

Free & Open Source Software for Microfinance: Increasing Efficiency and Extending Benefits to the Poor

Britta Augsburg¹ & J. Philipp Schmidt²

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Abstract

In this paper we investigate the potential of open source software to increase the impact of microfinance (MF) especially for the very poor and suggest a framework for econometric evaluation of such intervention. We argue that especially small and medium organizations play a crucial role, because they are more flexible in operations and familiar with the local context. We consider how new information and communication technology (ICT) can increase outreach of MF to the very poor within a self-sustainable holistic approach. We consider the potential of free/open source software projects to address the computing needs of small and remote MFIs, and we describe the reasons why no suitable solutions have emerged yet. While the use of FOSS and ICTs in general can help increase outreach, we feel the need to draw attention to the challenges that come with it; one should not forget that access to basic financial services is not all that is needed - especially by the very poor.

¹Graduate School of Governance, Maastricht University, The Netherlands

²United Nations University MERIT, The Netherlands & University of the Western Cape, South Africa

”The Millennium Development Goals can be met by 2015 but only if all involved break with business as usual and dramatically accelerate and scale up action now.”

UN Secretary General Kofi Annan

1 Introduction - Difficulties of providing financial services to the poor

In this paper we consider two important issues, which are widely discussed in the literature on microfinance, in the context of information and communications technology (ICT). The first issue concerns the outreach of institutions, mainly the outreach to the rural poor, including the ultra poor those that are usually left out and do not profit from the microfinance industry. The second issue concerns the delivering institutions and their financial self-sustainability. Usually, increasing outreach and becoming financial self-sustainable is seen as a trade-off. Targeting the very poor comes at high costs, so that institutions that aim for the former usually depend on donor funds and subsidies. Morduch (2000) refers to this debate as the “microfinance schism”, which centers on whether in order to achieve self-sufficiency, microfinance institutions (MFIs) must target marginally-poor or non-poor clientele so as to capture economies of scale and cover costs.

By definition most of the very poor live in rural areas with poorly developed infrastructure. It can take a full day to reach the closest bank and the opportunity costs by and large outweigh the benefit of such a lost day. Furthermore, many institutions have come to realize that their poor clients, just like anyone else, are in need of more than purely credit. A diverse range of financial instruments is needed to build assets, stabilize consumption and protect against risks. *Microcredit* developed into *microfinance*, including not only credit but also other financial services such as savings and insurance and one observes a further broadening of the concept to include services such as training, food programs, etc. Credit delivery in combination with such other services is often referred to as an *integrated* or *holistic* approach and has become increasingly popular over the last years. One of the main contributors to this development is Vijay Mahajan, director of BASIX India, based in Hyderabad, who fostered, together with Tomas Dichter, the idea of livelihood promotion. The success of this integrated model has spurred similar projects in other countries such as Kenya and Papua New Guinea.

In section 2 of this paper, we argue that especially small organizations play a crucial role within the holistic approach. Section 3 describes the information and communication technology needs and challenges of microfinance institutions, and considers the case of BASIX India, before focusing on the special technology needs of the important small institutions. In section 4

we introduce free/open source software as a solution to provide a common technology platform to increase efficiency of smaller MFIs. In section 5 we complement our discussion on how to increase outreach, by describing a simple methodology for evaluating the impact of MF. Finally, this leads us to a few recommendations, which are expanded in the conclusions.

2 Microfinance Overview - Why Small Organizations are needed

While we are safe to say that microfinance is a successful and important tool in alleviating poverty it is difficult, if not impossible, to track how many institutions are involved. The issue starts by defining what a “microfinance institution” actually refers to. The term is mostly used for all types of formal and semi-formal institutions that offer microfinance services but does not specify how many of their operations should be devoted to microfinance services and how their client profile should look like. This leaves a wide range of institutions including, but not limiting to, banks³, regulated MFIs⁴, (micro) credit companies⁵, credit (and savings) cooperatives and credit unions⁶ and Development NGOs and other non-profit microfinance intermediary facilitators.

