The Impact of Information and Communication Technology on

Intermediation, Outreach, and Decision Rights in the Microfinance Industry

by

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A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctorate of Philosophy

Approved April 2012 by the
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ARIZONA STATE UNIVERSITY

May 2012

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ABSTRACT

The microfinance industry provides financial services to the world's poor in hopes of moving individuals and families out of poverty. This dissertation document suggests that information and communication technologies (ICTs) are changing the microfinance industry, especially given recent advancements in mobile banking, Internet usage and connectivity, and a decreasing digital divide. These impacts are discussed in three essays. First, ICTs impact intermediation among various players in the microfinance industry. Second, ICTs impact the extent to which microfinance institutions (MFIs) extend their outreach to poorer or more geographically remote borrowers. Finally, ICTs impact the location of decision rights given newly forming peer-to-peer (P2P) social microlending organizations. As the microfinance industry increases its adoption and reliance on ICTs, new and interesting opportunities abound for researchers in the information systems discipline.

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1.1.   Motivation

Muhammad Yunus (2007b) founded the Grameen Bank in 1983. Its purpose is to

make small loans to groups of rural Bangladeshi women. He probably did not

realize that he started an industry that has a dramatic impact on poverty levels and

has undergone extensive changes throughout the last 29 years. The characteristics

of the recipients of microfinance loans remain largely unchanged. These

borrowers are often rural, poor entrepreneurs who benefit from loans to grow their

small businesses. The technologies used by borrowers and the microfinance

institutions (MFIs) that administer these loans are very different than they were in

the industry's humble beginnings. Today, a female basket weaver in rural

Cambodia receives a loan to purchase more long-stem grass materials for

weaving. This loan is administered by an MFI with its headquarters in the capital

of Phnom Penh and branches throughout Cambodia's provinces. Dozens of

lenders in developed countries fund her loan via a peer-to-peer (P2P) social

lending website where lenders receive regular updates on her business status and

loan repayment progress. Since the borrower has little time to travel to the branch

to make her loan payments or the money for a motodup (motorcycle taxi) fare,

she repays her loan by making electronic money transfers through her mobile

phone. Donors and investors are able to analyze the financial performance of the

loan portfolio, as well as the social impact of the MFI administering her loan and

also to compare the outcomes to other MFI in Cambodia and the rest of the world by viewing an online transparency promoter's website.

The evolving industry described above is *microfinance*, which Ledgerwood (2000, p.1) defines as "the provision of financial services to poor or low-income clients." *Microlending* or *microcredit* is a subset of microfinance. By offering small loans to poor individuals and groups who would otherwise be unable to receive loans through traditional banking institutions, microlending shows great promise as an alternative method to charity. Microfinance is proving to be more than just the provision of loans. It can also include microsavings, money transfers, and insurance provisions. Prior to the onset of microfinance, the only available lending channels for the third-world poor were moneylenders. Since moneylenders operate in unregulated black markets, they often exhibit a high level of corruption and are known to charge high interest rates or threaten physical harm on borrowers and their families in the event of non-payment (Schreiner 2001). Microloans administered by credible MFIs, however, are a legitimate form of loans and have found success in moving individuals out of poverty (McKernan 1996, Pitt and Khandker 1998). MFIs come in many varieties (e.g. non-government organizations [NGOs], banks, credit unions, rural banks, non-bank financial institutions). They exist to administer financial services to poor clients and are often located geographically near their clients.

Besides a unique approach to financial services and poverty reduction, the microfinance industry is also marked by a low amount of technological advancement (Ivatury 2004, CSFI 2011). Technology use among the world's

poor, however, tells a different story. Mobile phone and Internet users in developing countries are growing at a higher rate than in developed countries (Shamim 2007). These characteristics of both the nature of the industry and technology use lead to interesting research implications and questions, Does information and communications technology (ICT) investment and usage positively benefit the microfinance industry? If these benefits are found to exist, what is their impact on industry players and the structure of the industry?

Academic literature with respect to microfinance and ICT is nearly absent in the information systems (IS) discipline. A Google Scholar[1] search in five of the top IS journals revealed that no published articles contained the term "microfinance."[2] While research does exist on ICT use in the microfinance industry, those articles are written by academics and researchers in disciplines other than information systems (e.g. economics, finance, management, development) or are published in journals specific to development among other disciplines. Their content consists of cases where ICTs are used to address a problem or need in the industry.

Despite this gap in academic research, microfinance remains a rapidly growing industry. A 2007 survey found that there were 133 million microloan recipients, up from 13 million in 1998 (Apps 2007). This growth is expected to continue despite a slowing global economy. Dieckmann (2007) predicts that private investors will finance $35 billion to MFIs by 2015. Given recent

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[1] www.scholar.google.com
[2] *MIS Quarterly*, *Information Systems Research*, *Management Science*, *Journal of Management Information Systems*, and *Journal of the Association for Information Systems*

microfinance industry growth, new electronically-enabled entrants and a banking model that differs from traditional banks, the timing is right for a dissertation study on ICT and microfinance.

1.2.   Overall Research Questions

Kauffman and Riggins (2012, p.1) suggest that "ICT may be the instigator…and the potential solution to MFI survivability." Their research paper poses a comprehensive list of research questions dealing with the impacts of ICT on the microfinance industry in several aspects: the customer level, MFI level, donor level, and industry level. Researchers use this multilevel research approach in the contexts of ICT adoption (Weber and Kauffman 2011), entrepreneurship (Davidsson and Wiklund 2001), and strategic behavior (Schneider and De Meyer 2006) among others. The impacts of ICT in microfinance are widespread among many industry players. In order to achieve a comprehensive analysis, each essay in this dissertation focuses on one or more of these stated levels moving from general to specific as the chapters progress. The research question encompassing this entire dissertation follows.

What are the impacts of ICTs on the microfinance industry?

A Western philanthropic-minded lender has no means of funding a loan requested by an impoverished individual in a developing country without the use of an intermediary to match the borrower and lender, transfer funds, and enforce loan repayment. In the same way, a donor has no means of determining which MFIs meet their giving criteria without the use of an infomediary to publicly share the information. In the first essay, I categorize the various electronic-

enabled intermediaries in the microfinance industry while classifying the patterns that appear into a research framework. The overall research question for this study asks:

What is the impact of ICTs on market structure and intermediation in the microfinance industry?

While the first essay determines the impact of ICTs at the industry level, the second essay determines the impact that ICTs have on MFIs, the organizations that administer loans to poor individuals and groups. The specific impact of interest lies not on their financial or loan portfolio performance, but rather on their social performance which includes the ability to lend to individuals that are poorer or more geographically hard-to-reach and distant. The overall research question for this study asks:

What is the impact of ICTs on MFI outreach?

ICTs also increase transparency in the microfinance industry. The final essay highlights the new and growing P2P approach to microlending. This new approach connects Western lenders to poor third-world entrepreneurs in a lender-borrower relationship. The Internet technology use among these organizations has interesting implications for location of decision rights and its impact on microlending efficiency and effectiveness. With the advent of P2P social microlenders, loan funding decisions are shifting from MFIs to individual lenders in developed countries. This shift produces some interesting ramifications, and therefore the overall research question for the final study asks:

What is the impact of ICTs on decision-making rights among P2P social

microlenders?

To answer these research questions, I employ a range of research
methodologies including exploratory methods, market structure analysis,
quantitative methods including logistic regression, and qualitative methods with
case studies and pattern matching analysis. Using these methods, this dissertation
contributes to the body of literature on the impact of ICT on microfinance, posits
new theories, and provides practical advice for various industry players. The
remaining chapters in this dissertation flow from a broad, industry impact in
Chapter 2 to a narrower MFI organizational impact in Chapter 3 and finally the
specific impact of P2P social microlending in Chapter 4.

Chapter 2. The Impact of ICT on Intermediation in the Microfinance Industry

2.1. Introduction

Global poverty and malnourishment rank among the largest humanitarian problems in the world today. An estimated 925 million, or 13.6 percent of the world's population, were classified as malnourished in 2010 (Food and Agriculture Organization 2011). Children are the primary victims of malnutrition. One in three children in developing countries is malnourished and suffers an average of 160 days of illness per year. While global malnourishment slowly declined from 1969 to 1997, it has since increased to its highest recorded levels. Poverty ranks as the principal reason for malnourishment. In 2008, 1.35 billion people lived in poverty on $1.25 USD or less per day (Povcalnet 2011).

ICT has shown some impact on poverty. While this impact is only in an early stage, the potential is being demonstrated at the micro, intermediate and macro levels (Hanna 2003). Despite this slight improvement, evidence suggests an "indisputable link" between poverty and ICT (Flor 2001). Within developing countries, ICT offers the following benefits: strengthening social networks, challenging norms that prevent socially marginalized people from experiencing economic advancement, and providing the poor with access to information and knowledge that can improve their economic situation (Slater and Tacchi 2004). Countries that experience high poverty rates also have few telephone land lines and Internet service providers (ISPs) (Kiiski and Pohjola 2002). Unfortunately,

there exists a *digital divide*, a term referring to the discrepancy of technology available to, and used by, the poor versus the wealthy (Dewan and Riggins 2005).

Microfinance is an approach to alleviate poverty. It is defined as the provisioning of financial services to poor or low-income clients, including both consumers and entrepreneurs, who would otherwise not be served by traditional financial institutions (Ledgerwood 2000). For example, Winifred Neba operates a vegetable stand in her rural Cameroon village[3]. In 2009, she received a microloan of $1,050 to purchase a motorbike, registration documents, and fuel so she could establish a motorbike transport company. With the profits from her company, she plans to provide her daughter with a university education and build a home for her family. Winifred has already repaid 33% of her loan. GHAPE (Grounded and Holistic Approach to People's Empowerment), a microfinance institution (MFI) in Cameroon, administered this loan. A loan request such as this would have been rejected at a traditional lending institution due to either a perceived high risk for Winifred's start-up venture or loan administration costs exceeding the amount of potential interest earned. For-profit lending institutions tend to be unwilling to do business with a lender whose sole revenue stream comes from a vegetable stand in a developing country. The emergence of microfinance in the past three decades is viewed as a critical component in the fight against global poverty (Mosley 2001, Shaw 2004, Khandker 2005).

Despite numerous microfinance success stories, estimates reveal that 40% to 80% of the population in developing countries still do not receive basic financial

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[3]http://www.kiva.org/lend/7616

services (Cull et al. 2009). Some microfinance programs have found little success in reaching the poorest individuals, which they state are the target of their outreach (Hulme and Mosely 1996). Muhammad Yunus, a recognizable name in microfinance (founder of the Grameen Bank in Bangladesh), attributes this shortcoming to profit-maximizing MFIs, which are less successful in poverty reduction than social business MFIs (Yunus 2007a). One of the "promises" of microfinance initiatives is self-sustainability (Morduch 1999). This attribute makes microfinance a unique approach from most other charitable attempts at poverty reduction. Unfortunately, this initiative led many MFIs to favor financial performance goals over social performance goals and neglect clientele with the greatest need. The pendulum is swinging back toward social performance. The industry is responding by introducing tools, methodologies, and assessment frameworks to the industry in recent years (Copestake 2007, Bedecarrats et al. 2009).

ICT has shown a moderate impact on this industry, but indications reveal that it could have large impacts (Kauffman and Riggins 2012). Many of the tasks that intermediaries perform are enabled by, or at least improved by, various technologies. Intermediaries introduce both benefits and challenges to any industry. The microfinance industry possesses unique characteristics that are not shared with other industries (outreach-focused, donor-funded, and concentrated in developing countries). ICT has been shown to alter the roles of intermediaries and marketplaces in industries such as travel (Granados et al. 2003b, 2008), music (Bockstedt et al. 2006), and retail (Sarkar et al. 1995). Kauffman and Riggins

(2012) recognize that research on the impact of ICT in the microfinance industry is limited. As developing countries adopt ICTs and begin to bridge the digital divide, the impact of ICTs on the microfinance industry will increase. The industry can benefit from the scholarship of applicable academic research.

I pose research questions in order to determine how ICT impacts intermediation in the microfinance industry. My hope is that answering these questions can help improve the efficiency and effectiveness of intermediation in the microfinance industry so microfinance can indeed reduce poverty. Research questions (RQs) include:

- (RQ1) How has ICT created opportunities for intermediaries in the microfinance industry?

- (RQ2) How are ICTs fueling changes among these intermediaries?

- (RQ3) Based on the risks facing the microfinance industry and ICTs ability to address these risks, What will microfinance industry intermediation look like in the future?

- (RQ4) What are the implications for microfinance market participants given these predictions?

2.2. Theoretical Background

I draw on elements of intermediation and electronic marketplace theory, transparency theory, and e-commerce in my analysis of ICT in the microfinance industry.

Intermediary theory. Spulber (1996) defines an intermediary as an "economic agent that purchases from suppliers for resale to buyers that helps

them meet and transact." Microfinance as an industry uses intermediaries and the roles that these intermediaries play are the same as in traditional industries (e.g. automotive, financial services, engineering). These roles include (1) price setting and market clearing, (2) providing liquidity and immediacy, (3) matching and searching, and (4) guaranteeing and monitoring. Intermediaries in the microfinance industry play the standard roles that Spulber recognizes. These roles are often enabled by technology. Spulber's definition is limited in that it only refers to the transfer of goods, services, and funds. For the purposes of this paper, I also include the flow of information in the tasks that intermediaries perform.

Some intermediaries also function as electronic marketplaces. Bakos (1991, p. 296) defines an electronic marketplace as an "interorganizational information system that allows the participating buyers and sellers to exchange information about prices and product offerings." Bakos (1991) claims electronic marketplaces share the following five characteristics:

(1) Reduces information cost – Costs of obtaining information about prices and product offerings are lower in an electronic marketplace.

(2) Benefits from network externalities – As the number of participants in an electronic marketplace increase, the value of the marketplace to participants will also increase (Katz and Shapiro 1985).

(3) Imposes switching costs – The migration from traditional to electronic marketplaces requires investments in hardware, software, and staff training.

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(4) Participants benefit from economies of scale – While the initial investment to switch is large, the incremental costs for each additional transaction are low.

(5) Uncertainty of actual benefits among participants – Potential participants are not aware of electronic marketplace benefits often until long after switching.

Debate exists among researchers as to the effect that electronic marketplaces have on product prices. Traditional thought suggests that since high search costs allow sellers to maintain high product prices, lower costs should be expected among products sold in electronic marketplaces. Lee (1998) argues the converse in his study on the Japanese auto auction market and finds that buyers pay a premium due to contract costs that counter unknown variance in product quality. The argument can be simplified when discussed in terms of *asset specificity*, which is the heterogeneity of an input or how easily the input can be used by another firm, and *complexity of description*, the amount of information required to aid in the consumer's purchase decision (Malone et al. 1987). Goods ranking low on asset specificity and complexity of description are more attractive products for electronic marketplaces. These goods range from commodities like oil and wheat to media products (books, CDs, Blu-ray discs, etc.). Goods that rank high on the two dimensions are not as suitable for purchasing and selling in an electronic marketplace, exemplified by the automobiles used as the example in Lee (1998). In the microfinance industry, example products include loans or savings accounts. Both of these rank low on asset specificity, since money, a liquid asset, can be

used as an input in all entrepreneurial endeavors. They also rank low in terms of

the complexity of product description since loans have few defining components

such as interest rate, compounding method, amount, and loan term. To a

microfinance institution, a disbursed loan is an asset on their balance sheet, but it

also carries risk. These factors make microfinance products appropriate for

buying and selling in electronic marketplaces.

Much research in the IS discipline aims to determine if ICT diminishes the

need for the 'middle man' (El Sawy et al. 1999). Evidence of this can be found in

certain industries such as music and print media. Prior to Internet technologies,

portable electronic book readers, and audio compression formats, many

intermediaries existed between the artist and the end-consumer including

producers, record labels, publishers, distributors, and retailers. Beginning in the

late 1990s, artists could sell their music and media directly to consumers. Those

who benefit from this change are the artists who receive a greater percentage of

the final sale and the consumers who pay a lower cost and can deal with the artist

directly. Those who do not benefit are the other players in the market structure

between the artist and the consumer who were being disintermediated by these

advancements (Bockstedt et al. 2006). Since ICT can diminish the distance

(Cairncross 2001) between lenders and borrowers, less need arises for

intermediaries to play roles in the microfinance industry.

