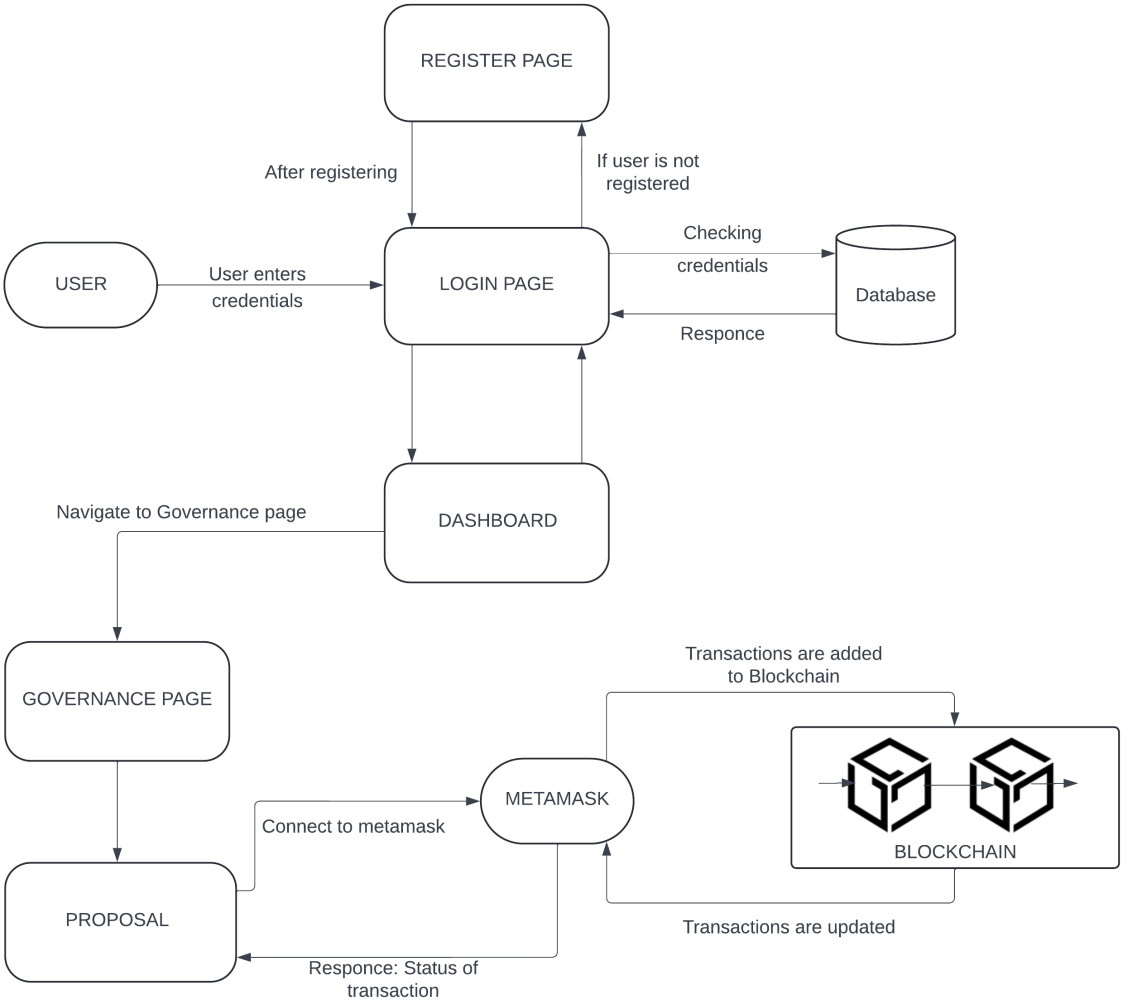

Figure 4.3: Level 2 Data Flow Diagram (Ref :dApp Development Tutorials)

4.3.4 Entity-Relationship Diagram

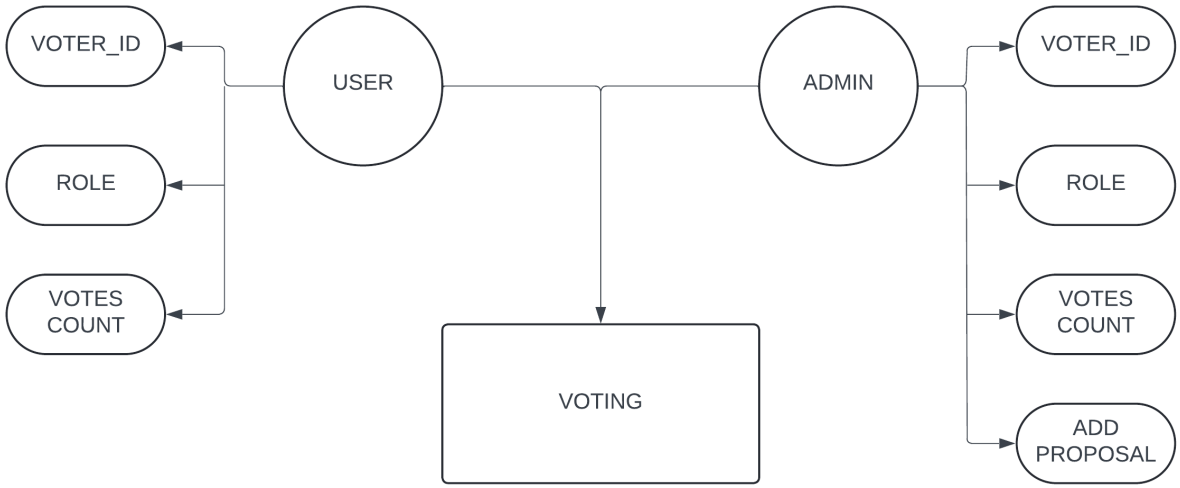

Figure 4.4: Entity-Relationship Diagram (Ref : Technical Research Papers)

