Abstract. Information and communication technology (ICT) is an important driver in the microfinance industry. Microfinance providers, both non-profit microfinance institutions (MFIs) and for-profit banks, provide financial services to the poor, and are critical for economic development in developing nations. As the industry matures, MFIs face a competitive environment, forcing them to balance the goals of outreach and sustainability. ICT may be the instigator of this new environment and the potential solution to MFI survivability. We propose research directions on the role and impact of ICT in the microfinance industry, using a microfinance technology and stakeholder ecosystem framework. This research is at the intersection of inquiry on ICT for development and the digital divide, the impact of microfinance, and the use of ICT in the financial services industry. We discuss the role and impact of ICT at the customer, the microfinance institution, donor, and industry levels.

Keywords. Digital divide, ICT, international development, microfinance, microfinance technology and stakeholder ecosystem, newly-vulnerable markets, stakeholder analysis.

1. INTRODUCTION

Information and communications technology (ICT) (also information technology, IT) is an enabler of economic development in developing nations [16]. The United Nations and the World Bank are partnering with governments to promote ICT to needy countries with the aim of bridging the digital divide and making aid funds stretch to promote economic development. This aim is seen in the U.N.’s Millennium Declaration from September 2000. One of its Millennium Development Goals (MDGs) is to create “a global partnership for development.” This includes cooperating with the private sector to “make available the benefits of new technologies, especially information and communications.”

An important economic mechanism emerging over the past three decades to encourage economic development is microfinance services. Microfinance is defined as “the provision of financial services to poor or low-income clients, including consumers and the self-employed” [29]. Microcredit involves giving small loans to such clients, which has proven valuable to small business entrepreneurs who otherwise might not be served by traditional financial institutions [3]. The impact of the microfinance gained publicity with the award of the 2006 Nobel Peace Prize to the Grameen Bank and its founder Muhammad Yunus [40], who is credited with formalizing the microfinance approach to serve the poor.

There are several types of microfinance providers (MFPs). Microfinance institutions (MFIs) are non-profit, non-government organizations (NGOs). There are also for-profit emerging bank organizations, and traditional financial institutions beginning to provide services to poorer segments of the population. Yunus founded Grameen Bank as a non-profit MFI to serve the poor of Bangladesh. He developed several important MFIs, including ones focusing on women and group lending. On the other hand, Banco Compartamos was founded as a non-profit MFI in Mexico in 1990, but transitioned to a for-profit bank in 2000 and became the first MFI to launch an IPO in 2007. Elsewhere, traditional banks in search of market expansion are examining the feasibility of providing credit to poorer segments of the population. These types of MFPs are converging toward the same marketplace, yet they bring different ICT capabilities.

As some MFIs seek sustainable business models and traditional financial services firms seek new customers among the poor, the boundaries between MFIs and traditional firms are dissolving, with ethical and moral issues arising at the same time [9]. Most MFIs have the dual objectives of outreach, to extend their reach to more of the poor, and financial sustainability, to achieve better financial performance. New competition from traditional financial services firms is facilitating a “mission drift” away from outreach to embrace financial performance outcomes [32]. These changes create higher interest rates and an avoidance of providing services to the neediest poor that may threaten MFI outreach [40].

ICT is being promoted as a tool to help MFIs extend their helping hands and remain viable in an increasingly competitive environment. It has been a favorite investment of the banking industry. Traditional financial institutions have found IT to be valuable at contributing to operational efficiency, analyzing and controlling risk, and reaching existing and new customers. MFIs have begun to invest in ICT to achieve similar benefits and remain afloat in a more competitive environment. But the use of ICT by MFIs and traditional lending institutions is what is driving the elimination of the boundary between the two groups. This is forcing MFIs into a more competitive business arena. A third perspective is that increased visibility in the microfinance industry via third-party web sites such as the Microfinance Information Exchange (MIX Market, www.mixmarket.org) creates competition among MFIs for donor funds. This causes them to seek more efficient business operational models and profitable business performance. But does ICT help MFIs to extend
their reach or does it cause them to combat increased competition, or both?

There is limited research on the role and impact of ICT in the microfinance industry. We propose that microfinance is a newly-vulnerable market that is ripe for structural change [5]. We apply concepts from Spulber [38] on market microstructure to develop a framework for the microfinance technology and stakeholder ecosystem that we use to suggest future research directions on the role and impact of ICT. §2 presents relevant areas of research that will inform our ability to understand the stakeholder ecosystem. In §3, we survey the few available studies on ICT and microfinance, and propose a technology and stakeholder ecosystem of the industry microstructure that we use to suggest a number of research directions. In §4, we apply our microfinance technology and stakeholder analysis to analyze the customer, MFI, donor, and microfinance industry levels. We hope to spawn research efforts to shed light on how ICT is driving microfinance and global economic development.

