Securing a Broken Lending System

White Paper

Team Kagojer Nouka

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Abstract

Being a rapidly growing economy one of the barriers that is holding Bangladesh back is the lack of a strong and sustainable financial system. Two core reasons which led us here are the lack of participation of general people specially from people of marginal and underprivileged communities and the lack of accountability in the lending process leading to corruptions and inefficiencies. We have proposed a solution to this problem, using Hyperledger Fabric blockchain, that brings all entities relevant to the lending process together, providing them with tools to do it more efficiently with lower risks and enabling collaboration to ensure collective benefit. As doing something through regulatory changes is often difficult and unsustainable, we designed our system with the goal of satisfying mutual interests and a fair incentive structure for all the parties. We primarily focus on documenting two sections of the lending process which are the credit history of a borrower and verifiable ownership of assets by bringing issuers, lenders, borrowers and regulators into our system increasing efficiency and accountability at each stage which ultimately leads to more sustainable economic growth.

Table of Contents

Current Scenario

Bangladesh is one of the fastest growing economies of the world right now. In order to sustain the growth, we need to ensure access to the services provided by a functioning and reliable financial sector to every citizen of the country. Although the banking sector provides various other services, the banks have two core jobs - helping people to safely save who have surplus money and lending that money to people who need it. Although there are issues with helping people save and invest their extra money in the economy, the lending process has some bigger issues that require more focused attention. Therefore, we will only focus on the lending process in this white paper.

One of the biggest problems with the lending process is that the formal banking sector can't reach most people of the country. A survey conducted jointly by the International Food Policy Research Institute (IFPRI) and the Bangladesh Institute of Development Studies (BIDS) revealed that 62 per cent of rural households obtained loans from informal sources and most of whom are smaller landowning groups. Only 14 percent of rural households could access loans from financial institutions that contributed to 25 percent of total loans received by rural households. Individual borrowers in the urban areas also face the same problems due to reasons explained later. This deprivation from access to a formal credit system makes them prey to various predatory practices like high interest rates, often as high as 10 percent per month. This puts already underprivileged people in a more disadvantaged position, and contributes to the increasing inequality of the country.

The other big problem plaguing this sector is that while banks are failing to lend money to the right people, they are also in trouble for lending money to the wrong people. The banking sector of Bangladesh is now facing a massive crisis regarding Non Performing Loans (NPLs). NPL is a loan that is in default or close to being in default which means they badly affect the health of the banking sector and also the economy of the nation. The international standard for NPL is 2 percent or below but in our country it is 5 to 6 times higher than the standard! According to Bangladesh Bank, 10.32 percent of total loans issued by banks in Bangladesh in December 2018 were non performing. If we narrow down our search to the state owned commercial banks and specialized banks, the situation becomes even more scary. State owned commercial banks had 23.86 percent and specialized banks had 15.10 percent of their total loans classified as NPL by Bangladesh Bank. However, many independent international organizations claim that this data is underreported. According to a report published by IMF, the amount of the defaulted loan in June 2019 was BDT 2,401.67 Billion (around one-fourth of all loans). According to the same report, the value of NPL has grown 417% in the last 10 years.

This high percentage of NPL is creating many problems for the banking sector of Bangladesh. NPL scams demolish the reputation and credibility thus negatively affect the share price of the bank. People gradually start losing their trust in banks. Credit and CAMELS (Capital adequacy, Asset quality, Management, Earnings, Liquidity, and Sensitivity) rating of the bank worsen. As the amount of NPL grows, banks have less money to invest. Banks become conservative while

lending, which in turns decreases innovation and investment which harms the overall economy. Studies show that 1% increase in NPL ratio can lead to 0.1% less growth of GDP.

