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Decentralized Finance

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Abstract: Currently, in the world there is a growing interest in the digital economy including the blockchain technology. Decentralized Finance (DeFi) is one of the leading current blockchain technology-related trends. Decentralized Finance (DeFi) is the (r)evolutionary movement to create a solely code-based, intermediary-independent financial system—a movement which has grown from \$4bn to \$104bn in assets locked in the last three years. Our paper is a p2p blockchain lending service. Using this application, people would be able to take loans on the blockchains. That means they can essentially lock up certain assets and borrow other cryptocurrencies and then pay back later after a certain amount of time.

Keywords: BlockChain, decentralized finance, DeFi, blockchain, ethereum, cryptocurrency, Loan Management System, User Privacy, Smart Contracts.

I. INTRODUCTION

Banking security and privacy remains a major challenge. This brings in the new technology in the field of financial services industry in the form of blockchain banking [1]. From greater user privacy and heightened security to lower processing fees and fewer errors, blockchain technology can make tremendous change in banking sector [2]. In this paper, the various core components and functions of the smart contract are outlined and analyzed. The proposed BC-based loan management is secure by thoroughly analyzing its security with respect to the fundamental security goals of confidentiality, integrity, and availability. The proposed system aims on preventing fraudulent attacks by decentralising the processes involved in Loan Sanctioning by using smart contracts and Ethereum Blockchain. Ethereum is an open-source, blockchain-based, platform which gives way for developing various Distributed Applications (DApps) for creating Smart Contracts. This platform provides advantages such as controlling frauds, system downtimes, interferences and the third-party frauds. Proof of authority and proof of work algorithms ensures that the data is real, authorized and immutable.

II. OBJECTIVE OF THE STUDY

- 1) Factors and attributes affecting lender, borrowers and the P2P platform, particularly in the context of Indian marketplace are studied.
- 2) Features of Blockchain and how they can help in P2P lending are explored.

III. SIGNIFICANCE OF THE STUDY

This study is significant for the development of the P2P lending industry, particularly in developing markets such as in India. Existing platforms can consider various blockchain features that can help them in better resource utilization and access to extending their business globally.

IV. DISCUSSION

A. History and Growth of P2P Lending

The first peer-to-peer loans are underwritten in the United Kingdom in 2005. The concept soon moved to the United States and Korea (2006) and later to other countries such as China and Sweden (2007), Israel (2011), Australia and India (2012), Ireland (2013), Indonesia, Bulgaria and Canada (2016), Latvia and Brazil (2018) etc. Zopa (UK), Prosper (US), Smava (Germany), WeLab (Hong Kong), SocietyOne (Australia), Trustbuddy AB (Sweden), Linked Finance (Ireland) and Money Auction (Korea) are the first p2p lenders in their respective regions.

With a 51.5% CAGR growth globally, P2P lending is currently the fastest growing segment in the finance industry. Market estimates that it will reach US \$460,312 million by 2022. With US \$15.98 billion lending in loans (as of 31 Dec 2015), LendingClub is the world's largest P2P lending company and the first such company to get listed on stock exchanges. Upstart, Funding Circle, Prosper Marketplace, CircleBack Lending and Peerform are some leaders in the category.

B. Peer 2 Peer Lending in India

Though introduced in 2012, much of p2p lending developments in India came after the Indian banking regulator Reserve Bank of India (RBI), vide a notification in September 2017, recognized P2P lending as a form of non-banking finance company (NBFC) and started issuing licenses to lending platforms. The Non-Banking Financial Company – Peer to Peer Lending Platform (Reserve Bank) Directions, 2017 notification dated October 4, 2017 is a master directions notification. It fairly dealt with the various aspects of p2p lending - eligibility criteria, registration process, scope of activities, prudential norms, operational guidelines, fund transfer mechanism, updates to credit information companies, transparency and disclosure requirements, fair practices code, grievance redressal, information technology framework, reporting requirements, supervision amongst others (RBI, 2017). Amongst key requirements to run a p2p lending platform include net owned fund of the company to be not less than Rs. 2 crores (to ensure skin-in-the game of the promoting company) and that the management and directors need to fulfil the 'Fit and Proper' criteria as laid out by RBI.