2. BACKGROUND

2.1. ICT and Economic Development

ICT enables economic development, e-commerce, and in a broader context, social inclusion, such as e-democracy, e-health, etc. [25]. Many organizations including the U.N., the World Bank, and numerous NGOs are working with governments to bridge the digital divide separating the ICT-capable haves and have-nots.

Issues exist at the individual level within countries, the organizational level within markets, and at the global level across nations [16]. Relative to the global digital divide, there are existing work on the global adoption of ICT and the linkages between adoption and country-level output and growth. For example, Dewan and Kraemer [15] show that ICT capital investments in developing countries are not particularly productive at the macro level since complementary capacity may not be present. They suggest that until supporting infrastructure is built, most developing countries will benefit from putting their aid monies in places other than ICT investments. Several research studies have examined the adoption of ICT and factors that encourage adoption in different international contexts [e.g., 14, 23, 28]. Other studies examine the adoption of wireless technologies that are particularly relevant for mobile banking [e.g., 26].

Dewan and Riggins [16] state that researchers should examine complementary policies and investments at the governmental level needed to encourage productive use of ICT. For microfinance, this recommendation would take the form of investigating what governmental policies and investments need to be in place that would allow MFPs to make productive use of ICT. Mathison [31] suggests that ICT-enabled banking services may be the “killer app” that sets off economic development and ICT adoption in the developing world.

2.2. Microfinance and Economic Development

The evidence is compelling. Microfinance has helped lift many out of poverty. By receiving financial services, particularly microcredit and savings accounts to poor and low-income individuals, small entrepreneurial microenterprises have been established that provide people with a livelihood that was not possible before. Apart from microcredit services from MFIs, many individuals are forced to access the informal lending market in their area, resulting in huge interest rate burdens. For example, interest rates in the informal lending markets of rural India can range from 3% to 10% monthly [37].

There are several estimates on how many poor people are served by microfinance. In 2004, 500 million microfinance customers received savings account services and nearly 100 million were microcredit borrowers [7, 32]. By 2006, some 133 million low-income customers were receiving services [12]. Assuming a typical family size of about five, this represents half a billion poor and low-income people with access to microfinance services globally, consistent with other estimates [9]. It is clear that the provision of ICT services to the microfinance industry is growing but still immature [11]. In 2005, 1.7 billion working adults made less than $2 per day and would be classified as among the global poor. About half of these – nearly a billion people – made less than $1 per day and are considered among the extreme poor and are the least served in terms of financial services. It is estimated that up to 80% of the population in developing nations still lack basic financial services [9, 18]. Even though microfinance began in Bangladesh in the 1970s, after 30 years of innovation, Mia [33] reports that in 2005 about half of the population of the country was still outside the reach of the major MFIs.

2.3. Have Banks Ignored Humanity’s “Long Tail”?

To commercial banks, the poor are considered hard to serve and represent financial risk. The poor may not be inclined or able to pay back loans [3]. Providing financial services to this clientele carries considerable moral hazard and information asymmetry risk. Questions arise. Are their plans to start a microenterprise economically feasible? Do they have the capabilities to make their businesses work? Because the poor have little or no collateral, have no credit history, have little or no experience handling money or managing a business, and may reside in a distant location, there is considerable risk serving these people. Rural markets are difficult to reach with financial services because they are in remote locations, have low population density and the sizes of transactions are relatively small [31, 37]. As a result, MFIs tend to serve more urban customers than rural customers [32]. Traditional lenders also have avoided this market because the loan amounts are typically quite small, as $100 per customer, leading to diseconomies of scale.
Parikh [34] notes several challenges in providing financial services to remote rural regions. First, it is difficult to collect information from clients. This has resulted in the innovation of village banking or group banking, as well as bank officers equipped with handheld technology devices. While group banking has proven successful, tests of handheld devices in the field have not always resulted in efficiency gains, particularly in projects where there was insufficient investment in the technology. Second, insufficient internal IT capabilities hinder MFPs operational efficiency. Many MFPs develop internal IT capabilities that prohibit them from taking advantage of developing standards and platforms. The third problem is the actual execution of financial transactions in rural regions. Security is a difficult problem when cash must be transported into and out of villages, and when fraud is hard to detect at the local level. Lack of security makes financial operations intractable [37].

