Microsoft Research India

Case Study

Preliminary assessment of a pilot intervention run by BASIX involving the use of handheld devices to record microcredit repayments[1]

June 2007

Mahesh Gogineni

The Technology for Emerging Markets group
Microsoft Research India
Bangalore

Correspondence contact: aratan@microsoft.com

[1] This report can be referenced as: Gogineni, M. "Preliminary assessment of a pilot intervention run by BASIX involving the use of handheld devices to record microcredit repayments." Microsoft Research India Case Study, June 2007.

SUMMARY

- In an attempt to reduce the costs of microcredit repayment data collection, the MFI BASIX recently implemented a pilot project in which field officers used handheld devices to record repayment transactions and print receipts, in place of the existing manual, hand-written process.

- The intervention involves the use of a point-of-transaction handheld device that allows field officers to capture financial transaction data electronically in the field, and then transfer it to the back-end database at the Unit/ branch offices accurately and securely by plugging in the device to the PC via a USB port.

- We find that the use of the handheld device-based channel has a significant impact on the costs involved in recording each loan repayment transaction, stemming from the combination of three factors:
    - The relatively high wages paid by BASIX to its operations staff compared to other MFIs.
    - The significant reduction in staff time needed to enter client repayment data in the field using the device.
    - The significant reduction in staff time needed to integrate the data on the device with the back-end database (back-end time costs for this sub-task cut twenty-fold).

- In addition, the use of a 'direct data upload from the device' option via a USB port (facilitated by BASIX's decentralized/ distributed MIS), avoids any costs associated with alternate wireless data transmission channels, which come with their own set of infrastructure limitations in rural settings.

- The cost savings from the channel are significant and deliver an 82% return on investment, which is associated with a payback period of ~1.2 years. The financial viability of the channel seems assured.

- We also find that clients trust the technology-enabled channel in part because they trust the field officers who handle the technology. Clients seem to place a premium on repeatedly making payments to the same field officer with whom they have been transacting in the past, regardless of whether the field officer's data management tools are manual or electronic.

- In conclusion, we provide recommendations on improving a number of implementation details that can further strengthen the daily workflow of the new technology-enabled channel.

I THE MFI AND INTERVENTION IN QUESTION

One of the major activities in microcredit operations is the collection of loan repayments from clients in scattered, remote locations. Current workflows have Microfinance Institutions (MFIs) facing high costs from the door-to-door collection of repayments from clients, including the costs associated with paper-based systems of collecting and processing repayment data. In an attempt to reduce the costs of repayment data collection, the MFI BASIX implemented a pilot project in which field officers used handheld devices to record repayment transactions and print receipts, in place of the existing manual, hand-written process. In this report, we present a preliminary evaluation of the operational and financial viability of this technology-based front-end channel for microfinance client data management.

Bhartiya Samruddhi Finance Limited (BSFL), one of the group companies of BASIX, operates as a Non-Banking Finance Company and is one of the largest MFIs in India in terms of total loan portfolio. BSFL is the financial arm of BASIX, which provides financial services, predominantly microcredit, insurance, and technical assistance, to the rural poor. The business is characterized by intense field presence due to unit offices being located in remote rural locations and loans originated at the customer's home or workplace through Livelihood Service Advisors (LSAs). As of 2007, BASIX works in 15,000 villages spread over 48 districts in the states of Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Orissa, Jharkhand, Chhattisgarh and Delhi. Unlike most MFIs, BASIX has an equal distribution of men and women in its clientele base.

BASIX management believes that a successful back office and Management Information System (MIS) are critical to managing a strong microfinance retail portfolio. At the same time, the organization has experimented with numerous front-end technologies to improve the transaction processes and costs in dealing with clients[2]. Their most recent experiment involves the use of a point-of-transaction device that allows LSAs to capture financial transaction data electronically in the field, and then transfer it to the back-end database at the Unit/ branch offices accurately and securely via the PC's USB port. BASIX's microfinance software application runs on the handheld device as well, and the device's data is synchronized with the server data on the PC automatically. Innovations of this nature are becoming more important in microfinance, because of the promise they hold in reducing costs and improving efficiency in a highly data-intensive industry. This handheld device pilot is currently deployed in 4 of BSFL's branches (2 in rural and 2 in urban areas), and in all 14 branches of KBS Bank, an RBI-approved local area bank that is also one of the group companies under BASIX.

