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► **To cite this version:**

Thilina Halloluwa, Dhaval Vyas. Dhana Labha: A Financial Management Application to Underbanked Communities in Rural Sri Lanka. 17th IFIP Conference on Human-Computer Interaction (INTER-ACT), Sep 2019, Paphos, Cyprus. pp.744-767, 10.1007/978-3-030-29384-0_45 . hal-02544590

HAL Id: hal-02544590

<https://inria.hal.science/hal-02544590v1>

Submitted on 16 Apr 2020

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Dhana Labha: A Financial Management Application to Underbanked Communities in Rural Sri Lanka

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Abstract. This paper presents findings from field trial of a mobile application called ‘Dhana Labha’ in a rural Sri Lankan community. Dhana Labha was designed to be used by the community members to manage their personal finances, oversee their performance in managing multiple microfinance loans and assist in loan collection. We distributed the application among thirty eight microfinance clients and studied their use over a period of six months. Our findings show that the use of Dhana Labha had a positive impact on existing local practices and financial awareness while prompting the participants to develop unexpected new practices around microfinance workflows. Our findings highlight the importance of understanding existing sociocultural practices for designing applications, as they strongly affect and shape the use of technology in a constrained setting.

Keywords: Microfinance, ICTD, Sociocultural Practices, Qualitative Study

1 Introduction

Financial management is vital in achieving long term as well as short term goals of an individual. Banking institutions play a critical role in this regard by providing various financial services such as savings, loans, and insurance. However, while these services have expanded their reach by introducing several Information and Communication Technology (ICT) based solutions, over 2 billion individuals remain outside the reach of formal banks [11] due to various reasons such as lack of financial infrastructure and credit history [73]. In these situations, microfinance institutions (MFIs) offer a solution by providing loans to these communities without collateral [72]. In the developing world, microfinance has taken a prominent role to support people whom the banks are unwilling to provide loans. These individuals are known as underbanked [27], who have limited access to financial institutions or unbanked [28], who do not have any access to financial institutions.

Microfinance is traditionally a coordinative process, in which micro-loans are released to a group of people instead of an individual. In recent times, the fields of HCI and ICTD have seen a growing number of studies around microfinance related activities (e.g. [1,3,15,16,51,52,73,74]). However, while there is a collective agreement on

the potential of ICT to support microfinance activities, most of the technology interventions have focused on enhancing transactional as well as procedural aspects of microfinance [57,65,71,73]. Yet, over the years, studies have shown that various social and cultural practices are at the root of the success of microfinance (e.g. [15,20,51]). In this paper, we report on the experiences of deployment of a mobile phone based financial management application that was designed to support the collaborative work associated with microfinance workflows in rural Sri Lanka. The application is meant to be used only by microfinance clients (members, group leaders and centre leaders) and not by the microfinance institutes (MFIs). The design and specific functionalities of the application, Dhana Labha, was informed from ethnographic work (e.g. [20,38,61]) conducted in similar contexts. Dhana Labha enables people to manage their finances and oversee microfinance loans. We distributed it to a rural underbanked community in Sri Lanka. We recruited participants via two MFIs operating within that community. The study was carried out over a period of six months with thirty-eight microfinance clients from eight microfinance groups. Instead of evaluating our mobile application, we focused more on using it as a probing tool [24] to understand the changes in experiences brought forward by this intervention.

The main contribution of this paper lies with the empirical findings where we describe how we used Dhana Labha as a technology probe to understand how the people living in a constrained environment with limited exposure to technology use a mobile application to manage their finances and microfinance related activities. By doing so, we elaborate on how the application influenced current local practices. Further, we describe how the application brought forward unexpected changes such as creating physical leaderboards, introducing physical badges while facilitating discussions around finances. These practices enabled building reputations and closing the gaps between social classes. It also had a positive effect on the awareness of the participants' financial situation. we report that these users are firmly accustomed to their existing sociocultural practices, and that attachment led them to use Dhana Labha in a way that the application was internalised and became a part of their current practice. As a result, we advocate that socio-cultural aspects need to be at the centre when designing for microfinance in Sri Lanka., We conclude by presenting design insights for future researchers focusing on sustained use of technology in a constrained setting aimed at supporting existing sociocultural practices through application design.

2 Related Work

2.1 HCI in Constrained Environments

In recent years, HCI practitioners have shown a larger interest in identifying research opportunities associated with cross-cultural design space which mainly targets HCI design for developing regions. The term "postcolonialism" generally refers to segments of people from lands which were previously colonized [2,29]. However, within the context of HCI, postcolonialism refers to methods that aim to engage and empower the community. Postcolonial computing is a term coined through this interest which advocates a shift in perspective focusing mainly on power differences, authority, legal

issues, participation, intelligibility and cultural aspects [29]. Therefore, many argue that some of the assumptions made by the researchers in the developed world may prove to be invalid in these constrained environments. For example, researchers have found that the UI elements and image representations took for granted in a developed country considered to be strange in developing countries [44].

Researchers have identified that gamification and use of game elements as a potential means of encourage participation specially with younger users [18,32,41]. They claim that it is easier for rural children to relate to technological tools if the tools simulate their real life experiences (e.g. traditional games[32] or a popular sport such as cricket [41]). Medhi-Thies et al [46] highlight the importance of mediators when introducing technology in marginalized communities due to the low literacy rates of participants. Wyche et al., [68] present their observations on the challenges people in the developing world where poverty, lack of electricity, network issues are facing when attempting to use Facebook. Jose et al., [30] identify social influence, curiosity, lifecycle of mobile as well as its content, privacy and security as the main reasons for upgrading to a new mobile phone in their attempt to design an ultra-low cost smartphone for the poor communities in India. Kolko et al. [37], suggest that the focus should be on work ecosystems and aspects such as power consumptions and interface. They discovered a significant difference in the extent of collaboration between high resource and low resource settings. Overall, researchers agree that it is important to develop a holistic understanding of cultural and social aspects when designing for users in these marginalized constrained environments.

2.2 Financial Matters in HCI

Understanding an individual's interactions with money is essential when designing financial applications [34]. Thus, many studies have been carried out to understand how individuals in different cultures and contexts interact with personal finances.

Vines et al., [63] have studied the personal finances of older adults in the UK to understand the strategies used to manage their finances. After a longitudinal study, the researchers advocate that the new technology interventions should explore means of strengthening the traditional methods instead of replacing them. A recent study done in China [69] has looked at the monetary practices of older adults' finances in China. The study reports that participants were relying on traditional methods even though there existed numerous technologically enhanced solutions due to their simple lifestyle. Vines et al., [64] further studied the low-income individuals and reported how they organise their finances by planning, prioritising, hiding, and delaying their transactions. Vyas et al. [66,67] have studied the Australian families and reported that these families have come up with creative methods and rely on physical tools to live well on less income. This fact has prompted the researchers to question whether pursuing the development of technological tools is a viable option [67]. They also point out that financial matters have the potential to bring families together and reported on family collaborations around financial matters [58].

Financial matters in ICTD. While there are several attempts to understand the financial management practices of individuals from the developed world (e.g.,

[30,52,54,55]), there is a lack of similar studies involving marginalised populations in developing countries. Studies have shown that when designing for non-literate users, features such as voice-annotation support, local language support, and graphical cues, need to be implemented [48]. Similarly, Kumar, Martin, and O'Neill [39] have looked into the financial practices of Indians, with the intention of understanding how mobile payment mechanisms could be integrated into current payment workflows. They report that the potential is high in India to adopt these new payment mechanisms if they are literate. Mesfin et al., [49] on features of mobile money applications for rural Ethiopia suggest that designers should focus more on social, cultural and religious practices as well as on embedded social meanings when introducing technology interventions. Halloluwa et al., [19] have explored the values associated with the financial affairs of rural Sri Lankans using participatory design workshops. They report three central themes (supporting family, Independence and spiritual beliefs) which acts as the driving force behind the financial decisions of rural Sri Lankans and suggest that the tools should focus on empowering these communities through technology.