2.4. Innovations and Challenges for Microfinance

In the absence of sophisticated analytical tools to estimate and manage risk, and ICT to overcome distance barriers, early microfinance pioneers developed a number of innovations to mitigate risk in this market. One such innovation is the concept of group lending, also called joint liability, whereby MFIs substitute group lending for collateral to reduce risk [9]. With group lending, a local MFI representative meets regularly, often weekly, with a group of 20 to 30 individuals who have jointly received microcredit for their various microenterprises. The representative collects small weekly payments, conducts training on money management, provides encouragement to micro-entrepreneurs, and relies on group pressure to encourage financial responsibility. Mersland and Strom [32] found that group lending accounts for 44% of MFI microloans versus 55.5% in individual loans. Though group lending has been successful in the past three decades and is not expected to disappear anytime soon, recent research has shown that there is a trend away from group lending to more individual-based lending to the poor in remote regions [9].

A second innovation has been to focus on women. For example, 95% of Grameen Bank customers in 2000 were women [9]. The third U.N. MDG is to “promote gender equality and empower women.” Microfinance is believed to be an important tool to achieve this goal. Focusing on providing financial services to women typically results in the development of more focused microenterprises, a lower likelihood the money will be used for non-productive purposes, has a more positive impact on children, and results in a higher repayment rate. Cull et al. [9] examined 346 institutions engaged in microfinance operations. Of those, 156 were non-governmental organizations (NGOs) that had non-profit status. For these NGOs, 95% of borrowers were women. The other 190 institutions were a mixture of banks, nonbank financial institutions, and credit unions that typically had more for-profit motives. For these institutions, 37% of the borrowers were women. Because women are the key target customers of many MFPs, the role of women within MFPs has been examined. Mersland and Strom [32] showed that MFIs with a female CEO have had better returns on assets and lower operational costs.

Microfinance originally suggested the provisioning of microcredit. Later this view broadened to include savings accounts for the poor. Recently, it has encompassed a range of financial services to the poor including credit, savings, insurance, leasing, payment transfers and remittance to foreign countries [31]. The growth in product offerings indicates a maturing of this industry, but also brings operational complexities.

MFIs face two often competing, although occasionally complementary goals: increase outreach to serve more clients and improve sustainability through satisfactory financial performance to maintain operations. The issue of sustainability versus outreach is hotly debated in microfinance [35]. Most researchers argue that they are competing goals and act as substitutes. Mersland and Strom [32] showed that higher average microloan amounts increases return on assets (ROA). So MFIs motivated by performance measures would tend to provide fewer loans in larger amounts, thus moving away from the microfinance model of microloans to help as many low-income customers as possible.

Singhal and Duggal [37] pointed out regulatory constraints that hinder innovation to allow MFPs to provide financial services to India’s poor. The MFIs would like to provide banking services to the poor using cashless smart cards. However, banks offer services through smart cards only to individuals who have maintain satisfactory accounts for at least six months, can only make transactions via a particular type of POS terminal, and may accept deposits only within bank premises. Singhal and Duggal [37] call for research into the feasibility of low-cost physical devices and what infrastructure is needed to boost services to the poor.

The results of an extensive study by a consortium of public and private organizations on microfinance services to the poor and how ICT could help concluded that three things must happen before microfinance services can be extended beyond the current client base [18]. Business process redesign must accompany investment in new technology. New markets would require innovative uses of appropriate technologies that can easily scale larger. The infrastructure to support this investment in new ITs could not be borne by MFIs alone.

2.5. IT and Financial Services, Microfinance and ICT

We view the opportunities that ICT holds for microfinance to be analogous to what has been possible in the provision of IT-enhanced financial services. IT value in
financial services develops from its application to business processes that offer “cheaper, better, faster” performance [13], new bases for the creation of value in the process of financial intermediation [19], and improvements in the reach to customers and the range of services offered [39]. The microfinance context is especially interesting due to the service distances involved, the necessity for building operational processes that are lean and effective, without undue complexity or expensive maintenance requirements.

Some of the most effective applications of IT in financial services are those that have impacts leading to the death of distance [6]. Recent work by Diniz et al. [17] on the operational and institutional networks for microfinance and rural banking services in Brazil is an exemplar. The authors report on the changes that network-based microfinance brought to remote areas of the Amazon River Basin, including bringing a cash economy to small villages, localizing salary disbursements, and improving the financial security of banking clients. In addition, Lyman et al. [30] describe the impacts of mobile phones in Kenya and the Philippines. They report that another transformation — this time from cash to stored electronic value, made possible by mobile phones — led to one million new mobile banking service users in less than one year in Kenya. It shows the transformation in reach that new mobile financial services can offer [4]. Surprisingly, Kenya had less than four million people with bank accounts in 2007.

