Higher Education Financing with Blockchain-Based Crowdsourcing Models

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ABSTRACT:

Financial difficulties continue to restrict access to education in developing countries. This initiative presents a solution in the form of a blockchain crowdsourced student loan platform. The platform connects students, brokers, and global investors in a decentralized network for secure, transparent, and efficient student loan financing. Brokers authenticate student credentials, then submit loan applications to brokers, and global investors provide the required capital, which is paid back with interest after the student graduates. The use of smart contracts and blockchain technology also serves to create a tamper-proof system that enhances accountability and reduces the burden on the government. This model improves the availability of education, encourages sustainable financing, promotes collaboration on a global scale, and fosters innovation. This model is transformative for the management of educational loans in developing countries, providing a workflow that can adapt to future needs.

Keywords: Crowdsourcing, loan, blockchain

INTRODUCTION

The socioeconomic impacts of higher education cannot be ignored, yet for many young people in developing countries, access remains elusive due to scarce resources. For many, access to education is limited by financial means. With traditional government-funded student loan programs, the limited availability of education financing is intensely felt, and the strain caused by global crises, such as COVID-19, places additional strain on the system. This proposal introduces a blockchain-based crowdsourced loan platform that allows students to access loans with the aid of a global financing network in a secure and transparent manner. In comparison to traditional models, this one leverages blockchain technology's immutability and smart contracts for security, traceability, and fairness. Students take out loans, their credentials are verified by brokers, and investors finance their education in exchange for a percentage of their future earnings. This ecosystem not only diminishes reliance on government subsidies, but also opens up worldwide

opportunities for education investment. Through decentralization, the platform seeks to transform student financing, making advanced education more accessible, reliable, and eco-friendly.

RELATED WORK

Innovations in educational financing systems have greatly accelerated due to the integration of blockchain technology and crowdsourcing. Zhao and Zhu (2014) carried out a primary assessment of crowdsourcing, focusing on its promise in decentralized problem-solving, noting its increasing significance in domains such as education, public participation, and collaborative frameworks. This work provided the rationale for the application of crowdsourcing in non-commercial contexts. Kodjiku et al. (2020) introduced the ExCrowd framework, a blockchain-based platform to resolve traditional crowdsourcing problems using smart contracts. This research showed the impact on transparency and satisfaction with work of blockchain-controlled reputation systems and incentive structures which can also inform the governance of student-investor relations. Turkanovic et al. (2018) created EduCTX, a decentralized education credit system which is based on the European Credit Transfer System (ECTS). Their system used a blockchain ledger to automate the verification of student achievements, creating trust between the institutions and learners, which allows for a trust model that is applicable to financial information in

student loans. Sunny et al. (2021) conducted a blockchain technology applications scanner and a comprehensive review across various domains. Their findings indicated that the use of blockchain in education is growing, and pointed out the possibilities for the blockchain to enhance transparency and data integrity and operational efficiency which is critical for the financial sectors that deal with public funds and private investment. Li and Han (2022) introduced EduRSS, an educational record blockchain-based and cryptographically secured record issue system. Their study stressed the need for privacy preserving storage and data sharing which is important in student loan systems that deal with sensitive financial and academic information.

TABLE1. Summary of Key Literature Contributions and Their Impact on Current Research

Author(s)	Contribution	Impact on Current Research
Zhao & Zhu (2014)	Explored crowdsourcing fundamentals, challenges, and research gaps	Provided theoretical base for applying crowdsourcing in decentralized finance for education
Kodjiku et al. (2020)	Proposed ExCrowd, a blockchain-based crowdsourcing platform with smart contracts	Informed the trust, incentive, and reputation mechanisms in student-investor relationships

Turkanovic et al. (2018)	Developed EduCTX for decentralized education credits	Introduced blockchain validation for educational achievements, transferable to loan systems
Sunny et al. (2021)	Reviewed blockchain applications across sectors including education	Highlighted blockchain's rising relevance and operational efficiency for educational systems
Li & Han (2022)	Proposed EduRSS for secure storage of educational records using blockchain	Emphasized privacy, secure sharing, and data integrity—crucial for financial and student records