2.3 Microfinance and Poverty

Over the years, various studies have illustrated the effectiveness of microfinance, its potential to improve the financial status of low-income families [12,22,42,43,45,70]. Furthermore, studies have found that microfinance has a positive impact on local economy [36], entrepreneurship [10], education [23], community engagement [8], social mobilisation [31] and social empowerment is widely accepted [33]. Microfinance can also reduce gender inequality [33,74] and tends to empower women particularly in male-dominated cultures [26,60]. Goodman [16] claim that even though microfinance has a defined set of workflows, people tend to modify them to fit into their existing borrowing practices. In their work with Bolivian underbanked community, Velasco and Marconi [62] report that there is a diversification of microfinance groups. They report that these groups are now transformed into supportive units which even conduct businesses together. Over the years, microfinance has attracted plenty of criticisms mainly due to the way loans are utilised. Several low-income families utilise borrowed money to meet household expenses and daily consumption instead of utilising it to generate income [14]. Several bad habits also contribute to the negative impact of microfinance. For example, Fernando [13] reports that some MFI clients meet loan repayments by borrowing money from individual moneylenders. They would even secure their loans with local traders in exchange for grocery items. Furthermore, the interest rates of MFIs are significantly higher than formal banks mainly due to higher operating costs [55]. As a result of the unproductive use of funds as well as higher interest rates have increased the personal debt of individuals which has led to increases in poverty [5] as well as emotional turmoil [59]. Overall, the influence of microfinance, as well as its impact on poverty reduction, appears to be variable and inconclusive [54].

2.4 Designing for Microfinance

Due to the prominence of microfinance within the financial affairs of the poor, HCI community has recently started showing greater interest in microfinance workflows (e.g., [1,15,20,51]). Notably, studies have been conducted to investigate ways to enhance these workflows. MFIs collect payments by visiting their members weekly or monthly depending on financial company policies. However, due to different schedules, and busy lifestyles some members may forget about the collection dates. Thus, Sambasivan et al., [56] have explored the impact of a mobile-based message broadcasting system which was used to send payment reminders. They describe the impact of such a system on aspects such as trust and individual identities. Similarly, O'Neil et al., [51] have looked into the lives of auto-rickshaw drivers who are continually on the road to make a living. Therefore, they have explored the possibility of using mobile money to collect payments. They report that mobile money applications alone would not be sufficiently successful, and any such technologies should be embedded into the broader loan repayment ecosystem. Complementing this work, Halloluwa et al., [20] have explored the broader loan repayment ecosystems of a rural Sri Lankan community. They report that sociocultural aspects such as trust, credibility, community engagement and familial support are central to the success of microfinance. Adeel et al., [1] have studied another aspect of microfinance that has gone unnoticed. They claim that loan officers are providing many services outside of their work requirement such as introducing new markets and offering financial advice, which plays a significant role in making microfinance work.

MFIs mostly operate in the rural regions of developing countries where infrastructural facilities are limited. Plogmann et al., [53] claim that lack of technological infrastructure as well as the distance (geographical as well as cultural) between MFI clients and technical experts is one of the significant barriers for introducing technological solutions to this community. It is evident that most current technological interventions to the underbanked community have been introduced focusing on the procedural and transactional aspects of microfinance [20]. However, Barton et al., [6] suggest that by expanding that focus onto microfinance clients and not entirely on MFIs, the designers will be able to develop a different perspective towards microfinance which can lead to more efficient, and sustainable solutions to current issues in microfinance.

3 The Setting

3.1 Rural Sri Lankan Society

Sri Lanka is an island nation with a population of 21 million, out of which 77.4% lives in rural regions [40]. The hierarchy of the Sri Lankan society is mainly patriarchal, particularly in rural regions [9]. Since this is socially and culturally entrenched, the involvement of women [21] and children [17] in financial decision making is limited.

3.2 Microfinance Institutions (MFIs), Centres and Groups

The primary financial service of microfinance is to provide micro-loans without collateral. However, to compensate for the lack of collateral, MFIs follow a group-based lending mechanism which ensures repayment [4,62,72]. That is, instead of releasing loans to an individual, the MFIs require their clients to be grouped. Several groups collectively form a centre. A leader will be selected for the centre. In addition, each group will have its own group leader. Leaders are responsible for making sure that their members do not miss payments. The MFI will allocate a loan officer (LO) to each centre. LOs make weekly/monthly visits to the centres to provide financial services. The centre leader is responsible for hosting the meetings. In most cases, a centre leader would also act as a group leader [20].

4 The Application

Specific features of the application are inspired by previous work with underbanked communities in Sri Lanka (e.g.[4,20,61]).

4.1 Dhana Labha and Personal Finances

Dhana Labha supports the individual members to manage their personal finances by inserting their expenses as well as their income. They can also view their transactions in a news feed filtered according to categories (Fig.1-a). There is a separate form for them to add their loan related information which gets added to the feed as an expense. They can also view all the information about their loans such as the remaining balance, next instalment and overdue amounts (Fig.1-b). At the initial setup, the members are prompted to select a language, either Sinhala (a native language) or English.

4.2 Dhana Labha and Common Microfinance Workflows in Sri Lanka

Collecting Payments. The centres are required to conduct regular meetings. The appointed LO will attend these meetings to release loans and collect repayments. However, prior research has shown that there are several activities carried out by the leaders in the background to ensure timely payments from their members [20]. Visiting the members one or two days prior to the meeting date to collect payments or remind about the payments is one such crucial activity. This allows the leaders to be informed about the payments of their members well in advance which in turn helps them to take necessary actions to cover for members who are struggling to make payments [19,20].

Dhana Labha allows the group leaders to manage their groups (Fig.1-c, d). Since most leaders manage multiple loans from different MFIs, the application allows them to create multiple groups, multiple loans and add members. Once that is done, the leaders can connect group members with their respective groups and loans. The application generates a weekly/monthly payment chart with colour codes (Fig.1- e). Leaders can insert their members' payment records to the application when they do home

visits. The colour of each week changes depending on the payment. At the end of each week, the application generates a leaderboard for each group based on the loan repayment progress (Fig.1- f).

Releasing a Loan. The loans are released to group members based on trust. That is, when one member obtains a loan, the others in the group become guarantors. If one member defaults on loan, all the members will be held accountable, and all further loans of the centre will be compromised. In addition, the loans are released in multiple rounds which allows the MFIs to evaluate a member's repayment capability as well as trustworthiness [4,20]. The leaderboard as well as the scoring system integrated to it is designed to assist members to build up their credentials and showcase their trustworthiness to the MFIs (Fig.1-f). A member can make a payment in full or as a partial payment. The application awards a single mark for full payment and a proportion of the payment as a mark for a partial payment (i.e. if instalment required is 100 rupees and the member made a 40 rupee payment, 0.4 marks will be awarded). 0 mark is given for a missed payment. Multiple borrowing is another common practice [61] supported by Dhana Labha. Members can create multiple loans and connect their profiles with those loans to manage loans obtained from multiple MFIs.

