Loan Origination System in Housing Sector Using Blockchain

Utkarsh, Hemant Pamnani, Puneet Saran, and P. Vetrivelan

Abstract This paper tends to analyze the pattern of automated loan origination, particularly in housing sector, with a clear demarcation of "potential" customers via an adequate blend of blockchain technology to smooth-out the very procedure unlike the tedious traditional fashion of loan sanctioning. It's basically a decentralized setup that stores debt history: Debt repayment of debt default. The proposed model can be of great aid to the SMEs (Small and Medium Enterprises) as they would be able to attain access to loans with no collateral in place, thus, with low risk and high-quality appetite, they would certainly be able to display their credibility and key-performance indicators through adequate distribution of information. The entrance of blockchain approach in our proposed model (inspired by Peer to Peer lending) ensures an accelerated and a quite transparent procedure of accessing loan funds without getting into the tiresome loop of conventional transactional dealings. This paper is superficially tending toward defining a feasible business model for Peer to Peer lending from a technical and business standpoint.

Keywords Blockchain · Lending · Peer to Peer · SMEs

1 Introduction

P2P lending is basically, a lending system that is free from the involvement of any collaterals [1]. The market segment targeted is essentially those with negligible or no credit history. Typically, this form of lending in risky as compared to regular

Utkarsh · H. Pamnani · P. Saran · P. Vetrivelan (✉)
School of Electronics Engineering, Vellore Institute of Technology, Chennai, India
e-mail: vetrivelan.p@vit.ac.in

Utkarsh
e-mail: utkarsh.2018a@vitstudent.ac.in

H. Pamnani
e-mail: hemant.pamnani2018@vitstudent.ac.in

P. Saran
e-mail: puneet.saran2018@vitstudent.ac.in

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lending methods as it involves no collateral or security against the loan offer. P2P lending is facilitated by the process of bidding, profiling, matching of offers, loan amount transfers and loan collections or recovery [2]. This entire process is performed digitally, and hence is bound to include certain extra costs like processing charges, maintenance charges, etc. Operational charges, however, would be reduced because it is an online process and the intervention of a human being would be much lesser as compared to a traditional process. This method of P2P lending helps with faster on-boarding processes and financial inclusion [3]. This paper explores the usage and the power of blockchain technology in the Peer to Peer lending space.

1.1 Objectives

The followings are the objectives of this project:

Return on sales (ROS) maximization, extended Peer to Peer lending, implementation of optimization algorithms, entire turn around time (TAT) reduction, self-instantiation and futuristic modeling, operationalize on real-time constraints, employment of validation checkers as well as robust machine learning algorithms to ensure smooth/transparent decentralization, encryption as well as decryption of relevant meta-data with the aim of intensive parallelization (as followed in Hadoop Distributed File System).

1.2 Background and Literature Survey

1.2.1 History of P2P Lending and Its Growth

Earlier known models of P2P lending were mainly dealing regarding lending money to friends, family and close ones—This is where a factor of trust began to show importance as the lending bandwidth grew in terms of people and ticket sizes. A problem of this kind gave rise to a lending system based on blockchain that facilitates Peer to Peer lending without involvement of an intermediary in the entire process. In India, P2P lending is primarily regulated by the RBI (Reserve Bank of India). The RBI typically grants licenses to market players to operate under the P2P lending space [4]. Companies with licenses can borrow money from central lenders and lend it further to their customers but cannot end it out from their own books. The limit on lenders is 10 Lakhs, and the limit on borrowers is also the same at 10 Lakhs [1, 5].

1.2.2 Blockchain

The role of blockchain in reducing costs, time of processing and the elimination of intermediary, in turn reducing operational costs have been covered in the previous

sections. Blockchain facilitates decentralization of data—this helps to eliminate the dependency of a single source for data storage and retrieval. Data immutability helps make the data encrypted cryptographically. A hashtag considered as an identification point for such a situation. To enhance and to add another layer of security, computers can act as validators for the data—this improves transparency and adds to the accountability of the process. Elimination of sub processes and/or simplification of the same using blockchain technology helps reduce costs as compared to traditional lending procedures. Blockchain technology as per (Fig. 2) holds the potential for being applied in financial processes like Government cash management, transaction processing, clearing and settlement of financial assets, bank ledgers, etc. Blockchain also offers solutions to issues like:

Efficiency, Lag in transactions, Fraud, Risks in operations.

Cryptocurrencies are implementations of blockchain that fit in the architecture of P2P lending. Flow of funds into the system would be faster and would take place without any additional bank processing charges or delays. This platform also has the capability of being scaled to various geographies globally and would limit the role of bankers to such implementations. This system could possibly eliminate the need of a third-party credit rating system. This is because the blockchain system is robust to keep track and would also be able to maintain the credit score of borrowers [6].

