Block-Chain Based Crowd-Sourcing Loan Platform with Settlement Process Optimization

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Abstract

The platform has undergone a comprehensive security examination that highlights its ability to withstand common cyberattacks and operational concerns. The examination shows the robustness and efficiency of the platform through numerical results and simulations. The platform guarantees the preservation of data integrity and user privacy through the utilization of sophisticated encryption techniques and consensus procedures. Furthermore, by using smart contracts, the platform's reliance on blockchain reduces the danger of loan default. These agreements provide an extra degree of protection for both lenders and borrowers by automatically enforcing the terms of the loan agreement and often including options for loan forgiveness under particular circumstances.

Keywords

Cybersecurity, Data Integrity, User Privacy, Encryption Techniques, Consensus Procedures

1. Introduction

In a time when obstacles and inefficiencies beset traditional lending processes, blockchain technology's introduction presents a game-changing remedy. Our blockchain-powered

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platform uses crowdsourcing and streamlined settlement procedures to completely rethink the loan industry. Fundamentally, this ground-breaking technology removes the barriers associated with traditional financial intermediaries by linking borrowers.

Every transaction is safely recorded through the use of blockchain's decentralized ledger, encouraging openness and confidence among participants. Smart contracts, which are digital agreements stored in the blockchain, streamline the loan application process and guarantee that terms and conditions are carried out without a hitch. Lenders are able to make well-informed decisions on loan offers because they have access to real-time data and risk assessments, while borrowers start loan requests and explain their needs. The platform's in-house loan matching technology matches qualified lenders with borrowers based on variables like risk profiles, interest rates, and loan amounts. The system assesses consumers' creditworthiness using sophisticated machine learning techniques, enabling fair and customized loan terms.

The optimization of the settlement process is one of its main breakthroughs. Transactions between lenders and borrowers happen quickly, safely, and without the use of conventional banking middlemen by utilizing blockchain's built-in features. This makes lending more accessible to a wider range of participants by cutting

down on transaction costs and processing delays. The platform's in-house loan matching technology matches qualified lenders with borrowers based on variables like risk profiles, interest rates, and loan amounts. The system assesses consumers' creditworthiness using sophisticated machine learning techniques, enabling fair and customized loan terms. The optimization of the settlement process is one of its main breakthroughs. Transactions between lenders and borrowers happen quickly, safely, and without the use of conventional banking middlemen by utilizing blockchain's built-in features. This makes lending more accessible to a wider range of participants by cutting down on transaction costs.

Our platform is designed with security and transparency as top priorities. Blockchain reduces the risk by guaranteeing that all transactions are auditable and tamper-proof through its immutable ledger. Our platform is designed with security and transparency as top priorities. Blockchain reduces the risk by guaranteeing that all transactions are auditable and tamper-reducing the likelihood of fraud and building ecosystem trust. Furthermore, the integrity and legality of the platform are maintained by regulatory compliance procedures, including as strong KYC and AML protocols. By democratizing access, improving efficiency, and building trust, our blockchain-based crowdsourcing lending platform transforms the lending

industry. Through the utilization of blockchain technology, we are revolutionizing the financial landscape, bringing about more inclusive, transparent, and resilient financing than in the past.

2 Literature Review

The paper of inquiry "Blockchain Solution for Enhancing Risk Management and Transparency in Loan Disbursements" by Sonawane, Ninad & Gupta, Pranshu & C. Laksh & S. Gururaja (2023) focuses on the urgent problem of financial fraud in loan disbursements in the international lending market. It draws attention to the dangers associated with borrower behaviors including submitting the same collateral to several institutions, as well as the shortcomings in collateral evaluation and banks' reliance on borrower reputation. To reduce these vulnerabilities, a Blockchain framework with multi-signature smart contracts is introduced in the suggested solution. The framework seeks to strengthen risk management and regulatory compliance in the loan distribution process by establishing a consolidated loan registry across various banks and improving transparency via the use of Risk Management Scores (RMS) and synchronized record-keeping procedures.