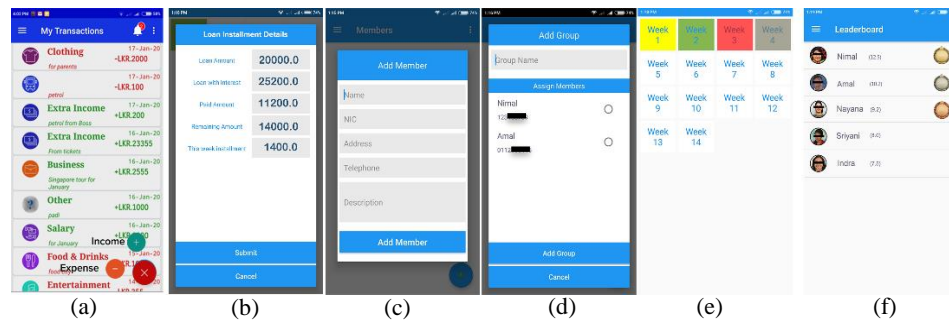


Fig. 1. (a) The transaction feed (b) The loan information sheet(c) group member adding (d) adding members to groups (e) The weekly payment chart with colour codes; full payments are indicated in green, yellow indicates partial payment and red indicate missed payments. (f) The group leaderboard with scores

5 The Study

5.1 Participants

The participants were recruited in collaboration with two MFIs operating in the Gampaha district, Sri Lanka. We distributed the application to members of eight groups, comprising 38 members. All of them had access to economical smartphones. In addition, five LOs took part in our study. However, their participation was limited to individual interviews. They were not given the access to the application.

5.2 Data Collection and Analysis

A qualitative approach was followed in collecting and analysing data. Two members of the research team conducted weekly, face-to-face, semi-structured interviews with the members at the microfinance centres and interviewed the leaders at their homes. We also conducted interviews with the LOs involved at the end of the study. We used telephone interviews in cases where participants could not meet us in person. Audio recordings of the interviews were made, and whenever required, photographs were taken of the interviewees. While one member of the research team conducted the interview, the other member took notes.

All the interviews were conducted in the Sinhala language. Since one of the authors is from a different geographic location, the interview data was translated and transcribed. The transcriptions were collectively coded, and themes were derived through the thematic analysis method [7]. Audio recordings, photographs as well as transcriptions were shared among the authors and explored individually. Afterwards, a cross analysis was conducted to compare the findings. Further discussions were conducted to resolve conflicting interpretations of data.

6 Findings

6.1 General Use of Dhana Labha

The application allowed the participants (both members and leaders) to manage their personal finances by adding their incomes and expenses to the application. They were also able to oversee multiple microfinance loans. Additionally, the leaders were able to manage their groups through the application. They took the application with them when they visit their group members to collect payments or remind meeting dates and updated payment chart in their presence (Fig.2-a). The leaderboard was only available to the leaders, and they would show it to the other members when they attend the meetings. Our interviews with the members suggested that our participants were excited about the intervention and found it useful.

Ramesh is a taxi driver who earns irregular incomes throughout the day. Here is how he explained his experience with Dhana Labha.

“Dhana Labha has made it easier for me to keep track of my transactions because my phone is always with me. I really like the charts of the application since it summarises my expenses.” – Ramesh

Thilaka, who works as a domestic worker stated that she prefers to write down her income and expenses in a notebook since she did not keep her phone with her while working out of fear of damaging it. At the end of each day, she would transfer her notes to the mobile phone (Fig.2-b).

“At the moment I get paid daily, but at the end of each month, I have to lend from my employer to cover for my loans. Dhana Labha has shown me that I spend small amounts of money each day for fast food and sweets which accumulates into a larger sum. Therefore, I have decided to ask for a weekly payment instead of a daily one. Hope that will help me save some money – Thilaka

This statement of her showed us how Dhana Labha helped her to reflect on her transactions which led her to make better financial decisions.

Overall, our participants stated that the application is engaging and useful. Yet, we saw that members gradually reduced their use of the application for entering their daily expenses. They would only enter data once in two or three days. They were mostly interested in microfinance portion of the application where they were able to see how other members progress with their loans.

We initially approached forty six members from 10 groups for the study. However, after the first week of use, two groups (eight members) opted out of the study. One group claimed that they do not trust the application and they fear that the MFI may use the application against them in some way.

“We do not want them to introduce something like this. The way it was is better. [...] In the past, we could negotiate with the leader and get a grace period.” – Members of a group who opted out

It was clear that some these members thought that the application would take away their chances to negotiate with their leaders on payments. The other group opted out stating their concern over the data usage of the application.

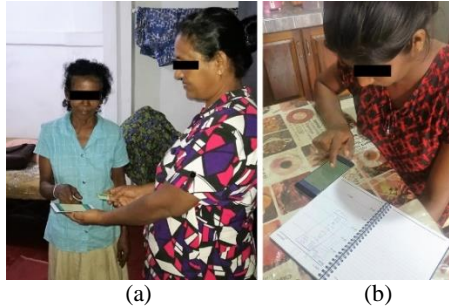


Fig. 2. (a) A group leader visiting a house of a member with the application to collect payment
(b) A member adding her transactions to the application by referring to her notebook

Family Communication. Our findings also revealed that Dhana Labha had prompted the members to initiate conversations among family members regarding financial matters.

Nimal is a cook who works at a roadside hotel in the city. Additionally, he undertakes occasional catering jobs to various village functions. Both Nimal and his wife Lakmini have been obtaining loans from MFIs for the past five years. However, in addition to MFI loans, Nimal has obtained several other loans from local money lenders without Lakmini’s knowledge. After we introduced the application, they have started inserting all their financial transactions, which showed Lakmini that they are in a lot more debt than she initially suspected.

“I never knew that my husband is in this much debt. I used to trouble him to start our own food stall. Now I think it is better to help him pay all these debts and then start working on a food stall” – Lakmini

Gunadasa, who runs a boutique shop with his wife wanted to get their son to join the family business. However, being a traditional Sri Lankan father, whom children always look up to as an authoritative figure, he has found it difficult to initiate such a discussion with his son.

“I always wanted to talk about financial matters with my older son. But I could not find a suitable topic. With Dhana Labha, I have something my son understands better than me. And he helps me enter all my expenses while I talk about financial matters” – Gunadasa

Both of these statements show that the application helped initiate discussion around finances within the families. This is significant because typically within the Sri Lankan rural regions, the father is considered to be the breadwinner and financial matters rarely discussed with the children or wife.

Prioritizing Payments and Improving Awareness. Members also reported that the application helped them prioritize their payments. For example, our participants stated that they used to pawn their gold jewelry whenever they struggle to pay the instalments. While this helps them pay for a single loan instalment, they end up having two debts, instead of one. However, most MFIs do not add additional interest to missed payments. The application has helped Kamala to understand just that. The loan instalment details form (Fig.1-b) of the application has shown her that she is behind her instalments and yet the instalment amount does not change weekly.

"I saw that my week's instalment for this week is 500 rupees and if I pay next week, the instalment is 1000 rupees. That is when I realised; the MFI is not charging an additional interest. But my gold loan charges a 1% interest per day. So I decided to pay the gold loan this week and pay my MFI loan next week." - Kamala

Pasini has a practice of taking loans from one MFI to repay another MFI's loan. The charts in the application have helped Pasini to realise that she has a lot of debt and with her current income that she will never be able to repay. We also interviewed some members about the colour codes in the weekly payment chart (Fig.1-c), and they said that they always wanted to have it green and hated to see red.