4.3.5 Use Case Diagram

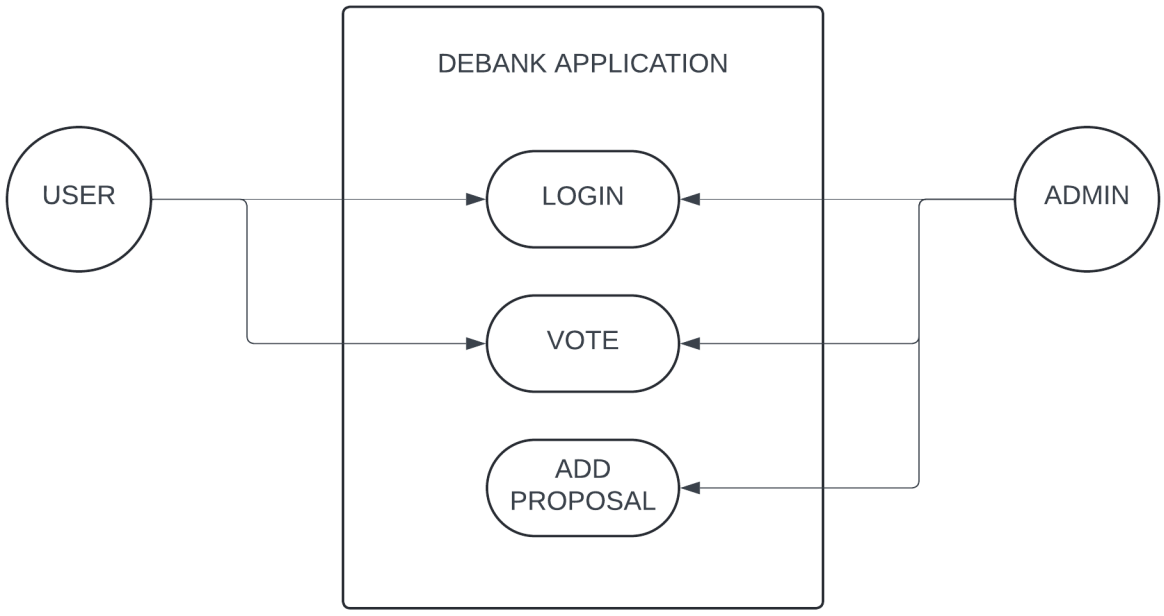

Figure 4.5: Use Case Diagram

Chapter 5

Methodology

5.1 Introduction

- This project employs a comprehensive methodology to design and implement a blockchain-based governance system for banks. Recognizing the need for enhanced transparency, security, and efficiency in banking operations, we adopt an iterative Agile development approach. This allows for flexibility and responsiveness to evolving requirements throughout the project lifecycle.

- The system leverages a permissioned blockchain framework, ensuring that only authorized participants can access and validate governance transactions. We implement smart contracts to automate compliance processes and enhance auditability. Key components of the architecture include a decentralized ledger, secure identity management, and a consensus mechanism tailored to meet the stringent demands of the banking sector.

5.2 Study Area

- This research will be done on banking as well as a blockchain system in India and abroad especially inland and cross-border businesses.

- This paper analyzes the supply chain design based on both banking and blockchain systems by incorporating one parameter, which is overall cost, time, process, and security based on the trading that is done between Kmv Project Ltd, and Kumkangkind Co Ltd.

- Government, banking, insurance, and personal identity protection are only a few of the areas where technology can will make a difference. In the blockchain industry, the United The same states are supposed to have the highest market share.

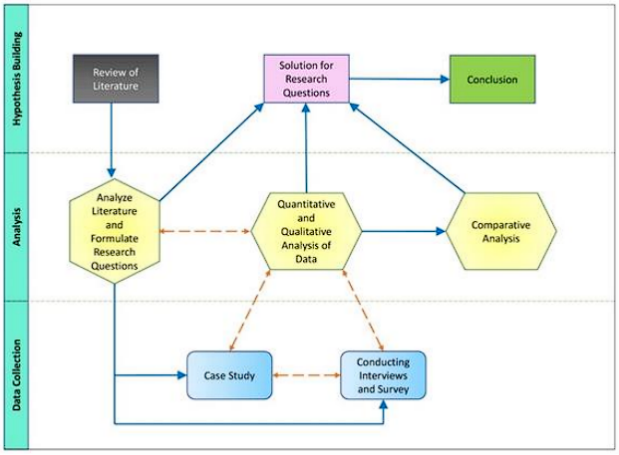

Figure 5.1: Methodology of study (Ref : ResearchGate.net)

5.3 Methodology

- This research is a comparison of bank and blockchain technology in the field of supply chain, which helps to analyze the working principle of both systems where their process, success of the metrics, and its output are evaluated, which helps in making smarter decisions while selecting the system for supply chain industry.

