

AN OFFLINE FIRST, THICK CLIENT ANDROID ARCHITECTURE TO EMPOWER MSEs

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ABSTRACT

Micro and Small-scale enterprises (MSEs) are a fast growing, credit-starved segment. They are underserved by the traditional banks for having undocumented, irregular income. On the other hand, microfinance institutions meet only lower credit needs.

Artoo helps address the challenges of lending to this segment. Traditional models had field agents collecting customer data on paper forms leading to an error prone, lengthy and cumbersome process. Artoo's mobile application digitizes the loan application process at the customer's doorstep, allowing for nuanced credit underwriting of MSEs with limited digital footprint even in far-flung areas having poor connectivity.

In this presentation, we will discuss how the offline first and thick client architecture of our android application makes this possible.

AUDIENCE

The session is targeted for individuals with basic knowledge about Fin Tech and MSE Lending and is appropriate for a beginner in the area.

INTRODUCTION

The Problem

MSE's are the small businesses we see all around us. The neighborhood kirana store, beauty parlor, small parts manufacturer are some of the examples. Consider some of the characteristics of these businesses:

1. Undocumented income sources
Many don't regularly file ITR or maintain sales records
2. Limited digital footprint
Majority of transactions are cash based. They may not have a credit history.
3. Irregular income
There is high seasonality in income, especially in the farming sector.
4. Dependency on proprietor
Proprietors find it hard to leave their place of business for visiting a bank to avail a loan. A day of absence is a day's business lost.
5. Location
Many situated in rural and semi urban areas with poor connectivity

6. Take time to build trust

They are more willing to trust a 'known' moneylender charging high interest rates than an unknown SFB (Small Finance Bank).

7. Poor financial literacy

Proprietors are usually not financially savvy. They need help during the loan process.

What are the implications of these challenges for any Bank lending to these businesses?

1. High risk

Limited digital footprint and undocumented, irregular income means banks have to take considerable risks if they want to lend

2. Hi touch

The fact that business owners have poor financial literacy and cannot leave the place of business means banks have to employ field agents to interact with potential customers at their doorstep.

How do we solve this problem?

If we consider the problem of lending to data poor MSEs, any potential software solution must solve for the high risk and high touch nature of the problem. These are the two salient ways:

Doorstep credit underwriting

One obvious reason is that customers find it hard to leave their place of business and come to the bank to apply for a loan. But there are also subtle aspects to this.

These businesses don't have sufficient documented income and may not have a credit history. How can they be assessed then? Having an agent visit the place of business and gather data while making a visual assessment ensures more credible data and hence lower risk. The field agents are mostly people belonging to the same milieu as the business owners. They have an intuitive understanding of the people whose business they are assessing. For instance, they can make out whether a cow really belongs to the farmer by observing its behavior. They can form an estimate of the number of people living in a house even if all members are not present.

Its important for a software solution to complement this field agent and not replace her. Eliminating the 'High Touch' factor will prove counter productive. An optimal software solution would be to combine the 'High Touch' factor with 'High Tech'. The solution must provide an intuitive and easy to use interface with rich data entry points and credit underwriting capabilities.

Considering the importance of personal interaction during the assessment process, doorstep credit underwriting becomes imperative.

Capability to work offline

MSEs are often located in far flung areas with poor connectivity. It's important that data gathering and credit underwriting happen at customer doorstep, whether or not connectivity is available. Otherwise, the field agent (or credit assessor) may have to make another trip to the business place.

Supporting these capabilities implies an architecture that is:

Offline first and Thick Client

What is offline first and thick client?

The client here is synonymous with the android application that is used by field agents for data entry and credit assessment. Offline first means that data entered by these agents is first stored locally in the application. It is transferred or synced to the server as soon as connectivity becomes available.

Thick client is the opposite of the popular 'thin client' paradigm of mobile app development. A thin client has minimal built-in functionality. It makes calls to the server over the Internet, mostly using HTTP APIs to transfer data entered on the device. Storing and processing the data happens on the server. A thick client is the opposite. It stores and processes data locally. Considering that devices have low memory and computing power compared to servers, this may seem counter intuitive.

Why offline first and thick client?

Considering that our solution needs to provide nuanced and reliable credit underwriting for MSEs at their doorstep irrespective of connectivity, the traditional android model of keeping the client or app 'thin' will not work.

Our android client is therefore 'thick'. It's equipped with credit assessment algorithms that can be run locally without having to make a network call. It is also 'offline first'. All data gathered is stored locally first before syncing it to the server, ensuring zero data loss.

How is offline first and thick client realized?

Figure 1 describes the Artoo architecture

- **Lending App**
This is the application providing a data entry interface to users, typically field agents or credit assessors. They enter customer profile, KYC details, assets, liabilities and business data. The app performs a cash flow analysis to arrive at a 'disposable income' for the applicant. This is the max installment they can afford to pay per month.

The amount of loan for which they qualify is derived primarily from this analysis.

- **Local Data Store**

This is the local database where all data entered through the Lending application is stored. Data entered is thus always available to users whether or not they have connectivity.