"Yes we are poor, but we are proud people. We took a loan because we knew we could pay for it. When I saw my record is marked in red, I felt ashamed." - Upendra

Seeing red in their records have made them feel as if they had done something shameful.

6.2 Trustworthiness and Credibility

MFIs employ a variety of tactics to determine the trustworthiness or the credibility of individuals. Conducting loan rounds, marking attendance are some of those tactics [20]. However, in many cases, the LOs rely heavily on group and centre leaders' words to understand the trustworthiness of members. As a result, an individual occupying a higher social standing can obtain a loan easily compared to someone from a lower social standing.

Our findings revealed that it is the people who occupy lower social standings that are more enthusiastic about the use of the application – particularly the visual elements such as leaderboards and charts. Nilupa, a domestic worker, has been using microfinance for several years and has faced difficulties in the past to make payments on time. This has painted a negative picture of her in the eyes of LOs as well as the other members.

"The whole group, as well as the villagers, looked down on me, and it is tough to get a larger loan approved since no one trusted me to pay. Wait and see; I will win the whole thing." - Nilupa

While Nilupa has not missed any payments recently, her previous negative track record had made it very difficult for her to get a larger loan approved. The application has given her a way to show others who looked down on her that she too is a proud and credible person.

While using the application, she led the leaderboard on several occasions, and she was hopeful that she would be able to get a larger loan approved. Her group members have confirmed that over the past six months, she has not missed a single payment not only with the MFI we worked with but also with other the MFIs Nilupa interacts with. One MFI has even released a loan of 20000 rupees which was previously rejected.

“The change in her is amazing. At one point we were even not sure if we wanted to work with her. She has missed many payments before. Her group leader has specifically asked me not to release a larger loan to Nilupa. Hopefully, she will continue this”- Nilupa’s LO

It was clear that leading the leaderboard has given her a taste of social recognition among her peers and this has motivated her and helped to improve her self-confidence.

We also observed the application is having a positive impact on the members’ lives outside the microfinance centres. Prema, another member who was considered to be struggling to make repayments, has not just paid all her microfinance instalments but also paid the debts she had to the village boutique shop. When prompted, she clarified that initially, it was only her husband who was earning, and she took loans to support the family. The husband paid the loans. But Prema’s desire to show her peers that she too is a trustworthy individual has motivated her to find a job at a local grocery.

“This whole experience has shown me what I can really do. If I could not pay the instalments, it would have been visible to everybody. I told my husband that I do not want to be laughed at anymore. I am happy that I took the initiative.”- Prema

While all the excerpts above highlights how Dhana Labha helped to motivate our participants and helped them to reflect on their financial decisions, the MFIs have seen another use for the application. One LO stated that now it is easier for her to reject loan requests as the mobile application clearly show the group members’ standings to the group.

“I am planning to come up with a method to determine whether to release a loan or not based on these application scores. If they do not have a good score, I can easily point it out. ” – An LO

And she believes that by increasing the awareness of members about the application and letting them know that this is a community driven initiative instead of something introduced by the MFIs, she would be able to make transparent decisions on loan rejections.

6.3 Missed Payments and Coercion

Members missing payments is a common issue in microfinance. To discourage this the Los withhold future loans of other members when a member of their group misses a payment. As a result, the group leaders take many precautions to make sure all their members make payments on time. A common practice is for the group leader to compensate for the member who missed a payment. But there are many occasions where they use tactics such as Public shaming [33] or the use of coercion [20] to collect payments . Interestingly, our intervention showed us that this type of technology intervention has a potential to reduce the occurrence such harmful practices.

Kumari is a centre leader who manages more than five groups. Since she is managing such a large number of people, it was difficult for her to compensate when multiple members miss payments. Therefore, she stated that she takes precautionary ac-

tions to make sure her members pay on time. Sometimes, this may even be through unethical and in some case unlawful means, such as threatening family members or even publicly humiliating members.

"I am not proud of it. But these MFI loans are a huge part of how we support our families. If the MFIs stop visiting, we will lose everything. I am prepared to collect the instalments by any means necessary."- Kumari

However, Kumari said that over the past six months, she only had to use coercive tactics once. The LOs we worked with, as well as the leaders, claimed that there is an overall drop in missed payments. Even the members who were really struggling to pay would at least make a partial payment to show their commitment to the loans.

While group leaders claimed that they have not had to use coercive tactics, several members stated that the leaders are now using the colour codes of the application to influence payments.

"She came to our place and showed me her phone. She said that since I have red in my weekly sheet, I would not be able to take the next loan. She said that she had not shown it the LO yet, but if I did not pay up, she would do it." – Rangika (a member from Kumari's group)

When a member misses a payment, instead of public shaming, this leader has threatened to show the application to the MFIs and stop them from releasing the next loan.

6.4 Social Negotiations around the Application

Even though initially, one group opted out from the study stating concerns that application prevents them from negotiating with the leader, we realised that several members have come to an understanding with their leaders to mark the payments even though the payment is not made. They would pay it at a later day of the month, and the leader will cover for them while charging an additional interest. While the leaders may not accept such a negotiation with all the members, they were happy to do so for a trustworthy person.

"You see, earlier, when we ask leaders to cover for us, they would always say many things claiming that we have missed the payments regularly. Now the application shows that we have not, which make it easier to ask for a loan from the leader."- Wasana's group members

These members have figured out that they can use Dhana Labha to negotiate with their leaders as well as LOs in a more meaningful way while justifying their claims.

Dileka is a centre leader who believes that members should take responsibility for their own loans and she should not have to visit them frequently to collect payments.

"I know the other leaders are doing many immoral things to collect payments. I simply do not want to stoop to that level. If they do not pay, I will try my best to cover for this loan cycle. But after that, I will not work with them."- Dileka

However, because of her attitudes towards the role of a group leader, she has struggled to collect payments from group members in the past. As a result, some MFIs have even stopped visiting her centre claiming that she is not taking responsibility for her members. The application has given Dileka an alternative tactic of which she feels comfortable using.

"It was common for my members to make a partial payment to me and bring the balance on the meeting date. Now, they see their week slots become yellow when they make partial payments, and almost immediately they agree to pay in full so that it would become green."- Dileka

She has realised that her members are very conscious of the colour scheme and they always wanted to have it in green. This has made her life as a centre leader easier since she does not have to visit the members to collect payments as frequently.

5.6 New Practices Influenced by the Application

Our interventions revealed that users had built additional practices around the functionalities of the application. Creating a handwritten leaderboard and introducing tangible badges are examples.



Fig. 3. Nadee describing her handwritten leaderboard



Fig. 4. Nilanthi proudly wearing the two badges and showing us her weekly payment chart

Handwritten Leaderboard. Priyanwada is a centre leader who has been interacting with MFIs for the past ten years. She found that her members are now showing an eagerness which was not there before.

“Earlier, they would just visit the centre, make the payments and leave. But now I see many of them talk about their loans and their financial situations with each other. I think the leaderboard and the charts of the application plays a major role in this because it helps to visualise their finances.”- Priyanwada

Nadee is a centre leader who runs a children’s nursery. Currently, she leads two groups. Nadee has seen that while all of her members seem eager about the application and the charts, only four of her members were actively using the application. The members were more interested in seeing the leaderboard (which was available only in the leader’s phone) than to see their own finances. Therefore, Nadee decided to create a physical leaderboard at her centre (fig.3). After each meeting, she would update the board in front of all the members.

She especially found that her members are engaging in discussions over the leaderboard where they kept asking how the winner is selected as well as how the score is calculated. Following is an excerpt where she explained this change.