The size of the Indian p2p lending market is at Rs. 200 crores in 2018 and industry estimates it to cross Rs. 1000 - 1500 crores in 2019 and to reach US\$4 - 5 billion by 2023. One key reason for the development of p2p lending in India is because of the launch of digital stacks (Aadhar, eKYC and digital payments). Access to CIBIL data helped the platform in credit evaluation, analytics and reporting. Penetration is currently largely concentrated in Tier 1 cities and is in picking up in Tier 2 and Tier-3 cities. While most focus was on salaried class borrowers, attention is now going towards SME lending as well. Defaults or bad loans in Indian p2p lending are below 2% and hence are under control so far. Indian platforms are now gearing towards building a multi-tenanted infrastructure by migrating to blockchain that facilitates easy sharing of lending data so as to mitigate risk. Faircent made a US \$1 million commitment towards this. Industry challenges include low financial literacy levels, a general fear of using digital products for safety reasons, lack of proper financial infrastructure (because of low PAN card penetration, low income-tax return filings, lack of awareness on credit scores), redundant KYC processes etc.

C. Blockchain

Blockchain's role in reducing cost, processing time and eliminating non-value adding intermediaries and thereby value addition to existing businesses models, particularly in banking and finance segments is well discussed (VijayaKittu&Aruna, 2018). After getting initial acceptance from core banking and financial areas, the technology is now making inroads into secondary functional areas such as the asset management industry and mutual funds (VijayaKittu&Prasada Rao, 2018).

Decentralization eliminates dependency on a single location for data storage and retrieval. Centralized authority is removed with consensus mechanism. Immutability makes data cryptographically encrypted and hash tag can act as data identifier. This will make the data safe and tamper proof and hence puts fraud and corruption under control. Because transactional data is distributed across the network, other computers can act as data validators and hence transparency and accountability are automatically achieved in the system. The elimination of processes (by removing non-value adding intermediaries) or their simplification (by doing KYC only once) can help reduce processing cost in the financial services compared to the conventional system. Blockchain has proved immense cost cutting benefits in both inter-bank and intra-bank as per several use-cases already available. Enterprise blockchain had dramatic speed optimizations compared to the original blockchain implementations and is now reaching industry grade latency. Permissioning and layering in the form of public and private blockchains keeps data access allowed only to parties having permission. Enterprise blockchain provides all the three essentials - high performance, high resilience and privacy and hence a suitable technology for financial services.

D. Blockchain Advantages for P2P

A blockchain solution for global peer-to-peer lending is on the horizon. P2P lenders using blockchain can help reduce delays, make quick approvals, eliminate the need for middlemen and bring transparency. The speed of backoffice processing and settlement is one of the major reasons why financial institutions are interested in blockchain and the same applies for p2p lending as well. Increased efficiency and cost reduction are the next biggest bets. Due diligence - a key but time-consuming aspect of lending can be speeded up.

While traditional blockchain implementations are public or private, most enterprise blockchains are consortium blockchains with part public and part private, semi-decentralized and permissioned. Smart contracts and digital signing help establish a contract between the parties and helps in legal enforcement.

Once a loan is issued, tracing the utilization of funds (to a certain extent) as well as aiding in recovery of loans that turned bad are relatively easier on a blockchain. This would be necessary in countries with low penetration of debt recovery agencies and when p2p lending loans are not insured (Gonzalez, 2018).

Cryptocurrencies are themselves blockchain implementations and can straight away fit into the P2P lending architecture. Thus, fund flow in the lending system will be faster and can happen without any bank processing overheads or delays. Further, the lending platform can be scaled globally with both lenders and borrowers placing their bids digitally while physically present in different geographies. Further, the role and involvement of central bankers would be limited in such implementations. This exactly irks Central banks and Governments and they have mixed acceptance about cryptocurrencies as a legal tender. While some approved it totally (Australia, Japan etc.), some rejected outright (Bolivia etc.) while most others are dealing with it on a case-to-case basis (Canada, New Zealand etc.) (Thomson Reuters, 2017). An extension of cryptocurrency funding for the p2p lending can be in the form of wallet money on the lines of PayPal and PayTM which many wallet service providers are exploring.

Enforcement of regulatory rules will become easy on blockchain. In the Indian context, there is no check in regard to the lending limit enforcements (as to lenders limited to Rs. 10 lakhs across platforms) because there is 64 ISSN 2394 - 7780 no such network or checks within the lenders themselves. Compliance and data reporting to the regulator can be easy and will be available to the regulator as and when needed. This will move the platform to data-pull mode instead of data-push mode.