The paper of inquiry "A Peer-2-Peer Management and Secure Policy of The Energy Internet in Smart Microgrids" by S. Ding, J. Zeng, Z. Hu, and Y. Yang (2023) analyses the rise of peer-to-peer (P2P) energy trading in industrial settings, including vehicle-to-grid networks and microgrids, emphasizing the security risks as well as the possible advantages. Because they are opaque, traditional energy markets frequently rely on middlemen, which creates weaknesses. The authors suggest the Energy Blockchain (EBC), a safe solution designed for peer-to-peer energy trading in the Industrial Internet of Things (IIoT), as a solution to this problem. By using blockchain technology, EBC ensures secure and transparent transactions, doing away with the need for middlemen. The report also recommends a credit-based payment option to reduce EBC transaction delays and guarantee quicker transactions without sacrificing security. Additionally, a system-wide credit-based loan management method based on the Stackelberg game is suggested. The research paper shows how EBC and credit-based payments work well together to provide a safe and effective P2P energy trading solution in IIoT environments, thereby promoting a more dependable and transparent energy market in industrial settings through real-world data analysis and simulations.

The paper of inquiry "Zero-Chain: A Blockchain-Based Identity for Digital City Operating System" by Asamoah, K. Omono, Xia, Amofa, Sandro, Amankona, and Obiri Isaac (2020)

explores the issues raised by the world's growing urban density and the need for cities to manage their resources more effectively. Digital technology integration becomes essential with the rise of the smart city concept as a remedy. The authors stress the necessity of a thorough digital identification solution that covers every element of the smart city ecosystem, including people, processes, and real and intangible assets. The digital city operating system, which they propose as a uniform, distributed platform for data integration, is specifically designed to enable secure identification of individual citizens. Upon successful verification, user attributes are gathered and securely transferred for the purpose of creating a digital identity that is kept on the blockchain. This technology establishes the foundation for a digital infrastructure supporting security.

The paper of inquiry "Excrowd: A Blockchain Framework for Exploration-Based Crowdsourcing" by Seth Larweh Kodjiku, Kodjiku SL, Fang Y, and Han T (2022) discusses how crowdsourcing paradigms can be revolutionized by blockchain technology. Blockchain-based crowdsourcing, which uses smart contracts for work and reward allocation, appears as an alternative to centralized methods with the emergence of cryptocurrencies and decentralized apps. The authors list a number of issues with traditional crowdsourcing systems, including incentive distribution and evaluation inequalities, expensive service costs, and biased reputation-based systems. In response, they present ExCrowd, a crowdsourcing platform built on the blockchain that uses smart contracts as a reliable authority to solve these issues and protect user privacy. The hyperbolic learning curve model and decision tree technique are used in the system's exploration-based crowdsourcing for worker selection and performance analysis. The paper describes the ExCrowd architecture and puts it into practice on the Ethereum public test network to show its efficiency, scalability, adaptability, and dependability.

The paper of inquiry "Privcrowd: A Secure Blockchain-Based Crowdsourcing Framework with Fine-Grained Worker Selection" authored by Qiliang Yang, Tao Wang, Wenbo Zhang, and Bo Yang (2021) By introducing blockchain-based systems that mitigate problems like single points of failure and Sybil attacks, the authors of the paper "Privcrowd: A Secure Blockchain-Based Crowdsourcing Framework with Fine-Grained Worker Selection" (Qiliang Yang, Tao Wang, Wenbo Zhang, and Bo Yang, 2021) address the shortcomings of centralized crowdsourcing platforms. But security and privacy issues still exist in blockchain-based crowdsourcing platforms, especially when it comes to sharing participants' private information and the requirement to protect privacy when doing activities like image

categorization and location-based data collection. The authors suggest PrivCrowd, a safe blockchain-based crowdsourcing system with precise worker selection, as a solution to these problems. PrivCrowd selects workers based on similar traits and protects task data privacy with a workable encryption strategy. PrivCrowd provides safe and passive solution gathering, as well as trade and fairness in evaluation for workers and requesters, by means of smart contracts. The practicality, usability, and effectiveness of PrivCrowd in resolving privacy and security issues in crowdsourcing contexts are validated by the outcomes of the experiments.