“It is amazing how it all worked out. As you know, most of our members are not educated, and they did not really care to learn about the interest rates. Initially, I tried teaching them but gave up very soon because none of them showed any interest. But now all of a sudden, they want to know the calculations behind the leaderboard.”- Nadee

Creating Identity through Badges. Inspired by the leaderboard and the members’ eagerness towards it, one MFI has introduced a badge system to their members. These were plastic badges given to the overall best member of the group (best member

badge) and to the members who made the full instalment payments for three consecutive weeks (loan leader badge) (fig.4).

“The lives of our clients’ are a bit simple. But this has created a sort of competition among them. Something they have not experienced before” – LO

It was clear that the game like experience and the opportunity to compete with each other have given a refreshing change to the monotonous lives of these members which in turn motivated them to manage their finances better.

Nilanthi is a boutique shop owner who has been interacting with multiple MFIs for the past three years. She has been awarded both the badges.

“We have not experienced such a thing in a long time. We had these when we were schooling. I remember our teacher gave us stars when we were small. I think this has a similar effect. I feel proud of myself for being able to have been awarded the two badges.” Nilanthi

The members went on saying;

“Now we do not have to look at leaders’ phone all the time. We know who is performing best in our group”- Senani

These practices have allowed them to build an identity for themselves as a credible person within their community and the badges allow them to have a sense of achievement. Evidently these members have accepted it as an opportunity where they can elevate their social status within the community.

The LO confirmed that they are planning to introduce the handwritten leaderboard as well as the badge system to rest of their MFI centres as this seems to motivate the members to become better re-payers.

7 Discussion

The following sections further elaborate our findings by exploring them through a postcolonial lens. We also discuss our opinions on sustained use of technology over a period of six months and share our design insights on the use of technology in a constrained setting.

7.1 Lessons learned from a postcolonial perspective

As mentioned earlier, the term postcolonialism in HCI refers to the methods that aim to engage and empower marginalized communities. This section elaborates on how certain aspects of postcoloniality came into play in different stages of this research.

Participation and power differences. We experienced that our participant responses are too polite and respectful. They often hesitated to give any negative feedback regarding the application or their experiences participating in the study. There were many occasions where we had to revisit a participant to obtain further clarifications. They would often address us as ‘Sir’ or ‘Mahaththaya’ (Sinhalese to sir). Instead of talking freely, they would always stand up and answer. Some participants were keenly interested in getting to use new technology or interact with devices. As a result, they kept on providing complements instead of sharing their genuine experiences. Therefore, treating these compliments with this context in mind is critical when researching

with a similar community. In cases where the researcher is from a developed country, it is advisable to employ a local researcher or a representative who understands the innate practices, beliefs as well as the hierarchies.

Communication. Communicating without ambiguity is another focal point in postcolonial computing research [29]. Even though one authour was a local researcher who were familiar with local customs, this was one of the main challenges we encountered. Particularly when discussing the participants' innate financial experiences.

One reason for reluctance could mainly be due to the sensitive nature of the topic; 'Personal Finances', which is considered an impolite subject to discuss with strangers. Another reason for their reluctance could have been the social class difference, as we were perceived as educated urban dwellers who had intruded into their rural community. Later they confided that they feared that we would collect their stories and publicize them, which would reflect negatively on their social lives. Even though we explained that the informed consent collection process and ethics committee guidelines prevented us from disclosing any of their personal information, the participants were not convinced and continued to show their distrust. Approaching the same participant through different members of the community whom they trust was a tactic we used to earn their trust. Sharing our personal experiences and discuss matters beyond personal finances such as their previous work experiences and various stories of the past were some of the frequent topics of discussions. Consequently, we had to spend several days outside the period of study conduct getting to know the participants and visiting their homes to build a strong relationship. While one may view this as a waste of time, this helped us to develop a greater understanding of their everyday lives as well as develop a holistic image of how they operate within the community.

7.2 Sustained use of technology by promoting actions beyond the status quo

This study showed that there is a potential to motivate the sustained use of technology by promoting actions beyond their current state of affairs. We realized that Dhana Labha have promoted new practices around the application outside of its intended use.

Community and Family Connectedness. Dhana Labha was never intended to be used as a communication tool. For example, it did not have social elements such as messaging or connecting members together since the aim of the application was to support personal finance and microfinance workflows. Nonetheless, we observed that our application contributed towards initiating discussions around finances at various levels.

Typically, a microfinance centre is formed as a focal point of loan collection [4]. The members would obtain loans from multiple MFIs which conduct meetings on the same date [61]. As a result, a member would usually visit a centre to mark their attendance and immediately would leave the centre so that they can attend the next MFI's meeting. However, with the introduction of scores and leaderboard, participants got inspired to know more about how the scores were calculated. We speculate that this is mainly to know how they can outperform the other group members. Once they understood that they lose marks when they miss a payment or make a partial payment, they would then talk to other members to learn how they were able to make

payments. This has inadvertently prompted them to discuss their financial affairs with other members as well as LOs. Nadee has understood the value of this and has taken the initiative to create a handwritten leaderboard at her centre. She now realises that her members are engaging more with fellow members as well as the LOs over their financial practices.

As mentioned earlier, the Sri Lankan society is traditionally patriarchal where males are seen as the breadwinners of the family. As a result, most husbands would not usually discuss the financial affairs with their wives. In addition, finances are considered an adult-related affair and the involvement of children is limited. While there are cases where children are expected to earn money by performing light chores in the village, most parents prefer to keep their children away from everyday activities associated with loans and repayments. We believe that this is mainly out of fear of losing their socially and culturally accepted position of “breadwinner” within the family. In this study, Dhana Labha has provided opportunities for the males to initiate discussions with their families. In Gunadasa’s case, he was able to get his son involved as he was struggling to enter his transactions to the mobile application. Nimal was able to finally share his actual financial standings with his wife so that she would help him pay the additional loans he took from money lenders.

Social Empowerment and Recognition. While we observed that some of the participants were eager to use Dhana Labha for its intended use (managing finances, collecting loans, etc.), it is the simple value-added features such as the leaderboard and instalment payment chart that captivated their interest. Even though the caste system does not have a prominent presence in the Sri Lankan community, the social status or class play a significant role. For example, a village baker or an astrologer are considered to be occupying a higher social class whereas the domestic workers or labourers are considered from a lower social class. Even the MFIs take into account these social standings when deciding on releasing loans as well as choosing group/centre leaders [20]. As a result, it is challenging for a person from a lower social class to obtain a larger loan, not to mention becoming a leader. The leaderboard has given those individuals occupying lower social classes a form of recognition as well as a means to gain respect from their peers, which has motivated them to continue without missing payments. We realise that these members place a significantly high value on such recognition. Nilupa’s and Prema’s experiences provide excellent examples of this. In Prema’s case, she not only paid off all her debt to other money lenders but also went on and found a job so that she can maintain her successful practices. The group members, as well as the LOs, have confirmed the fact that these members carry themselves more confidently within the centres. It also speaks volumes of the impact Dhana Labha had on empowering them.

Reducing Harmful Practices. Members missing payments or defaulting loans is one of the main issues the MFIs need to be aware of, particularly since MFIs release loans without obtaining any collateral. It is not only damaging to the MFI, it has an adverse effect on the members as well as the community. For example, members who miss several payments tend to take additional loans from individual lenders that ultimately leads to more debt [13,33]. The remaining group members will also have their future loans rejected which may cause community unrest among the group members.