The formal sector in India includes apex institutions such as the National Bank for Agriculture and Rural Development (NABARD), Small Industries Development Bank of India (SIDBI), and Rashtriya Mahila Kosh (RMK). At the retail level, Commercial Banks, Regional Rural Banks, and Cooperative banks provide micro finance services. In 2004, the estimated number of such retail credit outlets of the formal banking sector comprised 60,000 in the rural areas. Of these 60,000 about 12,000 were branches of district level cooperative banks, over 14,000 were branches of the Regional Rural Banks (RRBs) and over 30,000 rural and semi-urban branches of commercial banks. In addition almost 90,000 cooperatives credit societies at the village level were in operation. These numbers imply that on an average, there is at least one retail credit outlet for about 5,000 rural people. (Rao, 2004)

For the informal sector on the other hand it is much more difficult to get

³companies that fall under national banking laws with considerable microfinance activities (Banco del Desarrollo in Chile, Banco Solidario in Ecuador, but also the rural banks - BPRs - in Indonesia)

⁴financial intermediaries that are subject to government or Central Bank rules and regulations but are not banks (EDPYMEs in Peru, Fondos Financieros Privados in Bolivia).

⁵non-regulated companies involved in microfinance (Share Microfin Ltd. in India, Cambodian Entrepreneur Building Ltd.).

⁶formally registered cooperatives and unions that provide microfinance services to their members (SACCOs in Kenya, MACAPFs in Bulgaria).

a hold of accurate numbers not at last since no published data on private MFIs operating in the country exist. Rao (2004) reports that the estimate for these is about 800, split up in legal forms as displayed in Table 1.

Of these 700-800 MFIs only ten institutions (between one and two percent)

Types of MFIs	Estimated Nr.
1. Not for Profit MFIs	
a.) NGO - MFIs	400 - 500
b.) Non-profit Companies	10
2. Mutual Benefit MFIs	200 - 250
3. For Profit MFIs	6
Total	700 - 800

Source: Rao (2004)

Table 1: Legal forms of private MFIs in India

report to have an outreach of 100,000 microfinance clients.

This distribution is reflected all over the world. A campaign launched by the Microcredit Summit in 1997 undertakes every year a survey of microfinance institutions and find that in 2005 about 73% of surveyed institutions serve fewer than 2,500 clients, as displayed in Table 2.⁷

Size of Institution (in terms of poorest clients)	Nr. of Institutions	% of Institutions
1 million or more	8	0.3
100,000 - 999,999	41	1.3
10,000 - 99,999	276	8.7
2,500 - 9,999	515	16.3
Fewer than 2,500 Networks	2,321 3	73.4 0.1

Source: Microcredit Summit Campaign Report 2005, p.25, Table 3

Table 2: Number of Institutions by Size

Despite their relatively low number of poorest clients (see Tables 1 and 2) there are a number of reasons why we consider the small institutions as especially crucial for alleviation of poverty. First, “small institutions appear

⁷Network numbers given in the table “include data from three large networks: the National Bank for Agriculture and Rural Development (NABARD), see footnote 14, in India; the Association of Asian Confederation of Credit Unions (ACCU), which has 3,137,398 total and poorest clients, and the Bangladesh Rural Development Board (BRDB) which has 3,713,728 total clients and 3,528,041 poorest. These entities are not individual microfinance institutions, but they report the aggregate number of clients served to the Microcredit Summit and are included accordingly in our report, after we have eliminated any double counting.” (Microcredit Summit Campaign Report, 2005, p.25)

more likely to enter the microfinance market” (ADB, 2000). Considering that 90 percent of the poor in the world are estimated to have no access to credit yet, the need for more microfinance institutions in the market becomes obvious and if small organizations show more entrepreneurship then we must ask how they can be supported. In addition, it is the small and local organizations that have the potential of servicing those clients that are often left out by microfinance - the ultra poor. Institutions too often either do not prioritize or do not successfully reach this group. Reasons include the high costs of servicing the poorest people (since the very poor are not the most attractive clients for standard financial services), which collides with the increasing pressure of becoming financially self-sustainable. The ultra poor struggle with the most basic problems of food security and health and their primary concern is survival. It is not obvious how providing simple loans to this group can end the circle of poverty they are trapped in. A much more integrated approach, one that has the overall goal of establishing a regular source of income is needed; this can include financial services but more often starts with much more resource intensive activities, such as training and food assistance. The importance of offering such quality and flexible services is widely recognized as the means to response to the wide variety of the poors needs and many microfinance institutions started to diversify their portfolio of products and services offered. Since studies (see for example Morduch, 1998) show that the ultra-poor are still left out, the question arises whether institutions operating on a large scale are flexible enough to give the very poor the specialized attention they need, since this does not only demand time but also precise knowledge of the environment - something which small and localized institutions can offer.