The existing and new systems of processing client repayments are described below (see Figures 1 and 2). The central people involved in conducting this transaction (repayment collection) are the TA (Transaction Assistant – Back-end data entry officer), LSA (Field officer) and the Clients. The documents/ instruments involved in the transaction include Day-Wise Demand charts (DWDs), receipt books, the handheld devices themselves, and Passbooks that are kept with the clients. The model workflow is as follows: the DWD chart is prepared by the TA and handed over to the LSA at the beginning of every month. This DWD chart contains all the information of the clients whose repayments are due that month (information such as the account number, outstanding amount, amount due that month, amount to be paid next month, etc.) and takes about 5 min to prepare electronically and 20 min to print. Monthly collections happen for 4 days and each LSA collects repayments from about 450 members per month. During these collection days, the LSAs are very busy and struggle for time.

[2] Regy, P. and V. Mahajan. "IT@BASIX - Successes and Failures: A Retrospective." i4d magazine, 4 (5), May 2006, pp. 8-10. url: http://www.i4donline.net/articles/current-article.asp?articleid=665&typ=Features

Figure 1: Original Manual Loan Repayment Processing System

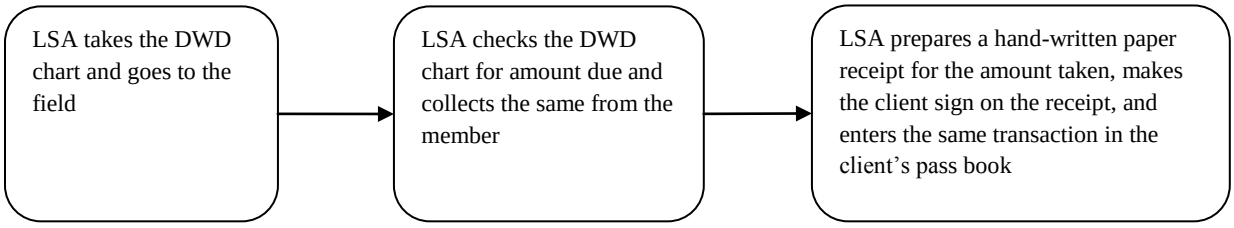

Figure 2: Pilot Loan Repayment Processing System involving the Handheld Device

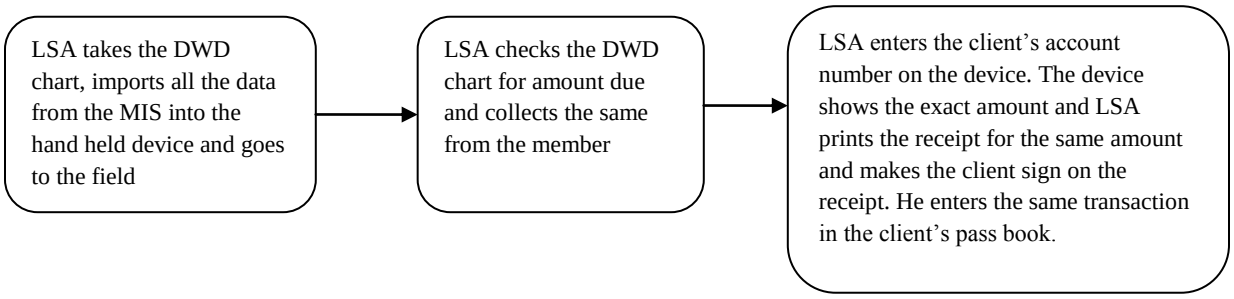

Figure 3: An LSA in the field using the Handheld Device

II EVALUATION METHODOLOGY

In this analysis, we calculate the Net Present Value (NPV) of the pilot technology intervention, taking into account the initial investment required to set-up the system and the future cash inflows that the system is expected to generate. The most basic decision criteria for a choosing an intervention are:

- If NPV >0, undertake the project.
- If NPV <0, reject the project.

The analysis was conducted in the following steps:

- First, the cost savings possible due to the implementation of the technology-based front-end system were calculated.
- The investment costs required to set-up the handheld device-based system and the operating expenses to run it were then calculated. The costs included under operating expenditure were only those incurred by the MFI for maintaining the new infrastructure. The operating costs incurred for daily operations, running the main office, and other expenses were not included since they would have been borne by the MFI regardless of the investment made in the new system.
- The RoI (Return on Investment) was calculated using the profit figures (revenue – expenses) and the investments made. In this, the cost savings from using the new system were used as the revenues generated in the ROI calculations[3].
- Accounting for inflation and the opportunity cost of capital, profits in future years were then estimated.
- The NPV of the investment and the Pay-back period of the new technology-based front-end channel were finally calculated.