Electronic-enabled intermediaries have also impacted businesses and industry.

Huber and Korn (1997) posit that collaborative coordination of value creation

increases for business partners who rely on electronic enabled intermediaries.

This poses a threat to traditional businesses that rely on brands and distribution relationships (Ghosh 1998). While it is true that many traditional intermediaries risk extinction due to advances in ICT, some intermediaries maintain relevancy by proactively "reinventing their value logic" (El Sawy et al. 1999). Their traditional roles of distributing goods to other market players shift to roles of service support, transaction processing, and contract enforcement.

Transparency theory. Transparent markets are characterized by complete and unbiased information (Porter 2001). In transparent markets, healthy competition flourishes. Consumers benefit from competition through lower product pricing, but sellers and producers have an understandable resistance to transparency because it often means sacrificing their financial advantage of information asymmetry. Less transparent market participants yield financial gains although these gains are reduced when more transparent sellers enter the market (Wilson et al.1999). The same is true in the microfinance industry; larger profits can be made by profit-maximizing MFIs that lend in markets where competitors (other MFIs) and their target market (individuals in poverty without access to traditional financial services) have limited access to market information. To combat this, organizations such as MixMarket and MFTransparency work in the industry to promote transparency and healthy competition among market players. As evidenced in Wilson et al. (1999) the financial benefits of adopting a non-transparent strategy among profit-maximizing MFIs decline as other MFIs become transparent. Consumers are not the only players that experience benefits

from transparency. Sellers also benefit with enhanced electronic representation of products and competitive/institutional forces (Granados et al. 2006, 2010).

Transparency offers many benefits to a marketplace and is used as a means to mitigate corruption (Bac 1999, Boehm and Olaya 2006), which is a growing concern in the microfinance industry (CSFI 2011). Another benefit of transparency is improved liquidity of a product for sale. Examples include an airline flight's empty seats (Granados et al. 2003b) or a donor's cash reserve for funding an NGO MFI. It also leads to a greater transfer of wealth between the producers and consumers since product turnover increases, while at the same time margins are reduced for intermediaries (Clemons and Weber 1990). Technologies like the Internet allow for consumers to determine sellers' costs or acquire several bids. Consumers pay lower prices and effectively increase their consumer surplus. In the context of microfinance, a borrower reviews the interest rates and loan products of several MFIs before making their borrowing decision. The same ramifications exist with consumer surplus – if a borrower is willing to borrow at a rate of 25% and finds a loan at a rate of 20%, the difference between the two is a surplus gain to the borrower. This discrepancy may lead to an increased willingness-to-pay, lowering the elasticity of demand in transparent markets (Granados et al. 2003a).

Another point pertinent to a discussion of transparency is that not all market players prefer transparency. Some sellers prefer not to join an electronic marketplace with high price transparency since high price transparency increases competition, lowers prices, and decreases profit margins. This has further

ramifications with consumers, who are less likely to participate in an electronic marketplace where fewer sellers are involved (Soh et al. 2006). For example, consider an airfare comparison website like Expedia.com. Airlines may be unwilling to join due to the reasons stated above. Consumers, in turn, will not want to visit a website that only compares airfares for a limited amount of airlines. Microfinance institutions may elect not to participate in a transparency-promoting website or database if they fear that their financial and loan portfolio data are unfavorable or if they make themselves a target for competition.

Based on this discussion, Transparency theory would suggest that intermediaries in the microfinance industry should exist to promote efficiency, healthy competition, and better interest rates. However, without intermediation and regulation, these activities fail to exist (Waterfield 2008). When viewing the interest rates charged by different MFIs in geographic regions, it can be determined that some MFIs charge interest rates far greater than a normal range. If regulated, customers have greater access to loans at repayable rates. Interest rates vary significantly relative to loan size, making sharing this information in a transparent manner difficult. Non-transparent pricing is common among MFIs and creates a market imperfection, generating potential for high profits for MFIs.

2.3. Research Method

I employ exploratory research methods, including business mini-cases, to determine the structures in traditional, ICT-enabled, and future predicted ICT-enabled microfinance market intermediation. This analysis views the changing industry from the perspectives of several players in the microfinance industry.

Bockstedt et al. (2006) used a similar approach by analyzing the impacts of ICT on the music industry and market structure. They compared the traditional market structure with an ICT-enabled market structure. However, I add to my analysis a future-predicted model. This additional model appears appropriate in an emerging area since the microfinance industry is further from maturity than the music industry.

For the traditional and ICT-enabled structures, I utilize observations of the market in its past and current forms. For the future predictive model, I rely on an industry risk perceptions report (CSFI 2011). I make an assumption that players in the MFI industry will adapt to address these risks and that those adaptations will cause changes in intermediation structure.

2.4. Traditional Microfinance Market Structure

I discuss in this section what intermediation looked like in the microfinance industry prior to advancements in ICT. The traditional microfinance market structure in Figure 1 depicts a subset of the microfinance industry microstructure proposed in Kauffman and Riggins (2012). Relationships between market players are represented by arrows, which denote both the type of good transmitted (funds or information) and the direction of the relationship. For example, the double-sided "loan funds" arrow between MFIs and borrowers shows that loan funds travel from the MFI to borrowers and vice versa.

Figure 1 Traditional Microfinance Market Structure
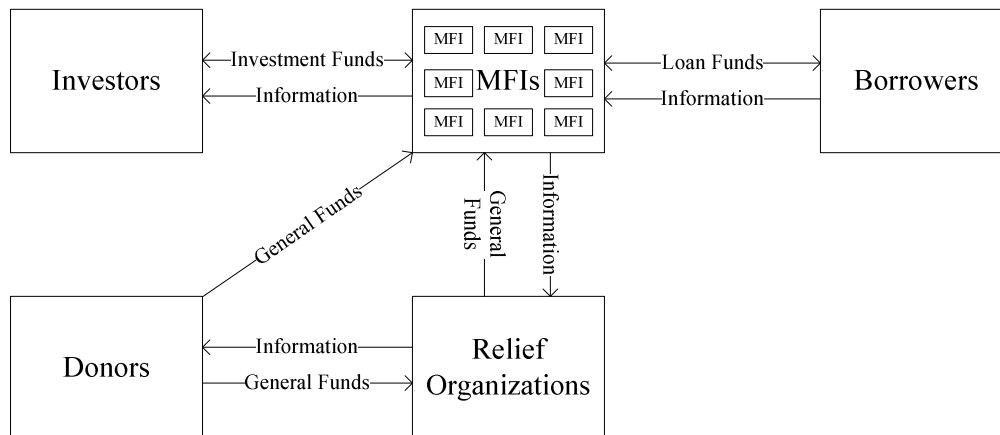
Table 1 notes which of Spulber's (1996) four intermediary roles are satisfied by each of the two traditional microfinance industry intermediaries. Not every market player is an intermediary. In the traditional structure, only two players function as intermediaries, MFIs and relief organizations. MFIs administer financial services to clients and relief organizations provide support, training, and funds to MFIs with donations received from donors. MFIs and relief organizations are intermediaries by definition since they fulfill one or more roles of intermediaries. Visually, these are the market players that have arrows going both into and out of them and reside between two market players. Donors, for example, do not qualify as an intermediary, since they do not fulfill any of the roles, and they do not reside between two market players with respect to funds or information.

Table 1 Traditional Microfinance Intermediary Roles

Intermediary	Price setting & market clearing	Liquidity & immediacy	Matching & searching	Guaranteeing & monitoring
Microfinance Institution	✓	✓	✓	✓
Relief Organization			✓	

2.4.1. Microfinance Institutions (MFIs)

Muhammad Yunus is considered the father of microfinance for his ground-breaking Grameen Bank founded in 1983 in Bangladesh. Yunus was awarded the Nobel Peace Prize in 2006 and more recently the Presidential Medal of Freedom in 2009 for his pioneering efforts in global poverty reduction. His business idea gives poor entrepreneurs an alternative to high-interest local moneylenders. The bank employs 23,000 staff at 2,500 branches and services 8 million borrowers. The Bank is self-sufficient and accepted no donations since 1998. It generated profits in all but 3 of its 30 years as an institution (Yunus 2007a). This model continues at Grameen and has since been adopted by NGOs in several other developing countries worldwide. On the other hand, the traditional microfinance model consists of an MFI business (NGO, bank, credit union, rural bank, or non-bank financial institution) acquiring capital stock from investors or donors. Traditionally, the MFIs were responsible for administration, enforcement, providing borrower support, and making loan funding decisions from their pools of loan applicants.

MFIs perform all four intermediary roles. For example, they set interest rates for loan products by gathering supply and demand information as well as comparing competitors' rates. They adjust these rates throughout the course of operating their business to clear the market. Since they provide liquidity and immediacy, they hold cash on hand ready to lend to potential borrowers. MFIs that receive donations from donors fulfill the matching and searching intermediary role by lending to individuals that align with the goals of the MFI. These goals were likely the reason that the donor chose to give to a particular MFI. Finally, MFIs monitor the repayment of loans to their borrowers and investments made by investors. They guarantee repayment to the best of their ability given market risks.

2.4.2. Relief Organizations

Many donations and investments to the microfinance industry prior to ICT occurred through relief organizations. Relief organizations were seen as intermediaries since many donors did not have knowledge of global MFIs or a means of transmitting funds directly to MFIs. Relief organizations like The Bill & Melinda Gates Foundation[4], CARE International[5], Oxfam[6], UNCDF[7], UNICEF[8], UNESCO[9], and UNIFEM[10] possess knowledge of and relationships with global MFIs. These relief organizations do not conduct microfinance transactions

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[4]www.gatesfoundation.org
[5]www.thecarefoundation.org
[6]www.oxfam.org
[7]www.uncdf.org
[8]www.unicef.org
[9]www.unesco.org
[10]www.unwomen-usnc.org

directly with borrowers, but instead support networks of MFIs worldwide by providing funding, training, and other resources. For example, the UK-based relief organization, Oxfam, recently partnered with an MFI, Micro Finance Fund,in Russia and provided them with funds for loans and training for young Russian entrepreneurs[11].

Relief organizations fulfill the matching and searching intermediary role by helping donors find MFIs that meet their criteria for donations and by helping MFIs locate donors to increase their capital stock. This practice results in a mutually beneficial relationship for both donors and MFIs, which are the market players that reside on either side of relief organizations.

2.4.3. Donors and Investors

Donors donate funds to MFIs so that MFIs will be able to alleviate poverty through their financial services or cover their operational expenses. Investors invest funds in MFIs with the expectation of earning a profit from a share of the MFI's interest revenue. Prior to ICTs, donors and investors relied on the MFIs themselves or relief organizations to determine the extent of an MFI's financial performance (of interest to investors and donors) and social performance (of interest to donors). Donors vary in their motivations for charitable giving. An extensive literature review of over 500 published articles on philanthropic motivation revealed eight different mechanisms that drive charitable giving (Bekkers and Wiepking 2010). These motivations consist of (1) awareness of

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[11]http://www.oxfam.org/en/development/russian-federation/supporting-young-entrepreneurs-microfinance-training

need, (2) solicitation and the method people are asked to give, (3) costs and benefits as they relate to the impact of giving, (4) altruism and a general interest in a cause, (5) reputation enhancement, (6) psychological benefits related to a "warm glow," (7) the desire to see one's values realized, and (8) efficacy and the view that one's contributions truly matter.

2.4.4. Borrowers

The final market participants in the traditional market structure are the borrowers. Although I use the term "borrowers," this group could also be the end-users of other financial products such as savings accounts or insurance. In the traditional market structure, borrowers have limited knowledge about the market and competition since they only interface with MFIs. They accept loan disbursements and make loan payments to MFIs and in some instances receive training or other services provided to them by MFIs.

2.5. ICT-Enabled Microfinance Market Structure

The microfinance industry has experienced a steady adoption of ICT since its inception in 1983, albeit at a rate lower than other industries (see Chapter 3). These ICTs have created new opportunities for some market players while diminishing the need for others. I discuss these changes in the subsections that follow. Figure 2 reveals the microfinance market structure in the presence of ICT. I use individual rectangles within the MFI intermediary box to depict the individual MFIs that make up this intermediary in order to compare it with the future predicted structure. Since banking correspondents and mobile service providers share the same roles as intermediaries for funds and information

between borrowers and MFIs, I depict those as a single split intermediary in my

diagram. A legend for the ICT-enabled changes is shown below the figure.

Figure 2 ICT-Enabled Microfinance Market Structure
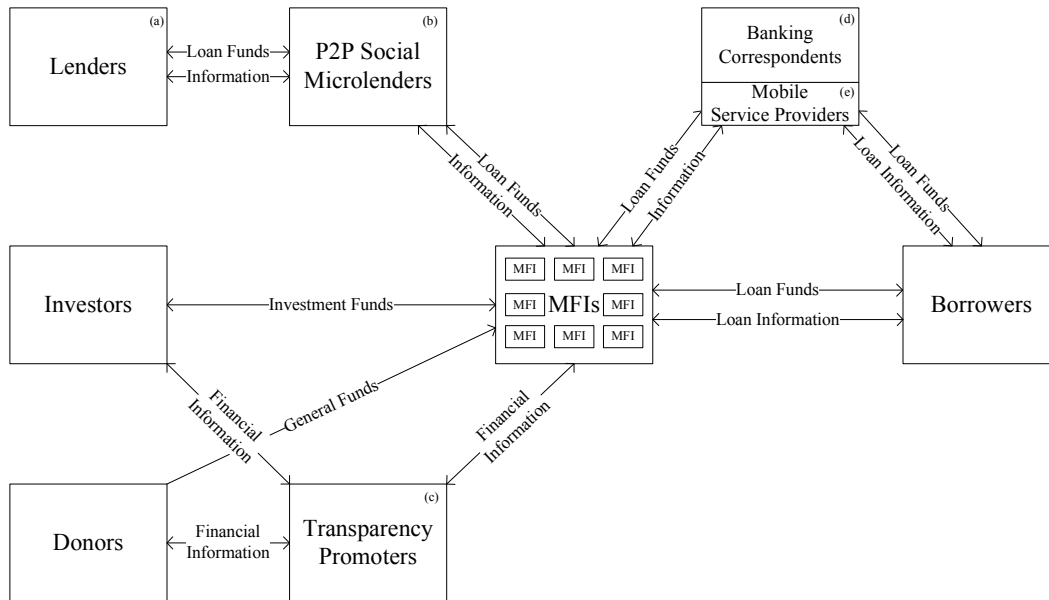
(a) Lenders (New Market Player Entrant)
(b) P2P Social Microlenders (New Intermediary Entrant)
(c) Transparency Promoters (New Intermediary Entrant)
(d) Banking Correspondents (New Intermediary Entrant)
(e) Mobile Service Providers (New Intermediary Entrant)

This market structure lists new intermediaries and each plays a different role.

Table 2 notes which of Spulber's (1996) four intermediary roles are satisfied by

each new entrant.

Table 2 ICT-Enabled Intermediary Roles

Intermediary	Price setting & market clearing	Liquidity & immediacy	Matching & searching	Guaranteeing & monitoring
P2P Social Microlender	✓	✓	✓	✓
Transparency Promoter			✓	✓
Banking Correspondent		✓		✓
Mobile Service Provider		✓		✓
Microfinance Institution	✓	✓	✓	✓

2.5.1. Lenders

The entry of P2P social microlenders discussed in the following section creates a new group of individual lenders. It also shifts the role of some market players from being donors to being lenders. The difference is that donors give to a cause or an organization that will in turn make loans to a poor population. Loan decision rights remain with the MFI. P2P social microlenders allow individuals to play a direct role as lender to individual loans (or portions of individual loans). Lenders make capital funding decisions and accept the risks (and in some cases the benefits) of default and interest earnings. Investors, on the other hand, invest money and expect interest or a financial return in the future.

2.5.2. P2P Social Microlenders

In 2005, Matt Flannery and Jessica Jackley suggested a new P2P approach to social microlending. Their idea evolved into Kiva[12], an organization that connects Western lenders with entrepreneurial borrowers in developing countries. Kiva posts loan-funding requests from MFIs on their website for lenders to browse.