“In developing countries like India - mainstream approaches and institutions fail to reach the poorest, especially in remote and less developed regions like northeastern and eastern India. Many voluntary non government organizations (NGOs) play a significant role in fostering meaningful opportunities for the poor, particularly in innovating ways for them to work together towards self reliance and to deal effectively usually with the mainstream. NGOs depend heavily on foreign funds in the absence of indigenous sources of non government funding and highly bureaucratic and schematized nature of government funding. Consequently, smaller NGOs often closest to poor people, cannot raise funds as they lack access to international donors. Much potential for outreach and innovation thus remains unharnessed.”

From the purpose of Rashtruya Gramin Vikas Nidhi (RGVN)⁸

⁸<http://www.rgvnindia.org/genesis.htm>

3 Information and Communication Technology and Microfinance

The Consultative Group to Assist the Poor (CGAP) estimates that currently about 500 million poor people have access to microfinance services. While this is a considerable number, it is only 16% of those that could benefit - only one sixth of the three billion poor people of working age have access to formal financial services.⁹ These numbers naturally imply the need to reach further and deeper - the need for a whole range of institutions that focus on very poor people and innovate to reach more of them in sustainable ways.

“With current grant-based practices, nonstandard data and the lack of infrastructure, microfinance institutions seeking growth will have difficulty even doubling their operations. New business practices and innovative solutions that do not require constant infusions of donor funds need to be applied if the industry is to achieve a breakthrough in scale,” (Sanchez, 2003)

The use of new information and communication technology (ICT) offers opportunities to lower the cost of financial services provision. We go a step further and argue that it is especially beneficial in increasing the outreach of (holistic) microfinance interventions to the very poor.

The ICT needs of microfinance institutions mainly focus on three objectives: (1) exchanging information with remote clients, (2) processing and managing data at the institutional level, both at central offices and in remote locations, and (3) reducing the potential for loss during monetary transactions (collection/delivery) in remote areas. A Management Information System (MIS) that addresses the needs of MFIs consists of different components, including hardware components (desktop and server computers, hand-held devices, mobile phones, etc.), network components and protocols (GSM or other mobile cellular networks, Internet, local area networks, etc.) and software components (user interfaces, databases, etc.). The particular business needs of an MFI define what is the most appropriate solution at all three layers. However, the particular focus of this paper is the software layer, which most directly represents the codified business processes of an institution.

The previous analysis of types and numbers of microfinance institutions provides a taste of the complexity that comes with the topic. This com-

⁹The estimate of how many poor people are not being reached differ by sources and country considered. Muhammed Yunus states at the International Seminar on Attacking Poverty with Microcredit in Dhaka, Bangladesh, January, 2003, that “In most countries it [microfinance] has not even reached 10% of the poor families within that country.”

plexity is further enriched through the wide range of services offered by the institutions. Looking at financial services alone, there are numerous different lending methodologies within microfinance, ranging from village banking over solidarity groups to individual lending. Also the methods for interest and payment calculations vary from one institutional model to the next and so do the number of loan products offered. At the front-office level, organizations that work with local agents in rural areas need to take into account their literacy levels and consider the use of indigenous languages. At the back-office level, where transactions are processed and assets tracked, an MIS needs to allow integration with different processing protocols that are in use by national banks and provide interfaces to upstream financial service providers. This intricacy is exacerbated given that many of these variations occur inside the same institution. Furthermore social, political, economic, regulatory, legal, and cultural aspects shape the environments that organizations operate in, and differ substantially between states, countries, and regions. All these issues are of relevance when talking about the right type of software for an institution. Not to forget, that these are spread all over the world so that different currencies, languages, and reporting requirements come into play (Mainhart, 1999).

Technology needs differ between organizations of different size, and at different stages of their development. Waterfield & Ramsing (1998) suggest to consider different software needs in the following three categories: (1) small-scale efforts with less than 2,000 clients, (2) institutions undergoing transition into large-scale institutions, serving between 2,000 and 10,000 clients, and (3) large-scale microfinance institutions, with more than 10,000 clients. Small MFIs, those that fall within the first category, may manage their operations with manual ledgers or spreadsheets and often do so since they simply do not have the institutional capacity - either in terms of computer sophistication, staff skills, or budget - in order to install and maintain a full-featured software package. Not last because manual data input is time consuming and error-prone, most MFIs eventually need custom-built or commercially-available MIS software to track financial transactions and create reports for management, donors, and regulators (CGAP Donor Brief No. 23, 2005). Expanding institutions go through "growing pains: The need to deal with substantial increase in activity and resources, as well as the need to become more systematic in their operating procedures in order to handle a much larger volume of information. Their technology requirements now include security provisions, the recording and reporting of auditing information, and ability to reliably handle much larger volumes of transactions. At the same time, these organizations often lack the managerial and technical skills to implement and use such sophisticated systems (Waterfield & Ramsing, 1998).