To gather data on the usage of the handheld device, a field survey was conducted over a period of three days at one of the branches where the new channel is being piloted (the Nizamabad branch in rural Andhra Pradesh). The survey included interviews with 3 field staff (LSAs), 2 back-end data entry staff at the branch level (TAs), and numerous clients. In all, over eight hours were spent interacting with around 100 clients across three villages served by the Nizamabad branch. Data was also collected through interviews with the Head of the IT division and the IT support staff at BASIX's Head Office in Hyderabad.

III FINANCIAL VIABILITY ASSESSMENT

The various transaction costs incurred by BASIX in collecting client loan repayments are listed in Table 1**.** Costs that are common for the manual system and the new technology intervention are not included here, including cash transport costs, passbook printing and entry costs, and LSA transportation costs. Looking at Table 1, we see that *the high cost of staff time involved in data collection and aggregation* is the major factor driving up costs in the paper-based system, given the relatively high wages that BASIX pays its operations staff compared to other MFIs.

[3] This follows the costing methodology in Kumar, Richa. (2004) "E-Choupals: A Study on the Financial Sustainability of Village Internet Centers in Rural Madhya Pradesh." *Information Technologies and International Development*, 2 (1), 45-73.

Table 1: Basix's transaction costs in collection of repayments[1]

Cost item (Repayment transaction)	Paper-based system (Rs.)	Handheld-based system (Rs.)
Front-end data collection labour cost		
Average time spent by LSA in filling out 1 transaction (min) [2]	3	0.8
Time spent by LSA per day to create the summary sheet (min)	30	1
No of transactions per day	115	115
Time spent by LSA per member to create the summary sheet (min)	0.261	0.009
No of clients handled by LSA per month	450	450
No. of transactions processed per LSA, per month	450	450
Time spent by LSA for error correction per month[3] (min)	90	0
Time spent on error correction per transaction	0.2	0
Total time spent by the LSA	3.46	0.81
Monthly salary of LSA (Rs.)	4500	4500
LSA' time cost in carrying out 1 transaction (Rs.) [4]	1.49	0.35
Back-end data entry labour cost		
Average time spent by TA in entering data of 1 CPF (min) [5]	0.4	0.033
Monthly salary of TA (Rs.)	6000	6000
Time spent by TA for error correction per month[6] (min)	90	0
Time spent on error correction per transaction	0.2	0
Total time spent by TA	0.6	0.033
TA's time cost in entering 1 transaction's data into the MIS[7]	0.35	0.02
Stationery cost		
Stationery expenses, including pens, glue, pins, etc. per LSA, per month	35	0
Stationery expenses per Transaction	0.0778	0
Paper and printing cost, per transaction[8]	0.7	0.329
Paper cost (Rs.)	0.7778	0.329
Data transport from field office to HO		
same for both the systems , so not included in this analysis		
Total variable cost per CPF	**2.62**	**0.70**
Savings per transaction(Rs)	1.92	
% savings per transaction	**73.3%**	

[1] All figures in this table were either estimated or approved by BASIX management.

[2] The LSA takes 15 min per group to record the transactions in the paper-based system and 5 min per group using the handheld device. These figures do not include the time taken for counting the money collected and entering the transactions into the pass books. This is because these activities are common to both the manual and electronic data recording systems. The average client group has 5 members.
[3, 6] Errors like writing the wrong account number for a particular member, or calculation mistakes. Figures provided by the LSA and TA.
[4] Average monthly salary for an LSA is Rs. 4500; 40 hour work-week and 4 weeks paid leave each year (365/12/7 = 4.345 weeks of work per month on average). So total no .of working minutes per month =4.3453*40*60). Using this we evaluate the cost in terms of the LSA's time.
[5] The LSA takes 3hrs for 450 members to enter the transactions in the paper-based system and 15 min for 450 members in case of the system using the handheld device.
[7] The average monthly salary for a TA is Rs. 6000; 40 hour work-week and 4 weeks paid leave each year (365/12/7 = 4.345 weeks of work per month on average). So total no .of working minutes per month =4.3453*40*60). Using this we evaluate the cost in terms of the TA's time.
[8] The receipt book used in the original system cost Rs. 70 per book and has 100 receipts. The printer roll used in the handheld device costs Rs. 23 each and can be used for ~70 transactions.

We find that the use of the handheld device-based channel has a significant impact on the costs involved in recording each loan repayment transaction. Importantly, *the significant reduction in staff time needed to (a) enter client repayment data in the field using the device, and (b) integrate the data on the device with the back-end database (TA time costs for this sub-task cut twenty-fold) is what drives the substantial cost savings from the use of the technology-based channel.*

In addition, the use of a direct data upload from the device option via a USB port, avoids any costs associated with alternate wireless data transmission channels, which come with their own set of infrastructure limitations in rural settings. It is important to note here that this low-cost data transport/ synchronization channel is made possible by BASIX's use of a decentralized/ distributed MIS, unlike other MFIs (e.g. Ujjivan) that rely on a centralized MIS without branch-level access to the central database.