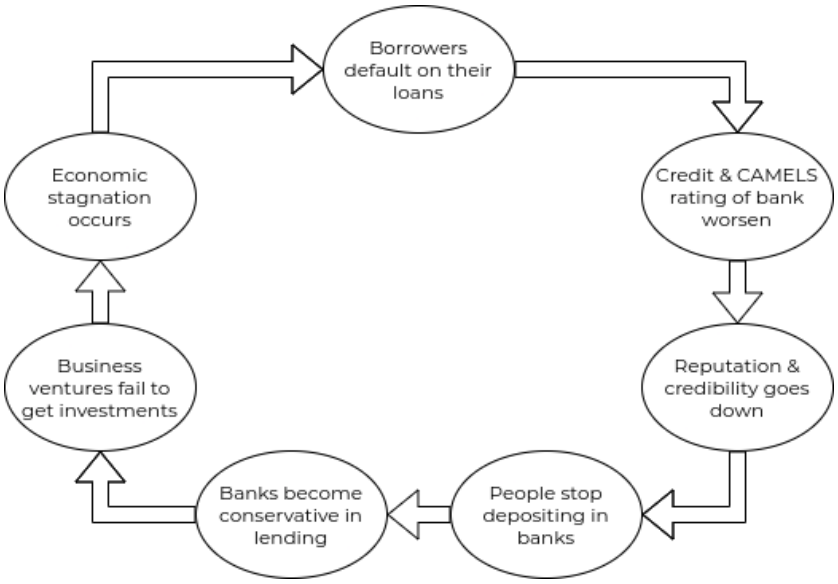


Figure: Cycle of NPL & Economic Failure

Problem Identification

There are many reasons behind this low participation in the banking sector and recent exponential increase in NPL. They can be summarised as following:

1. **Broken Asset Management System:** The process of collecting data about various kinds of collateral such as land property, letter of credit, bank deposit, insurance, income statements are all maintained via pen and paper. Most of the rural people don't have easy and fast access to these documents. Bank officials have to manually check these assets for any irregularity in the application. This makes the process of evaluating the value of a collateral very inefficient, difficult in the rural areas and due to lack of enough man-power very lengthy and error-prone. It also increases the chance of corruption in the process leading to issuing a loan against a non-existent or overvalued collateral which in turn leads to the loan getting NPL.
2. **Bad Governance and Corruption:** Bank directors and top-level executives are hardly accountable for their actions which enables corruption. They avail huge quantities of loans themselves with the intention of never paying back. Banks also give loans to people with questionable creditworthiness even without collaterals, compelled by pressure from powerful people, and compromising existing security standards.
3. **No Standard Evaluation System**: Although banks manage their internal data about their borrowers, there is no unified way of getting the credit score of an individual borrower. Bangladesh currently has 8 credit rating companies in business that provide credit rating to various institutions and businesses. But they are not capable of meeting

the demand of the whole sector. As a result, many loans are issued without proper checks about creditworthiness of the borrower.

4. **Lack of Cooperation**: In the last few years, many new banks have entered the market densely concentrated in the city areas, but the capacity of the sector and the size of the skilled workforce hasn't increased. This has led some of the new banks to have high NPL ratios. Many established banks are also suffering with the problem. This problem could have been solved if the banks could come together in building a system where they could share data efficiently. But as of today, no such system exists in Bangladesh.

Solutions

Lending Process

Whether or not a loan is qualified by banks can be determined by three simple questions:

1. *What is your ability to pay?*
2. *What is your willingness to pay?*
3. *What happens if you don't pay?*

A borrower proves their ability to pay by showing their current sources of income, their willingness is determined from their credit history and finally they provide some form of collateral in case they fail to pay back the loans. When we look deeply into the lending process we can primarily identify four separate categories of participants:

1. ***Borrowers*** like individuals or business owners who take the loan providing some collaterals
2. ***Issuers*** like the Land Registry, Income Tax or Insurance Agency who issue documents that verify the ownership of those collaterals
3. ***Lenders*** which are the Banks who lend borrowers loans against those collaterals based on certain conditions
4. ***Regulators*** who are government representatives like Bangladesh Bank who evaluate the debtors ability to pay back loans or the likelihood of defaults in loans

Proposed System

Our plan is to firstly *record assets issued as collaterals* on a blockchain. The issuers document these assets and issue digital documents which can then be used by borrowers to prove ownership over those assets. Banks can then issue loans against secure collaterals, verify the values of these collaterals by appraisals and determine whether the borrower is eligible for the loan.