The paper of inquiry "An Overview on Smart Contracts: Challenges, Advances and Platforms" authored by Zibin Zheng, Shaoan Xie, Hong-Ning Dai, Weili Chen, and Jian Weng (2021) gives a thorough analysis of smart contracts and how they affect traditional business procedures and industry. Smart contracts are integrated into blockchains to enable the automatic enforcement of contractual requirements without the involvement of a third party that can be trusted. This reduces costs associated with services, streamlines administration, improves the efficiency of corporate processes, and minimizes risks. Even with smart contracts' revolutionary potential, a number of obstacles still exist. With the help of sample examples, the article surveys the subject of smart contracts, including blockchain technology, the difficulties that smart contracts offer, recent technological developments, a comparison of smart contract platforms, and the classification of smart contract applications. Researchers, developers, and practitioners looking to maximize the potential for innovation in smart contracts will benefit greatly from the information provided by this survey, which offers insights into the rapidly changing world of smart contracts.

The paper of inquiry "Decentralizing Privacy Implementation at Cloud Storage Using Blockchain-Based Hybrid Algorithm" authored by Darwish, Marwan Adnan, Eiad Yafi, et al. (2020) discusses the important issues around security and privacy in cloud computing (CC) systems. Concerns about service-level agreement (SLA) violations including privacy exposure, data loss, and manipulation have surfaced despite the cloud computing industry's explosive expansion and promise. The authors suggest a blockchain-based hybrid algorithm to improve cloud storage privacy efficiency in order to address these issues. The method encrypts data using a revolutionary hybrid technique that generates and stores unique digital signatures on a decentralized set of blocks, before outsourcing the encryption process to data centers. The suggested framework, while requiring more processing power because of blockchain integration, shows intact data integrity, dependability, and enhanced user privacy through testing in a virtual cloud environment.

3 Objective

The project's objective is to create a crowdsourcing loan platform that democratizes access to financial services for people and small enterprises by utilizing blockchain technology and effective settlement processes. With the use of smart contracts and blockchain technology, this platform will simplify settlement procedures and offer transparent, safe, and affordable loan options. The program seeks to improve financial inclusion by guaranteeing security and transparency, which would make it simpler for impoverished people to obtain the money they need.

The ultimate goal is to support gender equality in the financial industry, encourage entrepreneurship, and offer loans at reasonable interest rates, all of which will help to reduce poverty and boost the economy. This effort is in line with the larger objectives of sustainable development while also promoting individual economic empowerment. The goal of the initiative is to build a strong economic foundation that can support long-term growth and stability in developing nations by facilitating more egalitarian and accessible financial services.

Through the use of cutting-edge technology, the platform seeks to transform financial access and promote social and economic advancement by offering dependable financial services to disadvantaged communities.

4. Need/Scope of the Project

The project's scope includes designing, creating, and deploying an all-inclusive crowdsourcing lending platform utilizing blockchain technology and streamlined settlement procedures. The goal of this project is to define the architecture, features, and user interface of the platform so that lenders and borrowers can communicate easily. The platform's key feature is the incorporation of blockchain technology, which makes it possible to record loan transactions in a transparent, secure, and unchangeable manner. To ensure efficiency and reliability, smart contracts will be used to automate loan agreements and settlement processes.A major component of the initiative is creating reliable risk assessment tools that use crowdsourcing to analyze borrowers' creditworthiness. This novel method guarantees dependable and data-driven lending selections. The platform is made to support a variety of loan kinds, such as microloans, business loans, and personal loans, meeting the needs of a broad spectrum of users and encouraging financial inclusion.