- This design approach has strengths that exist literature, proven data, case studies, and questionnaire survey.

Data Collection

- The primary and secondary sources were used to obtain the data for this research. A questionnaire survey was conducted in the process of data collection through the primary source that involved the selection of respondents from the supply chain industry, AEC firms, and AEC / Supply chain management students.

- This method helped in the success of this study because of its confidentiality and flexibility features with the high validity level, uniformity, and wide coverage along with the other important fact that it did not have any heavy burden on the respondents.

- The sample size for this research to conduct the questionnaire survey is 120 and responses obtained were 106. The participants for this survey were informed about the questionnaire survey through an informed consent.

Materials of Study 1) Role and process of banking in supply chain

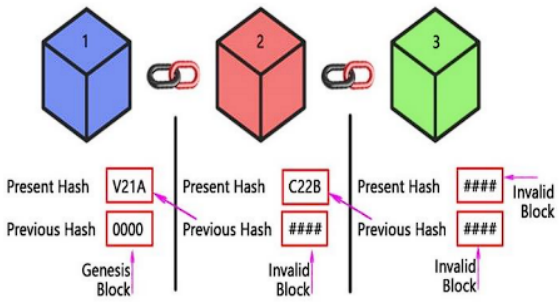

Figure 5.2: working of blockchain (Ref : ResearchGate.net)

- Blockchain is composed of a chain of blocks, and a transaction's past can go easily back to previous blocks.

- Each block has its own unique ID, containing the hash of the preceding block that guarantees security in regards to the transaction. Users authenticate and register all transactions in that network; these are also time stamped, ordered sequentially, linked to the preceding block, and permanent once connected to the network.

2)Working of smart contract t

- Let's now take a look at how blockchain applies in the supply chain industry.

- The smart contract aspect of the blockchain is relevant here: it requires the parties involved discuss and agree on terms of the contract before encoding all or part of the terms in a smart contract encoded within the blockchain.

- Smart contracts do run whenever the preset terms and conditions are met. After all, they just follow the rules that have been programmed within the contract.

- Smart contracts facilitate safe transactions to take place without the influence of third parties. It's an entirely decentralized process, and therefore at the time of confirmation of the deal, no middlemen are expected.

Chapter 6

Implementation

6.1 Introduction

- Implementation:

  Most importantly, the governance system for banks on the blockchain was implemented through the cohesion of MENR(T) stack technologies which are composed of MongoDB, Express.js, React.js, Node.js which is sometimes added to make it complete. In this case, however, we chose MySQL instead of MongoDB because it was needed for user data and governance records and management since it is a structured relational database. The reason for this decision was that MySQL is quite effective and efficient when handling data dealing with the banking sector which involves natural complex queries.

6.2 System Architecture

- The architecture includes a React.js-based front-end client, a Node.js and Express.js back-end server, and a MySQL database for data persistence. In this case, the front end and back end are connected and data exchange is managed using RESTful APIs which handle requests from the client and responses from the server.