Not only the diverse needs of today, but also a fast changing environment and pressure to innovate present challenges for software solutions and require the possibility for new features to be bolted on. New technologies that may make a dramatic difference to how microfinance institutions deliver services to their clients emerge rapidly. Latest developments include the adoption of handheld devices, the increasing diffusion of automatic teller machines (ATMs) and mobile banking - the use of mobile phones to execute transactions. Ketley & Duminy (2006, p.2) go as far as stating that "...the message is clear technology is changing the entire banking landscape. The poor are more and more becoming a viable target market for conventional banks. MFIs need to understand this challenge or risk becoming irrelevant." Hence, in order for a software solution, to be appropriate to the needs of diverse organisations and settings, and to ensure its adequacy in the future, it must be customizable. Only then will software be able to adapt to new institutional structures, higher volumes of activity, new pricing methods, new reporting standards, or any other relevant changes (Waterfield & Ramsing, 1998).

3.1 The case of BASIX

One example that provides an illustration of some of the issues just described is the experiences of BASIX India.¹⁰ BASIX India is an institution established in 1996, promoting the generation of livelihoods, working with almost 200,000 poor households in 44 districts and eight states across India and can hence clearly be classified in the third "software-need" category, having even had a system developed from scratch. Based on the particular needs of BASIX, FAMIS (Financial Accounting and Management Information System) was developed in 1995¹¹. The following eight years that their operations ran on this software, several alterations had to be made in order to increase functionality and robustness. Besides being adapted for their own use, BASIX supplied their software to several external MFIs, which in each case required tailoring to issues such as different lending technologies and interest calculation methods. One of these external users is for example Rashtriya Gramin Vikas Nidhi (RGVN), lending to groups as well as to small NGOs, and serving about 32,000 active borrowers.¹² Business analysts spent a lot of time with the organization and its staff in order to understand processes crucial for the adaptation of the software and translate them into software functionality. This was the case for every organization they worked with, increasing the number of different versions and hence the complexity greatly. To deal with this problem, FAMIS PLUS, a unified

¹⁰This case study draws heavily on Regy & Mahajan (2006).

¹¹The development partner for the software is the company Sadguru Management Consultants, who have subsequently been involved with other BASIX software development projects.

¹²<http://www.mixmarket.org>

version was developed that supports credit, savings and insurance. FAMIS was well suited for the needs of a small MFI, but did not scale well to accommodate the significant growth BASIX experienced. In response to future needs, a new solution named Delphix was developed. After almost five years of running pilots, fixing problems that occurred when migrating data and further adapting the software, BASIX completed migration to Delphix in 2005. Advantages of this system include extremely rich reporting features, and its flexibility regarding terminology, interest calculation method and lending/saving methodology. This set of more powerful features has led to the software being used by more than 50 organizations today.

The case of BASIX illustrates that software can be developed, which meets the demand of different microfinance institutions. It also shows though that even with custom-made software, continuous adaptation is of great importance - be it for different approaches taken, to include or change to new technologies or simply to handle growth of the organization. This obviously weighs heavily on an institutions budget. But not only costs form an obstacle. Drawing again on the experience of BASIX, other challenges, such as time-constraints are exemplified and determine what technology choices exist. For example, in 2005, BASIX launched urban operations in Hyderabad which called for the handling of new functionalities. Instead of going through the process of implementing modifications in Delphix, they chose to implement an existing (but separate) solution. Another example is IDIAS, which stands for Insurance Distribution and Administration System. This software was entirely developed in-house and BASIX is only working today on implementing these features into Delphix, although the software is already used for almost four years. The urge to offer the health, rainfall and livestock insurance that the software handles, outweighed the advantages of delaying its operationalization. In several other cases, BASIX was dictated by expediency in their decision to opt for banking software called BankSoft even though that made substantial customization efforts necessary.