2 Blockchain Futuristic Model

The entrance of blockchain approach in our proposed model (inspired by P2P lending) ensures an accelerated and a quite transparent procedure of accessing loan funds without getting into the tiresome loop [7] of conventional transactional dealings.

2.1 Methodology

This paper is inspired by P2P lending mechanism and the proposed model in this paper aspires to thrive on two major dependencies/ criticalities:

Self-instantiation of the built model, modern system integration, (optional) default cases computation and segregation of the "potentials."

Some of the robust algorithms as part of "AI-powered blockchain-involvement" around which the analysis is supremely aspired to work upon:

Validation Algorithms: For ensuring sufficient iterations of check, we could employ K-fold cross validation, Random bootstrapping, sub-sampling, etc.

Search Algorithms: For keeping demographic records of the customer-base, it's recommended to go with the virtual wrappers, being trained on informed search, breadth first search (BFS), depth first search (DFS), iterative DFS, etc.

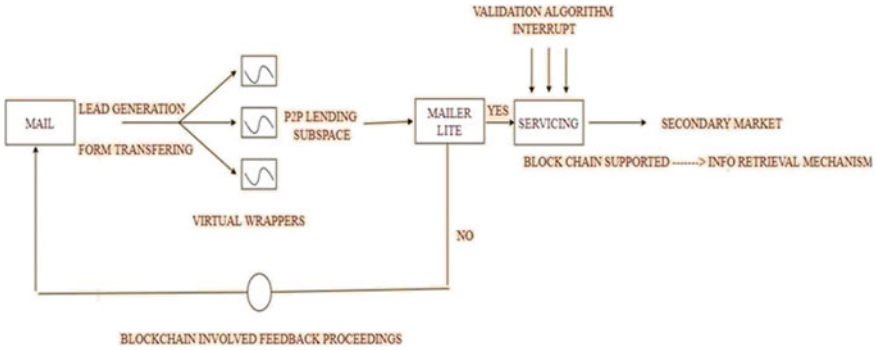

Fig. 1 Block diagram of proposed model

Predictive Algorithms: For the clear demarcation of the "potentials" as well as "weak learners," this could have been done with ease by decision trees as well as logistic regression, but our primed concern here is to work upon the strengthening of the ensemble model (blend of random bootstrapping as well as bagging). Also, boosting can be followed to make the ensemble more predictive.

Intensive Parallelization approach: Like HDFS where files are distributed and not copied or transferred, the similar approach is appreciated in loan origination system (LOS) blockchain model to attain a believable model with no dependence on collaterals (with constraints).

2.2 Implementation of Proposed Methodology

2.2.1 Origination

In origination, the borrower applies for a new loan and then application is then sent to a lender for processing. This is the standard procedure among all loans. With the help of blockchain technology, the above initial step can be improved with accurate record keeping [6]. This will give lenders access to borrowing information and data from their lead generation procedure as shown in (Fig. 1).

2.2.2 Fulfillment

Once the loan is fulfilled, the lender gives estimates of the loan amount and issues the loan itself. Blockchain can speed up this process by providing estimates within 3 days and also help with the details on the time stamped receival of documents.

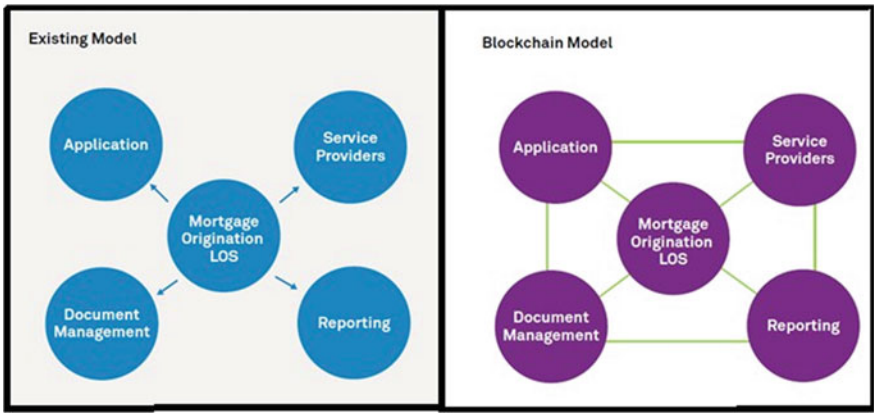

Fig. 2 Existing model in contrast with blockchain Model

2.2.3 Settlement

During a loan closing, many documents needed to be presented by the borrower's side, thereby adding stress to this complex process. The closing of a loan can be accelerated with precision with smart contracts via blockchain.

2.2.4 Servicing

In this step, the lender collects interest, principal and escrow from the borrowing. This ends up being a complicated exchange of information and money. With the aid of blockchain, servicing can be improved with heightened tracking of payments, increased data accuracy within loan transfers and ease of asset movement to servicers. This is due to blockchain's validation requirement.