Traditional financial services firms’ use of ICT is the source of other interesting issues. The debate over sustainability versus outreach, it turns out, is fueled by traditional financial services organizations that are becoming new entrants into the microfinance industry. An example of this is Banco del Estado de Chile, a government commercial bank that entered the microcredit business and was able to reduce the costs of microcredit loans by 18% using ICT [36]. They report that ICT devices are necessary in the field now.

Another example of the operational efficiency that traditional financial services firms can achieve relative to NGO MFIs is showcased in Cull et al. [9]. In a study of 346 institutions, the median bank spent about 12¢ on operating costs per $1 of loans outstanding compared to the NGOs at 26¢ — twice the cost plus. The authors pointed out many possible explanations for the higher rates of NGOs including their efforts to make many loans in small amounts, making loans to individuals in hard to reach locations, and the possibility that being subsidized by donors may lead to inefficiencies. They also found that institutions with higher operating costs tended to charge higher interest rates to their customers. But if MFIs charged lower interest rates, many of them would require higher donation rates to sustain their operations. Mersland and Strom [32] conclude their study of the operational capabilities of MFIs by advising that governments and regulators should seek to foster competition among MFIs, thereby forcing them to employ good management techniques and seek operational efficiencies. This sounds like traditional banking!

3. MICROFINANCE MICROSTRUCTURE

The microfinance industry is very information and service-intensive. These characteristics, the dynamic nature of competition, and the emerging role of ICT allow us to qualify this industry as a newly-vulnerable market. Clemons et al. [8] note that there are many industries where new entrants are able to enter and challenge the business of traditionally dominant firms. The markets may be attractive to attach, easy to enter, and difficult to defend. In the microfinance industry, non-profit MFIs pioneered the industry and currently exist as dominant organizations. However, traditional financial services organizations and other for-profit new entrant banks are seeking to exploit the current market conditions to enter and challenge MFIs for dominance. New entrants into newly-vulnerable markets seek to leverage lower overhead costs, new technologies, alternative distribution channels and the targeting of more profitable customers to make significant inroads into established markets. Traditional financial services organizations and for-profit new entrant banks are seeking to exploit each of these factors to challenge more established MFIs in the market for low-end banking clients. So the microfinance industry is ripe for restructuring.

Mathison [31] notes similar factors, emphasizing that for-profit and non-profit MFIs are being forced to adopt formal governance mechanisms and modern information systems due to three factors: increased financial services regulatory requirements, the need to enable expansion of outreach to more clients, which in turn provides economies of scale and ultimately financial stability, and to attract capital from donors and commercial investors. Organizations able to implement and make use of modern ICT will be more likely to survive in this newly-vulnerable market. The microfinance industry microstructure is shown in Figure 1.
The microstructure has a number of key stakeholders that are affected by ICT, as are the relationships between them that will be influenced by emerging technologies. We think of this context as microfinance technology and stakeholder ecosystem. Technology is the key change-maker that disrupts the operation of the industry microstructure.

First, MFIs operate for the most part in developing countries to provide microloans and other financial services such as saving accounts to groups, entrepreneurial microenterprises and individuals.

Relationship-wise, the microfinance industry exhibits considerable information asymmetries. Recipients of these microfinance services have limited or no credit history making it difficult to determine the feasibility of repayment of microloans. MFIs face considerable moral hazard with loan recipients’ efforts at repayment. Thus, the microfinance industry has relationship-based distortions that ICT can reduce leading to more efficient outcomes. Financial services may be provided directly from the MFI to the recipient or through the use of a third-party banking correspondent that could be a local retailer, postal outlet, lottery dispensing merchant, etc. They also can be provided to individuals or to groups, who ultimately redistribute money and services to individuals. This redistribution could be local or may extend outside as in the case of international remittances.

Second, like other financial services institutions, MFIs face considerable internal information processing, storage, and sharing challenges. Adoption of ICT by MFIs has lagged due to a variety of digital divide barriers and concerns that limited funds could be better used by providing loans directly to the needy. Only recently have these organizations begun investing in ICT capabilities, formal governance procedures, and other managerial techniques to achieve operational benefits.