3.2 The ICT needs of small MFIs

Most existing software for MFIs is developed by and for large organizations, often with significant financial support from donors, and not with the needs of smaller rural organizations in mind. In addition, these solutions are typically proprietary (or built on top of proprietary technology), which means their owners charge licensing fees for use of the software and control who can make changes to it. This is particularly unfortunate since even in cases where the owners do not charge for use of the software (Regy & Mahajan, 2006) the costs for training and customization can be significant. This prevents access to the technology especially for smaller and remote organi-

zations that cannot afford the required capital investment and are unable to modify existing packages to suit their needs. We see the case of BASIX as a good example of challenges and of how some of them can be tackled. Nevertheless, BASIX was in a unique position to respond to these challenges, since significant budget and expertise were available.

In sum, mature software packages and ICT solutions for MFIs already exist, but they are usually not suitable or affordable for the small institutions we are focusing on. Some of the obstacles, specific to these small organizations include:

- Lack of skilled staff to support the MIS
- Lack of local IT support and services environment for after-sale service, training, and support
- Lack of budget to procure and update/upgrade technology
- Very basic technology needs, which are not addressed well by existing sophisticated solutions
- High need for localization (language of interface, iconography, etc.)

In the section to follow, we will elaborate why we see Free and Open Source Software as a solution that has the potential of tackling the problems and challenges just illustrated.

4 Free and Open Source Software

During the past decade a new model for development of software has become very popular and holds considerable promise for the computing needs of small and remote MFIs. Free/Open Source Software (FOSS), is “software which is liberally licensed to grant the right of users to study, change, and improve its design through the availability of its source code” (Wikipedia, 2006). More specifically FOSS is developed by an international community of volunteer contributors, in a commons-based peer production model (Benkler, 2002) and makes explicit the rights that are typically reserved by copyright. These include (1) the right to modify the software; (2) to use the software with almost no restrictions; (3) to freely share the software with others; and, in order to enable modifications, (4) the right to inspect the source code. FOSS alternatives for many of the popular proprietary software products exist, and are used by private and public sector organizations in developing and developed countries. In some areas, such as webserver software, FOSS applications are market leaders.

Based on the experience of free/open source software projects in other areas we can identify a few advantages that the FOSS model holds in the microfinance context.¹³

FOSS enables the pooling of resources. Most small MFIs lack the financial means to purchase proprietary software licenses and donors might be reluctant to purchase software licenses for each MFI that they work with. However, in FOSS projects, networks of users contribute their expertise to design the system, and share the cost of development and maintenance. This lowers the financial burden on the individual users. Some literature suggests that larger numbers of users also lead to better detection and fixing of bugs and errors, however conclusive evidence is missing.¹⁴

FOSS comes without the requirement to pay a license fee.¹⁵ This is the case not only when the software is first installed, but also considering any future upgrades. In addition, FOSS can be installed on as many computers as desired, enabling an organization to share it with others, or a donor to distribute it to all of its partners. It is important to note that FOSS is not free of cost, since use of software requires hardware and services, but it removes software licenses from total cost of ownership. Despite statements to the contrary, license costs do matter when adjusted to the local earning potential (Ghosh, 2003).

The combination of no license costs with the ability to share and distribute creates an interesting mechanisms for donor intervention and funding. The potential multiplier effect of paying for software development once, and then sharing it with all of one's partner organizations is attractive to donors, who are reluctant to pay software license costs in each of the projects they support.

While resource pooling enables the creation of a common basic core solution, the cornerstone of FOSS remains the ability to inspect and change the source code. Every user remains free to make changes, develop extensions or custom modules for her specific needs (or hire someone to do it). This enables the development of very customized solutions, and is cost-effective since a common basic starting point exists and can be used free of charge. Ideally these contributions are then shared back with the community, increasing the value of the software to all participants.

Availability of a FOSS solution can stimulate development of a local support and service sector. Rural MFIs will require training, technical support and adaptation of the software. Small local entrepreneurs and companies

¹³Some good starting points are the community access project in the Extremadura region of Spain, or the development of the Open Office suite of applications.

¹⁴The positive influence of having more people inspect the source code is typically referred to as "Linus Law", http://en.wikipedia.org/wiki/Linus's_law, last accessed August 2006.

¹⁵While FOSS licenses do not prevent sales of the software, most licenses mandate the availability of source code and the right to redistribute, which reduces the potential market to one customer.

(who, in the FOSS model, are granted full access to the source code) can best address these needs, because they understand the local context. These local entrepreneurs can benefit from the free transfer of knowledge that is embedded in a software application and capture a much larger share of the value-added than resellers of proprietary software can (Ghosh, 2005).