The project's scope includes considerations for scalability, interoperability, and regulatory compliance, which guarantee the platform's sustainability and long-term viability. Interoperability ensures that the platform can interface with other financial systems and technologies, while scalability ensures that the platform can handle growing numbers of users and transactions. Regulatory compliance guarantees that the platform complies with laws and rules, upholding its legality and credibility. The overall goal is to establish a strong financial ecosystem that promotes social impact, innovation, and inclusivity. In order to promote economic empowerment and the reduction of poverty, the platform offers fair and easily accessible financial services that are in line with the global sustainable development goals. This all-encompassing strategy guarantees that the platform not only provides for short-term financial requirements but also supports long-term stability and economic growth in developing nations.

5. Problem Statement

Traditional Student Loan Challenges: Students may have heavy debt loads as a result of the present, complicated system for financing higher education. Limited Access to Capital: A lack of traditional credit history or financial resources makes it difficult for many worthy students to get funding for their education. In efficiencies in Loan Processing: The application and approval procedures for student loans can be cumbersome and drawn out. Lack of Transparency: Students frequently do not have access to clear information about interest rates, repayment schedules, or loan terms. Security Issues: Data leaks and hacking are possible with centralized systems that store student loan information. Uncertainty Regarding Student Incentives: Other than loan access, there isn't a clear benefit listed to encourage students to engage with the network. Uncertain Repayment Mechanism: There is no explanation of how loans are managed or repaid.

6 Architecture

This proposal describes a blockchain-based network that will transform the financing of student loans. The system, which was developed in Python and makes use of SHA-256 hashing for security, attempts to make the process more visible and effective for investors as well as students.

Important data, such as encrypted student IDs, loan details (amount, interest, and payback time), and encrypted investor data, are stored in each block of the blockchain ledger. This preserves a tamper-proof record of transactions while guaranteeing data privacy. Secure

hashing is handled by Python libraries like hashlib, and for an additional degree of security, ecdsa can encrypt investor and student IDs.

The core of the system is a Python-coded smart contract. Based on contractually specified terms, this self-executing application automates loan disbursement and repayment. While a student site makes loan applications, offer reviews, and payback tracking easier, an investor portal lets users browse loan requests and investment options.