Third, MFIs are constantly on the lookout for new sources of funding. Historically, there are several sources of funds. International donor organizations and individual donors – key stakeholders in this mix – can provide monies to MFIs who act on their behalf to provide outreach to the poor. MFIs provide a valuable intermediary function because they are typically located within developing countries, as opposed to international donors who have limited visibility “on the ground” where services are needed. Thus, donors face considerable risk because of their unfamiliarity with the local environment where their donations are to be used. In some cases, funds may be donated directly to MFIs especially when the receiving MFI has developed an international reputation. Donations can also be funneled through various types of relief organizations and networks operating in both the international environment and the developing countries. A third source of funds is from investors, mostly from the international environment, who seek rates of return and may split their investment funds between MFIs and traditional financial services organizations. It should be noted that many MFIs have an explicit goal of moving away from dependence on the donor model to an internally self-sustaining financial model based on expanded savings services to the poor [40].

Finally, we see that MFIs operate in an environment where traditional financial services firms may consider providing competing services to customers in developing nations. The extent to which this new entrant operates in a given region will impact incentives on MFIs to invest in ICT, adjust interest rates, and adopt more aggressive strategic objectives. This form of competition plays out in a context of increased activity by regulators both at the international and country-level, various types of third-party credit bureaus that provide information services on the financial viability of financial service recipients, and non-profit information exchanges that seek to provide visibility into market processes.

Part of what makes this newly-vulnerable market ripe for structural change is the dynamic nature and number of intermediaries in the industry. Spulber [38] states that intermediaries perform four important functions: setting prices and clearing markets; providing liquidity and immediacy; coordinating buyers and sellers using matching and searching functions; and guaranteeing quality and monitoring performance. ICT plays a critical role in allowing key intermediaries to perform these functions. We can identify several different intermediaries by noting players in the industry that have both an inflow and outflow of money or services.

Group leaders act as intermediaries between lenders and microloan recipients. They ensure good financial management and repayment accountability. Banking correspondents are intermediaries between the more distant financial institution and the recipient to ensure safe and convenient transactions. MFIs are intermediaries between international donors or relief organizations and local loan recipients to ensure development funds are used well. Traditional financial services organizations intermediate between investors and loan recipients to ensure investments are used productively. Relief organizations are intermediaries between international donors and MFIs to ensure that donations are used wisely and responsibly. Regulators, credit bureaus, and information exchanges intermediated between those providing funds and those receiving funds across the value chain.

We consider four levels where ICT can impact the microfinance industry.¹ At the customer level, we con-
sider how ICT impacts MFI loans use by customers, what types of projects are funded, and how ICT is used to reach and interact with the customer are the prominent issues. At the MFI level, the questions focus on how ICT impacts how MFIs operate internally for operational efficiency and risk management. At the donor level, the focus shifts to how ICT impacts the mechanisms for MFIs to secure funding and provide visibility to donors. Finally, at the microfinance industry level, the issues for study are how ICT impacts the structure of the industry in terms of strategic and outreach objectives, interest rates, and ability for other entities to enter the market.

4. PROPOSED RESEARCH DIRECTIONS

Using the four functions of stakeholder intermediaries, we next propose a series of research questions to better know how ICT impacts the microfinance industry.

4.1. ICT Role and Impact at the Customer Level

MFIs provide financial services to support microenterprises and facilitate economic development. Thirty years ago, most microfinancing was provided to farmers, handicraft entrepreneurs, livestock owners, and small store operators [9]. Funds that promote small business ownership can instead be used to promote clean water and power generation initiatives. In recent years, MFIs have provided loans to small businesses. Community-based telecentres, for-profit cybercafés, and mobile phone service providers are examples of community activities that can benefit. ICT is an enabling technology, so examining its role at the project level is key:

- Are supported projects with ICT components more likely to be profitable to the customer and the MFP compared to projects that don’t? Do they help to reduce poverty?
- What complementarities help ICT-enabled projects to be successful? Are projects aimed at increasing physical access to ICT ineffective if certain digital, human, and/or social resources are lacking?
- How much should MFIs seek to promote the use of ICT? Should funding be based on a customer’s ICT sophistication? What ICT-enabled financial services are key?

With the information asymmetries and moral hazard that MFIs face, analytical tools can be used to increase understanding of the market risk, which may allow MFIs to deal with potential customers better. Silva [36] reports that use of a credit scoring system on PDA devices allows MFIs to target a larger population with financial services. We propose questions on how analytical tools allow MFIs to directly serve their customers:

- Do they help MFIs to overcome information asymmetries to understand the viability of potential customers to repay loans? What are the implications for poverty reduction?
- Does ICT allow MFIs to improve their ability to screen customers, leading to successful economic development?
- Does equipping remote loan officers with analytical tools improve their ability to make loan decisions in the field?
- ICT can help overcome distance barriers that allow MFIs to serve remote rural customers better. ICT can help MFIs to monitor activities at local villages and reduce moral hazard and promote repayment. But:

- To what extent does ICT allow MFIs to achieve further geographical reach to serve remote customers?
- Does the use of ICT by the customer to interact with the MFI allow the customer to receive better services? Do MFIs have closer relationships with customers too?
- Does ICT allow MFIs to overcome social barriers and achieve the sociological reach to serve diverse customers including women, minorities and disadvantaged groups?