Considering these potential advantages one cannot fail to wonder why a FOSS solution for micro-finance institutions has not yet emerged. And indeed first attempts have been made (see for example the efforts by SEMBA Consulting, and the Grameen Technology Center, which will be described in more detail below), but so far none have succeeded in creating a full-fledged MIS or build a community of users and developers that could support the effort in sustainable fashion. We must ask what the reasons are that hold back development efforts of a FOSS solution, and how they could be overcome. Some of the most important factors, especially in the context of MF, are mentioned below:

- *Lack of awareness* - Despite its success in many areas of computing perception of FOSS is still clouded by misconceptions. Especially outside of technical circles, it is not often considered a credible alternative for proprietary software that can enable sustainable local software ecosystems.
- *Lack of donor support for software development activities* - Many donors fund capacity development, or infrastructure projects, but rarely the salaries of software engineers who develop FOSS.
- *Lack of computer engineering skills in many developing country* - While India boasts a thriving IT sector that is exporting services and products, most other developing countries are struggling to find the skilled labor needed to support their economies internal needs.
- *Difficulties to adapt management strategies* - FOSS projects require very different approaches to management, structure and hierarchy than closed source software development, where paid programmers develop applications that are designed by their managers. FOSS development processes are community-based, with clear hierarchies, and sets of roles (Lee & Cole 2003, Raymond, 2000), but it is not well understood how individuals take on certain roles. It is not an easy task to create a vibrant FOSS community and there are numerous examples of failed projects on the sourceforge.org website, which offers free hosting of FOSS development projects.
- *Reluctance to commit initial investment* - While FOSS projects are community-based, they are usually started and managed, by a small

group of individuals or organisations, who invest resources in developing a first version of the software. As Eric Raymond explains in his seminal piece (2000) on FOSS development in the real world of software solutions for MFIs, a basic prototype must be developed in a small group as a starting point for community involvement. According to Raymond it is sufficient if the software will “(a) run, and (b) convince potential co-developers that it can be evolved into something really neat in the foreseeable future. (Raymond, 2000, pg. 10). In the MFI context a higher level of usability might be required to convince potential partners of the value of joining the effort.

4.1 The case of Grameen Foundation Technology Center

The Grameen Foundation has been one of the most active supporters of a FOSS micro-finance application. In their first attempt, the Microfinance Open Architecture Project (MOAP) was started with a strong community approach and invited active participation in design and development. However, the project highlighted the difficulties of steering a software development project that aims to integrate a community of self-motivated (and self-selected) software developers. At one point the lead developer left the project and publicly announced his dissatisfaction with the direction the project was taking. Clearly a discouraging moment for an organization that is investing resources into the development of a community good. Grameen took the opportunity to learn from the experience and decided to close the development process in order to revisit its original strategy. They subsequently engaged Aditi, an Indian software development firm, to build the first release of the software. Once the first version has reached satisfactory levels of functionality and stability it will be released into the community under an open source license. Grameen aims to complement the technology platform, with efforts to build a community of MFIs that will use the software and support each other, and a network of volunteer programmers, who contribute development time to the project.¹⁶

4.2 A FOSS ecosystem

Successful FOSS projects are community efforts. They are supported by users and developers. Users report problems and bugs that they experience, request new features, and support each other in the use of the software. Developers (this category is usually broken down into further hierarchical levels) fix the reported bugs, discuss how to best improve the software, and develop new features. FOSS projects often bring together the private and public sectors, academia, and non-profit organizations. These actors

¹⁶http://www.gfusa.org/technology_center/mifos/beta_release/

participate for different reasons, they respond to different incentives, and they expect different outcomes. From the above discussion it becomes clear that a comprehensive approach is required to develop and support a core FOSS solution for MFIs and enable customization and deployment into a wide range of use-cases. The following is merely a rough sketch of the key components of a FOSS ecosystem. The exact interaction between different agents, and the appropriate intervention by policy-makers strongly depends on the local context.