It is important to consider these per-transaction savings in relation to the investments required to set up the technology-based channel. Table 2 lists the fixed and ongoing investments called for in setting up the handheld device-based front-end infrastructure.

Table 2: Investments in the Handheld device-based front-end channel (per branch)[1]

Item	**Handheld device Pilot – amount (Rs.)**
Fixed Investments	
Field data collection device (Handheld) per LSA	11500
Application development costs	0
Total fixed investment for year 1 (on average 12 LSAs per branch)	**138000**
Operating Expenses	
Training of the officers (Rs. 220 per LSA) [2]	2640
Repair maintenance (Rs. 750 per handheld per year)	9000
Total operating expenses for year 1 (12 LSA per branch)	**11640**

[1] All investments included in the table are for one branch.
[2] The trainer's salary is Rs. 12000 per month. Average training per branch is for a week. There are 55 weeks per year and 5 working days per week; 275 working days per year. The trainer's salary per year is Rs 144,000. Cost of the trainer's time per branch = (144000/275)*5. So the trainer's cost per LSA= ((144000/275)*5)/12.

Interpreting the cost savings that are possible by using the handheld device-based channel as revenue generated, the intervention's RoI is estimated in Table 3 below. We see that the cost savings from the channel are significant and deliver an 82% return on investment over the first year itself. However, these calculations do not account for the time value of money. We therefore estimate profits generated for the following 4 years (accounting for inflation at 5.5% per annum and the opportunity cost of this capital at 10%). The NPV of the project over four years is estimated to be Rs. **247,521**with a payback period of about **1.22** years. In sum, the financial viability of the new channel seems assured.

Table 3: Return on Investment (RoI)

Item	**Handheld device pilot (Rs.)**
Fixed investments	**138000**
No. of LSAs	12
Revenue generated (through cost savings)^	124390.37
Operating costs	11640
Profit	112750.37
Return on Investment	**81.70%**

^ Revenue generated = (savings per transaction * no of transactions per LSA per yr * no of LSA per branch)

IV OBSERVATIONS ON PROCESS

It was evident that the LSAs are extremely happy with the new repayment data management channel. The main advantage they describe from the introduction of this device is *the reduced time of conducting each transaction*. The other advantage reported is the *reduced number of errors*. Errors such as writing the wrong account number for a particular member, or calculation mistakes, have been dramatically reduced. The TAs are also very pleased with the introduction of the device since the new system has substantially reduced their data entry time at the back-end, given that the data is recorded in electronic form at source.

Clients too are comfortable with the use of the handheld device. They reported having no issues with the transition from the hand-written receipts to the printed receipts. Part of this ease with the new channel is, interestingly enough, attributed to the social relationship clients have with the LSAs. Clients place a great deal of trust in their local LSA. Almost all the clients spoken to described their trust in the MFI being entirely based on the faith they had in their LSA. They are, as a result, happy with any form of receipt as long as the same LSA (who has been transacting with them in the past) gives them the receipt and collects their cash. This is a particularly interesting observation in the context of proposals for improving the cost-efficiency of banking transactions between low-income clients and financial service providers by shifting to fully-automated channels that dispense of the need for loan officers as intermediaries.

It was interesting to note that in the client meetings attended, all the members of each jointly liable borrowers' group were never present. In 90% of the cases, the Group Leader (GL) had all the pass books and collected the money from all the members in advance and kept them with him/her. The LSA then went straight to the GL and transacted with him/her. In almost all the cases, there was no loss of work time from the client's point of view, i.e. the client's opportunity cost in conducting the repayment transaction with the LSA was minimal. This was because the LSA met the GLs at their work place or the

GLs handed over the money and the pass books to their spouses at home, who then passed it on to the LSA and accepted the receipt.

While the advantages of the new handheld device-based channel are significant, there remain several constraints in the loan repayment collection process that are worth targeting in future improvements to this technology-based front-end transaction channel. These are described below:

- Under the new system, a major portion of meeting time is spent entering the repayment transactions in the clients' individual passbooks. The handheld device has been successful in reducing the time for writing the receipts but it has failed to eliminate the time taken for the passbook entries. When asked about this supplementary effort, all the clients insisted that they wanted their passbooks updated by hand in addition to the printed receipts, though the same information was entered in the pass book and the receipt. Most clients were afraid of losing the receipt (given that it is a small, loose piece of paper), and so wanted the transaction recorded in the pass book as a more 'permanent' reference.