Internet e-banking and mobile phone-based m-banking are different. In developing countries, there are many more mobile phone users than Internet users. In some countries the ratio is 10:1 [27]. M-banking allows MFIs to reach more customers, yet e-banking can provide a richer medium with more functions and services. Related research questions are:

- Given that mobile phone adoption in developing countries is much higher than Internet adoption, what are the prospects for providing services to the poor this way?
- What are the short-term tradeoffs for providing financial services via cell phones or the Internet?

A related issue is the use of ICT devices by loan officers in remote regions that allow communication back to the MFP. In addition to having the customer equipped with mobile phone technology or the Internet, loan officers may be equipped with handheld PDAs. With PDAs linked with the MFI, microcredit officers can get quick authorization for loan requests [36]. Then:

- Which model is better? Having customers equipped with mobile phones or the Internet versus having the loan officer equipped with hand-held PDA devices?
- Which model is preferred? Under what circumstances? Does a loan officer with real-time linkages to MFIs improve service to customers? What benefits accrue?

ICT at the local level can lessen the need for group banking and may drive this toward more individual-based banking. Research should examine how ICT use by MFIs impacts their ability to engage in microloan activity with individuals versus groups. We ask:

- Is ICT driving a shift to individual banking? Are ICT-based financial services and group lending substitutes?
Is individual-based banking less personal than group banking, or more so? Can media-rich ICT functionality make individual-based banking more personal?

ICT-based delivery channels such as mobile phones and the Internet can be used to alleviate security concerns associated with microfinance services in remote locations [27]. Silva [36 - 2002] reports that integration of microfinance with identification tools, such as fingerprint IDs, boosted microfinance operations at Fondo Financiero Privado PRODEM (www.prodemffp.com); many recipients of microfinance services neither read nor write. The questions include:

- To what extent does ICT enhance security and allow successful financial operations? Is risk shifted for the MFI?
- Will users trust mobile phone confirmations from financial institutions more than direct human interaction?

Women make up the majority of microfinance customers. The role of women in leadership positions within MFPs has been shown to be important in the success of the provider. If women are specific targets of MFI operations and MFIs with women CEOs perform better, then there are important implications for providing microfinance services in areas where a gender digital divide exists. Research should examine the following issues:

- Do microfinance operational practices and results differ in regions with a significant gender divide? Does ICT help?
- Will ICT-based financial services be adopted as readily by women as microfinance?

Group lending may increase repayment rates as peer pressure bears on members of the group to act in good faith [3]. Appointed group leaders may receive and pass on training that encourages good financial management among group members. Group lending encourages groups to form where members have similar repayment capabilities. There may be a role for social networking technologies to increase group interaction that facilities effective microfinance. Research should investigate the adoption, use and impact of such ICTs. We ask:

- To what extent could social networking technologies be used to achieve existing benefits of group lending, without requiring the group to physically meet?
- What approaches to group lending would work by using social networking adjacent to group lending practices?

Another research direction that deserves comment involves the extent to which we will see widespread adoption by sometimes illiterate people, who have insufficient technical understanding to take much value away from microfinance ICTs in use. Prior research by Gurstein [22] points to the importance of effective use and implementation outcomes as a basis for unlocking the business and social value of community informatics. Microfinance-related ICTs are included in community informatics. The authors point out that, for community informatics to be value-bearing, they need to be effectively implemented and widely adopted [20, 21]. The barriers to achieving such an outcome are many though, and they are likely to affect some of the key area relationships in which different kinds of value materialize (e.g., health, education, etc.) [25]. It will be valuable to consider this as another key research direction to see how well consumers can be services by microfinance ICTs.

4.2. ICT Role and Impacts at the MFI Level

Financial services organizations have typically led in IT investment. We next propose research questions on the role and impact of ICT on MFI internal operations.