The loans issued by banks are also tracked in our system providing data for *credit history* of a borrower. This data can be shared among banks to maintain complete information about the credibility of borrowers.

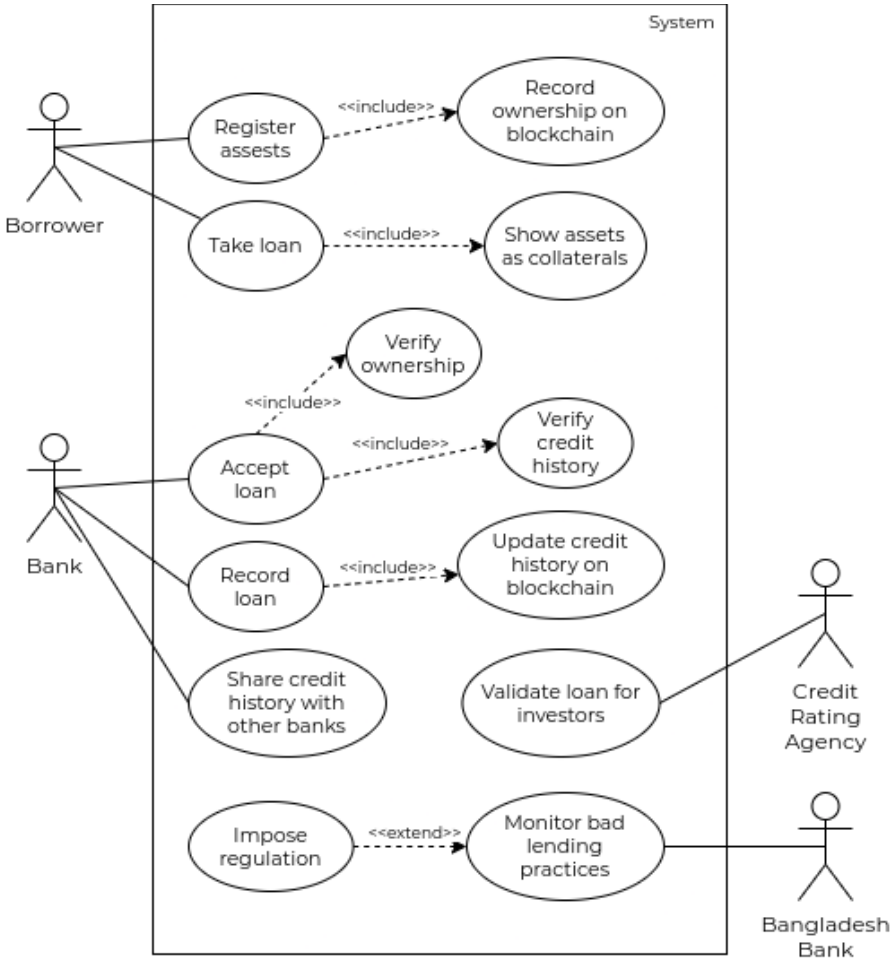


Figure: Use Case Diagram for Our Solution

Why Does It Work?

We primarily focus on documenting two sections of the lending process which are the *credit history* of a borrower and the *ownership of assets* by the borrower. The benefits earned by different parties in this system are:

- For issuers the immutability of the blockchain ensures that the data is incorruptible and thus safe from external influence, the process of digitally maintaining this data will also reduce their operational costs and make the ownership verification system more efficient and lastly distributed data sharing will allow other relevant parties to access this data without going through the issuers everytime.
- Borrowers can now prove the ownership of their assets easily to any institution. They can also provide their credit history which would count significantly in securing a new loan.
- Banks can use verified collaterals or even take temporary ownership of assets which secures the loan substantially. Each credit helps maintain a complete credit history of borrowers which other banks can utilize to determine credit-worthiness.