2.2.5 Secondary Market

The secondary market provides a space for loans to be bought and sold by various lenders and investors. Blockchain offers extreme transparency of ownership of assets and streamlines the transaction processes like smart contracts can be implemented in master services agreements, pooling and service agreements and investor contracts which cannot be easily manipulated and can be viewed within the chain. Also, blockchain's automatic, immediate update of information too ensures the safety of secondary market deals as shown in (Fig. 2).

Compiling all the discussed formulations, the model would head toward as: Primarily, the external borrower approaches P2P lending sub-space ("allowed" space for P2P lending by RBI [8]), major stakeholders being SMEs, potential guarantors,

Fig. 3 Breakdown of Mortgages with blockchain

etc. via "lead generation" form filling as shown in, followed by lending process fulfillment (AI-powered blockchain involved: blend of predictive algorithms and optimization classifiers). Thirdly, we go for settlement section which involves the blockchain-involved platform-independent dealings: MailerLite (email automation, landing page activation, etc.).

Followed by this, the concluding procedures include servicing as shown in (Fig. 3) using robust search algorithms and secondary market (Blockchain updation features as well as information-retrieval methodologies) [9].

2.3 Design Approach

The very purpose of introducing the concept of blockchain in proposing the design of the futuristic model is to ensure the fact that the crucial clouds embedded with decisive information regarding the customer-base remain privately secured from any random alteration, hack, or cheat by externals.

The concept of blockchain employed here, being superficially a digital ledger of transactions (DLT), is duplicated and distributed across the entire section of the proposed wireframe. Each block in the chain contains a number of transactions and relevant ensures in the form of discussed active algorithms, and every time a new feed occurs on the blockchain, and a record/clone of that transaction is added to every participant's ledger.

In short, the discussed concept is thriving on an immutable cryptographic signature termed as "hash."

A BPMN (Business Process Model and Notation) is ideally configured which is inline with the thought-process.

It starts from interface interactivity (when borrower steps into the P2P lending sub-space), followed by "Lead generation" automation through email. Then enters the procedure of loan assessment as well as fulfillment with the aid of optimization algorithms, followed by settlement and servicing with the aid of validation algorithms being applied on. Finally, stepping into the secondary market, where blockchain-supported information-retrieval approaches are employed to obtain the lowest level of abstraction (being more specific).

3 Conclusion

Decentralization at each section of the proposed model with the aid of blockchain technology (DLT as shown in (Fig. 4) along with the employment of vivid ML algorithms such as recommendation, search, validation, information-retriever, parser, locator, etc.) smoothens the tedious conventional procedure and the very process is tending to mirror-out the P2P lending with "no" collaterals [3], however, virtual parties are there to ensure veracity.

Furthermore, on-boarding procedure is taking less time due to the adequate digital customization with blockchain-involvement. Cost reduction due to the absence of any sort of physical intermediaries [4] except virtual wrappers and databases to carry out the smooth online transactional processing (OLTP).

Also, it leads to total TAT reduction, that is, turn around time decrementation due to the additional virtual controls.

Smarter interest rate generation following "Attribute Subset Selection" approach.

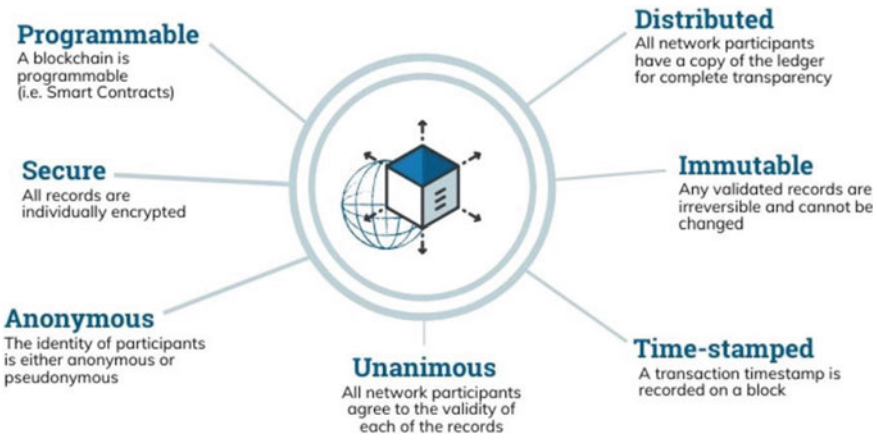

Fig. 4 Properties of distributed ledger technology (DLT)

4 Future Directions

Throwing light on the model feasibility, since the procedure is digitally adhered (automated), it almost resembles P2P lending (with soft allowance or liberty of "discussed constraints"). Loan origination system's, primary dependence for its future thriving, is on 3 criticalities:

Self-instantiation, modern system integration and default cases (cannot be accurately predicted).

Thus, the area of interest and scope of research/ analysis are more in the accurate prediction of default cases corresponding to the number of potential customers with an adequate blend of blockchain technology.

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