The use of blockchain technology has many benefits. First of all, the blockchain maintains a permanent record of every loan detail, which promotes transparency and confidence. Second, by streamlining loan processing and disbursement, the technology may lower administrative barriers.
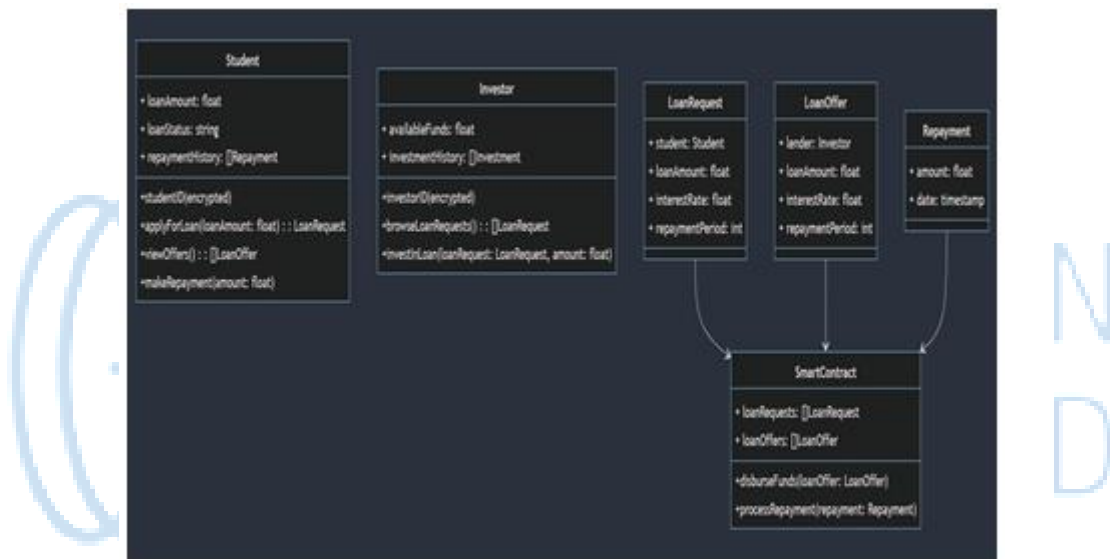
Thirdly, by practically making data unalterable, blockchain technology improves security. Lastly, by offering cryptocurrency prizes for validating transactions (also known as mining) on the network, later versions can encourage 'student' involvement. Keep in mind that this is only a conceptual framework. For real-world deployment, extensive development, strong security protocols, and possible interaction with well-known blockchain platforms such as Ethereum or Hyperledger Fabric are required. Though this system has potential for student loan funding in the future, it should not be used in real-world financial applications without extensive security assessments and legal compliance as it is presently intended primarily for educational purposes.
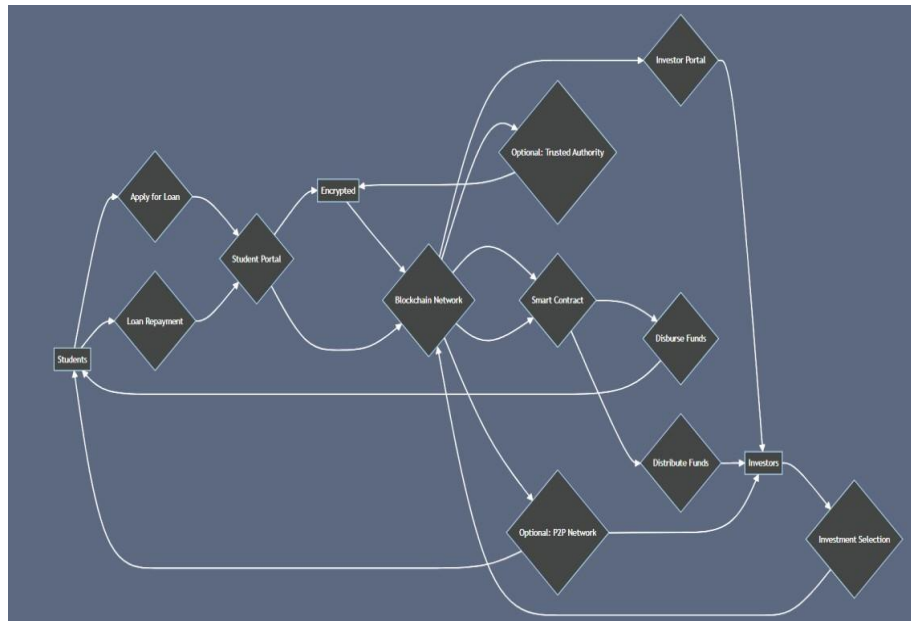
Fig: Architecture Diagram for Proposed System

An architectural diagram usually shows the parts and organization of a system or program, showing the relationships between different components. They frequently consist of several levels, including the data layer, presentation layer, and business logic layer. The visual representation of the links and links and data flow between these levels highlights the system's overall operation and design. Architecture diagrams can be used to illustrate particular technologies, servers, databases, and communication protocols used in a system in a technological setting. They support stakeholder communication and development by acting as a visual assistance for comprehending the general architecture of the hardware or software. Blockchain technology is gaining acceptance quickly due to the growing desire for transparency in the agri-food industry from both government authorities and customers. On the Ethereum platform, upgrading these contracts can be difficult and disruptive.