- *Users* - A sufficient number of MFIs is needed to split resources in a way that lowers the burden for each organization, and enables the sharing of knowledge and learning.
- *Developers* - Both hired/paid and volunteer developers are needed to design and write the software code for the application. The developer community is generally spread out geographically and diverse.
- *Service providers* - Training, customization, technical support and change management services are crucial factors that determine the success of technology, not only in the MF sector. Service providers need to be present in remote locations where MFIs operate.
- *Policy-makers* - Support from the public sector has been crucial for successful FOSS projects, especially in sectors where the use of technology could enhance socio-economic development, but market-based competition might not provide optimal levels of investment. The success of MF indicates that it is an area in which public sector support is justified.
- *Communities* - In successful FOSS projects, the above actors form part of a larger community. Creating such a community intentionally requires careful attention to the needs and motivations of individual actors and finding the right balance between providing support and structure and letting the community find its own structures.

5 Framework for Impact Analysis

What the eye does not see, the heart does not grieve about.
(Old English Proverb)

Besides the progress and increase in outreach that can more easily be attained by the use of FOSS and ICTs in general, we feel the need to draw attention to the challenges that come with it; one should not forget that the pure access to financial services is not necessarily all that is needed especially by the very poor. Issues such as training, additional services and market linkages are of great importance. The success of the implementation of FOSS solutions cannot purely be measured by numbers of people reached. All too often do impact assessments of new technologies or implementation of software concentrate on the beginning of the chain, meaning in particular on changes in the MFI and its operations, and not sufficiently on the benefits it brings to the customers. Focus lies typically on MFIs flexibility in operations and reporting, sustainability... These assessments belong to the school of thought commonly referred to as the “intermediary” school (Hulme, 2000) and associated with the Ohio State University School’s analyses of rural finance.

While all these are important aspects that will without any doubt be affected, we see the importance in assessing who benefits and how, and hence follow the intended beneficiary school of thought, getting as far down the impact chain as possible (Hulme, 2000). One needs to know how the poor deal with the options given to them and whether MF helped them to improve their standard of living.

In what follows we lay out how the effect of a program on customers reached can be estimated at relatively low cost. Given that a discontinuity takes place in time-dimension, which is clearly defined, the proposed technique is the before-after design, also called interrupted time-series design. These techniques can be improved upon with an additional data collection effort, involving control groups, but hence also higher costs.

The main scenario in assessing the effect of any intervention is simple one usually compares two people, one receiving the intervention and the other not . If the two people are exactly the same, other than their intervention status, then the difference between their outcomes of interest (such as income) can be taken as the effect of the intervention. If the individuals differ, differences in outcome cannot be purely attributed to the intervention. And of course, it is impossible to have exactly the same people and hence assessing the impact requires making an inference about the outcomes that would have been observed for program participants had they not participated often referred to as the potential-outcome approach to causality. In the empirical literature on program evaluation, one of the most commonly-used approaches to construct this counterfactual, is to compare a person

with him- or herself. Behind it lies the idea that persons can be in both states at different times, and that outcomes measured in one state at one time are good proxies for outcomes in the same state at other times at least for the no-treatment state (Heckman & LaLonde, 1999). The control responses (outcomes) come from the era before the intervention, the treated responses come from the era after.

From this emerges the ‘before-after (BA) estimator, which can nicely be applied in the setting at hand. In order for this method to be applicable, longitudinal data on outcomes measured before and after a program for a person who participates needs to be available. After explaining the methodology we will go into more detail on which variables are needed and oftentimes already exists and hence no additional effort has to be put into data collection.

5.1 Methodology

The BA design identifies the post-break effect $E(y_1 - y_0 | d = 1)$, where y is the outcome of interest, the subscripts 0 and 1 indicate before and after the intervention respectively and d is the treatment indicator, so that $d = 1$ specifies that an intervention takes place and $d = 0$ that it does not. In our setting, if we want to estimate the effect of a loan¹⁷ d , taken in time period t on income y , we can compare y before and after the receipt of the loan.

In this approach, one makes one crucial assumption, namely that $y_0 \perp (d|x)$, where x are characteristics of the individuals, also referred to as covariates. This assumption states that post program outcome is independent of treatment status (given the covariates). Put it differently, one assumes that changes in the overall state of the economy between $t = 0$ and $t = 1$, or changes in the life cycle position of a cohort of participants, do not influence the evolution of the outcome with the intervention differently than without it. If this assumption is violated however, the model is misspecified and one might get the false impression that d matters.

While this evaluation strategy is not particularly novel, we want to draw attention to the fact that almost no extra data collection effort necessary in order for microfinance institutions being apply to apply this methodology and hence to get an idea of whether their programs have a positive impact on their customers lives.