- Moreover Credit Ratings Agencies can properly judge the quality of these loans and determine the likelihood of defaults. These ratings can then set a standard against which all banks are evaluated which will force banks to become more sincere in their lending process.
- Regulators will have access to real time data about lending practices by banks and, in case of any suspicious activity, conduct investigations using verified data and hold the banks accountable.

All of these steps contribute greatly to making a more transparent lending system with established credibility for borrowers, fewer defaults and higher levels of accountability at each step.

Why Blockchain?

The reason we have chosen a blockchain based solution instead of a simple cloud based application is because we want to utilize some fundamental properties that blockchain provide - *data immutability* to ensure the asset/loan data has not been tampered with, *secure data sharing* to improve collaboration between entities without compromising security and lastly *data transparency* for people who deserve a loan to prove their credit worthiness in a system which currently holds no such standards.

Market

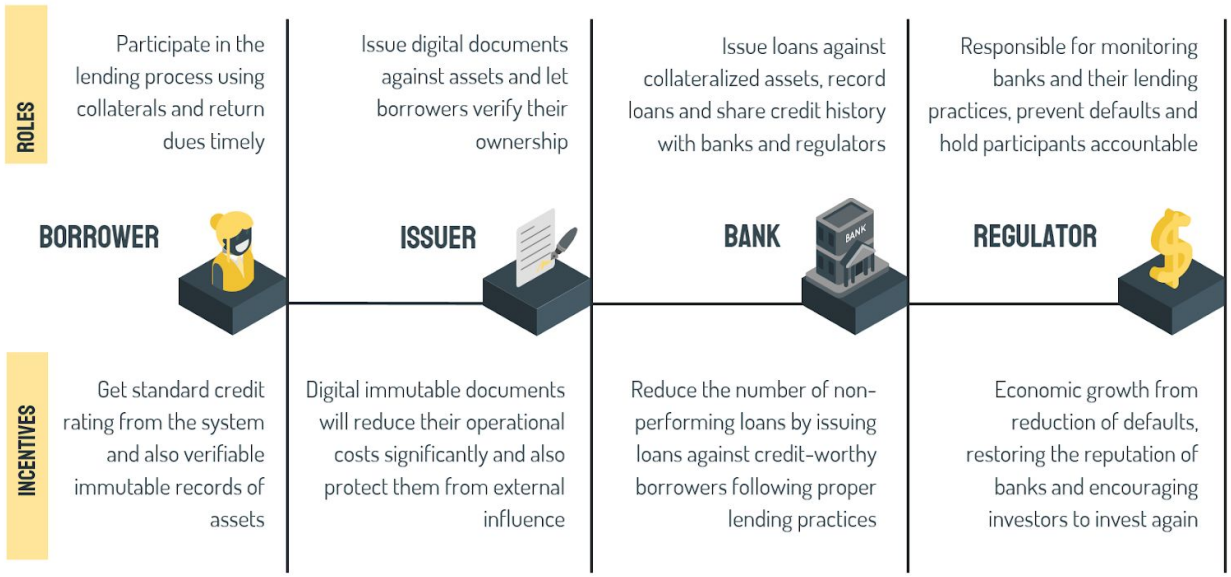
Amount of Private Sector Credit at the beginning of 2016 was just about BDT 6,000 Billion. It has drastically risen to BDT 11,266 Billion by February 2021 and is expected to reach BDT 13,382 Billion by the end of 2022. Currently 86% of the rural people in Bangladesh as well as a large urban population don't have access to a formal credit system. Bangladesh is heading to become the world's 25th largest economy in 2035, says a recent report by the Centre for Economics and Business Research (CEBR) and by 2025, it will be the 34th largest economy in the world. Such a huge economic upsurge will come from poverty alleviation, an influx in middle class and upper middle class families and lots of new business ventures. This makes it paramount that we actively try to establish a stable financial services industry to support this rising economy, which makes solutions like ours a necessity for the government and society at large.