Proof of Authority (PoA) is a consensus method that relies on reputation and offers a workable and effective solution for blockchain networks, particularly private ones. Because the PoA consensus mechanism capitalizes on the value of dentities, block validators are taking their reputations rather than cash. As a result, the randomly chosen validating nodes that serve as reliable entities safeguard PoA blockchains. Because it depends on a small number of block validators, the Proof of Authority concept is an extremely scalable system. Participants who have been pre-approved and serve as system moderators verify blocks and transactions.

7. Implementation

The given code snippet imports a number of packages and modules that are necessary for Django web development and blockchain implementation. Block creation, transaction management, and blockchain validation are among the features associated with blockchain data structures that are probably encapsulated in the "Blockchain" and "Block" modules. To help with optimization, the "timeit" module allows performance measurement by timing code execution. The "random" and "string" modules enable the creation of random data, which could be helpful in a blockchain setting for testing and 'simulation' purposes. The "django.shortcuts" module on the Django side provides tools for managing user authentication, processing HTTP requests and responses, and generating templates—all essential tasks for developing online applications. In a similar vein, the "django.contrib.auth" module offers user authentication and authorization features that are essential for safeguarding web applications and controlling user access.

Forms and database models—two crucial Django components for managing user input validation and data persistence—are probably defined in the ".forms" and ".models"`modules. Developers can create safe, dependable web apps with blockchain features by utilizing these packages and modules. Decentralized and impenetrable data structures may be implemented with the help of the blockchain-related components, and Django offers a framework for building user-friendly web interfaces and handling user authentication and data storage. By combining Django with blockchain technology, developers may construct cutting-edge, safe online applications that can handle sensitive data and transactions.

```python
from django.shortcuts import render
from django.contrib.auth import authenticate, login, logout
from .forms import CustomerSignUpForm, CustomerLoginForm, UpdateCustomerForm
from django.shortcuts import redirect
from .models import CustomerSignUp
from django.http import HttpResponseRedirect, HttpResponse
from django.urls import reverse
from django.contrib.auth.decorators import login_required
from django.contrib.auth.models import User
```

Creation of Smart Contact:

A self-executing contract with its terms encoded directly into code is known as a smart contract. Because it is blockchain-based, the agreement's immutability, security, and

transparency are guaranteed. For the Ethereum blockchain, smart contracts are usually written in programming languages like Solidity. Without the need of middlemen, they automate and enforce the performance of commercial agreements. Tokenization, supply chain management, voting systems, and decentralized finance (DeFi) are just a few of the uses for smart contracts. After being installed on the blockchain, smart contracts run independently and carry out preset activities in response to certain triggers. By using the decentralized network of nodes to reach consensus, they make sure that everyone is abiding by the rules of the agreement. This technology has the power to completely transform conventional company procedures by cutting expenses, decreasing mistakes, and improving transactional efficiency.

Connection with Python Django:

The process of connecting Python with Django entails utilizing Django's integrated Python support. To define models, views, forms, and templates, developers use Python code. This enables the building of dynamic web applications. Django skill fully combines the simplicity and flexibility of Python with robust web development tools like database administration, template rendering, and URL routing. With the help of Python's vast libraries and frameworks, developers can effectively create scalable and reliable web applications by enhancing Django's capability. Developers may easily create high-performance web apps using Python and Django by utilizing the readability of Python and the productivity-boosting features of Django.

Registration:

Borrowers, lenders, and validators all have different registration processes that are specific to their roles on the blockchain-based loan sourcing platform. During registration, borrowers usually supply information about themselves, their credit history, the terms of the loan, and the details of any collateral. This information contributes to the creation of a profile that guarantees the accuracy of borrower data and promotes transparent loan transactions. Lenders typically need to register using their business credentials, contact details, lending preferences, and risk assessment standards. Lenders are integral to the platform's lending ecology, helping to fund loans and evaluate borrower creditworthiness. Verification credentials, competence areas, and reputation scores are provided by validators upon registration. In order to check loan requests, determine borrower eligibility, and guarantee platform rules are being followed, validators Additional procedures like identity verification, submitting supporting evidence, or accepting platform rules and regulations may be required during registration,