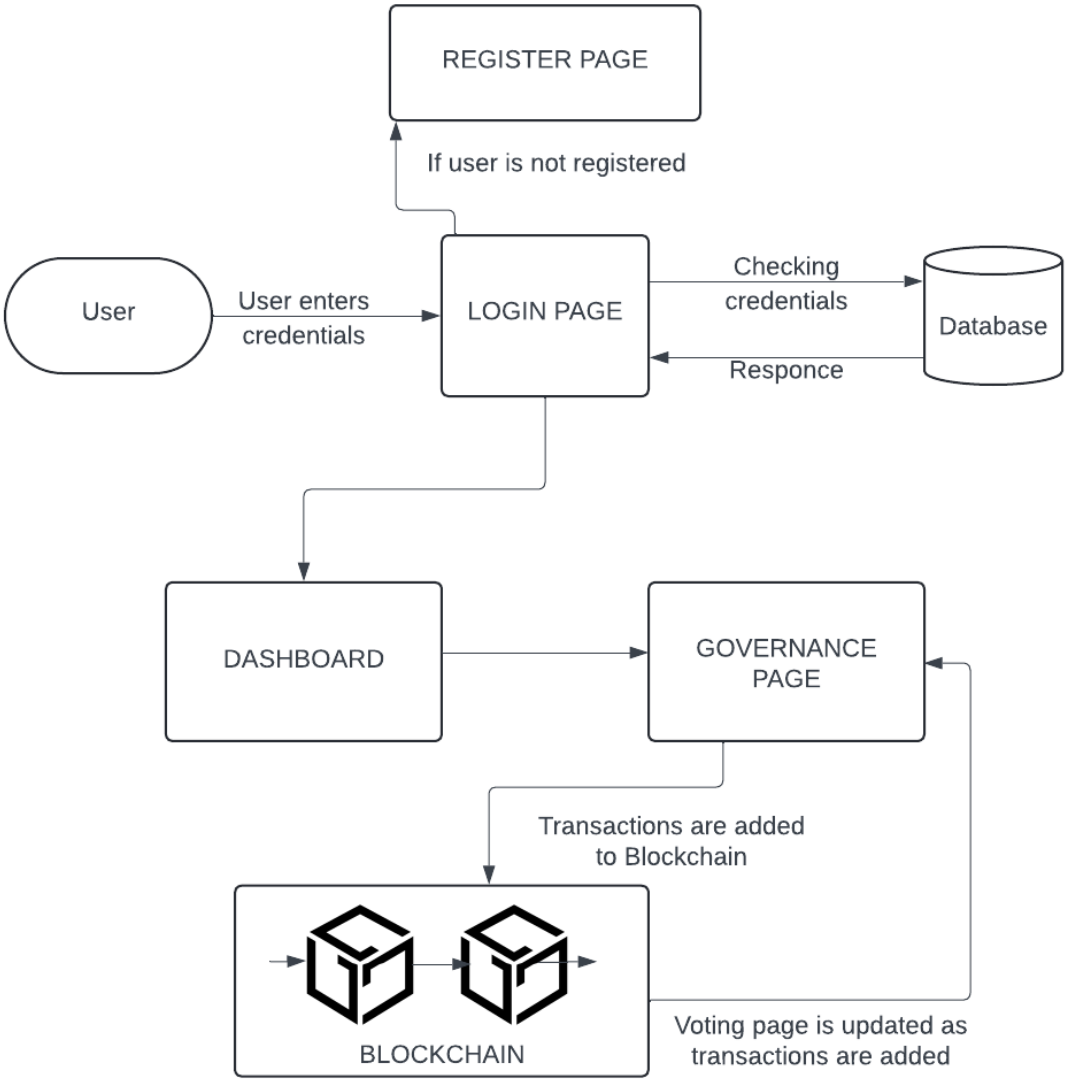

Figure 6.1: System Architecture Diagram (Ref : Technical Research Papers)

6.3 Database Design

- With respect to the system, the need to build a schema in the MySQL database arose, which was necessary to keep the users, transactions, and audits. Among the tables that were included are:

  Users: It keeps records of the user's login details and categories (e.g., staff, and reg.)

  Transactions: Record all transactions related to governance to be traced and held accountable.

  AuditLogs: It logs any amendments done on the governance documents for record keeping and compliance.

6.4 Smart Contract Development:

- Smart contracts were created in Solidity, a programming language used for writing smart contracts on the Ethereum Republic of Blockchain. The contracts undertake crucial transactional governance responsibilities, such as:

  Regulatory Compliance: This includes automatically checking transactions against a set of compliance requirements.

  Voting Mechanisms: It assures safe participation of the stakeholders in decision-making processes.

  In order to enhance smart contracts development, we brought in libraries and tools which included:

  Web3.js: To enable communication of the Ethereum blockchain from our Node.js application.

6.4.1 SmartContract

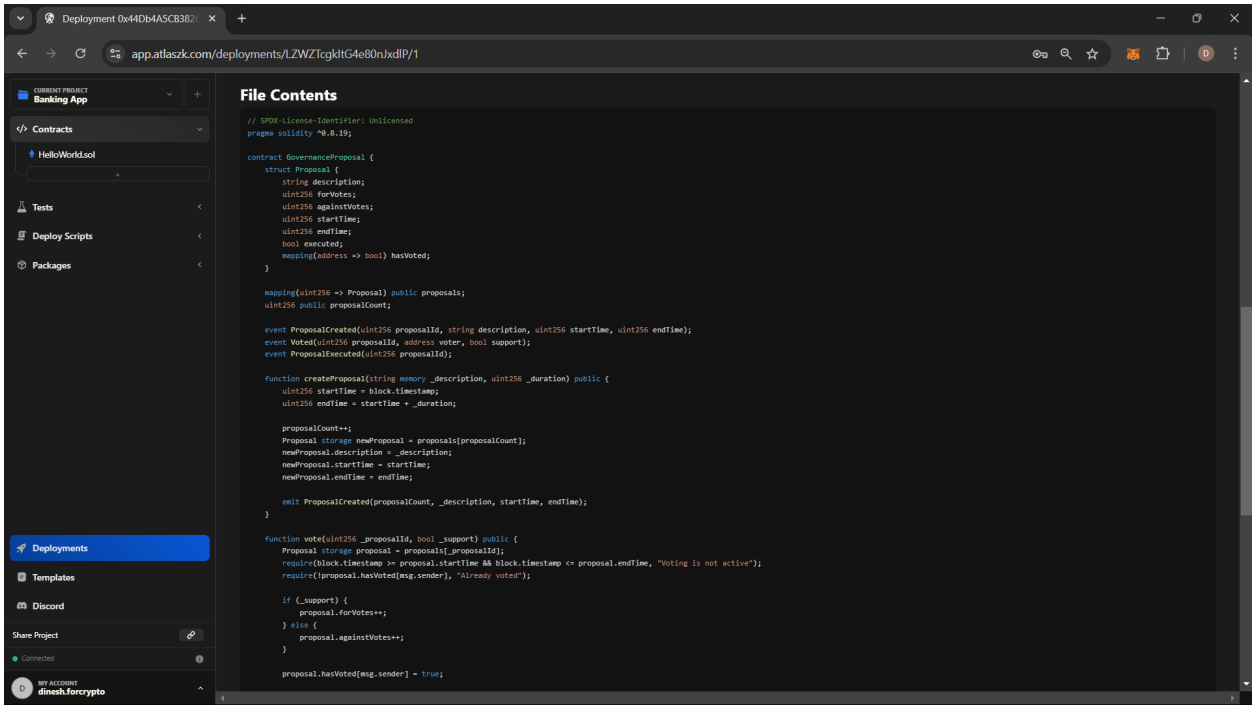

Figure 6.2: SmartContract

6.5 Testing and Deployment

- For the usability and secure nature of the smart contracts, we used Ganache, which is a personal Ethereum blockchain. Thanks to Ganache, it was ¡was it? Who's going to ask? ... :)¿

possible to test how the smart contracts work in a local environment before they are uploaded to the actual blockchain. This step included:

Creating Wallets: Creation of end-user wallets for the purpose of conducting transactions.