- Though all the information that is present on the DWD chart exists in electronic form on the handheld device as well, the LSAs are more comfortable checking the data from the DWD paper chart rather than from the handheld device. The reason for this is that the device's screen is not large enough to see all the fields of data at once. So the LSA has to use arrow keys to navigate through the fields. LSAs therefore prefer looking up data on the DWD paper chart, rather than using the device for checking the same information.

- There are a considerable number of minor errors in the data that resides in the device. In 70% of the cases, there is a difference of Re. 1 in the amount due between the DWD chart and the data that is displayed on the device. In all these cases the LSA has to retype in the exact amount and then print the receipt. The LSA loses a significant amount of time due to this re-entry. The frequency of errors also increases when the figures are re-typed and not pre-filled.

- There are differences in the paper roll sizes that are used for taking receipt print-outs on the handheld device. Some rolls can be used for 60 transactions and some can be used for up to 90 transactions. Though there are varying roll sizes, the supplier charges BASIX the same price of Rs. 23 per roll.

- 2 out of the 3 LSAs met had problems with the battery backup of the handheld device. They had complaints that the charge in the battery was not sufficient to carry all the transactions in 1 day even if they re-charged the device for the entire night.

- LSAs feel that there is no need for the clients to sign on the printed receipt. Since the LSAs prefer not to tear the office copy (the counter foil), they have to turn the whole device towards the client and have them sign. This takes up a considerable amount of time (many clients are illiterate or semi-literate, and are uncomfortable signing their name in the first place), and increases the risk of damage to the device (since clients have to write on the device).

Figure 4: BASIX's handheld device for loan repayment data management

- LSAs feel the need for a provision to roll up the used receipts on the device. At present they roll it up themselves and then bind the roll with a rubber-band. The same can be observed in the photo shown (Figure 4). When the LSA goes to the next group, he removes the band, takes the print-outs, gets them signed, tears the client's copy, rolls the counter foil and binds it again with a band. The LSA loses a considerable amount of time as a result of this process.

V CONCLUSION & RECOMMENDATIONS

From the financial viability analysis conducted in this paper, it is safe to conclude that BASIX's handheld device-based intervention to streamline client loan repayment data management will be financially viable. The project can expect to break even in around 1.3 years, which is exceptional given that the device can be expected to have a life of 4 years or more. The significant reduction in staff time needed to (a) enter client repayment data in the field using the device, and (b) integrate the data with the back-end database, is what drives the substantial cost savings from the use of this technology-based front-end channel. In addition, the use of a 'direct data upload from the device' option via a USB port (facilitated by BASIX's decentralized/ distributed MIS), avoids any costs associated with alternate wireless data transmission channels, which come with their own set of infrastructure limitations in rural settings. However, the availability of reliable connectivity infrastructure at rural locations could make online data transmission using the devices a possibility in the future.

In terms of addressing shortcomings in the existing workflow around the use of the device, BASIX should look into the discrepancy in the data between the DWD chart and the data that exists in the device for each client. The errors in the data that are present on the device have to be corrected for a reliable and accurate IS to be maintained. BASIX should also talk to the device provider to look into the short battery life of the device. If the device's charge doesn't last long enough, the entire implementation is wasted and the LSA has to resort to the old receipt books to record the transactions by hand.

The possibility of having a provision on the device to roll up the used receipts would be worth investigating. BASIX should also consider removing the customers' signature column from the printed receipt, given the issues in implementing this requirement. Pin-based electronic authentication possibilities to serve the same purpose would be worth investigating. The disparity in the printer roll sizes

is also a point of concern, and it would be useful for BASIX to enquire with the provider on why they are being charged the same price for varying roll sizes. More long-term, it would be strategic to further train the LSAs in the use of the device so that they start using it to check information on amount due, outstanding balance, etc., instead of turning to the DWD chart to retrieve these pieces of information for the client. This increase in the scope of the device's usage will further save BASIX the money and time that is now spent preparing and printing the DWD paper charts.

Looking ahead, given that clients trust the technology-enabled channel in part because of the trust they place in the LSAs who handle the technology, the MFI should make it a priority to retain good field staff and ensure that individual staff build long-term relationships with their clients. In this context, it does not seem wise to follow a system that rotates LSAs between villages (as is standard procedure in some MFIs due to concerns around fraud), since clients seem to place a premium on repeatedly making payments to the same LSA with whom they have been transacting in the past and in whom they place their trust regardless of whether the LSA's data management tools are manual or electronic. Gaining a deeper understanding of these interactions between the IT intervention and the people implementing the change is therefore critical if successful technology-enabled systems are to scale and benefit the largest set of low-income microfinance clients.