A robust blockchain implementation could eliminate the need of any third-party credit rating checks or “proprietary ratings” as the blockchain system itself can keep a track and maintain credit scores of the borrowers. Some platforms, such as Libra Credit have built a credit scoring system that is universally applicable. The lender also allows crypto-to- fiat, crypto-to-stablecoin and crypto-to-crypto lending thereby giving a high degree of flexibility to the borrowers. Banks are not remaining as bystanders looking at P2P lending disrupting them. Collateral-based blockchain powered lending applications for liquid assets are implemented by ING and Credit Suisse. However, their fight is short amidst industry headwinds. Secure Automated Lending Technology (SALT) Lending, ETHlend, Ripio Credit Network, Lendoit, Jibrel Network, HashLend are the some popular p2p lending platforms built on blockchain and smart contracts.

V. HOW P2P LENDING DAPP WORKS?

- 1) *Step 1:* Lender creates a profile.
- 2) *Step 2:* Lender waits for the loan requests.
- 3) *Step 3:* Borrower creates an account.
- 4) *Step 4:* Borrower sends a request for the loan.
- 5) *Step 5:* Lender interviews the borrower.
- 6) *Step 6:* Smart Contract fixes the rate of interest.
- 7) *Step 7:* Auto-payments using Smart Contracts

A. DApp System

The DApp is developed by following the approach of developing, implementing and testing the DApp in the ethereum simulator Ganache[8].

Primarily, the Ganache Ethereum Simulator is launched using ganache-cli command in the command prompt. The simulator then creates 10 accounts which resemble the nodes in the blockchain.

As the next step, connect to the Remix IDE by selecting the option Web3. Provider localhost:8545. Then browser is started on localhost:8545 and by logging in to metamask wallet and handle the database part through infura ipfs.

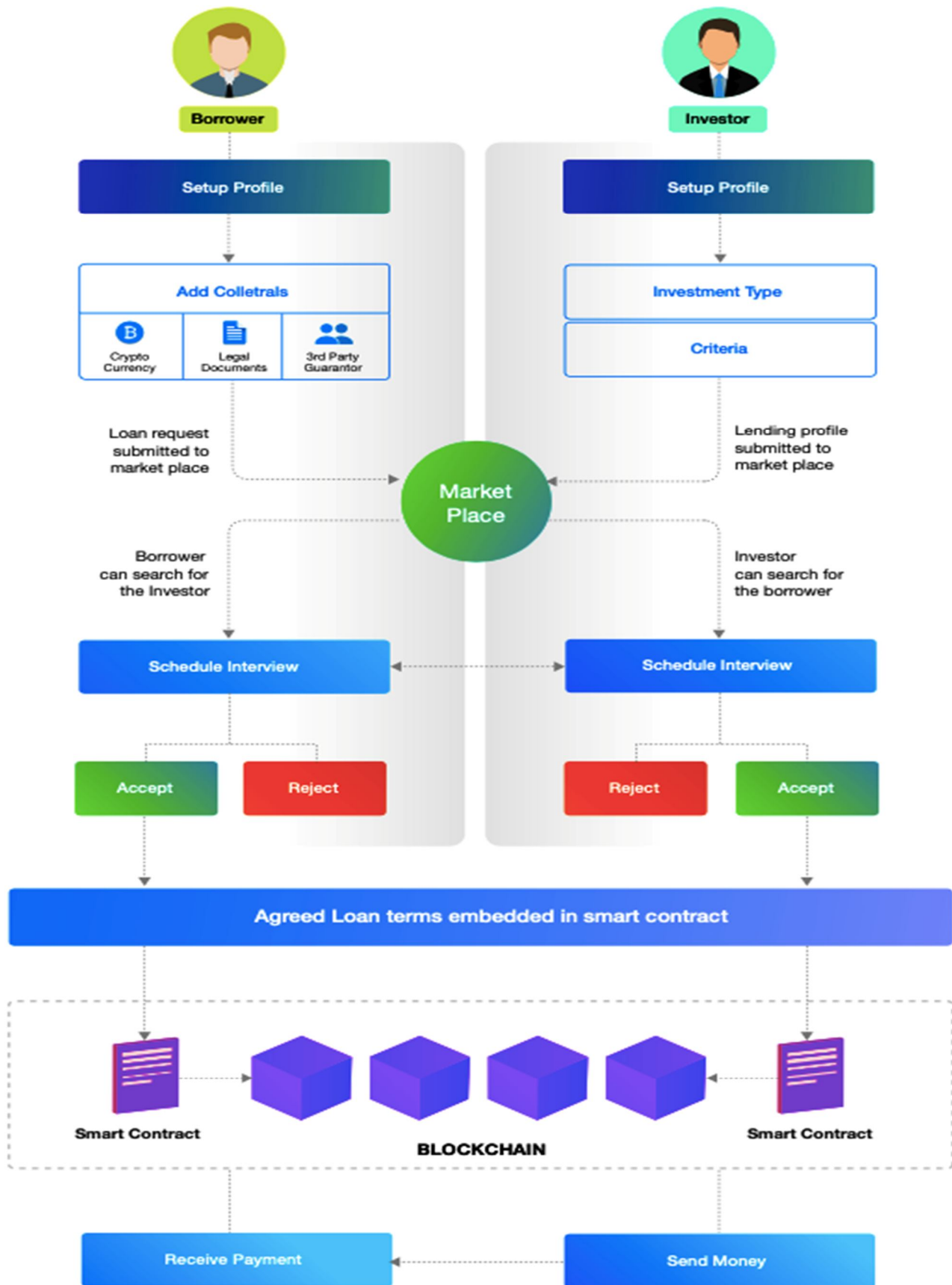
B. Loan Requesting and Sanctioning Process