Simulating Transactions: Carrying out governance transactions in a controlled setting.

6.6 Front-End Development:

- React .js was used to develop the front end application of the system which is a responsive application for system stakeholders interaction with the governance system. Notable functionalities that were included are:

  User Authentication: Logging into the system securely and restricting roles to certain functionalities.

  Transaction Dashboard: Governance transactions and the status on compliance to activities.

  Voting Interface: Effective interface for stakeholders to exercise their votes on governance issues.

6.6.1 Login Page

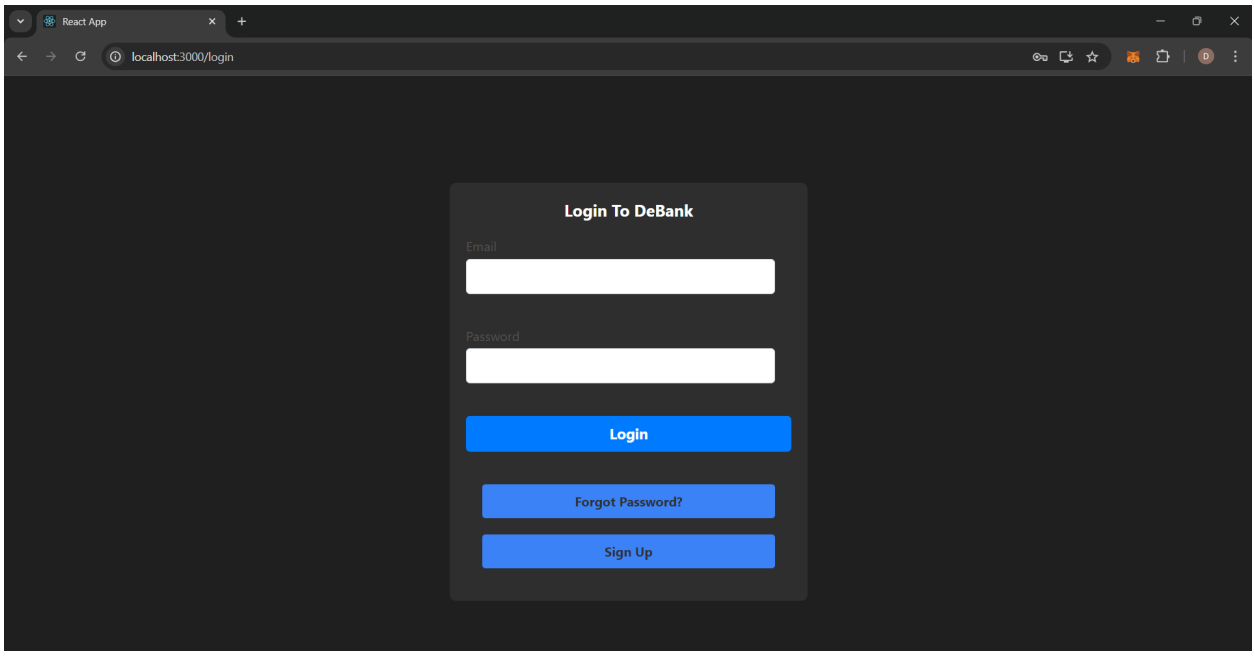

Figure 6.3: Login Page

6.6.2 Register Page

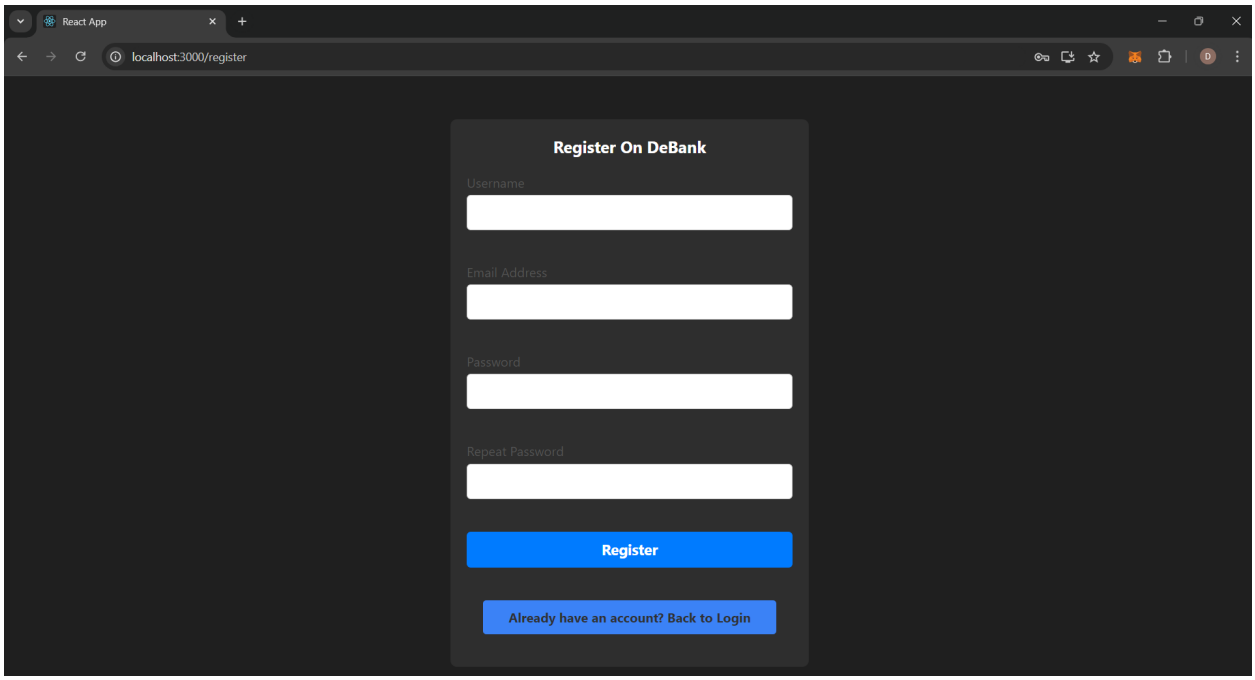

Figure 6.4: Login Page

6.6.3 Dashboard

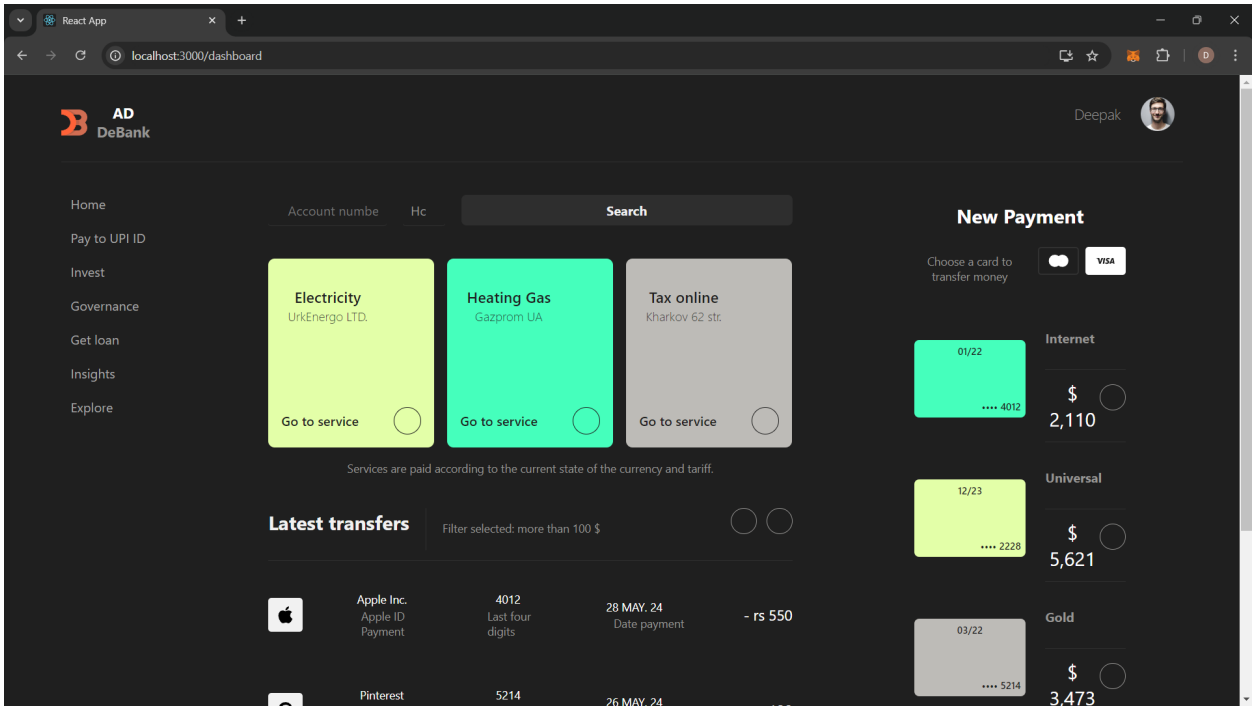

Figure 6.5: Dashboard

6.6.4 Governance Page

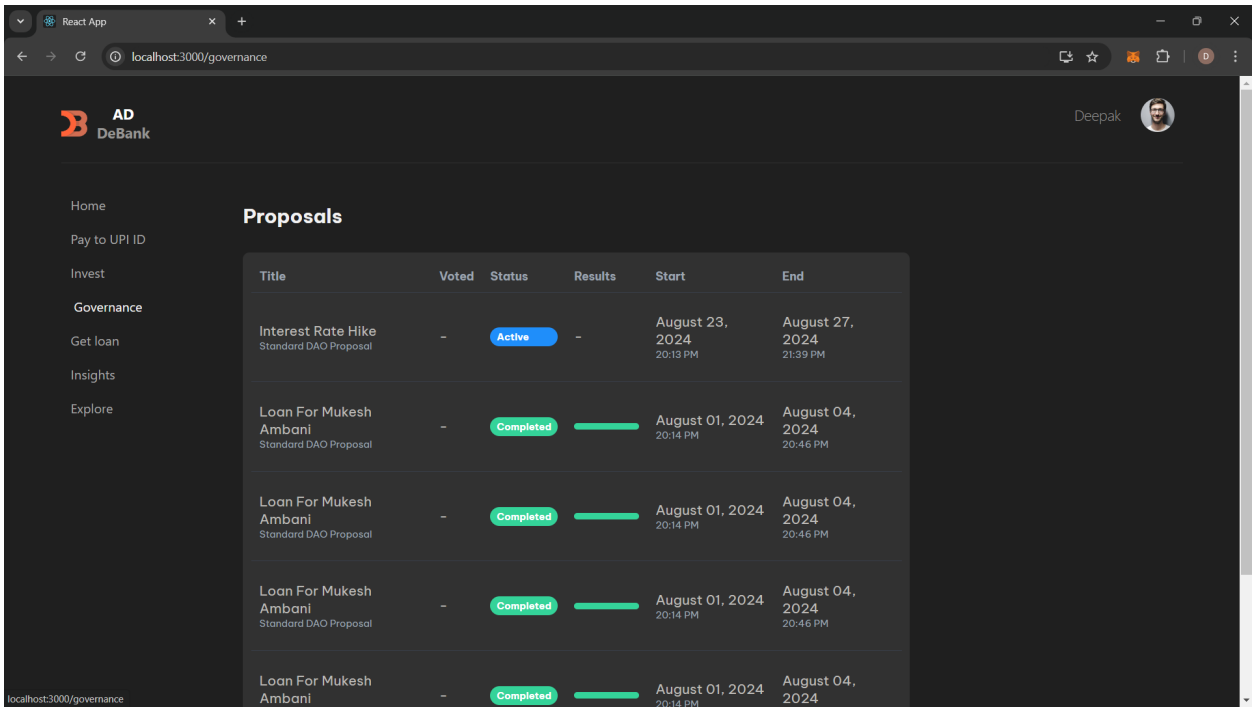

Figure 6.6: Governance Page

6.6.5 Proposal Page

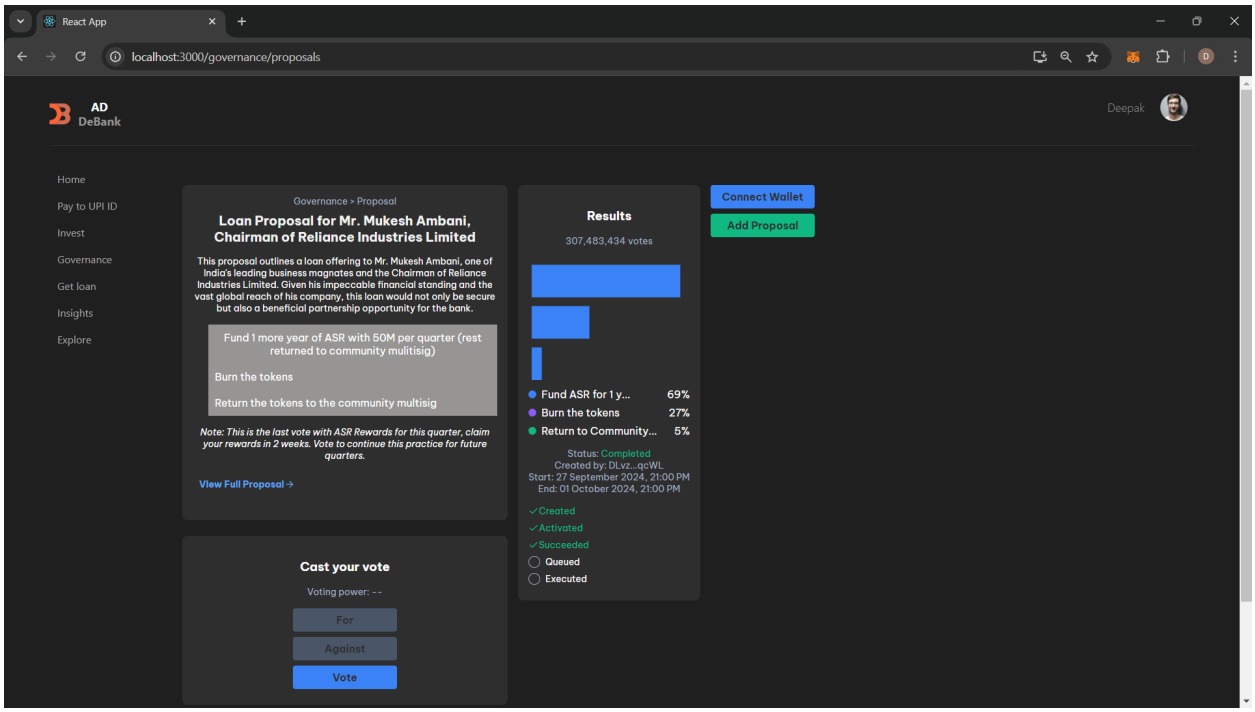

Figure 6.7: Proposal Page

6.7 Integration:

- The front-end, the back-end, MySQL database and Blockchain integration was carried out to bring about cohesive communication. The back-end APIs were set to carry out user and database transactions of the MySQL and Ethereum database to enable updating of governance activities in real-time

Pilot Deployment:

- Deploy the blockchain-based governance solution in a pilot environment with a select group of banks or financial institutions.
- Monitor the pilot deployment closely to gather feedback, identify areas for improvement, and assess the real-world performance of the system.
- Iterate on the design and implementation based on lessons learned from the pilot phase.