Therefore to mitigate missed payments, the MFIs follow a set of proven practices such as conducting loan rounds and taking attendance [10,72], which allows them to monitor the loan payment patterns of individuals.

However, we identified that the notion of winning something over the other members had triggered a chain reaction which ultimately reduced the number of missed payments. Another such tactic of MFIs to reduce missed payments is to only accept influential people within the community as centre leaders [20]. The rationale behind this is that a leader who is socially respected and influential would take actions to influence the members to make payments. Sometime, the MFIs may completely discontinue the centre. Hence, the leaders usually make sure that their members pay on time and in cases where they are unable to pay, the leaders themselves will cover their payments. However, they could only cover for a member for a limited number of times. On instances where members would continue to miss payments, some leaders resorted to using violent actions such as verbally and physically threatening the families and forcefully collecting payments. Through our explorations, we observed that our intervention had a positive influence on such harmful practices. Several leaders have mentioned that now there is an intrinsic motivation among the members who previously were notorious for missing payments since they wanted to win over the others. In addition, even in difficult cases, the weekly instalment payment chart was enough to influence members to make full payments. While one can argue this to be a different form of coercive tactic, it is harmless compared to the previously utilised methods such as physical/ verbal abuse and public shaming (e.g. [13,20,33]).

We believe that the continued use of Dhana Labha was due to the collective outcomes described above which mainly extended the functionalities of Dhana Labha beyond the confines of single use while promoting actions outside the status quo.

7.3 Design Implications for Future Work

Complimenting the prior work on socio-cultural practices and their influence on the microfinance workflows (e.g.[1,15,20,51]), our work demonstrated just how those practices are attuned to the lives of our participants. However, this habituation led us to critically question the focus on existing technology introductions for the microfinance sector, which has mainly aimed at supporting MFIs and its related organisational and transactional practices (e.g. [57,65,71]). Instead, we discuss implications where the focus would be to support community engagement and connect these underbanked communities together.

Gamification in a constrained setting. The participant's use of Dhana Labha prompted us to wonder that there may be a potential for a social network that incorporates gamified elements. The participants' eagerness towards the leaderboard and physical badges shown a great potential to motivate users make timely payments and improved group participation. And since this is a practices proven to be successful in few other contexts in similar environments, particularly in encouraging participation (e.g. [18,47]), it would be interesting to study how these communities would react to a full gamified experience with leaderboards, badges through the application, awards, and discussion boards. By expanding the use of application beyond the con-

of single usage, we may be able to inspire improved social networking. Understanding how such enhanced social experiences through technology impacts on the participants' day-to-day lives could be an interesting research avenue. At the current state, the members can only see their own transactions, and only the leaders could see the loan progress of the other members. Instead, in our next iteration, we plan to share the leaderboard with all our participants so that they could see their standings.

How these plans could be implemented is another interesting question given the various constraints we have to operate in. On the one hand, the use of such an application may have a financial cost for the users because any social communication has to be done through a data network. Though we are aware that mobile data cost is minuscule in Sri Lanka (e.g. [25,50]), changing the perception of these people towards the use of mobile internet could be challenging. This was evident for us when one group opted out claiming that they fear the application will "eat up" their data allocations. On the other hand, we do not believe our participants are familiar with such social elements and sophisticated features. The economical smartphones they use may not be adequately powerful to handle those features either.

We believe that most of these constraints can be overcome simply by conducting a few training workshops with the participants. For example, we could improve their awareness of data charges and the economical data packages offered by internet service providers. Therefore, if they were made aware of these and taught how to activate these packages, we believe that they could be motivated to use Dhana Labha for social networking.

Visibility through situated displays. Another potential line of work is exploring the use of situated displays. What impact would Dhana Labha have if it could communicate through a situated display at the microfinance centre to a broader audience? This suggestion is inspired by Nadee's handwritten leaderboard and how it prompted the members to compete with each other as well as initiate discussions. All members of the centre could be automatically connected and synchronised to the display when they arrive at the centre. It would be interesting to investigate how to scale this up and understand the impact of such an intervention at a larger scale. There could be multiple centres within a single community because a centre would consist of around 25-30 members. This means that a single MFI may operate in multiple centres within the same community. Therefore, if the MFIs could derive information from these displays, it may also allow them to maintain a decentralised database of their centres and members. Since our findings suggested that our participants were eager to win over their peers and showcase their credibility, initiating a centre-wise competition and examine how that impacts social and community relationships could be of interest.

As a learning tool. It would also be interesting to see how Dhana Labha could be used as a learning tool to provide much needed financial literacy to the underbanked. For instance, Nadee stated that most of her members are unaware of interest rates or uninterested in learning about them. As a result, most of them are unaware that they are actually agreeing to pay a significantly larger interest rate to MFIs than what formal banking institutions are charging [55]. Despite many attempts by Nadee to teach her members about these financial aspects, she had failed to do so due to lack of interest from her members. Instances such as Gunadasa's experience of getting his son

involved in a discussion on family finances, Dhana Labha helping Thilaka to reflect on her transactions and Kamala prioritizing her payments led us to question whether there is a potential to use the same application to improve the financial literacy of these families. Helping these communities improve their financial literacy and awareness can help them better manage their personal finances which in turn may have a positive impact on their overall financial situation.

8 Conclusion

In this paper, we have presented a six-month-long exploratory study aimed at understanding the effects of introducing a financial management application to the underbanked rural community in Sri Lanka. Through our findings, we reveal that our application impacted on several levels of our participants and their families' lives. Notably, we saw that our participants used it to showcase their credibility and to socially negotiate as well as to foster new practices. We also identified that our intervention had a positive impact on some of the critical aspects of microfinance such as members missing multiple payments which accumulate into a more substantial debt as well as the use of coercion in collecting payments. Moreover, the application helped to improve our participant's awareness of their financial status. Consequently, we realised that even though the functionalities of the application mainly supported microfinance workflows and managed personal finance, the participants' existing socio-cultural practices strongly influenced and shaped the use of technology.

The insights derived from this research highlight that the current practices of participants are habituated to their lives in such a way, that they look for ways to seamlessly merge technologically driven solutions with their practices. These findings led us to question the technology centred visions for designing within the ICTD domain. Realising the importance of understanding the microfinance community and its inherent sociocultural practices, this study provides design insights for future technology designers who aim at introducing technological aids to the underbanked community. We suggest that researchers should explore ways to promote additional actions beyond the current state of affairs through technology since those were the aspects proved to be having a broader impact and promoted sustained use of technology over a longer period which is critical in new technology interventions.