Research needs to examine why MFIs have been reluctant to adopt and invest in ICT. In Bangladesh, MFIs adopt ICT for operational efficiency reasons to manage the information processing needs of existing customers needing microfinance services rather than to improve their reach to a broader customer segment [33]. Mia also suggests that in Bangladesh some MFIs are hesitant to adopt ICT because they don’t know the benefits. They have a history of making decisions based on intuition rather than computer-based models too. Labor costs are low too. We ask:

- What factors lead to adoption of ICT by MFIs? Does available low-cost labor affect MFIs' use of IT? How?
- Does MFI size matter? Do large MFIs have the capabilities to invest in needed ICT capabilities? Does this impact the ability of small MFIs to survive and provide outreach?

Even after the organization adopts ICT as a resource, it is possible that individuals within MFIs might be reluctant to make use of the technology. Employees may not be familiar with ICT and may be hesitant to adopt. Or they may be willing to adopt, but lack the appropriate skills. Research should examine:

- To what extent are bank officers at the local level able to adopt ICT technology such as PDAs or analytical software tools? Does this affect MFI performance?
- What skills and human resource capacity are needed to make adoption at the individual level smooth work well?

Given the insufficient number of skilled ICT workers in developing countries, there are concerns about staffing IS operations at MFIs. It is appropriate to evaluate how much MFIs should outsource their IT needs. However, the context within which most MFIs operate makes this a difficult problem. New software has entered the market to meet the needs of microfinance service providers. MFI managers must choose whether they will develop internal capabilities or look outside though. So:

- When MFIs develop their own internal systems, do they need to employ fully capable IT operational staff?
- Is there a tradeoff between acquiring international technical talent that may lack an understanding of the local context versus local IT service providers that understand the culture, but may lack technical skills?

Banks have more efficient operational capabilities
than NGO MFIs [9]. MFIs make small loans to individuals in hard-to-reach locations. However, banks have more sophisticated ICT capabilities, allowing them to be more efficient in their operations. We suggest:

- What metrics should be used to determine the ICT sophistication by these organizations?
- Is there a link between ICT use and interest rates to customers? Does MFI ICT use improve microloan ROA?
- Can MFIs operate without sophisticated back-office ICT automation? Systems for customers? System integration?

Ahmad [2] suggests that MFIs do not plan for effective use of back-end systems, due to lack of strategic ICT use. MFIs may not be aware of how ICT can shape strategy. Purposely incorporating ICT into their strategic plans would allow MFIs to target specific MDGs. As the industry matures, we must ask:

- To what extent will strategic use of ICT for integration of the front-end with the backend systems impact performance and the ability to provide effective services?
- In what ways can ICTs shape MFI strategy? Does ICT contribute to fulfillment of specific U.N. MDGs?

4.3. ICT Role and Impact at the Donor Level

Most MFIs rely on external donors to supply funds necessary to carry out microfinance activities. Donors typically exist outside of the local country context where microfinance activities take place. So it can be difficult for donors to know if an MFI is making a good faith effort to engage in good business practices and make an honest effort to extend outreach services to the truly needy. In addition to this moral hazard, donors also lack information about the internal workings of MFIs due to information asymmetries. Therefore, it is difficult for donors to be assured that their donation moneys are being used as they intend. Information systems that provide more transparency into the operations of MFIs decrease donor risk and should increase competition for donor funds among MFIs. The MIX Market is one such information intermediary that seeks to meet this need. New research should explore these questions:

- Does internal ICT investment impact the ability of MFIs to be more transparent in providing information to capital providers? Do MFIs that have invested in internal systems and receive more donor and/or investment capital?
- Do third-party information intermediaries change the nature of information made available to outside parties? What theories of information transparency can inform research into the impact of these infomediaries?
- Can external donors and investors trust internally-generated MFP financial information when there is a lower level of transparency due to poor use of ICT?

4.4. ICT Role, Impact: Microfinance Industry Level

Our objective is to propose investigation regarding how ICT impacts the microfinance industry structure and its strategic transformation. There is increased competition between non-profit MFIs and for-profit financial services firms for donor/investor financing on the front-end and the search for customers on the recipient end. There are new intermediaries emerging in the market structure that may be able to alter the balance of power. In terms of industry transformation due to the changing balance between sustainability versus outreach for non-profit MFIs and for-profit financial services organizations, there are several important questions:

- Will NGOs be swallowed up by for-profit firms that can profit by offering better financial services to the poor?
- Does ICT allow them to reach lower in the client population to serve customers?
- Do ICT-based efficiency benefits allow firms to offer services to customers that were not previously justifiable?
- What analytical models can be developed that investigate impacts of for-profit lenders versus non-profit lenders?
- What are the long-term prospects for traditional financial institutions to expand into new markets if they are able to invest in ICT at a faster rate than MFIs?
- Is leverage gained by MFIs joining together? What externality benefits can be realized? [18]?