Competition

The current blockchain space is dominated by Decentralized Finance (DeFi) applications like MakerDAO or AAVE. Bangladesh is a country which currently does not have the regulation as well as technological foundation to embrace these applications. As a result, we haven't seen any such initiative in Bangladesh. There are initiatives outside Bangladesh that work with asset documentation or distributed data sharing between banks using blockchains but we are yet to find any application that integrates both of these into a single coherent system with practical incentives.

The service that we are providing our partners is the easy, fast and reliable access to data about various assets and a unified credit history generated from borrowers and banks. These systems currently resort to third party services to ensure security and reduce risk or willingly take more risk. Instead of trying to disrupt their existing system, we are providing them with tools to do it more efficiently with lower risks, replacing competition with collaboration to ensure collective benefit.

Partners



Risk Analysis

The feasibility of our model depends upon the enforcement of certain standards upon banks, not via government regulation but by incentives, to prevent bad lending practices. Our goal was primarily to make the system more accountable without regulation but if there is deep rooted corruption then we might have to depend on government intervention and policy changes.

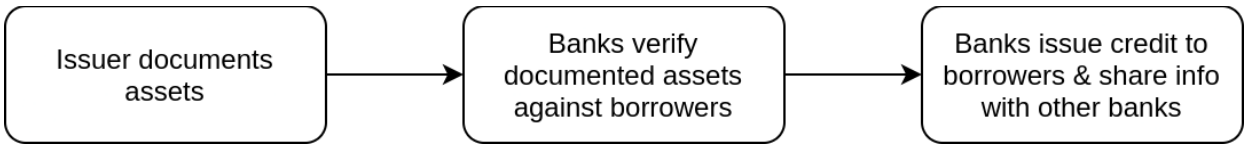
Asset tokenization is another popular way of introducing digital representation of physical assets. However, lots of factors like fractional ownership of assets, liquidating assets for equivalent currency and peer-to-peer transfer of ownership requires more regulatory support, which is what makes this approach unfeasible. We have decided not to go with asset tokenization, but simply asset documentation, considering its feasibility in spite of the popularity of the technology.

Disintermediation is a very common approach in financial applications such as this. But bringing about such massive changes in a country like Bangladesh is quite impossible at first. So we decided to instead integrate all such intermediaries into our system and then in the future try to optimize the system for better efficiency and transparency.

Asset documentation at this scale is a very complex task which would make some agencies skeptic of our approach. But we have reasons to hope that this will not be the case for the majority for two reasons. Firstly, Bangladeshi Government has been working toward making all services digitally accessible and encouraging and supporting efforts to do so. Secondly, Bangladesh also has the experience of executing digitalization at this scale (although not using blockchain) when issuing NID cards for every voter before the 2008 election.

Architecture

We work with issuers to document the assets digitally and provide a way for the owners to verify these assets to the bank. The bank then records loans against these collaterals and shares these with other banks, regulators and auditors.