REFERENCES

1. Muhammad Adeel, Bernhard Nett, Turkan Gurbanova, Volker Wulf, and David Randall. 2013. The Challenges of Microfinance Innovation: Understanding 'Private Services'. In *Proceedings of the 13th European Conference on Computer Supported Cooperative Work: ECSCW 2013*, 21–25.
2. Syed Ishtiaque Ahmed and Steven J Jackson. 2015. Residual Mobilities : Infrastructural Displacement and Post-Colonial Computing in Bangladesh. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 437–446.
3. Chandana Alawattage, Cameron Graham, and Danture Wickramasinghe. 2018. Microaccountability and biopolitics: Microfinance in a Sri Lankan village. *Accounting, Organizations and Society*: 1–23.
4. Anura Atapattu. 2009. State of Microfinance in Sri Lanka. In *State of Microfinance in*

- SAARC Countries. Colombo.
5. Deepak Barman, Himendu P. Mathur, and Vinita Kalra. 2009. Role of Microfinance Interventions in Financial Inclusion: A Comparative Study of Microfinance Models. *Vision: The Journal of Business Perspective* 13, 3: 51–59.
 6. Susana Barton, Carlos del Busto, Christian Rodriguez, and Alice Liu. 2007. *Client-focused MFI technologies case study (microREPORT #77)*. Washington.
 7. Virginia Braun and Victoria Clarke. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3, May 2015: 77–101.
 8. R M Brook, K J Hillyer, and G Bhuvaneshwari. 2008. Microfinance for community development, poverty alleviation and natural resource management in peri-urban Hubli-Dharwad, India. *Environment and Urbanization* 20, 1: 149–163.
 9. R Casinader, S Fernando, and K Gamage. 1987. Women's Issues and Men's Roles: Sri Lankan village experience. In *Geography of Gender in the Third World*. (J.H. Momse). Albany: State University of New York Press, 309–322.
 10. Karlan Dean and Martin Valdivia. 2011. Teaching entrepreneurship: Impact of business training on microfinance clients and institutions. *Review of Economics and statistics* 93, 2: 510–527.
 11. Asli Demirguc-Kunt, Leora Klapper, Dorothe Singer, and Peter Van Oudheusden. 2015. *The Global Findex Database 2014: Measuring Financial Inclusion around the World*.
 12. Eduardo H. Diniz, Marlei Pozzebon, and Martin Jayo. 2008. The Role of ICT in Improving Microcredit : The Case of Correspondent Banking in Brazil. *Cahier du GReSI no 08*, 03.
 13. Jude L. Fernando. 2006. *Microfinance : perils and prospects*. Routledge.
 14. J. Friedmann. 1992. Empowerment: the politics of alternative development. *Empowerment: the politics of alternative development*.
 15. Ishita Ghosh, Jay Chen, Joy Ming, and Azza Abouzied. 2015. The Persistence of Paper: A Case Study in Microfinance from Ghana. In *Proceedings of the Seventh International Conference on Information and Communication Technologies and Development*, 13.
 16. Rachael Goodman. 2017. Borrowing Money, Exchanging Relationships: Making Microfinance Fit into Local Lives in Kumaon, India. *World Development* 93: 362–373.
 17. T. Halloluwa, D. Vyas, H. Usoof, P. Bandara, M. Brereton, and P. Hewagamage. 2017. *Designing for financial literacy: Co-design with children in rural Sri Lanka*.
 18. T. Halloluwa, D. Vyas, H. Usoof, and K.P. Hewagamage. 2017. Gamification for development: a case of collaborative learning in Sri Lankan primary schools. *Personal and Ubiquitous Computing* 22, 2: 391–407.
 19. T Halloluwa, P Bandara, H Usoof, and D Vyas. 2018. Value for Money : Co - Designing with Underbanked Women from Rural Sri Lanka. In *Proceedings of the 30th Australian Conference on Computer-Human Interaction, OZCHI '178*, 1–12.
 20. T Halloluwa, H Usoof, and D Vyas. 2018. Sociocultural Practices that Make Microfinance Work : A Case Study from Sri Lanka. In *Proceedings of the ACM: Human-Computer Interaction*, 1–21.
 21. H M A Herath. 2015. Place of Women in Sri Lankan Society: Measures for Their Empowerment for Development and Good Governance. *Vidyodaya Journal of Management* 01, 1: 1–14.
 22. H M W A Herath, L H P Guneratne, and Nimal Sanderatne. 2015. Impact of microfinance on women ' s empowerment : a case study on two microfinance institutions in Sri Lanka. *Sri Lanka Journal of Social Sciences* 38, 1: 51–61.
 23. Nathalie Holvoet. 2004. Impact of microfinance programs on children's education. *ESR Review* 6, 2: 27.
 24. Hilary Hutchinson, Benjamin B Bederson, Allison Druin, et al., 2003. Technology probes: inspiring design for and with families. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '03)*, 5: 17–24.

25. Hutchison. 2018. Hutchison Telecommunications Sri Lanka | The best 3G Internet provider Pack Comparison. Retrieved December 19, 2018 from <https://www.hutch.lk/pack-compare/>
26. International Labour Office. 2008. *Small change, Big changes: Women and Microfinance*. Geneva. Retrieved June 4, 2018 from http://www.ilo.org/wcmsp5/groups/public/@dgreports/@gender/documents/meetingdocument/wcms_091581.pdf
27. Investopedia. 2017. Underbanked. *Investopedia*. Retrieved September 4, 2017 from <http://www.investopedia.com/terms/u/underbanked.asp>
28. Investopedia. 2017. Unbanked. *Investopedia*. Retrieved September 4, 2017 from <http://www.investopedia.com/terms/u/unbanked.asp>
29. Lilly Irani, Janet Vertesi, Paul Dourish, Kavita Philip, and Rebecca E Grinter. 2010. Postcolonial Computing: A Lens on Design and Development. In *Proceedings of the 2010 CHI Conference on Human Factors in Computing Systems*.
30. San Jose, Sarita Seshagiri, and Aditya Ponnada. 2016. Exploring Regional User Experience for Designing Ultra Low Cost Smart Phones. *CHI Extended Abstracts on Human Factors in Computing Systems*: 768–776.
31. Naila Kabeer and Munshi Sulaiman. 2015. Assessing the Impact of Social Mobilization: Nijera Kori and the Construction of Collective Capabilities in Rural Bangladesh. *Journal of Human Development and Capabilities* 16, 1: 47–68.
32. M Kam, M Akhil, A Kumar, and J Canny. 2009. Designing Digital Games for Rural Children: A Study of Traditional Village Games in India. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems , CHI 09*, 31–40.
33. Lamia Karim. 2011. *Microfinance and Its Discontents: Women in Debt in Bangladesh*. University of Minnesota Press.
34. Jofish Kaye, Janet Vertesi, Jennifer Ferreira, Barry Brown, and Mark Perry. 2014. #CHIMoney: Financial Interactions, Digital Cash, Capital Exchange and Mobile Money. In *Proceedings of the extended abstracts of the 32nd annual ACM conference on Human factors in computing systems - CHI EA '14*, 111–114.
35. Joseph Jofish Kaye, Mary Mccuiston, Rebecca Gulotta, and David a Shamma. 2014. Money Talks : Tracking Personal Finances. *Proceedings of the 32nd annual ACM conference on Human factors in computing systems - CHI '14*: 521–530.
36. Shahidur R. Khandker. 2005. Microfinance and poverty: Evidence using panel data from Bangladesh. *World Bank Economic Review* 19, 2: 263–286.
37. Beth E Kolko, Alexis Hope, Waylon Brunette, Karen Saville, Wayne Gerard, Michael Kawooya, and Robert Nathan. 2012. Adapting collaborative radiological practice to low-resource environments. *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work*: 97–106.
38. Vasu Kongovi and Saurabh Sinha. 2014. *Microfinance sector in Sri Lanka : Opportunities and growth strategies*.
39. Deepti Kumar, David Martin, and Jacki O’Neill. 2011. The times they are a-changin’. In *Proceedings of the 2011 annual conference on Human factors in computing systems - CHI '11*, 1413.
40. Sri Lanka. 2014. *Computer Literacy Statistics - 2014 Department of Census and Statistics*.
41. Martha Larson, Nitendra Rajput, Abhigyan Singh, and Saurabh Srivastava. 2013. I want to be Sachin Tendulkar!: a spoken english cricket game for rural students. *Proceedings of the 2013 conference on Computer supported cooperative work*: 1353–1364.
42. V Ledgerwood, Joanna White. 2006. *Transforming Microfinance Institutions: Providing Full Financial Services to the Poor*. World Bank Publications, Washington, DC.
43. Philippe Louis, Alex Seret, and Bart Baesens. 2013. Financial Efficiency and Social Impact of Microfinance Institutions Using Self-Organizing Maps. *World Development*