PROBLEMS IN THE IMPLEMENTATION OF BLOCK CHAIN Concern for Integration: Applications based on block chain technology offer extremely interesting solutions that require significant amendments in or total modifications of the existing systems, As such, financial institutions have to coordinate the transition properly in order to make the change

Ledger Level Security: In this paper, only those participants who have those which have undergone the necessary scrutiny should be allowed to join the block chain. Organisations with real-world legal. Thus, those skills which predict membership are the norm (it). In contrast to retail users who can withdraw from participation).

Chapter 7

Testing

7.1 Test Cases

Test Case ID	Test Case Description	Precondition	Test Steps	Expected Results	Status
TC-001	User should be able to register successfully	Application is running	1. Go to Registration page. 2. Fill in valid details. 3. Submit the form.	A success message should appear, and the user should be redirected to the login page.	Passed
TC-002	User should log in with valid credentials	User is registered	1. Navigate to Login page. 2. Enter valid credentials. 3. Click on Login.	User should be logged in and redirected to the dashboard.	Passed
TC-003	User should see homepage content after login	User is logged in	1. Log in. 2. Check the homepage.	Homepage content (e.g., menu, items) should be displayed.	Passed
TC-004	User should be able to log out successfully	User is logged in	1. Click on Logout button.	User should be logged out and redirected to the Login page.	Passed
TC-005	Admin should be able to approve new product listings	Admin is logged in	1. Navigate to the Admin Panel. 2. Approve a product listing.	Product should be approved and visible on the user end.	Passed
TC-006	User should be able to connect wallet	wallet is not connected	1.Navigate to Proposal page 2.Click on connect wallet button 3.Sign in the transaction	Wallet should be connected to the proposal page	Passed
TC-007	User should be able to vote "For" or "Against"	vote not registered	1. In proposal page select "For" or "Against". 2.Click on "vote" button. 3.Approve the transaction in Metamask	vote should be registered after approving transaction , transaction should appeare in blockExplorer	Passed
TC-008	user should be able to send fiat to onther users through UPI payment method	no transaction is recorded	1. Navigate to Payment section 2. Enter Amount, Desired UPI id ans select Bank Account 3.Click on "PAY" button	Transaction should be appeared in "Transaction History" Tab	Passed

Chapter 8

Conclusion

- The project **Governance of Banks Using Blockchain Technology** demonstrates the transformative potential of blockchain in enhancing governance practices within the banking sector. By leveraging blockchain's decentralized, transparent, and immutable features, banks can address key governance challenges such as fraud prevention, auditability, and regulatory compliance. Smart contracts offer automated, secure enforcement of governance rules, while distributed ledgers ensure real-time transparency across financial operations.
- The integration of blockchain can lead to more efficient decision-making, improved risk management, and enhanced trust among stakeholders. However, challenges such as regulatory hurdles, scalability concerns, and integration with legacy systems must be carefully managed to ensure successful implementation.
- In conclusion, blockchain technology provides a promising framework to revolutionize the governance of banks, paving the way for a more secure, efficient, and transparent financial system. This project has highlighted the critical role that blockchain can play in future banking governance models, driving innovation and ensuring long-term stability in the industry.

Chapter 9

Future Work

For the project **"Governance of Banks Using Blockchain Technology,"** there are several potential areas of future research and development to enhance its applicability and impact in the banking sector:

9.1 1. Integration with Existing Legacy Systems:

Future work could focus on creating seamless integration solutions between blockchain platforms and the legacy systems that most banks currently rely on. Developing hybrid models that allow banks to gradually transition to blockchain without disrupting existing operations will be crucial.

9.2 Improving Scalability and Efficiency:

Blockchain technology, particularly in large-scale financial institutions, must overcome scalability challenges to handle high transaction volumes efficiently. Future research could explore advancements in consensus algorithms (

e.g., Proof of Stake, sharding, or Layer 2 solutions) to improve the speed and scalability of blockchain networks for bank governance.

9.3 Regulatory Framework and Compliance:

Further work is needed to develop standardized regulatory frameworks that govern the use of blockchain in banking. Collaboration between banks, regulators, and technology providers is critical to ensure compliance with existing laws, while also addressing privacy concerns, data security, and jurisdictional challenges.

9.4 Interoperability Between Blockchains:

Future research can focus on improving interoperability between different blockchain platforms, allowing banks to operate across multiple blockchain networks seamlessly. This will help in facilitating broader adoption across different banking institutions and industries, enhancing collaboration and data sharing.

9.5 Decentralized Identity and KYC/AML Solutions:

Exploring the use of decentralized identity solutions integrated with blockchain-based Know Your Customer (KYC) and Anti-Money Laundering (AML) systems will help streamline compliance processes, reduce costs, and increase security for banks. Future work could develop standardized protocols for identity management on the blockchain.

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