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[12]http://www.kiva.org

Lenders can invest any amount in $25 increments up to the remaining amount of the loan to be funded. Once the loan is fully funded, Kiva transfers the funds to the MFI who in turn loans the funds to borrowers. The MFI administers the loan and enforces loan repayment. As the loan is repaid, principal funds are transferred back to Kiva and eventually back to the lender. The MFI retains the interest earned on the loan. This P2P approach to microfinance poses a significant change the market structure. New market players, namely lenders, are created. Prior to technologies like the Internet and electronic funds transfer (EFT), the notion of a single loan administered to an entrepreneur in a developing country funded by dozens of western borrowers would have only been possible with a significant paper trail and administrative effort. Without ICTs, transaction costs would be too high to sustain this business model. Investors and donors make general funds available to MFIs, but the MFIs retain loan funding decision-making rights.

There are several other, albeit smaller, organizations with business models similar to Kiva, including GlobalGiving[13], Wokai[14], MicroPlace[15], Zidisha[16] and MyC4[17]. I refer to these players as P2P social microlenders because they are an intermediary for loan funds and thus a microlender, even though they lack a direct relationship with end-user borrowers. ICT enables these new market intermediaries because the model would be extremely difficult without user-facing interfaces to MFIs and lenders built on Internet platforms. Postal mail

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[13]http://www.globalgiving.org
[14]http://en.wokai.org
[15]http://microplace.org
[16]http://www.zidisha.org
[17]http://www.myc4.com

would be too risky and slow to process all the loan funding transactions and repayments while coordination with checks would be difficult to implement and costly. Kiva uses PayPal, an industry standard for transmitting money over the Internet.

Similar to MFIs, P2P social microlenders fulfill all four of Spulber's (1996) intermediary roles. Primarily, they provide liquidity and immediacy to MFIs by providing capital stock for funding. They also provide matching and searching services to lenders interested in making a loan to individuals that meet their criteria for lending. One particular Kiva lender prefers group loans with less than 12 months of repayment made by MFIs that offer training and insurance[18]. Web platforms like Kiva make it easy for lenders to filter search results to find lenders that meet specific criteria such as this. Finally, P2P social microlenders monitor MFIs by ranking them according to financial and social performance.

2.5.3. Transparency Promoters

Technologies also enable a new way for investors and donors to make investment decisions. Microfinance industry transparency promoters like MixMarket[19] and MFTransparency[20] offer a means of consolidating financial and loan portfolio information on MFIs, funders, service providers, and networks. Investors and donors can use this information to decide which organizations will receive their investments and donations. Microfinance industry transparency promoters accept

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[18]http://www.kivafriends.org/index.php/topic,5331.msg79110.html#msg79110
[19]http://www.themix.org
[20]http://www.mftransparency.org

donations, but only to advance their cause of transparency promotion, not to fund MFIs.

Donors and investors can make funding transactions independent of the industry transparency promoters and thus transact directly with MFIs. Thus, the need for relief organizations diminishes with ICT, and they are shown as disintermediated in my ICT-enabled market structure. I also witness this change in the industry by observing many relief organizations that have established their own MFIs instead of continuing to fund others. Relief organizations founded three of the largest MFIs in Cambodia: World Vision established VisionFund in Cambodia and Indonesia, World Relief established Kredit Microfinance, and Save the Children established Hattha Kaksekar Limited (HKL). Today, relief organizations are being forced to shift into a new intermediary role or risk disintermediation, which is due to ICT enabling donors to have communication channels and information directly with MFIs.

ICT enables transparency promoters to exist with platforms like the Internet in order to provide information to interested parties. Database-driven MIS systems and the use of e-mail allow MFIs to generate applicable reports and share them with the transparency promoter.

Transparency promoters fulfill matching and searching intermediary roles in the microfinance market while helping investors and donors locate MFIs that meet their criteria by allowing users to filter lists of MFIs. Similar to a P2P social microlender, they monitor MFIs by ranking MFIs transparency with a diamond rating and by making social performance reports publicly available for download.

2.5.4. Banking Correspondents

Banking correspondents are commercial entities like post offices, general stores, or Internet cafes that partner with a microfinance institution to administer loans to and collect payments from borrowers (Kauffman and Riggins 2012). Banking correspondents allow MFIs to expand their geographic outreach to remote villages without having to open branches. Since borrowers have less distance to travel to conduct banking transactions, banking correspondents benefit MFI customers. The banking correspondent already has an established place of business. Banking correspondents can supplement their primary source of revenue by receiving a fee from each transaction they process. As long as the banking correspondent is connected to a central MFI via phone or the Internet, MFIs require infrequent visits to banking correspondents to collect aggregated payments. The fees that MFIs pay to banking correspondents are lower than the costs of establishing a local branch with a facility, infrastructure, and staff. Safety is also improved since currency travels a lesser distance by both borrowers and MFIs.

Brazil has been an exemplary country for its adoption of correspondent banking. Brazil had 38,000 recognized banking correspondents in 2004 and over 90,000 in 2005 (Kumar 2006). Caixa Economica, an MFI in Brazil, works with a banking correspondent location that handles over 8,000 transactions per month. ICT enables the correspondent banking model since it allows MFIs to coordinate with their correspondents in real-time and at a low cost, providing that certain technologies are in place. These technologies might include point-of-sale (POS)

devices, pin pads, teller machines, computer terminals, and an Internet connection.

Banking correspondents fulfill the liquidity and immediacy intermediary role since they can obtain loan funds to borrowers more quickly and receive loan payments from borrowers faster than if the borrower transacted with the MFI directly at their branch or headquarter office location. They also fulfill the monitoring role by tracking loan payment transaction history.

2.5.5. Mobile Service Provider

Another type of technology being used by MFIs are mobile payments. Mobile payments enable borrowers to receive loan disbursements and make loan payments using their mobile devices. There were 5.9 billion mobile subscribers at the end of 2011, which equates to servicing 87 percent of the world's population[21,22]. Mobile service coverage areas have grown accordingly as have data speeds and 3g service areas. Mobile phones provide an affordable way for the poor to share some of the same connectivity benefits as the wealthy. Mobile phone users outnumber banked people in most developing countries (Porteous 2006). M-pesa is the name given to the mobile payment capability of Safaricom, an African mobile service provider[23]. Several African MFIs use M-pesa to disburse loan funds to borrowers and accept loan payments from borrowers.

This particular technology enables MFIs to lend to individuals that are too geographically distant to coordinate with profitably. It also saves borrowers the

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[21]http://www.itu.int/ITU-D/ict/facts/2011/material/ICTFactsFigures2011.pdf
[22] This statistic is not adjusted for individuals who possess multiple mobile phones, which is common in the developed world and in Asian countries.
[23]http://www.safaricom.co.ke/index.php?id=250

costs of travelling to an MFI branch to conduct a transaction or check a balance (Donner and Tellez 2008). Since MFIs do not provide mobile services or lease phone traffic on cell towers, they rely on mobile service providers to fill this gap. Most mobile service providers already have capabilities for fund transfer, so the *option cost* (Dos Santos 1991) of coordination with MFIs is minimal. Mobile service providers collect a transaction fee from the sender or receiver of payments. Vodaphone, Safaricom, and Zantel constitute some of the larger mobile service providers working with MFIs to process transactions. Adoption has been more rapid in East Asia, Africa, and the Philippines.

FrontlineSMS (formerly CreditSMS) has developed free and open source tracking software for use by MFIs. They claim that an MFI using their software can start conducting business with a small capital investment:

"The hardware necessary to run [FrontlineSMS] includes a laptop computer, one cell phone for every microloan officer and recipient, and one solar panel for each cell phone. With low-energy LINUX-based netbooks available for less than US$400.00, used cell phones available for US$10.00, and reliable solar panels available for as little as US$6.50, it is feasible for a small MFI to buy all the inputs necessary to become self-sufficient for approximately US$1,000.00."[24]

Mobile service providers fulfill two intermediary roles. First, they provide liquidity and immediacy to borrowers and MFIs by allowing transactions to occur immediately without lags due to travel and transaction processing times. Second, they monitor loan payments by providing a transaction history that is

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[24]http://arc.peacecorpsconnect.org/view/279

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automatically linked to a database without the need for manual entry required in traditional loan disbursements and payments.

2.6. Future Predicted ICT-Enabled Microfinance Market Structure

Microfinance has experienced incredible growth over the past decade. However, alongside the benefits of a growing industry to address the needs of the poor comes a multitude of risks. *Microfinance Banana Skins* reports that this high rate of growth is the cause of industry difficulties with respect to their clientele, management, back office, resource management, and mission (CSFI 2011).

Washington, DC-based CGAP (Consultative Group to Assist the Poor) partnered with London-based CSFI (Centre for the Study of Financial Innovation) and has administered the *Microfinance Banana Skins* survey annually since 2008. Survey respondents include practitioners, investors, regulators, and deposit-takers in the microfinance industry. The breakdown of respondents is shown in Figure 3.

Figure 3 Microfinance Banana Skins Respondents (source: CSFI 2011)
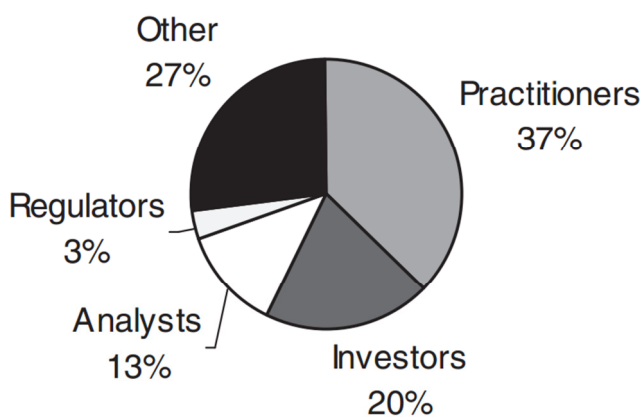
Questions asked in the survey aimed to rank the severity of the greatest perceived risks (banana peels/skins) threatening the microfinance industry in the next 2-3 years. Banana peels have often been portrayed in cartoons and comedy as

an item that will cause an individual to slip and fall, thus the analogy with a risk.

The annual report shares the top 24 banana skins and top 24 fastest rising banana

skins (rise in rank position as compared with two years prior) that are replicated in

Table 3. The 2011 survey had over 500 respondents from 86 countries. The

Banana Skins survey focuses on large MFIs with more than $5M in assets.

**Table 3 Perceived Risks to the Microfinance Industry – Banana Skins
        Report Summary 2011**

Biggest risks	Fastest Risers
1. Credit risk	1. Competition
2. Reputation	2. Credit risk
3. Competition	3. Reputation
4. Corporate governance	4. Political interference
5. Political interference	5. Mission drift
6. Inappropriate regulation	6. Strategy
7. Management quality	7. Staffing
8. Staffing	8. Unrealizable expectations
9. Mission drift	9. Profitability
10. Unrealizable expectations	10. Inappropriate regulation
11. Managing technology	11. Corporate governance
12. Profitability	12. Management quality
13. Back office	13. Ownership
14. Transparency	14. Liquidity
15. Strategy	15. Product development
16. Liquidity	16. Macro-economic trends
17. Macro-economic trends	17. Managing technology
18. Fraud	18. Interest rates
19. Product development	19. Fraud
20. Ownership	20. Transparency
21. Interest rates	21. Back office
22. Too much funding	22. Too much funding
23. Too little funding	23. Too little funding
24. Foreign exchange	24. Foreign exchange

Source: (CSFI 2011)

The research in this section uses the *Microfinance Banana Skins* report to

frame my discussion and inform my predictions for ICT-enabled intermediation in

the near future. I assume the players in the microfinance industry have a vested

interest in addressing their risks and changes to the intermediation structure is likely to be a part of risk mitigation. Many banana skins mentioned in the report can be mitigated with intermediation that is not enabled or enhanced by ICT. While these changes are of interest to the industry, the focus of this paper is on ICT-enabled intermediation and the discussion will be limited to those changes.

My process to make predictions of future market structure changes was as follows. In my reading of the report, I recognized areas for new intermediary entrants, shifts in the roles of intermediaries, and for disintermediation. ICT plays a role with respect to addressing these problems. The report states, "Poor management information systems lead to ill-informed decisions and contribute to another set of risks; poor accountability and transparency" (CSFI 2011, p. 34). The industry is responding with technological advances. A respondent in Tanzania stated that MFIs "are moving more and more into acquiring affordable advanced technologies and building internal capacities to handle back office operations" (CSFI 2011, p. 34). I discuss seven predictions in the subsections below and show how they lead to my predicted future market intermediation structure. I narrowed down the list of 24 banana skins to 13 based on the relevance and applicability they exhibited with my predicted intermediary changes. Table 4 summarizes my predictions and which banana skins inform my predictions. Checkmarks in each cell show where a risk informed a prediction. For example, a checkmark in the top-left cell reveals that the Credit Risk banana skin informs my prediction of new Credit Rating Organization entrants. The lack of a checkmark in the bottom-right cell reveals that the Fraud banana skin fails to

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inform my prediction that the MFIs will merge and conglomerate. The basis for these and other predictions are included in each of the following subsections.

Table 4 MFI Banana Skins and Intermediation Prediction Matrix

	Credit Rating Organizations	Transparency Promoter Role Shift	Operations Outsourcers	Remote MFI Management	Mobile Provider MFIs	Commercial Bank Entrants	MFI Conglomerates
Credit Risk	✓		✓				✓
Reputation	✓	✓			✓	✓	✓
Competition	✓	✓	✓	✓	✓	✓	✓
Inappropriate Regulation	✓				✓	✓	
Management Quality			✓	✓	✓	✓	✓
Staffing			✓	✓	✓	✓	✓
Mission Drift	✓	✓	✓	✓			
Managing Technology			✓		✓	✓	✓
Profitability (CR?)	✓		✓	✓	✓	✓	✓
Back Office			✓	✓	✓	✓	✓
Transparency	✓	✓					
Strategy	✓			✓			
Fraud	✓	✓					

A market structure diagram with my future predicted microfinance market structure is shown in Figure 4. In this model, several market players act as MFIs or provide services to MFIs that are not intermediaries to other players, so they are shown in the MFI box. I depict the shift from many, smaller MFIs to fewer, larger MFIs by the quantity and size of the MFI boxes. Finally, the breakdown of banking correspondents to mobile service providers is depicted by the size of the box dedicated to each intermediary. They both play similar roles, serving as intermediaries with funds and information between MFIs and borrowers. My predictions include a greater role for mobile service providers than banking correspondents; hence, less space is dedicated to the latter.

Figure 4 Future Predicted ICT-Enabled Microfinance Market Structure

Lenders ←Loan Funds→ ←Information→ P2P Social Microlenders

Banking Correspondents
Mobile Service Providers

MFIs
(c) OOO (d) RM (e) Mobile Service Provider
(g) MFI (g) MFI
(g) MFI
MFI   MFI
(f) Comm Bank

Investors ←Investment Funds→

Borrowers ←Loan Funds→ ←Loan Information→

Loan Funds / Information
Loan Funds / Loan Information
Loan Funds / Loan Information

Financial Information
Financial & Social Information
Borrower Information
Borrower Information

Donors ← Financial & Social Information → (b) Transparency Promoters ← MFI Portfolio Information → (a) Credit Rating Organizations

(a) Credit Rating Organizations (New Intermediary Entrant)
(b) Transparency Promoters Provide Social Performance Information (Intermediary Role Shift)
(c) Operations Outsourcing Organizations (New Market Player Entrant)
(d) Remote MFI Management (New Market Player Entrant)
(e) Mobile Service Providers Serving as MFIs (Intermediary Role Shift)
(f) Commercial Banks Serving as MFIs (New Intermediary Entrant)
(g) MFI Mergers, Acquisitions, and Conglomerates (Intermediary Structure Change)

The future predicted market structure describes three new intermediaries and each of these plays different intermediation roles. Table 5 notes which of Spulber's (1996) four intermediary roles are satisfied by each new entrant.