- 46: 197–210.
44. Gary Marsden. 2006. Designing technology for the developing world. *Interactions* 13, 2: 39–59.
 45. Mohummed Shofi Mazumder and Wencong Lu. 2015. What Impact Does Microfinance Have on Rural Livelihood? A Comparison of Governmental and Non-Governmental Microfinance Programs in Bangladesh. *World Development* 68: 336–354.
 46. Indrani Medhi-thies, Pedro Ferreira, Nakull Gupta, Jacki O’Neill, and Edward Cutrell. 2015. KrishiPustak: A Social Networking System for Low- Literate Farmers. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 1670–1681.
 48. Indrani Medhi, S N Gautama, and Kentaro Toyama. 2009. A comparison of mobile money-transfer UIs for non-literate and semi-literate users. *Proceedings of the 27th international conference on human factors in computing systems*: 1741–1750.
 49. Woldmariam F. Mesfin, Gheorghita Ghinea, Solomon Atnaflu, and Tor-Morten Groenli. 2016. Monetary Practices of Traditional Rural Communities in Ethiopia: Implications for New Financial Technology Design. *Human-Computer Interaction* 0024, April: 1–45.
 50. Mobitel. 2018. Plans and Rates - Prepaid | Mobitel. Retrieved December 19, 2018 from <http://www.mobitel.lk/broadband/plans-and-rates-prepaid>
 51. Jacki O’Neill, Anupama Dhareshwar, and Srihari H. Muralidhar. 2017. Working Digital Money into a Cash Economy: The Collaborative Work of Loan Payment. In *Computer Supported Cooperative Work (CSCW)*.
 52. Tapan S Parikh, Paul S Javid, Sasikumar K, Kaushik Ghosh, and Kentaro Toyama. 2006. Mobile phones and paper documents: Evaluating a new approach for capturing microfinance data in rural India. In *Proceedings of the 2006 CHI Conference on Human Factors in Computing Systems*, 551–560.
 53. Simon Plogmann, Muhammad Adeel, Bernhard Nett, and Volker Wulf. 2010. The Role of Social Capital and Cooperation Infrastructures Within Microfinance. In *Proceedings of COOP 2010, Computer Supported Cooperative Work*, 223–244.
 54. C. Rooyen, R Stewart, and T.de Wet. 2012. The Impact of Microfinance in Sub-Saharan Africa: A Systematic Review of the Evidence. *World Development* 40, 11: 2249–2262.
 55. Richard Rosenberg, Scott Gaul, William Ford, and Olga Tomilova. 2013. Microcredit Interest Rates and Their Determinants 2004 – 2011. In *Microfinance 3.0* (Köhn D. (e). Springer Berlin Heidelberg, 69–104.
 56. Nithya Sambasivan, Julie Weber, and Edward Cutrell. 2011. Designing a phone broadcasting system for urban sex workers in India. In *Proceedings of the 2011 CHI Conference on Human Factors in Computing Systems*, 267–276.
 57. Vijeta Singh and Puja Padhi. 2015. Information and Communication Technology in Microfinance Sector : Case Study of Three Indian MFIs. *IIM Kozhikode Society & Management Review* 4, 2: 106–123.
 58. Stephen Snow, Dhaval Vyas, and Margot Brereton. 2017. Sharing, Saving, and Living Well on Less: Supporting Social Connectedness to Mitigate Financial Hardship. *International Journal of Human-Computer Interaction* 33, 5: 345–356.
 59. Meera Srinivasan. 2017. Getting sucked into a quicksand of debt. *dailymirror*. Retrieved November 1, 2017 from <http://www.dailymirror.lk/article/Getting-sucked-into-a-quicksand-of-debt-133083.html>
 60. RB Swain and FY Wallentin. 2009. Does microfinance empower women? Evidence from self-help groups in India. *International review of applied economics* 23, 5: 541–556.
 61. G Tilakaratna and D Hulme. 2015. Microfinance and Multiple Borrowing in Sri Lanka : Another Microcredit Bubble in South Asia ? *South Asia Economic Journal* 16, 1: 46–63.
 62. Carmen Velasco and Reynaldo Marconi. 2004. Group Dynamics, gender and microfinance in Bolivia. *Journal of International Development* 16, 3: 519–528.
 63. John Vines, Mark Blythe, Paul Dunphy, and Andrew Monk. 2011. Eighty something:

- banking for the older old. In *Proceedings of the 25th BCS Conference on Human-Computer Interaction*, 64–73.
64. John Vines, Paul Dunphy, and Andrew Monk. 2014. Pay or Delay: The Role of Technology when Managing a Low Income. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*: 501–510.
 65. John. Vong and Insu Song. 2015. Mobility Technology Solutions Can Reduce Interest Rates of Micro fi nance Loans. In *Emerging Technologies for Emerging Markets. Topics in Intelligent Engineering and Informatics*. Springer, Singapore, 11–24.
 66. Dhaval Vyas, Stephen Snow, Margot Brereton, Uwe Dulleck, and Xavier Boyen. 2015. Being thrifty on a \$100K wage: Austerity in family finances. *Proceedings of the ACM Conference on Computer Supported Cooperative Work, CSCW 2015–Janua*: 167–170.
 67. Dhaval Vyas, Stephen Snow, Paul Roe, and Margot Brereton. 2016. Social Organization of Household Finance: Understanding Artful Financial Systems in the Home. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*, 1777–1789.
 68. Susan P Wyche, Cliff Lampe, Nimmi Rangaswamy, Anicia Peters, Andrés Monroy-Hernández, and Judd Antin. 2014. Facebook in the developing world: the myths and realities underlying a socially networked world. *CSCW Companion '14: Proceedings of the companion publication of the 17th ACM conference on Computer supported cooperative work & social computing*: 121–124.
 69. Ping-jing Yang and Xianghua Ding. 2016. Today ' s Life Style and Yesterday ' s Life Experiences : A Study of Financial Practices of Retirees In China. In *CSCW '16 Companion: Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion*, 441–444.
 70. H Sultana and M Abdul Jamal. 2017. Impact of Microfinance on Women Empowerment Through Poverty Alleviation: an Assessment of Socio- Economic Conditions in Chennai City of Tamil Nadu. *Asian Journal For Poverty Studies* 3, 2: 175–183.
 71. AYeow, D Lee, K Chuen, R Tan, and M Chia. 2018. *Indonesian Microfinance Institutions (MFI) Move to Technology – TBOP ' s Prodigy Experience*. Elsevier Inc.
 72. Muhammad Yunus. 2003. *Banker to the Poor: The story of the Grameen Bank*. Aurum Press LTD, London, UK.
 73. Jennifer Zamora. 2016. Mobile as a Means to Electrification in Uganda. *Proceedings of the First African Conference on Human Computer Interaction - AfriCHI'16*: 187–191.
 74. Quanda Zhang and Alberto Posso. 2017. Microfinance and gender inequality: cross-country evidence. *Applied Economic Letters* 24, 20: 1494–1498.
 75. John Zimmerman, Jodi Forlizzi, Justin Finkenaar, Sarah Amick, Ji Young Ahn, Nanako Era, and Owen Tong. 2016. Teens , Parents , and Financial Literacy. In *Proceedings of the Designing Interactive Systems Conference on*, 312–322.