PROPOSED APPROACH

This study proposes a solution to the financial difficulties of students from underdeveloped countries by creating a blockchain based crowdsourcing system. The system unites three primary participants: students (loan requesters), brokers (verifiers), and investors (funders). Through a web form, students apply for loans and specify their academic information as well as guarantors. Brokers verify the applications and allocate suitable investors based on the criteria like the amount requested and the investment ceiling. The entire process starting from registration, verification, and loan disbursement to repayment monitoring is managed through smart contracts within the Ethereum blockchain. Upon matching
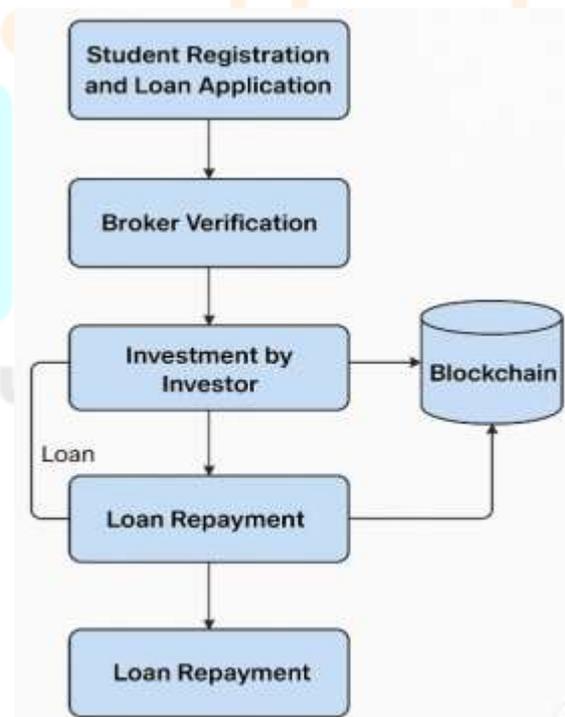
student with an investor, the contract automates the distribution of funds and enforces the repayment terms. Once students with a funded education get a job and start repaying, the investors get back their principal amount with the agreed interest. With the blockchain, there is immutability, security, and transparency for all the information and transactions. The system also removes the need for government facilitators, thus, speeding up the process, and building trust amongst users. It also broadens the scope of financing by students, thus, making the financing more available globally. Investors get a well-structured low-risk investment avenue to fund the academic pursuits of students, while disadvantaged students get a chance to improve their education. This innovative model supports students from low-income families who wish to pursue higher education.

Figure 1: Proposed educational funding System

METHODOLOGIES

The proposed blockchain-based crowdsourcing loan platform is developed using a layered and modular methodology that integrates frontend design, backend processing, smart contract development, and blockchain interaction.

1. System Architecture and Technology Stack:

The platform comprises three main components: the user interface (UI), the Django-based backend server, and the Ethereum blockchain. HTML/CSS and JavaScript are used for the UI, offering responsive and user-friendly interaction. The backend, built using Django, handles user authentication, broker-verification processes, and API calls to the blockchain via Web3.py. Ganache is employed as a local Ethereum environment for testing and development purposes.

2. Smart Contract Design:

Smart contracts are written in Solidity and deployed on the Ethereum network. These contracts manage core functions like addUser, setLoanRequest, and setPayment. They ensure decentralized automation of user registration, loan request submissions, investor allocations, and repayment tracking. The contracts are immutable and execute only when predefined conditions are met, thus maintaining system integrity.

3. Workflow Process:

- **Student Module:** Students sign up and submit loan requests.

- **Broker Module:** Brokers verify details and assign matching investors.

- **Investor Module:** Investors choose to fund loans and monitor repayments.

- **Smart Contract Automation:** Handles fund disbursement and repayment using logic-based conditions.

4. Security and Data Integrity:

To ensure data integrity and security, blockchain transactions are cryptographically signed. User data is hashed and stored securely, preventing tampering and unauthorized access. The platform supports transparency as all actions are traceable on the ledger.