Table 5 Future Predicted ICT-Enabled Intermediary Roles

Intermediary	Price setting & market clearing	Liquidity & immediacy	Matching & searching	Guaranteeing & monitoring
Mobile Service Provider MFI	✓	✓	✓	✓
Commercial Bank MFI	✓	✓	✓	✓
Credit Rating Organization			✓	✓
P2P Social Microlender	✓	✓	✓	✓
Transparency Promoter			✓	✓
Banking Correspondent		✓		✓
Mobile Service Provider		✓		✓
Microfinance Institution	✓	✓	✓	✓

2.6.1. Credit Rating Organizations

Prediction: Countries will introduce new credit rating systems or extend current credit rating systems to microfinance end-users and providers.

   Risks. Credit risk is one specific type of risk informing this prediction. 75% of countries responding to the Banana Skins survey mentioned credit risk in their anecdotal responses (CSFI 2011). Credit risk was mentioned in respondent text responses more than any other risk. The risk is widespread and evident in all global regions. In the early years of microfinance, portfolio risk was largely due to macro level economic impacts. Developing economies are more prone to spikes and shocks than their developed counterparts. If the Honduran economy suffers a sharp downturn, citizens will delay purchasing new clothing for their families; therefore, a seamstress in Honduras is at risk for defaulting on her loan. Since developing economies are typically more agrarian than developed economies, weather patterns often lead to loan defaults for failed crops. Concerns over the macro economy and foreign exchange are low and declining (CSFI 2011), but due to increased competition, more borrowers that risk loan default due to overindebtedness. Multiple borrowing occurs when borrowers borrow from many lenders at once or acquire a loan from a second MFI to repay the loan from the first MFI. A managing director of a Columbian MFI reported that the number of MFIs servicing one customer increased from 1.5 to 4 in recent years and that 75% of their MFIs borrowers were also borrowing from other institutions. The risk is that MFIs across the globe are forced to write off these loans and suffer heavy

losses. Credit rating experiments in South America reveal that credit scoring can improve the accuracy of risk judgments while cutting costs (Schreiner 2000, 1999a, 1999b).

Many developing countries do not have formalized laws requiring citizens to repay personal loans. A respondent from Cote d'Ivoire said, "apart from calling in the bailiffs, there is no law that obliges borrowers to repay their loans" (CSFI 2011, p. 28). A banking regulator in Rwanda described their microborrowers as developing a "culture of non-repayment" (CSFI 2011, p. 22). Another survey respondent said the industry is experiencing "increase delinquencies, program deterioration, and damage to clients' well-being" (CSFI 2011, p. 21). A nationalized online credit rating system will assist an MFI determine if a client is at risk of over indebtedness. I expect to see this first adopted at the economy or country-level, but considering economies of scale and the ability for ICT to reduce the costs of coordination over a distance, this rating system could expand to the global-level.

Another risk informing this prediction is a declining reputation due to the issues previously mentioned. If outsiders know that lending decisions are vetted with a credit rating system, MFIs will experience greater confidence by outsiders and an improved reputation. Xavier Reille, a CGAP manager in France, declared, "Previously, microcredit was seen as a good thing and money lending as a bad thing. With the increased focus on short term profit in several markets, the lines are blurring and the reputation of the sector is tarnished. The onus is on MFIs to show that they are following responsible practices" (CSFI 2011, p. 23).

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Competition is yet another banana skin informing my prediction. In the early stages of microfinance, investors saw competition having a positive impact on the industry, viewing it as improving innovation and efficiency. Increased competition has several negative ramifications including (1) loan sharking behavior, (2) poaching of clients and staff, (3) deceptive advertising, (4) loan officers incentivized to acquire new clients regardless if the borrower needs the loan or not, (5) loans made for personal consumption instead of business growth, and (6) lending to customers that are urban and less poor. Loan officers often neglect to perform time-consuming background checks on clients for fear of losing commission.

Other risks leading to credit rating system adoption include inappropriate regulation, since regulators will know which MFIs to regulate more heavily depending on the credit scores of their loan portfolios. This will save the good MFIs from time and difficulties dealing with unnecessary regulation. Transparency promoters can make the average credit ratings for MFIs publicly available and reveal which MFIs are most guilty of multiple lending. The risk of fraud will encourage adoption of a credit rating system since it will be more difficult for credit officers to manufacture clients if the MFI runs credit checks on each borrower. Finally, strategy risks are mitigated since additional adequate knowledge about customers will assist MFIs in developing their strategy, especially if credit scores can be aggregated by village or region.

Credit rating organizations fulfill two of Spulber's (1996) intermediary roles. First, they provide matching and searching services to MFIs and help them

analyze the creditworthiness of potential borrowers without the need for personal visits and interviews. Second, monitoring of borrowers improves with credit rating organizations, since MFIs report on the repayment of loans at the end of the loan term. In past market structures, loan repayment monitoring was limited to the databases and knowledge of individual MFIs. With the advent and prediction of more credit rating organizations, this data can be stored and accessed in aggregate across several lending organizations.

Prediction explanation. Based on the risks facing the microfinance industry, I expect more countries to roll out credit rating systems of their own or extend current credit rating systems to microfinance customers and providers. This prediction is also held by Schreiner (2000, 2002).Lending institutions in developed countries benefit from databases that assess credit worthiness of individuals with a score or a grade. In the United States, the most commonly used score is the FICO score system which ranges from 850 (best) to 350 (worst) and takes into account payment history, credit utilization, length of credit history, types of credit used, and credit inquiries. An American bank's request for a credit report of a potential borrower is immediate, easy, and low cost. Microfinance institutions on the other hand have to administer their own research to determine the creditworthiness of the potential borrowers including assessments of collateral, interviewing neighbors, shopkeepers, educators, and even liquor establishments within the borrowers' communities. This process is time consuming, arduous, and more subjective than its process counterpart in developed countries.

Ecuador is the latest developing nation to implement a centralized risk database, Central de Riesgos del Ecuador. It is governed by the *superintendencia de bancos* (superintendent of banks) in the administrative unit of the Ecuadorian government. Access is granted to loan officers in the microfinance and commercial banking sectors, large business assessors, and property managers. The database already contains a majority of Ecuador's population and stores name, address, spouse, phone numbers, occupations, and national ID numbers, among other fields. Credit scores are on a letter grading system from A+ (best) down to E (worst).

2.6.2. Transparency Promoters Emphasizing Social Performance

Prediction: Transparency promoters will shift toward presenting more MFI social performance information.

Risks. Reputation risk informs this prediction because when information is presented publicly on an Internet platform, MFIs will be incentivized to protect their reputations. Similarly, dangers arise in competition because it can cause MFIs to take greater risks. Competition drives MFIs to explore untapped market segments, which is beneficial because it improves outreach. On the other hand, competition can be detrimental since little is known about these new market segments. Competition often "pushes MFIs to focus on parts of the market that are already well served and ignore those that are not, usually the neediest and those out in the country" (CSFI 2011, p. 24). A Columbian respondent stated, "MFIs concentrate on areas with good economic performance with aggressive credit offers" (CSFI 2011, p. 24).

Another risk informing this prediction is mission drift. MFIs may start out with intentions of social performance, but may drift toward serving individuals who are not among the neediest if enticed by financial incentives. In the presence of transparency promoters that provide more social performance data, disincentives arise for mission drift. Another form of mission drift is shifting lending from small businesses to general lending for consumption purposes which can harm the industry's reputation. Daniel Schriber, director of investment analysis at Symbiotics in Switzerland, suggested that microfinance lending for consumption is "a huge reputational risk for the whole industry" (CSFI 2011, p. 23).The industry suffers from bandwagon effects and promotes *funder-fashionable loans* such as housing loans, education loans, green loans, sustainable loans, or clean water loans, sometimes at the expense of their overarching social mission.

"More and more transparency is expected with the increasing attention of the international media" (CSFI 2011, p. 34). A respondent from the Netherlands declared that "the microfinance industry will increasingly have to prove the effect of its activities. More transparency will be needed towards MFI clients, investors, and the outside world (about the image of exploiting people)" (CSFI 2011, p. 35).Investors choose to invest in the microfinance industry for profit and their decisions may relegate social performance to the wayside.

Fraud risk can decrease with a role shift by transparency promoters. If transparency promoters employ a rigorous audit procedure for social performance, MFIs will be disincentivized for fraud and have more opportunities to be

uncovered. Finally, since the risks of liquidity and funding continue to decline for MFIs, social performance will be more financially feasible for MFIs and of more concern to donors and investors whose financial needs are already satisfied.

Prediction explanation. Based on this discussion, I predict that ICT-enabled transparency promoters will shift to presenting more social performance information on MFIs. Transparency promoters like MFTransparency and MixMarket present ample financial and loan portfolio data of MFIs which they make publicly available to interested parties. These well-established organizations present information on thousands of MFIs worldwide. They harness Internet technologies as their primary method of communication to interested parties and liaise with reporting MFIs via e-mail and internal reporting tools. The industry relies on these organizations because "regulators worry that inadequate disclosure could erode the confidence of investors and customers" (CSFI 2011, p. 11).In their current state, they present very little data on social performance. The collected fields are often optional, self-reported, and difficult to vet.

2.6.3. Operations Outsourcing Organizations

Prediction: MFIs will outsource office tasks and logistics previously accomplished in-house.

Risks. With increasing industry competition, interest rates decline and the economy is becoming more demand-driven. Borrowers benefit since lower interest rates result in increased consumer surplus, which they can use to educate their children, feed their families, and invest in other entrepreneurial ventures. For MFIs, however, competition challenges their ability to earn a profit with declining

interest rates. Competition also drives MFIs to poach informed staff from other MFIs since skilled labor is limited in developing countries where MFIs operate (CSFI 2011).

Staff members are often ill-equipped with education and knowledge to make informed decisions at their respective MFIs. Small shops are especially at risk for efficiency loss due to staff quality. Respondents mentioned staff capability frequently in their responses, referring to a lack of talent and competent manpower. Alex Pollock, director of microfinance at the United Nations Relief and Works Agency (UNRWA) said, "MFIs must recognize that at some point their operations will reach an optimal level, at which point they will need to concentrate more clearly on maintaining their edge through customer service and improvement in their business processes that they may have neglected because of openness in the market" (CSFI 2011, p. 36).

Internal operations technologies at MFIs are weak and the microfinance industry cannot afford technologies that enable efficient transaction processing. Larger organizations, conversely, have access to technologies and software that allow for efficient processing of large amounts of transactions. With respect to internal systems, an Indian respondent mentioned, "a significant ramp up is required"(CSFI 2011, p. 32). Staff lack IT skills; therefore, many respondents state that MFIs quickly outgrow their back office systems. Large organizations benefit from economies of scale in transactions processing that small organizations lack (Lacity and Hirschheim 1995). For example, the costs for a small business to increase their payroll processing from 10 paychecks to 20

paychecks are greater than the costs of a large organization to increase their

payroll processing from 30,000 paychecks to 30,010 paychecks. Payroll

processing at the large organization is more likely to be automated with lower

marginal costs of adding one additional staff member on payroll. Large MFIs

experience similar economies of scale benefits over their smaller counterparts.

Operations outsourcers pool MFIs' transaction processing tasks and allow small

MFIs to experience similar economies of scale benefits.

An increasing credit risk also informs this prediction. Since it is difficult to

enforce repayment, MFIs could employ collection agents to locate delinquent

borrowers with more efficiency than the MFI's own loan officers. MFI Back

office employees often lack appropriate skills. Respondents to the *Banana Skins*

survey cited stories of poorly managed MFIs losing track of their borrowers and

the repayment status of their loans.

With respect to mission drift, many MFIs find their core competencies not in

their operations but in their ability to communicate with borrowers and meet their

needs. MFIs that outsource their operations can focus their efforts and energies on

their mission and clients. Finally, respondents shared that MFIs can prevent fraud

by tightening internal controls, centralizing staff records, and installing stronger

systems.

Prediction explanation. I expect to see the industry respond to these risks by

outsourcing many of their operations tasks including background checks,

transaction processing, payment collection, and fund disbursement. Outsourcing

organizations could benefit from economies of scale, access to technologies that

would be prohibitively expensive to a small MFI, and staffed with experts in their respective area. Since few MFIs possess the financial resources to invest in these areas, operations outsourcing organizations will enter the industry to fill that gap. The efficiency gains from outsourcing would enable MFIs to succeed in an industry marked by growing competition. Although outsourcing typically conjures up images of wealthy Western organizations, like Dell Computer setting up call centers in a developing nation such as India, outsourcing is not uncommon among development organizations as well. The World Bank utilizes an accounting office in Chennai, India that handles all back-office processing for its worldwide operations.

Technologies like the Internet, Voice Over Internet Protocol (VOIP), Virtual Private Networks (VPNs), remote desktop, and mobile phones enable this outsourcing to take place since they all decrease transaction costs. As more MFIs computerize their operations and set up client/server environments, the location of the person entering data into their computer system is irrelevant. While most organizations in the developed world outsource operations for lower labor costs, microfinance institutions will outsource due to efficiency gains and staff productivity.

In cases where managing technology is the impetus for operations outsourcing, an alternative arises for MFIs to use software-as-a-service (SAAS) and business-process-as-a-service (BPAAS). SAAS is receiving increased attention among MFIs (Ashta 2011). With SAAS, no need develops for MFIs to make large capital investments in hardware and software since MIS software and

its respective databases are hosted online and accessed by MFI staff with Internet-enabled clients. This reduces an MFI's need for skilled IT staff since the hosting company handles maintenance, backups, security, and upgrades.

2.6.4. Remote MFI Management

Prediction: MFIs and their branches will be managed remotely.

Risks. The main risk informing this prediction is management quality. Managers in developing countries are typically under-educated. A US-based microfinance analyst stated: "Finding the right people to promote the growth and sustainability of an MFI is very difficult. From consultants to managers, MFIs have a very small source to choose from" (CSFI 2011, p. 30). A survey respondent from Egypt concurs: "badly managed MFIs will feel more challenged, and mergers might be more and more common in the market" (CSFI 2011, p. 35). Risks of mission drift and strategy loss become mitigated with remote MFI management. A successful strategy "will depend on quality management, which is not abundantly available" according to an MFI director in East Africa (CSFI 2011, p. 35). Managers spread their vision to employees at remote locations in a rich form and at lower costs. ICT also mitigates *agency costs* (Jensen and Meckling 1976) dealing with MFI management. An agent at a branch will not act in the best interest of the principal at headquarters, but since technologies allow the manager to manage remotely, these costs subside.

Prediction explanation. Similar to challenges with staff at MFIs that process day-to-day transactions, challenges arise with inadequate MFI management. Julie Abrams, a consultant with Microfinance Analytics, said: "MFIs will have to be

impeccably run, laser-focused and strategically sound to thrive. There will be no room for sloth or sloppiness in operations, governance, risk management, and customer focus; being proactive in all of these will be key" (CSFI 2011, p. 35).

Based on these risks, I predict that MFIs will utilize technologies that allow for remote management of organizations or branches. Remote management allows manager involvement in many organizations, or many branches of a single organization without physical presence at each branch. A skilled manager affects change with a broader scope than an under-educated manager at one MFI. Cost savings also take place with this arrangement. Many of the same technologies listed in the previous subsection that enable operations outsourcing also enable remote management. Increased bandwidth worldwide allows for richer (Daft and Lengel 1984, Daft et al. 1987) media communications between a manager and his or her staff at an MFI or a branch location.

2.6.5. Mobile Service Provider MFIs

Prediction: Mobile service providers will enter the microfinance industry as MFIs, providing loans directly to borrowers.

Risks. The first risk that informs this prediction is the risk of managing technology. Small MFIs cannot manage technology as well as mobile service providers. Mobile service providers work primarily in technology and the technological cost of offering loans is minimal compared to the costs of an MFI entering the mobile services market. Mobile service providers already maintain established management information systems from their current operations. A US-based microfinance consultant disclosed that MFIs "won't position

themselves aggressively enough to take advantage of branchless banking services and will be overtaken by mobile network operators and large banks who figure out how to get into rural areas and go down-scale" (CSFI 2011, p. 33). Furthermore, a US-based policy advisor said that mobile banking "has only been proven at scale in very few [MFIs]. The institutional capacity of the financial institution and the mobile phone provider and the quality of the partnership will be critical to more success stories" (CSFI 2011, p. 33).

MFIs in many countries complain that they are more heavily regulated than commercial banks. Depending on local laws, mobile service providers may be treated as MFIs and face the same difficulties as their traditional counterparts. If mobile service providers remain unregulated as a provider of financial services, they could take advantage of their position over both commercial banks and traditional MFIs.