- **Data App**

The data app is responsible for syncing or transferring client application data from the local data store to the cloud server. The app invokes server APIs for the following

- Syncing data entered offline

A changes log is maintained in the local DB. The data app checkpoints each successful server sync in the log. The app keeps checking the changes log at regular intervals. All application data modified after the last checkpoint is synced to the server. This call is attempted as soon as connectivity is available.

- Fetching data from server

The Lending app also needs to know of any new data in the server, relevant for the current user. For instance, an application submitted by the field agent might have been sent back by their manager for further review. The data app polls regularly for these changes

- **Cloud Server and data store**

The cloud server exposes API interfaces for data access and modification. It stores data synced by clients in the cloud data store and makes it available to other organization roles reviewing the application data.

Applications once completed by field agents are submitted for review. Senior credit appraisers in the bank do this review through Artoo's web portal.

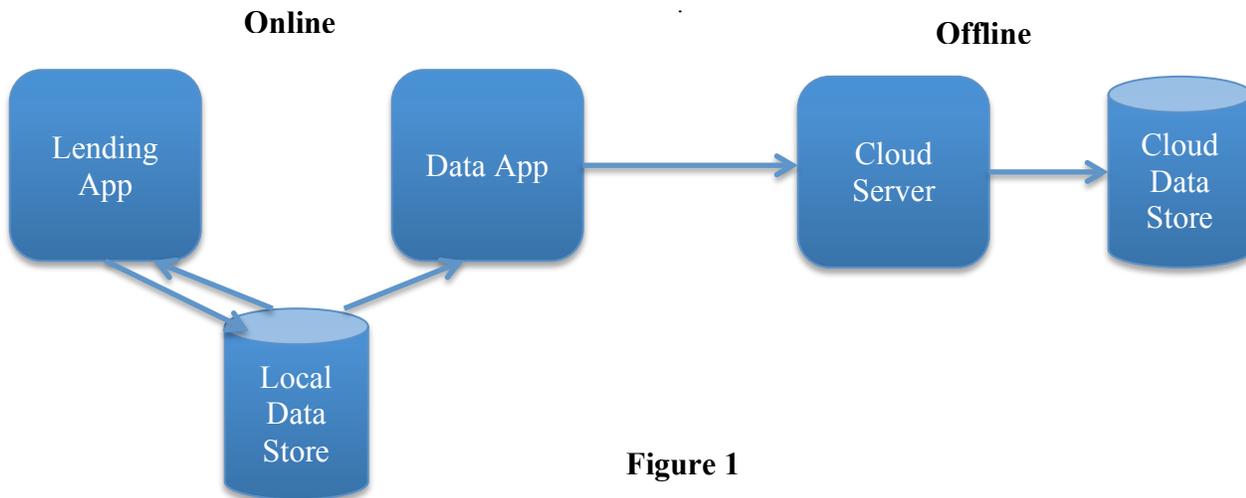


Figure 1

CONCLUSION

Having worked extensively with lenders and businesses in the MSE segment, we realize, quite unlike other software products, that we must complement and assist the human agent. Not replace them. This insight, combined with the offline first and thick client requirement of our domain has enabled novel android application architecture.

FUTURE DEVELOPMENTS

We aim to make our application simpler, faster and more intuitive to use. Our major work now is in the following directions:

- Reducing manual entry

This frees up the field agents' time to build rapport with their customers, a crucial aspect for building trust. We partner with data providers to this end.

- Leveraging data

We have valuable business and demographic data of MSE proprietors. This data can be leveraged through machine learning (with privacy laws compliance) to provide meaningful insights on customer data to field agents as they fill out applications. E.g. a tailoring shop owner claiming X monthly income will be compared with peers in the same demographic and occupation group. The agent will be notified if X falls within the peer group range or is an outlier. If outlier, the agent will be encouraged to probe further.

PARTICIPATION STATEMENT

I commit to present the topic on the stipulated date, if selected

BIO

Aparna has over 10 years of industry experience in software engineering

She graduated with a B'Tech in Computer Science and Engineering from JNTU, Hyderabad

After working for a couple of years with Infosys, she moved to the US and did a Masters in Computer Science from Rutgers, NJ. She worked for a year in the US as Research Scientist at Applied Communication Sciences (ACS, now Vencore Labs). After moving back to India, she worked for a couple of years at Samsung Research, Bangalore. Aparna worked extensively on Android as part of her master's thesis. The stint at ACS and Samsung introduced her to server middleware development.

Her passion for bridging the digital divide brought her to Artoo in 2016. She has since been working across the tech stack – Android, Web powered by Ember JS and a Node.js backend. She has a deep understanding of the technical implications of building a SaaS product for MSE lending.

A devoted mom and a passionate engineer, she enjoys reading and good problems to solve.

More at:

<https://artoo.com/aparna-vaikuntam>

https://medium.com/@aparna_52912

<https://www.linkedin.com/in/aparna-vaikuntam-a70a76a>

REFERENCES

More about Artoo and its solution for MSE lending can be found at:

<https://artoo.com/>

<http://villgro.org/artoo/>