5. Testing and Validation:

Unit and integration testing are performed using Django's testing tools and Ethereum's Truffle Suite. Functional testing includes use-case validation and error handling for user roles. A comparison graph visualizes storage benefits using blockchain compression versus traditional storage.

RESULTS

The developed platform was tested in a simulated blockchain environment using Ganache, with interactions conducted through the Django-based web interface. Functional testing confirmed that students could successfully register, apply for loans, and view their loan status. Brokers were able to verify applicants and assign appropriate investors, while investors

could allocate funds and monitor repayments.

Smart contracts handled key operations such as loan disbursement and repayment tracking without manual intervention. The immutability and transparency of blockchain ensured that no transactions could be altered once recorded, enhancing system trustworthiness. Investors received timely updates, and repayments were automatically linked to student job statuses through smart contract triggers.

A comparative analysis between traditional storage and blockchain-based compression demonstrated significant space efficiency, as shown in a visual bar chart. Additionally, response times remained consistent under varying loads, indicating system scalability.

Security audits confirmed that user credentials and transaction data were secure, thanks to blockchain hashing and digital signatures. The integration of Web3.py with the Django backend proved effective in maintaining real-time interaction with the Ethereum network.
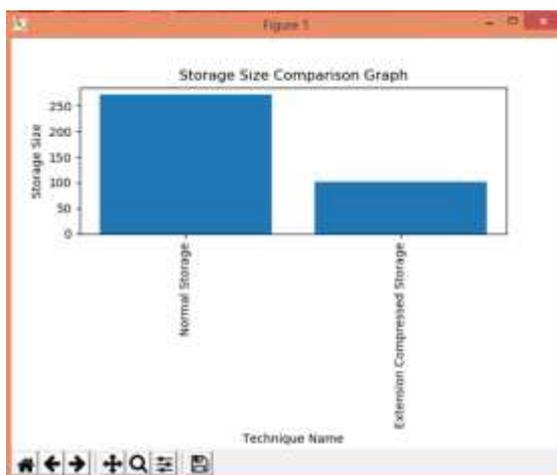
X-axis shows two methods: the normal technique and the compression technique. The y-axis represents the storage size. When we use the normal method, the storage size is higher, which means the cost is also more. But when we apply the compression technique, the storage space used becomes much smaller, which helps reduce both the storage requirements and the overall cost.

DISCUSSION

The results of this project highlight the transformative potential of blockchain technology in the field of educational finance, particularly for developing countries. Traditional student loan systems are often plagued by inefficiencies, bureaucratic delays, and lack of transparency, which this platform effectively addresses. The integration of smart contracts enables automated enforcement of loan agreements, ensuring that funds are only disbursed and repayments triggered under verified conditions.

The system's decentralized nature reduces dependency on government funding and invites global participation, thereby expanding the funding pool. Investors gain confidence from the immutability and transparency offered by blockchain, which ensures that loan allocations and repayments cannot be tampered with. Students benefit from streamlined access to funds and a simplified application process.

One challenge identified was investor selection optimization, which may require advanced algorithms in future iterations to enhance matchmaking accuracy. Additionally, while local testing yielded promising results, scaling to a public Ethereum network may introduce cost and latency concerns due to gas fees and transaction times.

CONCLUSION

With the help of blockchain-based crowdsourcing, this project offers a practical and pioneering response to the funding gap for education in developing nations. It integrates students, brokers, and investors into a single trust-less ecosystem with transparency and security. The entire loan process for applications, verification, funding, and repayment is automated and secure using smart contracts. The administrative burden is minimized, and real-time tracking coupled with unchangeable records improves trust from the investors. Blockchain technology not only improves trust, but also aids in enhancing data integrity. This model, which shifts the funding burden from governments to global investors, creates a more inclusive and sustainable model for student financing. The platform, however, still has to tackle unresolved issues like blockchain scalability and investor matchmaking. After refinement and deployment in the real world, this platform has the capability to change the perception of student funding for those in economically challenged regions, thereby giving the power to a larger number of students to realize their academic ambitions.

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