Staff members employed at mobile service providers possess more experience with technology. As larger organizations, they hire more skilled staff. With the declining reputation of MFIs, mobile service providers could lead customers away from MFIs for financial purposes. Additionally, mobile phone providers possess greater brand awareness than MFIs. The marketing of the phone services will leak over to increase awareness of their mobile payment and microfinance services.

Prediction explanation. Based on the risks discussed above, mobile service providers will realize that they can provide loans directly to subscribers in their pre-established and extensive networks, bypassing MFIs altogether to earn higher revenues. MFIs rely heavily upon on mobile phone service providers to process

loan payments and disbursements. Ashta (2011) considers mobile phones the single most important delivery channel for the poor. The services of mobile providers prove invaluable to MFIs since they reduce the time, communication, and transportation costs associated with servicing borrowers that are geographically distant or hard to reach. The mobile service providers benefit from this arrangement by earning revenue from a percentage of the funds transferred or by charging a fixed amount per transaction. The MFI, however, still retains all of the profits for themselves.

2.6.6. Commercial Bank MFIs

Prediction: Commercial banks will enter the microfinance industry as MFIs.

Risks. MFIs experience aggressive competitive pressure from commercial banks. A Russian respondent stated that commercial banks are "aggressively moving 'down' to increase margins, bringing with them retail experience, instruments, and financial resources which microfinance organizations cannot compete with" (CSFI 2011, p. 12). Public banks are able to borrow from the public to raise funds unlike NGO or privately held MFIs.

With respect to management quality, staffing, back office, and technology, commercial banks are better equipped than their MFI counterparts (Tucker and Miles 2004, Tchakoute-Tchuigoua 2010). Since the microfinance industry is more transparent with transparency promoting infomediaries, commercial banks will find ease in learning about their competitors positioning themselves to maximize profits. Finally, the laws in many countries regulate MFIs more heavily than commercial banks. Commercial banks can provide financial services to the same

clientele as MFIs without adhering to the same set of rules that traditional MFIs are required to follow.

Prediction explanation. Based on the risks facing the microfinance industry, MFIs will not only experience competition from mobile service providers, but also from commercial banks. Commercial banks now realize the profit potential in microlending. They are shifting to the right in the long tail of banking[25]. The *Banana Skins* report referred to an "entry of well-heeled commercial banks armed with mass marketing skills and new banking technology" (CSFI 2011, p. 7).

2.6.7. MFI Conglomerates and Mergers

Prediction: MFIs will merge and form larger conglomerates.

Risks. MFIs face challenges of competition and their shortcomings in staffing, management, technology, and back office. If several MFIs in a geographic region conglomerate, they will have a stronger infrastructure to efficiently deal with a large number of transactions. Larger MFIs benefit from more robust MIS, which was considered the single most important technology for scaling (Ashta 2011). As profitability risk and credit risk decrease, larger MFIs will be less likely to lend to the same individual than multiple, smaller MFIs.

Prediction explanation. "Badly managed MFIs will feel more challenged and mergers might be more and more common in the market" (CSFI 2011, p. 34). I predict fewer, larger MFIs in the microfinance industry. This results from mergers and acquisitions among MFIs and conglomeration of several MFIs. I depict this in my future predicted microfinance market structure as fewer, larger boxes inside

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[25] See section 3.2

the MFI intermediary container. "The [microfinance] industry is coming to the end of a period of rapid and easy growth, and will have to restructure to survive [by] consolidating smaller MFIs and specializing larger ones" (CSFI 2011, p. 36). ICT drives consolidation since ICT reduces coordination costs. Knowledge managements systems on centralized servers incorporate the knowledge of many MFIs and benefit from economies of scale.

Larger organizations possess greater ICT capabilities (Evangelista et al. 2005). Also, research shows that in other industries, organizations with higher ICT capabilities outperform those with lower ICT capabilities (Bharadwaj 2000). Assuming the microfinance industry responds to technology similarly, potential productivity gains from technology that can be realized through larger firms will serve as another impetus for MFIs to merge and form conglomerates.

2.6.8. Other Microfinance Industry Intermediation Predictions

I considered other intermediation predictions for inclusion into this discussion. While I do not delve into these further, I still find them important enough to mention. Other predictions include: (1) disintermediation of funders since funders are more of a requirement for startups, and MFIs find themselves attaining financial sustainability in a short period of time, (2) new intermediary entrants of deposit insurance organizations in developing countries like the Federal Deposit Insurance Corporation (FDIC) in America since the report states that credit risks could lead to massive withdrawals of deposits at MFIs, (3) new intermediary entrants of collection agents because many countries in the developed world do not enforce laws for loan repayment, and (4) new intermediary entrants of

standards-setting organizations (SSOs) for reporting to transparency promoters since currently much ambiguity exists across countries on how to report social performance.

2.7. Implications

The following subsections highlight the implications of my prediction to various players in the microfinance industry. Recommendations are supplied to market participants based on the anticipated market changes discussed earlier.

2.7.1. Implications for MFIs

With the entry of credit rating organizations, MFIs will need to make some changes to remain viable. Their loan officer staff will have more time to perform other tasks considering how credit score inquiries take less time than the traditional screening process. This leads to fewer loans officers and smaller firms (Brynjolfsson et al.1994) with attrition, or loan officers' time shifted to other tasks. MFIs will need to employ staff trained on the credit rating system, invest in a membership if applicable, and have the correct technologies in place to be able to access the information presented by the credit rating organization. This allows MFIs to identify clients guilty of multiple borrowing and therefore may choose to adjust their loan portfolio accordingly.

With an increased emphasis of social performance by transparency promoters, MFIs' standards hold to a higher level. This shifts their business practices to align with what the industry finds acceptable or become less transparent.

MFIs need to streamline their business practices and operations, possibly by outsourcing operations and management. This lowers costs and maintains

competitiveness in increasingly crowded markets. They may still be successful in remote areas with little competition, but conducting business with clients in urban centers will be difficult in a demand-driven market given many microfinance institutions' poor efficiencies. Adoption technology through capital investment or through SAAS enables an MFI to streamline their operations and cut down on time-intensive paperwork tasks.

MFIs need to emphasize core competencies that mobile service providers and commercial banks lack: relationships with villages, ability to communicate with the poor and understand their needs, flexibility, delivery channels and branches, and designing unique credit products. In this case, even if they do not offer the lowest interest rates, they will offer more customer value.

Finally, MFIs need to assess when to conglomerate. Given my predictions, two MFIs working together may generate a greater profit and/or social impact than two separate entities. Along with financial motivation, members of conglomerates need to share similar social performance goals or else risk mission drift.

2.7.2. Implications for Transparency Promoters

Transparency promoters should work with credit rating organizations to supplement their analysis of MFIs' loan portfolio riskiness with information on the credit rating system.

As more mobile service providers and commercial banks enter the industry as providers of microfinance services, transparency promoters should pursue providing social and financial performance information. They could frame a

convincing argument to join by emphasizing the corporate social responsibility gains that a for-profit institution like a mobile service provider or commercial bank would communicate to its investors and customers.

Transparency promoters should institute policies for how to address MFI conglomerates and mergers. When reporting historical figures, how does the information of the previously independent MFIs aggregate? Do the profiles of the merging MFIs remain intact? This is important given all the mergers I predict, and because MFIs care about their outward appearance to investors and donors visiting websites of transparency promoters.

With an increased emphasis on social performance transparency, transparency promoters extend their clientele to service end-users of microfinance services. This is a recommendation for a few more years in the future when Internet use penetration is higher among individuals in poverty. If in ten years there are as many of the world's poor with an Internet-enabled smartphone as there are with simple mobile phones today, transparency promoters could make known the services, products, and social performance of MFIs in the region of the mobile subscriber. Transparency promoters may offer this information in more languages than currently available and format their websites for accessibility and compatibility with low-bandwidth smartphone users. This will have the effect of making the market even more demand-driven.

2.7.3. Implications for Donors and Investors

Donors will have an increased ability to assess which institution should receive their donations due to entrants of credit rating organizations and transparency

promoters emphasizing social performance. This information can be made available to donors quickly and cheaply and therefore decrease a donor's search costs. Given the prediction of MFI mergers and conglomerates, there will be fewer, larger institutions in the basket of possible donation recipients. Fewer options for donors interested in smaller MFI operations will be available.

Investors interested solely in financial gain may oppose the predicted industry changes with respect to social promotion emphasis by transparency promoters if it causes MFIs to sacrifice financial gains for social gains.

2.7.4. Implications for Logistics Providers and Operations Outsourcers

Based on my prediction that competition will drive MFIs to seek out efficiency gains, logistics providers and operations outsourcers should advertise their services to microfinance institutions. Their marketing campaigns should focus on the cost and time savings that can be realized by MFIs who elect to outsource their operations.

2.7.5. Implications for Banking Correspondents

Banking correspondents will likely see their role diminish since mobile payments are even more cost effective than a banking correspondent. A banking correspondent is only more valuable to an illiterate borrower who does not own a mobile phone or does not have mobile service in his or her village. With 5.9 billion mobile subscriptions worldwide, fewer borrowers will value the services of banking correspondents over mobile payment options.

2.7.6. Implications for Mobile Service Providers and Commercial Banks

If mobile service providers enter the market as providers of microfinance services, they will require the same knowledge and skills unique to their MFI competitors. Where MFIs are strong (the core competencies listed in the implications for MFIs, most of which are related to effectiveness), mobile service providers are weak. However where MFIs are weak (staffing, management, economies of scale, and technological capabilities, most of which are related to efficiency), mobile service providers are strong. Mobile service providers may also determine that borrowers are unconcerned with effectiveness attributes of a lender provided the interest rates remain low. Therefore, they may elect to focus solely on acting as a price leader in the market.

If commercial banks enter the market as providers of microfinance services, they must address the same issues as mobile service providers, since many currently lack the skills and knowledge necessary to meet the needs of poor customers. Historically, commercial banks solely served wealthier clientele.

2.7.7. Implications for Borrowers

The predictions I make on the microfinance industry can also be leveraged by borrowers. First, they must discontinue the practice of multiple-borrowing. Since credit rating organizations make this information known to MFIs, this puts a borrower's credit-worthiness at risk. Second, they should invest in a mobile phone if they have not already. This allows for the expansion of MFI options, provided that the MFIs enable mobile coordination and transactions. They might also seek information on what other services can be provided via mobile phones and when

transparency promoters start offering information to borrowers. Borrowers should adopt a smart phone when the value of the services offered to them as a microfinance end-user exceeds the costs of the phone and its data connectivity.

2.7.8. Implications for Researchers

It is my hope that other researchers and academics understand the value and interest in the microfinance industry as a unique research context. I am attempting to add to a new stream of literature. The future predicted market structure provides a basis for suggesting new studies and determining if my predictions hold. Researchers can study countries like Ecuador where credit rating organizations are rolled out to MFIs and determine how they impact transparency, outreach, interest rates, and loan portfolios at participating MFIs. Additionally, researchers can evaluate the historical breakdown of banking correspondents and mobile service provider use among MFIs to conclude if there is a shift occurring and if so, what are the implications for MFIs and borrowers. Researchers can also determine how to best coordinate the information and data stored by transparency promoters and credit rating organizations to see if a mutually beneficial relationship can exist between the two. Another interesting study might explore the impact of social performance information on the investments and giving by investors and donors, respectively. Finally, researchers can determine if MFIs are utilizing efficiency and effectiveness gains from operations outsourcing organizations, remote management, and conglomeration to compete with commercial banks and mobile service providers.

2.8. Conclusions

The research presented in this paper addresses questions related to the pre-ICT microfinance industry, the involvement of ICT, and how intermediation will change in the future given current risks. I use observation to determine that intermediation in the microfinance industry was quite rudimentary prior to ICT. With the advent of ICT, many new intermediaries and players are entering the market: lenders, P2P social microlenders, transparency promoters, banking correspondents, and mobile service providers. The flow of information and funds given ICT also changes. A perceived risk report (CSFI 2011) informs several predictions about the impact of ICT on the microfinance industry future. These predictions include (1) new entrants of credit rating organizations, operations outsourcing organizations, and commercial banks (2) role shifts of transparency promoters and mobile service providers, and (3) other predictions including MFI conglomeration and remote MFI management. In each of these three market structures, I graphically depict the changes along the value chain from donors, lenders, and investors through to the end-user or borrower. These predictions offer a basis for making recommendations and implications for market players affected by the future market changes. It is my hope that market players will find these recommendations valuable and that they will drive them towards turning microfinance into an exemplar industry for efficiency and effectiveness at creating value for the world's poor.

As ICT changes the market structure, I observe more complexity in the market. ICT-enabled intermediation is certainly adding more intermediaries and

players than disintermediating existing players. In the microfinance industry, ICT changes are not shifting the intermediary roles that each player fulfills. The intermediary roles that MFIs fulfilled in the 1970s are the same roles that they are fulfilling in present day and that I expect them to fulfill in the future. The same is true for P2P social microlenders and transparency promoters. While the future adds more complexity and market structure participants, the intermediation roles of these players will remain constant.

A limitation of the predictions in this research is that I base them on a report of *perceived*, not *actual* risks to the microfinance industry. I may discover, for example, that multiple lending by poor borrowers does not lead to the perceived credit risk cited by many survey respondents. Since the growth of the industry has been so rapid, there is little empirical evidence of the long-term impacts of multiple lending on either poverty alleviation or MFI default rates and financial performance. Another limitation is that I base my predictions on a risk analysis and make the assumption that risk will drive market structure change, but the other elements may impact intermediation change as well, such as profit potential, legal changes, or even a technological change that is yet undiscovered.

Chapter 3. Breadth and Depth: The Impact of ICT on Outreach Capabilities of Microfinance Institutions

"The shift toward social performance is occurring in response to some of the larger negative press stories of the last few years. Unquestioning support for microfinance is fading and industry players are under increasing pressure to adjust incentives toward [a] social mission first and foremost."

-JD Bergeron, Director of Social Performance at Kiva.org, January 20, 2012.

3.1. Introduction

Prior to the early 1980s, the world's poor were disadvantaged with an inability to receive basic financial services of savings, loans, and insurance. In response to this disparity, Muhammad Yunus (2007a) founded the Grameen Bank[26] in 1983 to provide basic financial services to a population of rural female Bangladeshis. Grameen Bank employs an unconventional approach to banking in the areas of loan approval, ownership, branch locations, regulation of loans, and loan interest (see Table 6). Since then, many developing countries have witnessed new entrants of *microfinance institutions* (MFIs) aimed at providing financial services to the world's poor. Goals of MFIs may range from profit maximization to social poverty-reduction (Yunus 2007b). Despite, or perhaps because of, Grameen Bank's unconventional approach to banking, it has profited in all but one of their years in business.

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[26] Literally means "bank of the villages" in the Bengali language.

Table 6 Grameen Bank vs. Conventional Banks

	Conventional Banks	Grameen Bank
Loan approval	Based on what has already been acquired by a person	Based on the potential of a person
Ownership	Owned by rich men	Owned by poor women
Gender of borrowers	More loans to men	97% of borrowers are women
Branch location	Urban centers and business districts	Rural areas
Banking location	Customers go to the bank	Bank goes to the door-step of the customers
Regulation	Legal punishment for defaulted loans	No legal instrument between lender and borrower
Interest	Loan interest has no cap	Loan interest capped at the amount of the loan

Today, the microfinance industry is comprised of thousands of organizations like Grameen Bank called *microfinance institutions* (MFIs). The microfinance industry was a $640M industry in 2004 and will grow to $20B by 2015 (Dieckmann 2008). One of the "promises" of microfinance initiatives is self-sustainability (Morduch 1999). This aspect makes microfinance a unique approach from most other charitable attempts at poverty reduction. MFI operational sustainability and financial sustainability is the extent to which an MFI can utilize its revenues earned from lending operations to cover their operational expenses and all expenses, respectively. This definition of sustainability may differ among other institution types, such as relief organizations, who define sustainability as the extent to which their efforts enable individuals or villages to operate independent of charitable donations. Unfortunately, the sustainability initiative led many MFIs to favor financial performance goals over social performance goals and neglect clientele with the

greatest need. Now the pendulum is swinging back toward social performance with "tools, methodologies, and assessment frameworks" (Bedecarrats et al. 2009, p.22) introduced to the industry in recent years (Copestake, 2007). The *2011 Microfinance Banana Skins* report stated, "microfinance has come of age, and with that, new issues have arisen. In an increasing number of markets, the rapid rate of growth and outreach means that microfinance is confronting the same forces of competition, credit cycles, and consolidation seen in other sectors" (CSFI 2011, p. 2).