The first UI of the DApp is the sign up / login page. Once the user logs in, the welcome page appears. Then he/she has to sign a message using their private key and this signature is then stored in the bank database. If login not available, the user creates an account in the Banking website by entering his/her Public Key along with the basic information for KYC. Then, the Loanee / Representative of an organisation has to digitally sign a fixed message(Previously set by the bank and updated periodically) using his/her Private key before applying for Loan.

If the verification is a success, then, the bank officials digitally sign the details of loan using their private key and upload the signed details in the blockchain. In case of loan, the block hash is stored in the user database.

When the required number of bank officials authorize a particular loan(i.e) more block hashes are stored for a particular loan, the loan is sanctioned. Hence, multiple authentications and verifications are done before sanctioning loans thus augmenting more security by decentralizing the loan process[11-15].

C. User Interface Design



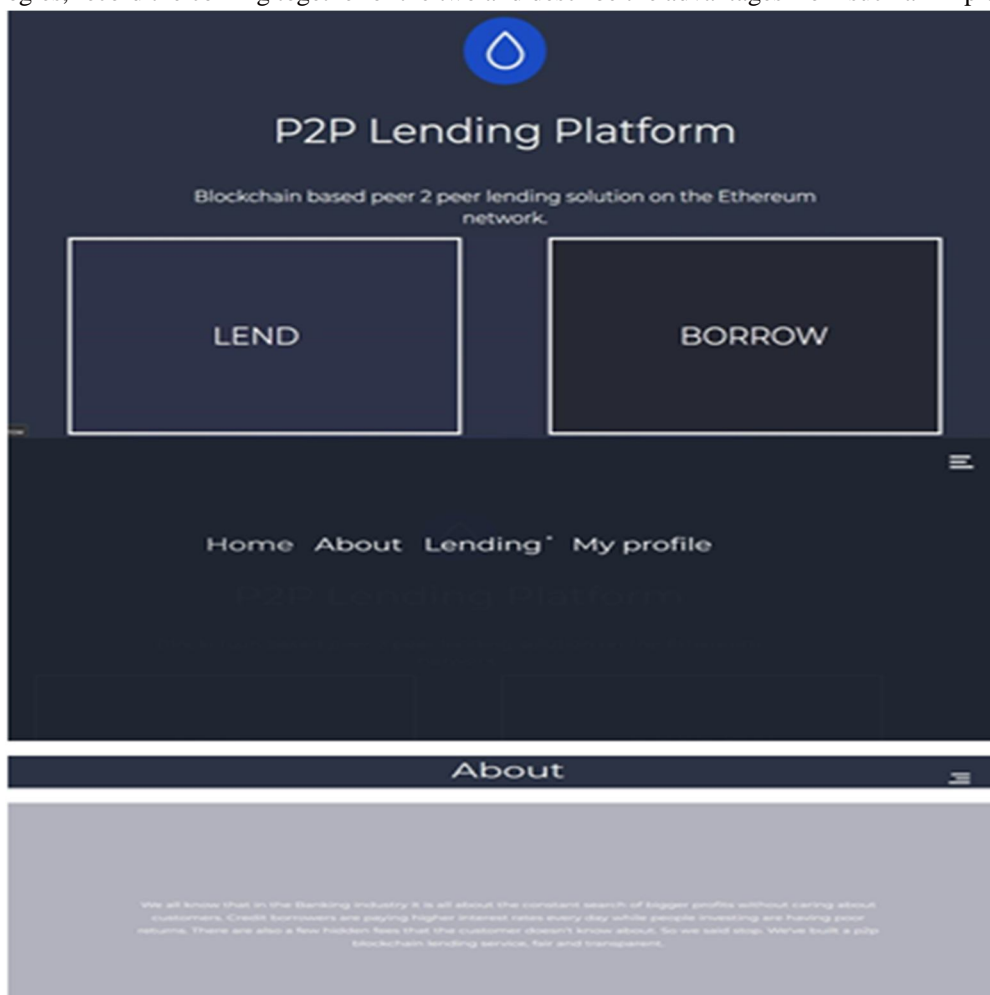
VI. LITERATURE SURVEY

A summary on early P2P lending is well documented by (Bachmann, et al., 2011). Trustworthiness aspects such as attractiveness and loan amount (Jin, Shang, & Ma, 2018) are thoroughly covered. (Duarte, Siegel, & Young, 2012)'s empirical evidence showed that borrowers who appear trustworthy indeed have better credit scores and lower default rates. However, lenders do not lower their interest rates enough to fully account for the trustworthiness. Listing information such as interest rate, repayment method and borrow reliability often account to one-third of lending documentation and are important to build trust to the lender. Loan applicant characteristics such as employment status and social interaction decide success of a P2P loan application (Park). The language and persuasion abilities displayed in the listing speaks a lot and influence lenders (Larrimore, Jiang, Larrimore, Markowitz, & Gorski, 2011). The trustworthiness of the borrower is more important than the intermediary (Zhang, Tang, Lu, & Dong, 2014). While US studies such as (Lin, Viswanathan, & Prabhala, 2009) say social capital (SC) has an impact of lender's trust in the borrower, other works, such as in the Chinese context contradicted (Zhang, Tang, Lu, & Dong, 2014).