Microfinance institutions usually ask new clients to fill out an application form when applying for a loan. The information captured in the form can be used as before data. As one wants to account for many characteristics of the individuals the more information is provided from the application form the better. Clients of BAISX India for example have to fill out a registration

¹⁷We define here as an intervention taking up a loan. Different services offered by microfinance institutions could be thought of.

form and additionally an appraisal form is completed when applying for a loan. These two documents together already give a wide range of information on the client, from the occupation, revenues, assets, place of residence¹⁸, information on other family members (occupation, sex, age, educational status), expenditures, etc.

‘After data is usually not readily available and would therefore have to be collected additionally. The same questionnaires should be used and could be filled out after successful repayment of a loan or at point of default. Alternatively, in case no extra data wants to be collected, one could concentrate the analysis on those customers that apply for a second loan, since then appraisal form should be filled-out again. This would obviously constrain the analysis to estimating the effect of taking a loan on customers that re-apply. Hence, with minimal (or even no) extra effort to collect data, one can perform an econometric analysis of whether the desired effect of a program, such as raised income, is achieved or not.

It should be mentioned that, while suggested methods can be very powerful and cost-effective, establishing causality is a critical issue and - as with every methodology - validity of assumptions is crucial. If assumptions do not hold, one can get biased results and over- or underestimate program impact. It is therefore important, to give the possible failure of assumptions attention. One criticism could for example be that one would expect the effect of taking up a loan to take place gradually over time so that it can get difficult to separate the treatment effect from the time effect due to other factors that vary over the same period. Another important aspect is that microfinance customers are seldom typical of their communities; they might have certain traits and skills, such as motivation and entrepreneurial spirit, that since they are unobserved - can bias estimates and hence lead to a skewed perception of the effectiveness of the program.

The most direct way to address such a potential bias is to collect data on individuals that did not participate in the program - a control group. This would obviously involve time and costs, but would greatly improve estimation results in case assumptions of the before-after approach are believed not to hold. There is a vast literature on program evaluation, but studies that should be mentioned in the context of evaluation of microfinance programs are Coleman (2002), who introduces a very interesting survey design, Pitt and Khandker (1998) and Morduch (1998).

¹⁸Village information sheets that are filled-out when expanding operations into a village can enrich the type of data available. These sheets collect information on the size of the village (number of inhabitants), number and types of shops, transportation possibilities, distance to main road,...

6 Conclusions

The topic of ICTs in microfinance is of great importance, because its fundamental goal is the extension of benefits to more and poorer people. While this goal is of interest to many developing countries, especially transition countries are in promising positions. Brazil or India have great experience with successful microfinance projects, but are under pressure to extend the benefits and improve living conditions of its many rural poor. In addition these countries have relatively well-developed ICT sectors and software development capacity, and this local availability of skills presents an opportunity to create the affordable and adaptable software solution that is needed by the small rural MFIs in developing countries. The public sector can play a crucial role in supporting the diffusion of MF services to the poor, by supporting/funding collaborative software development for MFIs, facilitating knowledge networks between MFIs, raising awareness of the advantages of a collaborative approach that is built on FOSS. At the same time, this is a time of opportunity for the private sector, both large MFIs as well as small local organizations and service providers who could support and maintain the IT infrastructure of small remote organizations. We have stressed the importance of providing affordable and appropriate technology to increase outreach of holistic MF services to the very poor. At the same time we are cautious as to the measurable impact of such intervention. It remains a crucial research need to find out more about the individuals that are being reached and the impact on their living conditions, to avoid equating simple increase in numbers of clients with real impact on livelihood. This can only be achieved through carefully designed monitoring and ongoing evaluation efforts. First, it is important to know ‘who’ is being reached and consider the trade-off between increasing outreach and reaching the very poor. We argue that this trade-off is important and that it is the reason why a diverse set of institutions is needed: large institutions that can serve the poor and not-so pure on a large scale and small and local institutions that concentrate on the ultra poor. Policy-makers need to consider the special support that these smaller institutions might need since their operations are struggling to become self-sustainable. In order to increase the number of such small organizations, governments should lower barriers of entry in this market specifically. This can be done through adjusting the regulatory framework or providing support and services. We argue that the development of a FOSS MIS for these smaller organizations would facilitate their scaling up, and allow them to implement stricter evaluation and reporting standards, which in turn would enable access to donor funding. In addition, government should encourage the collaboration between MFIs of different sizes and at different stages of development. Providing a common technology platform and standards for exchange of data would greatly facilitate this process.

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