Lately, negative press stories that have led players about aggressive financial practices by MFIs have led players in the microfinance industry to give increasing credence to social performance. This change is evident at Kiva, one of the most recognizable brand names in the microfinance industry. They have adopted a system of social performance badges that field partner MFIs can earn by completing a due diligence process and demonstrating compliance to certain criteria. Badges include: anti-poverty focus, vulnerable group focus, client voice, family and community empowerment, entrepreneurial support, facilitation of services, and innovation[27]. Outside of Kiva, individual MFIs highlight their social performance on their websites and promotional materials. A French organization, Comité d'Echanges de Réflexion et d'Information sur les Systèmes d'Epargne-crédit (CERISE), was founded to increase accountability among MFIs and rank them on twelve outcome measures using a refined survey instrument[28].

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[27]http://www.kiva.org/about/socialperformance
[28]http://www.cerise-microfinance.org/-impact-and-social-perfomance-

MixMarket[29], the largest transparency promoting infomediary in the microfinance industry, started a program in 2009 that awards MFIs with silver, gold, and platinum badges for high levels of social performance disclosure. Previously, MixMarket only awarded MFIs with one to five diamonds based on financial disclosure.

While the primary motivation for this research comes from the need for outreach as mentioned above, this need is also validated by the New Structural Economics (NSE) theory (Lin 2012). NSE suggests that in order for developing economies to upgrade their endowment, they must strategically develop industries that maximize comparative advantages at any given moment in time. This approach is unique since it takes into account the special characteristics of each economy instead of classifying them all into a homogeneous category. NSE is a strong explanatory theory because it explains development miracles in East Asia and stagflation of the 1970s that previous Keynesian theory was unable to explain. Since the world's unbanked are also poor and rural, NSE suggests that structural changes and technological innovations that enable reaching this population may be the key to maximizing comparative advantage. ICT enables MFIs to reach the local level where comparative advantages are the greatest. This occurred in the late 1990s with the World Bank when it decentralized many of its operations and placed more staff in the field where need was the greatest (McFarlan and Delacey 2003). The percentage of World Bank country directors in the field increased from 0% in 1996 to 66% in 2002. In the same time period, the

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[29]http://www.themix.org

percentage of regional staff in the field increased from 38% to 50%. Despite their geographic distance from headquarter operations, field staff remained connected to colleagues in urban centers via videoconferences, satellites, e-mail, and centralized knowledge management databases. The World Bank decentralized their operations since opportunities for growth thrive among the poorest and rural borrowers.

There is evidence of a trickle-up effect when working with the poorest members of an economy, often found in the most rural regions of a country. Sam Daley-Harris, Director of the Microcredit Summit Campaign shared the following story:

"*[sic]* Several years ago two friends of mine were speaking with a group of 40 clients at a micro-bank in South Asia. Through the translator, they asked the 40 women what impact the bank had had on the husbands of the non-borrowers; not their husbands, but the husbands of women who are not with the bank. The clients said, 'Before we took our loans, our husbands were day-[laborers], working for others whenever they could find work. When we took our loans our husbands stopped being day-laborers and worked with us bicycle rickshaw, husking rice, growing garlic on leased land. This caused a shortage of day-laborers in this area, so the husbands of the non-borrowers who were day-laborers their wages went up.'"[30]

Lin (2012) and his NSE theory argue further that aggregating country-level data to produce models overlooks many important details. For example, a

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[30]http://www.unfpa.org/gender/micro.htm

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measure of Internet users per 1,000 population in a developed country will not reflect the whole country. It will overestimate the Internet penetration in a country like Libya since the majority of the Internet users in Libya live in the wealthiest section of Tripoli. To effectively evaluate the impacts of ICT, one needs to examine the ground-level and consider individual cases. My research acts on this advice by addressing the impact of ICT on social performance of individual MFIs around the world.

Social performance can be costly since the poorest customers require smaller loans that are more expensive to administer per dollar lent, and the most geographically distant customers require MFIs to incur time and costs associated with travel to and from branch offices. One would think that there is a tradeoff between social performance and financial performance, which many refer to as the "microfinance schism" (Morduch 2000). Research suggests this is not the case. While MFIs with outreach strategies do have greater operational costs, other benefits such as staff productivity and portfolio diversification outweigh these costs. Bedecarrats et al. (2009) state that the reason for this is that MFIs with broader outreach strategies have greater client participation and work in markets with lower levels of competition. They also generate a greater social impact. The poorest individuals in the world, who lack access to clean water, are at the greatest risk for AIDS among other diseases, are at the greatest risk for violence, and are stuck in a generational cycle since they lack access to education (Sachs 2005). MFIs greatly impact these global problems by focusing their efforts on these individuals.

Many industries adopt information and communication technologies (ICTs) for their various benefits, and the microfinance industry is no different. ICTs reduce coordination and transaction costs without increasing risk (Malone et al. 1987). This partly explains the rapid adoption of technology in the past 20 years in industries worldwide. During the period of 2004-09, the ICT penetration in developing countries increased 3 to 4 times (WTI 2011). The microfinance industry, however, lacks IT skills and has been slow to adopt ICT. "Poor management information systems lead to ill-informed decisions and contribute to another set of risks: poor accountability and transparency" (CSFI2011, p. 34). In 2004, 40 percent of MFIs used manual ledgers to manage their portfolios and track loan payments; as a result, these MFIs took on average 4.9 days to discover a missed loan payment (Ivatury 2004). A follow-up study in 2008 revealed negligible improvements over the following four-year period (CGAP 2009a). These systems are slow, inefficient, labor intensive, prone to human error, and lack redundant backup, while ICT "underpins an MFI's ability to track loan repayments, sustain growth and product reliable reporting and data analysis" (Ivatury 2004 p. 25). A microfinance analyst respondent in the *2011 Microfinance Banana Skins* survey of industry risks acknowledged the matter simply, "Invest in technology or cease to exist in five years" (CSFI 2011,p. 32). If MFIs neglect technology adoption, they "will be overtaken by mobile network operators and large banks who figure out how to get into rural areas and go down-scale" (p. 33).

Research reveals that ICT offers several benefits. While much of that research is not specific to the microfinance industry, I might expect to notice the following

benefits realized through ICT use in the microfinance industry: (1) an increased

ability for transparency due to electronic reporting and communication of

financial and loan portfolio information (Granados et al. 2010), (2) more channels

for communication between lenders and borrowers (Boyd and Ellison 2008,

Wasserman and Faust 1994), (3) cost savings due to decreased coordination and

transaction costs (Malone et al. 1987), (4) cost savings due to automation

(Morrison 1997), and (5) an increased ability to serve clients that are poor,

geographically distant, and/or socially marginalized (Mathison 2005). The focus

of this study is on the last item in this list which I refer to as MFI outreach – the

ability and focus of an MFI on providing financial services to clients who are

poor, geographically distant, and/or socially marginalized (Schreiner 2002).

Individuals who fall into these categories have a greater difficulty receiving

loans, even from microfinance institutions, due to the higher cost of administering

services to these clients (Bottomley 1963, DeYoung et al. 2008). I refer to these

clients as residing in the *long tail of banking* – the rank ordering of a given

population on their access to banking services. MFIs with a greater outreach have

clientele further to the right of the long tail of banking.

Through my research, I aim to understand the nuances of how ICT adoption

impacts MFI operations and outreach. We employ case studies to explore this

impact. I use grounded theory building, semiotics, and content analysis

methodologies to develop a detailed research model depicting the relationships

between primary conceptual categories in the context of ICT adoption and use in

the microfinance industry. A qualitative approach allows me to ask *how* and *why*

research questions. The answers to these research questions (RQs) should explain present circumstances and trace operational links over time among MFIs (Yin 2008):

- (RQ1) How does ICT adoption impact MFI operations? Which ICTs impact which MFI operations?

- (RQ2) How does ICT adoption impact MFI outreach? Which ICTs impact MFI poverty outreach? Which ICTs impact MFI geographic outreach?

- (RQ3) How do changes in MFI operations brought about by ICT adoption impact MFI outreach? Which changes impact MFI poverty outreach? Which changes impact MFI geographic outreach?

The remainder of the paper is organized as follows: Section 2 discusses the theoretical background for this study and uses these theories as a basis for my propositions. Section 3 describes my research methodology, discusses why case study is the appropriate methodology to answer my research questions, and presents my research design. Section 4 explains my research materials and how I obtained them. Section 5 describes my analysis, findings, and tests for robustness. Section 6 contains three highlighted anecdotes from my research materials. Section 7 proposes an empirical study to test hypotheses in the same context using another method. Finally, section 8 concludes the paper and lists some of the study's limitations.

3.2. Theoretical Background and Propositions

Theoretical development occurs in a different manner with a case study

methodology than traditional empirical approaches. Theories in quantitative

studies generalize to make inferences on a population in a process called

statistical generalization, while qualitative studies use existing theories as

templates to explain reality. Case study researchers generalize findings to broader

theories in a process called *analytic generalization* (Yin 2008). This research

draws on elements of electronic markets, transactions cost theory, distance theory,

and long tail theory in an analysis of ICT in the microfinance industry.

    Transaction Cost Theory. Williamson (1981) reports that the costs of a good

or service is more than just the base cost. Transaction cost theory views the cost

of a good as the all-in costs of economic exchange. The all-inclusive costs of an

economic transaction include search costs, time costs, shipping costs, transaction

costs, and coordination costs. Related to transaction cost theory is the electronic

markets hypothesis, which suggests that ICT decreases search and coordination

costs without increasing transaction risk (Malone et al. 1987). In other words,

benefits are available to market participants who strategically employ various

technologies (Hess and Kemerer 1994). In the context of the microfinance

industry, the benefits of ICTs are realized in cost savings from transactions. Table

7 suggests further costs associated with economic exchanges and how ICT

reduces them.

Table 7 The Effect of ICT on Transaction Costs

Type	Effect of ICT
Search Cost	ICT-supported intermediation between buyers and sellers creates an e-marketplace that lowers buyer costs to acquire information about seller prices and produce offerings. This reduces buyer search cost inefficiency (Bakos 1997).
Management and Control Cost	Monitoring employees and trading partners ensure transactions can be performed electronically by the principal rather than the agent, reducing cost (Gurbaxani and Whang 1991).
Shipping Cost	ICT reduces coordination cost, which reduces shipping cost (Gurbaxani and Whang 1991). This reflects ICT-led cost reductions throughout the flow of goods in a supply chain.
Time Cost	ICT supports faster communication at lower cost; the marginal cost of communicating over a greater distance is essentially zero (Cairncross 2001). Technologies allow voice communication, document sharing, and messaging between parties to occur instantaneously.

MFIs' businesses are heavily transaction-based, with a large number of small loans. Poor and geographically distant clients have relatively larger transaction costs than wealthy, geographically close clients (Bedecarrats et al. 2009). Administering loans to distant customers requires increased travel and time costs to disburse the loan and enforce repayment. Each loan also has fixed costs such as labor for clerks entering information into their systems, screening borrowers, and processing disbursements and repayments. Variable loan costs change with the size of the loan. These costs cover default risk, which is greater for larger loans, and any bank costs of processing larger transactions (Armendariz de Aghion and Morduch 2007, Waterfield 2008). If the fixed cost and variable costs of administering a $100,000 loan are, for example, $100 and 2% respectively, then the total cost is $2,100, or 2.1% of the total loan amount. The financial institution

administering this loan must charge an interest rate greater than 2.1% in order to earn a profit on this particular loan. Conversely, the total cost of administering a small loan of $500 would be $110, or 22% of the total loan amount. In this case, the financial institution charges an interest rate greater than a massive 22% to begin earning a profit. This example explains why microloans require higher interest rates for MFIs to maintain financial sustainability. A reduction in transaction costs increases an MFI's ability to serve poor and distant clients without as sizable of a sacrifice of increased costs.

Distance Theory. People consider "distance" between two places in *physical distance* or *geographic distance* terms. For geographic distance, I consider either the physical distance a lender has to travel to visit a borrower or the amount of time it takes to travel between them. These measures of distance have implications in the economic marketplace. In the context of international trade flows, researchers concluded that for every 1% increase in physical distance between two countries, trade flows decrease by 1.1% (Frankel and Rose 2002). Other research suggested that the amount of trade that takes place between countries 5,000 miles apart is only 20% of the amount that would be predicted to take place if the same countries were 1,000 miles apart (Ghemawat 2001).

Transaction costs increase with distance. Monitoring costs (Sussman and Zeira 1995) and information asymmetries (Hauswald and Marquez 2003) increase in a direct relationship with the geographic distance separating lender and borrower. Frances Cairncross (2001) dedicates a book on a phenomenon that is shaping the present information-centric world. She calls her theory the 'death of

distance.' Distance was previously an impediment to communication and trade. With advances in information and communication technologies, the concept of geographic distance and proximity becomes less of a barrier. The trans-Atlantic telegraph cable was one of such technologies making the concept of geographic distance irrelevant. After the cable was laid, it did not matter how many thousands of miles New York and London were separated since the communication could occur instantaneously (Chiles 1987, Garbade and Silber 1978). The cost of transmitting information over the cable one additional mile was effectively zero.

In the microfinance industry, the poorest clientele reside far from urban centers. It costs more for MFIs to service distant borrowers for the reasons stated above. MFIs deal with these increased costs by charging higher interest rates or by decreasing the costs associated with serving distant clients. An analysis of the microfinance industry in Niger reveals that distant borrowers experience higher interest rates, more restrictive loan conditions, more intensive screening and greater delays to obtain a loan than geographically close borrowers (Pedrosa and Do 2008). The electronics market hypothesis and transaction cost theory discussed earlier theorize how ICTs mitigate these increased costs without the MFI having to resort to higher interest rates.

Long Tail Theory was traditionally used to describe retail product offerings. The most common use of the long tail has been to describe consumer products, with mainstream high-volume goods in the wide section of the curve and low-volume niche products in the narrow part of the curve (Anderson 2004, 2006). Internet retailers like Amazon.com create a market for niche products,

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recognizing that digital goods have zero to low inventory costs. Amazon has

opportunities to earn revenue by selling small quantities of a large number of

goods in the skinny part of the tail in addition to selling large quantities of a small

number of goods in the wide part of the tail.

When applying this concept to the idea of microfinance, the interpretation

changes, but the shape of the curve remains the same. In banking, the wide part of

the curve represents the world's population served by traditional banks while the

thin part of the curve represents the population of the world that receives few

financial services. The *law of diminishing marginal returns* states that each

additional unit of input (say, labor or machinery) yields a smaller increase in

output than the previous unit of input, ceteris paribus (Samuelson and Nordhaus

2001). In the case of loan products, it means that the percentage return on a loan

diminishes with each additional dollar lent to the same borrower. Therefore,

assuming that the loan administration costs and transaction costs are minimal, and

default rates are uniform across all loans, there is greater profit potential in

microlending small amounts to many borrowers than in traditional lending of

large amounts to fewer borrowers.

Although charging higher microloan interest rates appears to be an unfair

practice, as explained earlier, microloans require higher interest rates because

MFIs need to recover their higher administration costs. While a $100K loan at

40% APR interest is far from attractive, a $1K loan at 40% APR interest is more

appropriate and is not uncommon. Also, it conforms to the law of diminishing

marginal returns; we can expect that the $1K loan will yield a higher percentage return than the $100K loan.

To represent the long tail of banking, I plot the rank ordering of the world's population against their access to financial services (Stutzman 2007, Serrano-Cinca and Gutierrez-Nieto 2012, Hersman 2007). The result is a concave down curve with a decreasing slope, as shown in Figure 5. Three areas of the curve classify individuals.