depending on the platform or system being utilized. The goal of the registration procedure is to create a reliable network within the blockchain loan sourcing platform for lenders, validators, and borrowers. It makes loan transactions more transparent, efficient, and trustworthy, which facilitates smooth lending procedures and improves the experience for all parties involved.

```python
def sign_up_view(request):
    error = ''
    if request.user.is_authenticated:
        return HttpResponseRedirect(reverse('home'))
    form = CustomerSignUpForm()
    if request.method == 'POST':
        form = CustomerSignUpForm(request.POST)
        # print(form.cleaned_data['username'])
        if form.is_valid():
            user = form.save()
            user_profile = CustomerSignUp(user=user)
            user_profile.save()
            username = form.cleaned_data['username']
            password1 = form.cleaned_data['password1']
            print(username,password1)
            user = authenticate(request, username=username, password=password1)
            if user is not None:
                login(request, user)
                return HttpResponseRedirect(reverse('home'))
            return HttpResponseRedirect(reverse('login_App:login_customer'))
        else:
            if User.objects.filter(username=request.POST['username']).exists():
                error = 'customer already exists'
            else:
                error = 'Your password is not strong enough or both password must be same'
    return render(request, 'loginApp/signup.html', context={'form': form, 'user': "Customer Register", 'error': error})
```

Log in:

```python
def login_view(request):
    form = CustomerLoginForm()
    if request.method == 'POST':
        form = CustomerLoginForm(data=request.POST)
        # username = request.POST['username']
        # password = request.POST['password']
        # print(username, password)
        if form.is_valid():
            username = form.cleaned_data['username']
            password = form.cleaned_data['password']

            user = authenticate(request, username=username, password=password)
            if user is not None:
                login(request, user)
                return HttpResponseRedirect(reverse('home'))

        else:
            return render(request, 'loginApp/login.html', context={'form': form, 'user': "Customer Login", 'error': 'Invalid username or password'})
    return render(request, 'loginApp/login.html', context={'form': form, 'user': "Customer Login"})
```

Fig: Login Page

Users can log in as lenders, validators, or borrowers on this blockchain-based loan sourcing platform. Each position and functionality is distinct. Features that let borrowers apply for loans, supply collateral, and monitor loan statuses are available to them. Conversely, lenders have the ability to examine loan applications, finance loans, and receive interest on their capital. In order to check loan requests, determine borrower eligibility, and guarantee

platform rules are being followed, validators are essential. Every kind of user on the platform adds to the lending ecosystem, which makes it easier for borrowers and lenders to trade loans in an open and effective manner.

8. Result and Discussion

Blockchain technology's Proof of Authority (POA) and Proof of Stake (POS) consensus techniques are compared in the context of food supply management; each has unique benefits and uses. The foundation of Proof of Authority is the identification of reliable validators who are given permission to approve transactions and add new blocks to the blockchain. These validators are usually well-known members of the network, including respectable companies or people, who are selected for their experience and reliability. When it comes to food supply management, POA is comparable to reputable certification organizations or well-established regulatory bodies that are in charge of confirming the legitimacy and caliber of food items. Their support gives the supply chain legitimacy and reassures customers about its dependability and honesty. However, Proof of Stake works on a different principle, selecting validators according to the amount of bitcoin tokens they own and are prepared to "stake" as security. A higher stake increases the likelihood that a validator will be chosen to validate transactions and receive rewards. Proof of Stake can be compared to supply chain participants, including farmers, distributors, retailers, and consumers, who have a stake in maintaining the system's efficiency and transparency in the context of managing the food supply. Their involvement and commitment in the supply chain are what make it more dependable and secure. In summary, Proof of Stake encourages active involvement and investment from stakeholders to safeguard the network, whereas Proof of Authority depends on reliable validators to uphold the integrity of the blockchain. These consensus-building techniques can be used in conjunction with one another to guarantee credibility and transparency in the food supply chain.