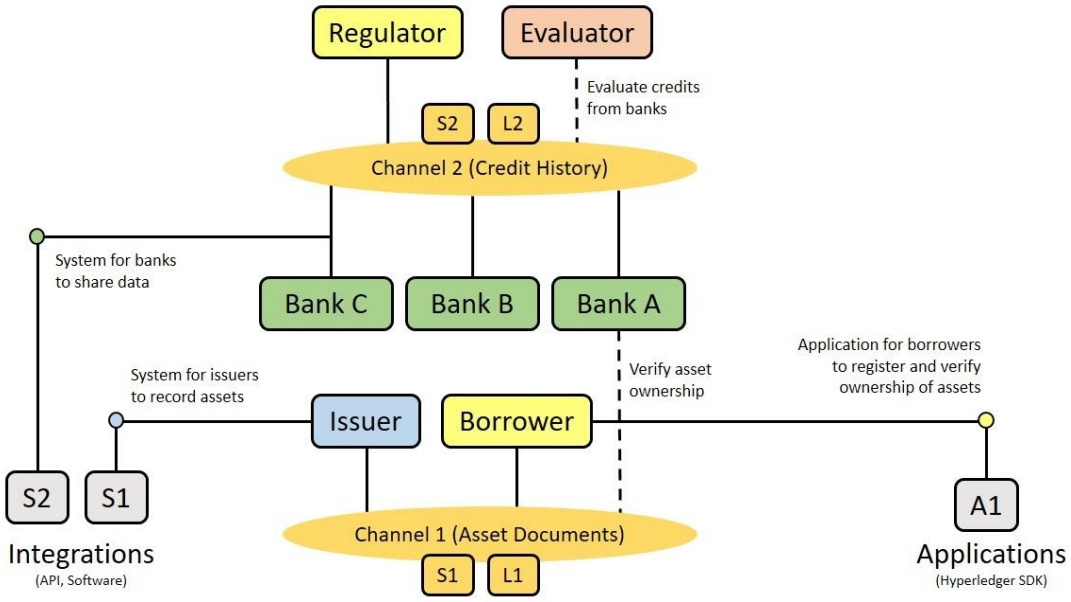
Choice of Blockchain

The use of blockchain ensures that the overseers get verified data and the integrity of data for owners is maintained. The most mature blockchain platforms are Etherium, Corda and Hyperledger. We had to go with a permissioned blockchain to allow private data channels to ensure privacy and access control features to restrict some participants from changing sensitive data. As Etherium is a public blockchain, we decided not to go with it. We also considered common applications like asset documentation and verification and enterprise data sharing and figured that Hyperledger Fabric satisfied all of our use cases. The Hyperledger ecosystem is the most mature among enterprise blockchains and also has the backing of big tech companies like the Linux Foundation and IBM. So we decided to build our application using *Hyperledger Fabric* considering all criterias.

Integration with Existing Systems

Our system is not altering the current methodologies followed by our partners, instead we are just allowing them to integrate their current implementation with our system to make it more efficient and resourceful. We plan to help the issuers maintain their own documents digitally which they don't currently do. The digitization of documents and using digital signatures for identities is a common solution implemented in many contexts and should not disrupt their current working model.

On the other hand most banks have some kind of existing legacy systems that they internally use to manage their workflow and record accounts, loans, transactions, credit history etc. They would have to update the system to record a transaction only after it has been accepted through consensus by the blockchain. They can interact with the blockchain using our API and only provide some necessary credit data determined by the government and then continue their regular workflow.



Governance

In our system, we are digitally documenting assets like properties, insurance, business documents, etc. But the issuers are already keeping track of these data. As the concerning issuers are already reliably keeping record of the assets our model doesn't require them to do anything more than just to keep the records digitally. We can also rely on them to represent assets faithfully and consistently on a blockchain by introducing members for oversight like regulators and credit ratings agencies.

Network Membership Governance

1. **Member on and off boarding:** We plan to start with a single bank and the issuers their customers use to verify their collaterals. We will gradually bring more issuers into the system to use different kinds of collaterals. Other banks can also enter the system by agreeing to rules established on the network and getting permission from the regulatory agencies of the government.
2. **Data ownership:** In the system banks have full ownership over their client data and only share a part of it with regulators, auditors and other banks to determine loan and borrower credibility. Issuers also have control over their asset data and allow banks to only verify this data with them.
3. **Permission structure:** As issuers join the network, they consent to share (read-only) user asset data with banks and credit rating agencies at a cost bargained for collectively. Banks evaluate these assets and record their issued credits and then consent other banks, regulators and auditors to access (read-only) only the data deemed necessary by regulators.
4. **Regulatory oversight provisioning:** We allow regulators (Bangladesh Bank) to monitor the loans issued by each bank. They can also use auditors, credit rating agencies to

evaluate the integrity of these loans and hold each bank accountable. Regulators are also in control of an ordering node and have the responsibility of resolving any conflicts that arise.