Figure 5 The Long Tail of Banking
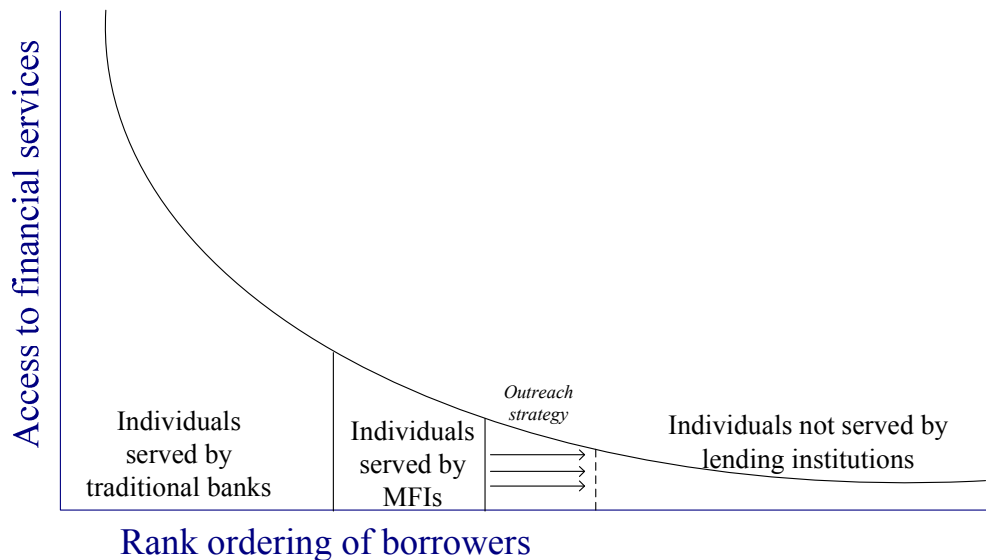
The leftmost area of the curve represents *individuals served by traditional banks* for loans. These loans have the lowest administration and transaction costs per dollar lent. The interest that the banks receive from these lenders is sufficient to cover their administration and coordination expenses. A traditional Pareto distribution suggests that 80% of all banking services in the world serve 20% of the global population.

The middle area of the curve depicts the *individuals served by microfinance institutions*. These individuals apply for loans that, according to traditional thinking, would not be profitable enough for lending institutions to cover their administration and coordination expenses. This is due to the perceived high risk of the loans. Since the borrowers are low-income and because the loans are generally small, traditional banks would have to charge high interest rates to recover their fixed expenses, which would end up being a large percentage of the loan principal (Waterfield 2008). These loans are high risk and low principal, so the aid-driven microfinance industry often relies on donations and other external funding to compensate for the loss.

Finally, the rightmost section of the curve represents *individuals not served by any lending institutions*, either traditional or microfinance. The world's poor fit into this category. According to the 2008 World Bank Development Indicators, half of the world's population, over 3 billion people, live on less than USD$2.50 per day (Povcalnet 2011). Yet these 3 billion people consume only 2.4% of the world's resources. The poor population almost completely overlaps with the unbanked population; 2.7 billion unbanked adults live in the world (CGAP 2009b). Loans to this population have the greatest administration and transaction costs per dollar lent. The high cost of lending to these individuals is due to administrative efforts, low principal amounts, or geographical remoteness; so, even MFIs find difficulty in lending to them. In addition to the higher costs, other deterrents such as perceived risks, portfolio quality, etc., exist in the minds of outside investors. When I previously introduced the concept of MFI outreach, I

referred to the extent to which MFIs lend to these individuals in the far right part of the tail.

MFIs exist to bring financial services to those far to the right in the long tail. In the digital music business, retailers realize profit potential in selling goods in the long tail. The same holds true for microfinance. In theory, a lender can earn more money lending small amounts to many entrepreneurs than lending large amounts to few entrepreneurs. MFIs can take advantage of this profit potential by increasing their poverty and geographic outreach, thus bringing banking services to more of the world's poor and extending to the right the vertical line separating those serviced by MFIs and those without access to financial services.

Long tail theory informs my study and theory. ICTs possess the potential to increase access to financial services, especially to the population in the right part of the curve. Because ICTs reduce administration and transaction costs, the gap between costs per dollar lent in the wide part of the tail and the thin part of the tail is narrowing. Moreover, the law of diminishing marginal returns discourages lending to the already-served population and encourages lending to new borrowers in the long tail of banking. The risk perception of lending to the underserved population is also diminishing because of increased familiarity of doing business with this population, availability of transparent data regarding repayment rates, better monitoring of loans due to ICTs, and enhanced analysis of potential borrowers. These interrelated phenomena shift the dividing line between customers served by MFIs and those that are not to the right (see Figure 5). More people bank with MFIs who, in turn, earn a profit. Industry evidence for increased

competition exists in markets currently served by MFIs. A managing director of a Columbian MFI reported that the number of MFIs available to service one customer increased from 1.5 to 4 in recent years and that 75% of their MFIs borrowers were also borrowing from other institutions (CSFI 2011). Considering the perspective of the vendor, or MFI, lower risk is associated with lending to individuals in the long tail of banking. From my discussion of transaction cost theory and the electronic markets hypothesis, ICT permits lower search costs thus assisting MFIs in locating the 'next unbanked person' as they move to the right in the long tail. Borrowers who were not considered possible clients to traditional banks can now be considered and even yield profit potential for the lender.

ICT-enabled MFI Outreach Theory. Each of the above theories seems to directly govern various components of the microfinance industry in the context of ICT's progress. ICTs decrease transaction and coordination costs (electronic markets and transaction cost theories), which are the inhibitors of MFI operations performance. Also, smaller loans can be repaid at higher interest rates due to higher return potential (long-tail theory and the law of diminishing marginal returns). Furthermore, ICTs show the potential to mainly reduce the time and cost of communicating with distant and underserved populations (distance theory). Research using a case study methodology permits me to pose *process theories* that explain how, following a set process, events or occurrences result in input states leading to outcome states (Van de Ven 2007).

Informed by these theories, I summarize a new *ICT-enabled MFI outreach theory*: ICT adoption among MFIs will result in direct improvements to MFI

operations (P1) and a greater capacity for poverty and geographic outreach (P2). MFI operations serve as a mediator between ICT adoption and outreach impact (P3). Case study methodologies employ propositions, not testable hypotheses with operationalized variables. The goals of these *conditional propositions* (Van de Ven 2007)are to direct attention to the elements of the study (Yin 2008), in this case ICT adoption, MFI operations, and MFI outreach. This logic suggests the research model and propositions in Figure 6.

Figure 6 Research Model and Propositions
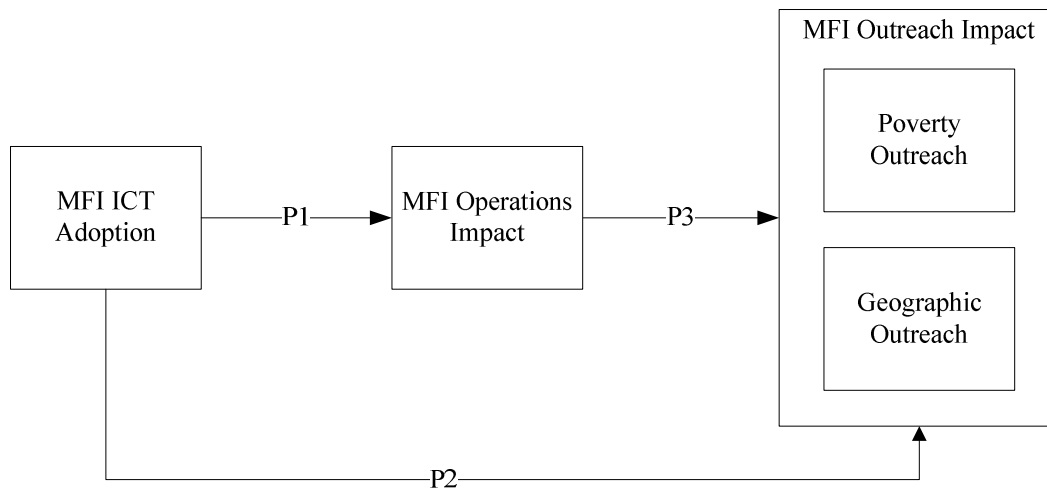
Using this model, testing two rival theories is possible. One is a *mediated effect* theory, which suggests that MFI operations mediate all effects of ICT adoption on outreach. If analysis of my research materials determines that ICT adoption has no direct effect on outreach since all of the effect is mediated through MFI operations, I can then confirm the mediated effect theory. The mediated model is my first choice for testing, since there are a number of studies stating the impact of ICTs on firm operations (e.g. Barnes et al. 2002, Shiels et al. 2003, Sigala 2005). ICTs are making fundamental changes to the way that MFIs

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operate and this, in turn, affects outreach. ICT by itself may not directly impact

performance (McAfee 2009), especially in developing countries (Dewan and

Kraemer 2000). Instead, ICTs affect change in business processes and the way

that staff members perform their tasks. Since no previous studies can confirm or

deny direct impacts of ICTs on social performance and outreach, this research

explores this possibility. The competing theory is a *direct effect* theory,

suggesting that ICT adoption directly impacts MFI outreach independent of any

mediating factors. If my findings reveal that MFIs are able to impact their

outreach by adopting ICTs independent of changes to their operations, then I can

conclude with evidence for a direct effect theory. The implications of these rival

theories to MFIs are paramount to the practical application of this research. The

results of this study will enlighten MFIs if a reason exists to initiate and expect

operational changes in conjunction with ICT adoption if they intend to expand

their outreach.

3.3. Research Methodology and Research Design

3.3.1. Case Study Research Methodology

In the context of MFIs and their adoption of ICTs, many decisions made in

the midst of increasing reliance and dependence on technology. These decisions

relate to which ICTs should be adopted, when these ICTs should be adopted, what

impact will these ICTs have on operations and productivity, the cost savings of

ICTs, and which staff should use the ICTs. ICT adoption and technological

change does not simply occur over the course of time, but it is the result of a set

of decisions that lead to change. These factors direct me to opt for a case study

research methodology since its purpose is to illuminate sets of decisions, specifically why certain decisions were taken, how they were implemented, and their final result (Schramm 1971).

MFIs' decisions whether or not to adopt specific ICTs contain too many variables for a quantitative empirical research approach. Fortunately, case studies "cope with the technically distinctive situation in which there will be many more variables of interest than data points" (Yin 2008, xvii). Also, using multiple sources of data and multiple cases, results can converge into findings with a triangulation process, making my analysis and findings more robust (Yin 2008).

The case study methodology is part of the family of qualitative analysis. Yin (2008) states that this methodology is preferred when (1) *how* and *why* research questions are explored, (2) the researcher exhibits little control over events, and (3) the research focuses on a contemporary phenomenon in a real-life context. My research aligns with these qualifiers because (1) my research questions are posed as *how* and *why* questions, (2) my time in the field collecting interview responses and observing staff members had little to no impact on the events of interest - adoption of ICTs, performance of operations, or outreach capabilities of the MFIs I visited, and (3) members of the microfinance industry are technology adoption laggards; many real-life MFIs are in the midst of a technology adoption phenomenon.

The case study methodology permits me to use the multiple sources of evidence I collected in the field. My research materials include interview responses, e-mails, and personal observations. Cases studies analyze real-life

situations involving actual decisions and their ramifications (Yin 2008).

Experiments, on the other hand, rely on artificially simulated scenarios devoid of

real-life implications and do not capture the complexity inherent in real life.

When analyzed, the observation of these complexities via case studies (1) *explain*

causal links, (2) *describe* context and intervention, (3) descriptively *illustrate*

topics within an evaluation, and (4) *enlighten* outcome intervention in different

situations. For these reasons, the case study methodology can yield richer analysis

and conclusions than rival methods. The methodology is not without its

challenges and is "among the hardest types of research to do because of the

absence of routine procedures" (Yin 2008, p. 54). I explore these further in the

limitations section of this paper.

3.3.2. Research Design

The three main constructs in my research model are ICT adoption, MFI

operations, and outreach. My research materials converge on these constructs and

allow me to show in detail the relationships between them. Each of these

constructs has multiple dimensions as prior research suggests. For example, ICT

adoption can be hardware and software related; it may result from a change in

internal processes, and/or it may be a consequence of a country-level

infrastructure policy. Initially, I planned to apply Kroenke's (2012) elements of an

information system to categorize ICT adoption changes, but not be restricted by it,

as I expect new, meaningful categories to emerge from my field observations.

Similarly, I expect the impact that ICT adoption may have on MFI operations to

fall into common discernible categories such as those related to security,

transaction processing, data quality, communication, and loan application evaluation. Finally, I measured the impact on outreach in terms of poverty and geographic outreach, as stated in my research questions.

My research design is intended to answer in detail how these specific ICT adoption changes impact particular MFI operations. ICTs can either impact outreach directly or through MFI operations as a mediator. I will map relationships between ICT adoption categories, MFI operations impacted, and MFI outreach categories by analyzing the quantity of ICT changes that impact specific outreach categories. After I compile my research materials, I expect these relationships to reveal themselves as patterns.

My research design employs a multiple case study approach. Single case studies are necessary in the context of a unique, rare, or critical scenario, such as an academic institution prototyping an innovative classroom technology (Yin 2008). Multiple case study approaches result in studies that are more robust (Herriott and Firestone 1983). Research materials for this study come from 14 different MFIs across 8 countries. While MFIs around the world exhibit many differences with respect to operations, technological capabilities, and clientele among others, the context of this study are MFIs around the world and not a specific subset of MFIs. I *pool* the findings from research materials and observe common patterns in order to test my theory through a clear set of propositions. The logic underlying the multiple case studies in my research design is termed as *literal replication*; it is advised against treating case studies as a *sample of cases*

or to treat a single case study as a *respondent in a survey* (Yin 2008). I detail the choice of the cases and collection of my research materials in the next section.

3.4.   Research Material Collection

Items used for analysis in qualitative studies are considered *research materials* (Myers 1997), not *data* implying rows and columns of words, numbers, and figures. My research materials are from *multiple primary sources* (interviews, fieldwork, direct observation, written data sources, and e-mail messages). The *unit of analysis* for this study is the MFI. For interview and e-mail responses, the *data collection source* is a staff member at an MFI or a Kiva Fellow assigned to an MFI. For fieldwork and direct observations, the data collection source is the organization itself. The unit of analysis is synonymous with *case* in case study research (Yin 2008). According to the grid in Figure 7, the optimal case study method to determine how and why an MFI works occurs by collecting data from multiple individuals about the organization. My research falls mainly into the bottom left quadrant of Yin's (2008) framework.

Figure 7 Data Sources, Units of Analysis, and Study Conclusions (Source: Yin 2008)

Data Collection Source

	From an individual	From an organization	
About an individual	Individual behavior Individual attitudes Individual perceptions	Individual employee records Interview with individual's supervisor; other employees	If case is an individual
About an organization	How organization works Why organization works	Personnel policies Organization outcomes	If case is an organization

Design (left axis) — **Study Conclusions** (right axis)

My research materials were collected from three types of sources. Between August 2011 and November 2011, I volunteered as a Kiva Fellow at Kredit Microfinance and VisionFund Cambodia, two MFIs headquartered in Phnom Penh, Cambodia. "Since 2007, the Kiva Fellows Program offered over 400 individuals a rare opportunity to put their skills to work in support of global microfinance. Applicants chosen for the program serve as Kiva's eyes and ears on the ground, working directly with microfinance institution (MFI) field partners in over 60 countries around the globe."[31] As a Kiva Fellow, I followed a work plan working alongside MFI staff, visiting borrowers in the field, and liaising between Kiva and their network of field partners. This opportunity permitted me to conduct extended face-to-face, in-depth interviews with staff at not just these two, but also other MFIs in Cambodia. The second set of research materials addresses

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[31] www.kiva.org/fellows

the limited country-centric nature of my interviews. I employed the services of other Kiva Fellow colleagues stationed at MFIs in other parts of the world - South America, Central America, Eastern Europe, Asia, and Africa. I communicated with them extensively and gathered e-mail responses regarding ICT usage and MFI operations/outreach with respect to the MFIs where they were stationed. The third set of research materials consist of fieldwork and direct observations while closely working with, and performing tasks for, a subset of the interviewed MFIs in Cambodia.