A system or process's performance and efficiency can be greatly improved by comparing the Point of Arrival (POA) and Point of Sale (POS) over time. When goods or services are delivered to a specified location, such a warehouse or retail store, they are represented by the POA, and when they are sold to customers, they are represented by the POS. Businesses can have a thorough grasp of their supply chain and sales operations by examining the trends and patterns of POA and POS data over time.A stable and harmonious connection between POA and POS signifies a proficient inventory management and supply chain framework. To

guarantee that there is enough stock on hand to satisfy client demand, the POA should ideally come before the POS. Inconsistencies in the dates of POA and POS could indicate stockouts or overstocking, two types of inventory management inefficiencies. For example, regular occurrences of POS before POA may indicate a delay in inventory replenishment, which could result in lost sales opportunities or disgruntled customers.
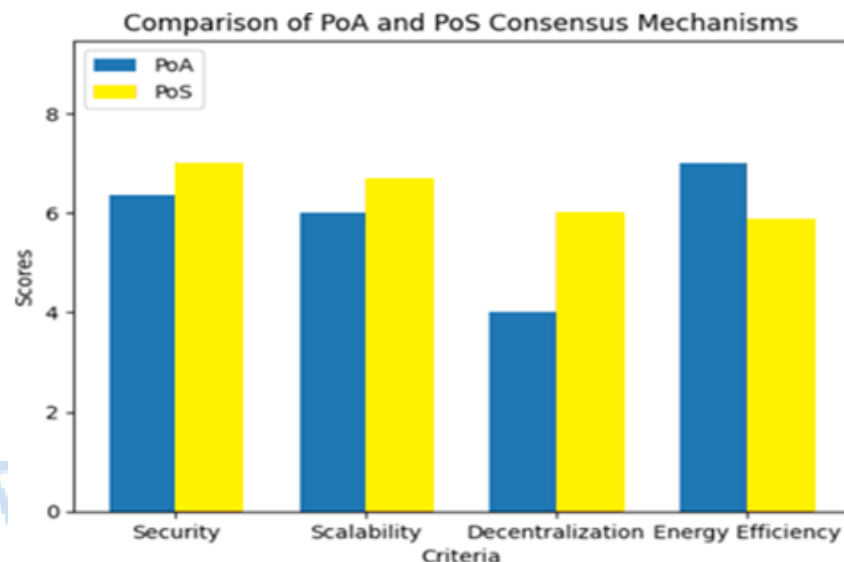

Fig: Comparison of Poa and Pos

9. Conclusion

To sum up, this proposal offers a fresh idea for a blockchain-based platform that upends the current student loan structure. Through the utilization of smart contracts and blockchain technology, the system seeks to create an environment that is more efficient, safe, and transparent for investors as well. The primary advantages are increased accountability and transparency due to the blockchain's immutable records. Efficiency is increased by using automated smart contracts for streamlined loan processing and payout. Furthermore, by making data unchangeable, blockchain technology greatly improves security. In the future, student participation might be encouraged by offering them money in exchange for confirming network transactions. With more funding available, students may be able to reach investors who may not have had much experience with traditional loans. Nevertheless, this concept acts as a basis for additional advancement. It is essential to conduct a thorough security audit in order to find and fix any vulnerabilities before implementing in the real world. Relevant financial regulations in the target markets must also be complied with in the design and operation of the system. Investigating pre-existing blockchain frameworks can

maximize functionality and expedite development. Scalability and speed optimization are important factors to take into account when managing a large number of users and transactions. Pilot testing in the real world with a small user base might yield very useful feedback for additional improvement. Ultimately, putting decentralized identification systems into practice can improve user privacy and data control even further.

With continued innovation and attention to these factors, this blockchain-based strategy has the potential to completely transform the student loan market. It may open the door to a time when everyone can get an education at a lower cost.

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