Internet technologies such as Web 2.0 and digitization have shifted the lending market place to online platforms and have dramatically cut cost and time. Strong regulations give confidence to market participants. Absence or weak regulations will create uncertainty, keep the market in infancy, slows down financial innovations and not encourage market players to step-in (Fong, 2015). Would some countries have explicitly codified regulations (such as India, New Zealand and the US), most others have existing legislation that can be applied on P2P lending. (Philippon) discussed about regulation of Fintech's, (Fong, 2015) on Hong Kong, (Adriana & Dhewantoa, 2018) on Indonesia (comparing with India and China) and (Stern, Mäkinen, & Qian, 2017) on China.

VII. RESEARCH METHODOLOGY

This study uses Descriptive research to gather preliminary information, observe the growth and development of the p2p lending and blockchain technologies, record the coming together of the two and describe the advantages from such an implementation.



VIII. FINDINGS

- 1) P2P lending is in nascent stage in various countries and the regulatory strength is not that strong. Regulatory compliance is hardly checked.
- 2) The instances of defaults are low in new markets but are very high in matured markets such as in China.
- 3) Lenders who are taking high degree of risk with p2p lending are getting rewarded with equity-type exorbitant returns in most cases. However, as marketplace matures, the returns might not look that attractive.
- 4) Enterprise Blockchain gives performance, accommodates all stakeholders into the framework and can help foster the industry.

IX. SCOPE FOR FUTURE STUDY

- 1) Country-specific regulatory aspects as well as comparison studies on p2p lending can be done.
- 2) The concept of alternative lending further evolved Lending-as-a-Service consortiums and into other models (consumer, small businesses etc.). The US recently even got a registered alternative lending fund. This dimension can further be explored.
- 3) (Aziz, Dowling, Hammami, & Piepenbrink, 2019) discussed about machine learning (ML) applications in finance, particularly in forecasting and modelling. (Destine, Lerner, Mehmetaj, & Shah, 2016) used ML to forecast probability of full payment or default. These papers showed other disruption technologies can help in various aspects of p2p lending.

X. CONCLUSION

This study adds up to the existing literature on p2p lending and thereby enriches the existing body of knowledge. P2P lending is a boon to borrowers with broken credit scores and to lenders who take higher degree of risk for higher returns. While the default instance is few in developing markets, they are high in matured markets. With its improved processing performance, smart contracting and permissioning, Enterprise blockchain is of immense use for P2P lending platforms. Cost efficiencies, reducing time for onboard new members, issue and recovery of loan and compliance can all be done using this technology. Hence, blockchain can help in the development of the p2p lending industry.

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