Business Network Governance:

1. **SLA Management:** The banks, issuers and other entities all agree to share required data faithfully mentioned in the above points. While doing so, they will have to provide uptime of 99.5% (The Open Banking Implementation Entity standard), turn around time of less than a minute (should be renegotiated based on increasing complexity and technical advancements every quarter), Average time to answer in 5 minutes in case any problem occurs during the work hours. In case any entity fails to follow the agreement, the regulators can take punitive actions (fine, expulsion from the system or other legal actions).
2. **Legal and Regulatory Compliance:** Two kinds of institutions exist which have different kinds of regulation-- banks whose regulation is imposed upon by Bangladesh Bank which is also in the network and issuers who need to maintain asset ownership data transparently so borrowers can prove their ownerships. None of these sectors conflict with the other in any regulatory framework, so they can coexist.
3. **Business Operations Structure:** Banks are free to continue their own business, just sharing additional data determined by regulators. Most of the parties involved are government entities so business motives are not a primary concern.

Technology Infrastructure Governance:

1. **Distributed IT Management Infrastructure:** In order to enforce easy and uniform IT experience, we will host the whole network on an agreed upon reputable cloud provider. The peer nodes are managed by the concerning entities i.e. bank, issuer and government. They will also manage the cost of managing the peer.
2. **Technology Assessment and Adoption:** A board of technical experts will be formed with representatives from various entities. They will periodically discuss new improvements and standards in the industries, security measures, and agree to standards to enforce on the system. They are then approved by regulators and then implemented at each level (banks, issuers). The standards will be enforced with the help network configurations & regulators.
3. **Data Entry:** Points of data entry are very crucial as it determines core points of failure for any secure blockchain. Our primary data sources are - 1. Asset documents recorded by issuers in the presence of owners and digital signature which ensure the integrity of the data then onwards and 2. Credit records from banks which are monitored by regulators to determine the integrity of loans issued and hold banks accountable. This ensures that at each point of data entry participants either don't have the ability or incentive to cheat the system.
4. **Data On-Off Chain:** Documents are recorded off chain with their hashes embedded in each transaction with timestamp and digital signatures. Again banks keep most of their transaction data off-chain but only share some data in the blockchain which is necessary

to determine reliability of a borrower e.g. previous loans, collaterals, returns on loans, etc.

Action Plan

Our initial plan is to conduct some domain surveys (1-2) then work with registries and banks in a particular locality (3-4) and then move on to collaborating with other banks and incorporating new registries (5-6). We can implement the following steps:

1. **Find Banks:** Target the banks that are currently most vulnerable to corruption and unsecured loans, most of which are state owned commercial banks and specialized banks.
2. **Find Registries:** Conducting a survey into the common types of collaterals accepted by the banks and the registries which record the certificates to these assets e.g. Government Land Registry offices, National Board of Revenue, Bangladesh Road Transport Authority, etc. A list of the registry offices which result in the most defaults should be listed.
3. **Asset Documentation:** We want to work with 3 most accessible registries in a particular locality to digitize their assets providing digital signatures to certify ownerships.
4. **Collateralized Loans:** We will then create a system for the banks working in that locality to record these assets as collaterals and issue loans to the borrowers.
5. **Evaluation & Restructuring:** Evaluate the interactions between borrowers, issuers and lenders and improve governance structure to allow coordination and reconciliation.
6. **Enterprise Collaboration System:** Then we implement this solution in multiple localities, collaborating with new registries, and onboarding new banks into our network and allow secure data sharing to establish credit history for all borrowers.

Value Proposition

Our plan is to introduce technical infrastructure in current banking and registry systems. We are aiming at increasing efficiency and accountability in the lending and borrowing system rather than direct monetary profit. These changes will bring value both at individual and government level, both of which are described below:

1. **People:** Individuals get the ability to verify ownership of their assets in a secured way with a lot less bureaucracy. People in a developing country like ours can get access to a standardized credit rating system which will benefit them in future financial transactions.
2. **Government:** One of the fundamental problems our economy is facing is the ongoing deterioration of the financial services sector. But now the government will have a lot more oversight over the government banks, enforce secure lending practices and hold these services accountable. This will ultimately help expand the economy and greater financial stability and growth.