Because MFIs and traditional financial services firms have difficulties reaching remote locations, they now partner with local establishments that act as agents to make financial services available to local clientele [17]. Called branch office franchises [31] or banking correspondents [24], these local partners are equipped with ICT access devices. Local third-party service providers can be retailers such as grocery stores, drugstores, gas stations, the postal company, and the local lottery outlet. An existing telecentre can function as a local intermediary [31]. Because often have PCs and the Internet, MFPS may be able to offer financial services unavailable via a cell phone or even an ATM machine. We expand Ivatury’s [24] research questions:

- Do banking correspondents as intermediaries increase the ability to provide services to the poor? Is any establishment type a better financial services intermediary?
- Do telecentres work well as microfinance intermediaries?
- What is the appropriate business model for banking correspondents? How is the local market impacted when it has only one viable banking correspondent establishment?

In a globalized world, migrant workers are working in, and sending money to many countries [1]. MFIs are looking to provide financial services to the poor, not in a given local developing country context, but in a cross-border context. So we ask:

- Under what circumstances do microfinance-based remittances fuel economic growth? Will this help the poor?

Information transparency is increasing in this industry due to government and regulator requirements, as well as information provided by third-party infomediaries such as the MIX Market [32]. Regulators exist in the
international context and within most countries where microfinance operations take place. They may require specific reporting procedures that can burden small MFIs relative to traditional financial services firms that are accustomed to such requirements. Depending on the regulator’s policies, lenders may engage in more or less aggressive lending policies based on the extent to which deposits are guaranteed. Different regulation across regions may impact the extent to which MFIs operate in few or many countries. These issues are impacted by the level and sophistication of MFI investment in ICT. So we should ask:

- Does information transparency from third-party infomedaries substitute for microfinance industry regulation?
- Do increased regulations foster competition among MFIs, forcing them to employ good management techniques and seek operational efficiencies through IT investments?

5. CONCLUSION

We have sought to provide a set of research questions that will explore multiple levels of analysis related to the impacts of IT on microfinance. We have given special care to the role of ICT in furthering economic development and efforts to bridge the digital divide. We have also considered the role of microfinance in promoting economic development and encouraging entrepreneurship in micro-businesses.

We proposed a microstructure view of the microfinance industry as a basis for formulating research directions that relate to the kinds of impacts that different stakeholders in microfinance are experiencing or will experience. The stakeholders include the customer, microfinance institution, donor, and the microfinance industry, as whole. Our investigation emphasizes the importance of implementing research to yield sharp insights about the stakeholders in microfinance, and the beneficial impacts that will arise around them.

A key contribution of our work is to have asked research questions that can be answered in the context of the microfinance technology ecosystem. An important aspect of our work – and one that we think should drive future work – is to focus on issues that arise in the ICT-driven changes in relationships between the stakeholders. By focusing on the changing relationships, that it will be possible to predict the future evolution of the microfinance industry. The relationship dynamics in microfinance that we have described occur in other contexts, although never in a context where some of the key stakeholders represent the long tail of financial services customers – poor people around the globe.

The research directions that we have laid out will lead to a richer understanding of how ICT will drive unique changes and developments. This is important. It will provide the basis for evaluating how well the institutions of microfinance are able to support the millennium goals of the U.N. It will help to reduce poverty, improving the equality of women in the human long tail of the global economy, and provide a basis to get financial institutions truly connected to the global mission of enhancing the quality of the human condition.

We are in the process of initiating empirical research in this arena. Trying to work toward getting the questions “right” will be essential for the development of actionable new knowledge in this context. The research questions and directions that we laid will be able to be explored with theories from economics, strategy, regional development, finance, marketing, operations management, information systems and human behavior. The likely result will be rapid advances – if only academicians and practitioners can jointly muster their resources to address the most pressing problems.

The key problems will only be solved with research methods that are attuned to the research directions we outlined. At the level of the consumer, the MFI and the donor, it will be possible to conduct rich case studies and empirical research, as a means to build an understanding of the inner workings of the microfinance industry microstructure. There is a strong impetus to conduct research on how human behavior changes in the presence of ICT-based microfinance too. In addition, it will effective to construct economic and finance models that seek to understand key relationships in depth, as well as behavioral models of adoption and implementation, based on the available theory. As we move higher in aggregation to the microfinance and banking industries, and to the stakeholder ecosystem, such approaches as systems dynamics and macro-empirical modeling will be more appropriate.

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