3.4.1. Research Material #1: In-Depth Interviews

I personally conducted in-depth interviews with eleven staff members at six MFIs in Cambodia. The shortest interview I conducted lasted one hour and the longest spanned many conversations over the period of several days. The strengths of the interviews lie in the fact that they focus directly on the topic of a case study, and they provide unique insights on causal relationships and explanations (Yin 2008). In an ideal environment, a researcher will choose which cases "most likely illuminate your research questions" (Yin 2008, p. 19). I were not afforded the luxury of case study choice since my Kiva Fellowship was limited to Cambodia.

During *in-depth interviews*, the researcher collects facts in addition to the interviewees' opinions. Case study methodologists contrast this with *focused interviews*, which are characterized by questions with little deviation from the original list of questions for the purposes of fact corroboration. On the other hand, *structured formal surveys* collect quantitative survey data from participants in conjunction with other qualitative research materials (Yin 2008). The interviews

for this study consisted of many follow-up questions where the researcher explored the opinions and ideas of the interviewees such as, "What is a technology that you would like to see implemented to make you more productive, save you time, or make your job easier?"

I approached these interviews with a prepared list of 13 multi-part questions created prior to arrival in Cambodia. This list of prepared questions is available in Appendix A. The actual interviews often deviated from my prepared list of questions upon discussing an interesting anecdote, company history, or staff member opinions. Interviews in case study research are recommended to be "guided conversations rather than structured queries. In other words, although [the researcher] will be pursuing a consistent line of inquiry, [the researcher's] actual stream of questions in a case study interview is likely to be fluid rather than rigid" (Rubin & Rubin 1995). Not only are the direct responses an important part of the research materials, but also are the researcher's inferences about how events transpired. Convergent evidence from multiple interviews, physical evidence, and common sense formulate the basis for these inferences (Yin 2008).

During the interviews, I collected notes on interviewee responses. I did not record the audio of my conducted interviews, which is recommended by some case study methodologists for reasons including completeness, improved recollection, an ability to use quotes in publication, and because it frees the researcher from the distraction of typing notes during conversation. Other case study researchers do not recommend recording interviews for drawbacks such as making the interviewee more nervous, making the researcher less of an active

listener, difficulty in locating passages, and a high time and financial cost of transcription (Belanger 1999). The decision to use recording devices depends on several factors including the content of the interviews and company policy. Despite the arguments for and against the use of recording devices, it is a choice of personal preference (Yin 2008).

One memorable interview resulted through a social connection at an event in Phnom Penh. A fellow expatriate aid worker mentioned that his local Khmer-speaking church manages Our Farmers Fund in which church members and foreigners are owner-investors for microlending to poor church members and rural villagers. I requested the contact information of the fund manager and met him for an afternoon discussion. The fund manager is the only employee at Our Farmers Fund and manages a $15,000 loan portfolio. When I ascertained that he tracks the entire operation in a series of Excel spreadsheets, I asked for more information on his system's capabilities. I was pleased to learn that he carried his laptop and subsequently volunteered to show me his spreadsheets. I observed how he added a new investor and loan to the system, and recorded a repayment. Each of these processes was a labor intensive task. I struck a good friendship, and he even volunteered to take me on the back of his motorbike to my next appointment in Phnom Penh. Following my discussion, we e-mailed back and forth on the topics of open source microfinance loan management software, profiles on MixMarket, and setting up web profiles to make Our Farmers Fund more attractive to outside funding.

3.4.2. Research Material #2: Kiva Fellow E-mail Responses

Eight Kiva Fellows located in countries outside of Southeast Asia participated in collecting information from their respective MFIs on my behalf and communicated the information to me via extensive e-mails. These Kiva Fellows were embedded in their respective societies on similar assignments with similar responsibilities. They worked as closely as I did with their MFI staff, borrowers, and computer systems. Each had two to eight months of field experience before I gathered their input. To structure their approach, each was asked a simplified version of the open-ended question set I used in Cambodia. They were encouraged to describe any examples they might have observed with respect to ICT impacting poverty and geographic outreach. The examples they shared were from their respective geographic regions and assigned microfinance institutions.

Responses from Kiva Fellows in seven different countries ranged from 171 to 518 words with a mean of 326.25 words and a standard deviation of 99.04 words. The strengths of documentation research materials like e-mails include stability since they are unobtrusive, exact, and can be reviewed indefinitely (Yin 2008). The ICT penetration of the countries represented varies heavily. On the low end is Sierra Leone with 0.002 Internet users per capita (ranking order #206 out of 210 countries)[32]. Turkey ranked the highest with 0.180 Internet users per capita (rank #103). The average penetration for the countries represented in my research materials is 0.056.

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[32]http://www.nationmaster.com/graph/int_use_percap-internet-users-per-capita. Data source: CIA World Factbooks from 2003 to 2008.

3.4.3. Research Material #3: Fieldwork and Direct Observation

Another component of the research materials consist of researcher observations.

These observations are a valid component since I employed *ethnography*, which

requires a significant amount of field time immersed in the organizations I studied

(Lewis 1985, p.380). Both the fieldwork I performed as a Kiva Fellow and the

experiences of living and working among Cambodian MFI staff members

complement the more formalized interview and e-mail research materials. I spent

the weekdays of my 3-month Kiva Fellowship in the offices of MFI headquarters.

The manager assigned me a desk, and I attended meetings, interviewed staff for

positions, met borrowers in rural villages, visited branches, analyzed systems

implementation proposals, edited web content, provided training on Kiva web

tools and procedures, and wrote documentation. While these tasks did not result in

documentable research materials for use in analysis, the tacit knowledge gained

from these experiences indirectly influenced the questions I asked in interviews,

the methodology used in data analysis, and other common sense logic (Yin 2008)

used to relate ICT to MFI operations and finally to MFI outreach performance.

   The strengths of direct observation and fieldwork research materials lie in the

fact that they cover events in real time, enhance the tacit knowledge of the

researcher and cover the context of the case in a more complete fashion (Yin

2008). I also developed personal relationships with my Cambodian colleagues at

daily breakfasts and lunches, weekly staff devotional meetings, and the occasional

game of volleyball after work. Phnom Penh also hosts an active expatriate

community of which I was a part. Many personal acquaintances shared

connections and opinions on the microfinance industry that led to frequent casual

conversations regarding the issues facing the microfinance industry in Cambodia.

Table 8 summarizes the sources and content of all research materials used in my

analysis.

Table 8 Source Research Material Summary

MFI Name	Country	In-Depth Interviews by the Investigator	Interview Material from other Kiva Fellows	Fieldwork / Direct Observation of the Investigator
Banco D-MIRO	Ecuador	n/a	yes	n/a
BRAC Sierra Leone	Sierra Leone	n/a	yes	n/a
Center for Community Transformation	Philippines	n/a	yes	n/a
Cooperativa San José (CSJ)	Ecuador	n/a	yes	n/a
CREDIT World Relief	Cambodia	• Founder	n/a	n/a
Hattha Kaksekar Limited (HKL)	Cambodia	• Environmental Social Officer • V. P. of Operations and COO	n/a	n/a
IMON International	Tajikistan	n/a	yes	n/a
Kredit Microfinance	Cambodia	• Reissue Coordinating Officer • Network Unit Manager • Partnership & Staff Loan Officer • Kiva Coordinator	n/a	Fieldwork and direct observation
Maxima Mikroheranhvatho, Plc.	Cambodia	• Kiva Coordinator • Assistant IT Manager	n/a	n/a
Maya	Turkey	n/a	yes	n/a
Micro Start	Burkina Faso	n/a	yes	n/a
Our Farmer Fund	Cambodia	• Fund Manager	n/a	n/a
SMEP Deposit Taking Microfinance Limited	Kenya	n/a	yes	n/a
VisionFund Cambodia	Cambodia	• Treasury Manager	n/a	Fieldwork and direct observation

3.5. Analysis and Findings

I utilize a combination of grounded theory building, semiotics, and pattern matching to analyze my research materials. This section provides an explanation and justification of my analysis methodologies. The first of these, *grounded theory building*, suggests that data collection and analysis are interrelated parallel tasks as opposed to traditional methods where data collection starts and finishes before data analysis (Martin and Turner 1986). Grounded theory building suggests that an initial starting point is to "play" with collected research materials.

It was through this process of reviewing and categorizing responses that led me to *semiotics*, where words and signs from research materials are assigned primary conceptual categories. These categories represent components to be tested (Myers 1997). In the responses to interview questions, interviewees spoke about (1) changes their MFI made in ICT, (2) the impact that those changes had on MFI operations, and (3) the impact that ICT and MFI operations changes had on poverty and geographic outreach. These three elements comprise the primary components of my theory and initial research model. These primary conceptual categories serve as building blocks for a pattern-matching mode of analysis.

3.5.1. Pattern Matching Analysis

Pattern matching is a process that aims to determine links between categories through anecdotal evidence or frequency of occurrences (Yin 2008). Researchers use this methodology to compare empirically based patterns with predicted ones. If the patterns collide, the results can help a case study to strengthen its internal

validity (Trochim 1989, Yin 2008). Pattern matching is a preferred case study analysis methodology when answering how and why research questions requiring full and rich explanations of phenomena occurring within a context (Yin 2008). I followed the six steps recommended by Miles and Huberman (1994) for pattern matching analysis:

   (1) Putting the information into different arrays. I tagged text within my interview and e-mail response notes with specific references made to the three variables of interest: ICT adoption activities, the impact of these changes on MFI operations, and the impact on MFI poverty and geographic outreach. I recognized 25 different individual ICT adoption activities and classified these into seven categories of ICT adoption. In most cases, ICT adoption activities spanned multiple categories. Database change tracking, for example, fits in the Database category while call centers fit into the Hardware and Telephony categories.

   As mentioned earlier, I initially based the conceptual categories on Kroenke's (2012) five elements of information systems: hardware, software, people, processes, and data, made modifications to this list to improve their applicability to the microfinance context while mapping my interview responses. These changes included breaking out Telephony (TEL) and Networking (NET) as separate elements from Hardware (HW) and Software (SW), removing Kroenke's "people" element due to a lack of responses in that area, and adding Infrastructure as a new country-level element since the countries in which MFIs operate are in various stages of technological infrastructure maturity with many in infancy. Figure 8 shows the seven ICT adoption categories along with their two or three

letter abbreviations in the format that will be used in later figures and analyses.

Table 9 lists the 25 ICT adoption activities and the category(s) that each fit.

Figure 8 ICT Adoption Categories Template

Database (DB)	Software (SW)	Policy (POL)	
ICT Adoption Categories			
Infrastructure (INF)	Networking (NET)	Hardware (HW)	Telephony (TEL)

Table 9 ICT Adoption Activities and Categories

ICT adoption activity	DB	SW	POL	INF	NET	HW	TEL
Role-based user-access-rights MIS	✓	✓	✓				
Interactive and flexible real-time financial reporting	✓	✓	✓				
Nationwide centralized risk database	✓	✓		✓			
MIS evolution (paper-spreadsheet-in house-client/server)	✓	✓				✓	
Computerized market research	✓	✓					
Integration between loan system and accounting system	✓	✓					
CRM software	✓	✓					
Change tracking	✓						
Migration from faxing to scan/e-mail		✓			✓	✓	
Skype adoption and online conferencing		✓			✓		✓
Remote desktop		✓			✓		
VPN adoption		✓			✓		
Off-site data backup			✓		✓	✓	
ATM system adoption and expansion				✓	✓	✓	
Increased branch Internet connection				✓	✓		
Improved bandwidth				✓			
Country-level infrastructure improvements				✓			
PDAs for loan officers					✓	✓	
Electronic money transfers					✓		
Call center						✓	✓
Mobile banking						✓	✓
Replacing dated PCs						✓	
Digital photography of borrowers						✓	
Mobile communication between MFIs and borrowers							✓

I similarly analyzed my tagged research materials for consistent patterns where respondents shared how they observed ICT adoption impacting MFI operations. Interviews, e-mails, as well as field notes, repeatedly mentioned the following nine categories of MFI operations impacted by ICT adoption. Table 10 lists the nine MFI operations constructs along with the explanation of the positive impact the ICT adoption had through these operational improvements.

Table 10 MFI Operations Change Constructs

MFI operations construct	Explanation of ICT's impact
Flexible Loan Products	Allows MFIs to offer a wider range of loan products or more flexible loan products with advanced software and loan tracking systems
Loan Monitoring	Decreases late payments and loan defaults via real time reporting and linked branch databases
Portfolio Analysis	Prevents multiple-lending to borrowers and decreases portfolio risk
Data Immediacy	Allows for decisions and loans to be made more quickly
Data Reliability	Decreases mistakes, mitigates data loss through offsite data backups, affords less error-prone human intervention due to mobile banking
Transaction Processing	Allows electronic disbursements, computerization and automation of loan disbursements and payments
Communications	Increases communication frequency between borrowers with mobile-phones and loan officers without the need for a face-to-face visit at the branch or village
Security	Allows electronic fund transfers instead of cash manually carried by MFI staff and vehicles, prevents malicious access to data and allows user-rights based roles in internal databases/software, using firewalls, authentication, etc.
Branch Banking	Increases the ability to open or sustain branches in geographic regions distant from headquarters

(2) Making a matrix of categories and placing the evidence within such categories. I consistently observed many interactions between the conceptual categories of ICT adoption and the impact of these ICT adoption activities on operations. Table 6 shows the resulting matrix of the direct impacts of ICT

changes on MFI operations as gathered from the research materials. The cells are populated with a designation of High (*H*) or Low (*L*) denoting the "strength" of impact that the ICT adoption activity had on each of the nine MFI operations constructs. This strength is a composite measure that includes: (1) the number of respondents that related the same impact, (2) the perceived intensity of the impact in their response, and (3) the investigator's evaluation based on fieldwork and direct observations. For example, many respondents indicated a large impact of MIS upgrades on their MFI's ability to expand their suite of loan products, thus deserving an 'H' designation in the cell for MIS evolution's impact on Flexible Loan Products. Conversely, the impact that interactive real-time reporting has on flexible loan products is minor, given the weakness of research materials to justify this connection or minimal respondents noting this connection. Thus, I populate this cell with an 'L.' Finally, no respondents shared that adopting role-based user access rights in their MIS had impact on Flexible Loan Products, nor did I witness this connection in my fieldwork or direct observations. Therefore, this particular cell is left empty. One can see in Table 6 that each ICT adoption activity impacted at least one of the nine MFI operations constructs and each MFI operations improvement was resulted from at least 5 of the 25 ICT changes.

Table 11 ICT Changes and MFI Operations Relationship Matrix

	Flexible Loan Products	Loan Monitoring	Portfolio Analysis	Data Immediacy	Data Reliability	Transaction Processing	Communications	Security	Branch Banking
Role-based user-access-rights MIS					H			H	L
Interactive and flexible real-time financial reporting	L	H	H	H	L		L		L
Nationwide centralized risk database		H	H		L				
MIS evolution (paper-spreadsheet-in-house-client/server)	H	H	H	H	H	H	L	L	L
Computerized market research	H	L	H		L				H
Integration between loan system and accounting system	H			H	H	H	L		
CRM software	H	L	H				L		L
Change tracking					H			L	
Migration from faxing to scan/e-mail				H		H	L	L	
Skype adoption and online conferencing				L		L	H		H
Remote desktop				H		L	H		H
VPN adoption				H		L	H		
Off-site data backup					H			L	
ATM system adoption and expansion		L		H	H	H	L	H	L
Increased branch Internet connection				H	L	H	H		H
Improved bandwidth				H		H	H		H
Country-level infrastructure improvements				H		H	H		H
PDAs for loan officers				H	H	H	H		L
Electronic money transfers		L		H	H	H	H	H	H
Call center		L					H		L
Mobile banking	L	H		H	H	H	H	H	L
Replacing dated PCs				L			L		
Digital photography of borrowers					L				
Mobile communication between MFIs and borrowers		H		H	L	L	H	L	

(3) Creating data displays – flowcharts and other graphics – for examining the data. In this step, I map (1) the direct relationships between ICT adoption categories and MFI operations, (2) the direct relationships between ICT adoption categories and MFI outreach, and (3) the mediated relationship of ICT adoption on MFI outreach through MFI operations. Rectangles in the top third represent the seven categories of ICT adoption, rectangles in the middle third

represent MFI operations impacted by ICT, and the diamonds in the bottom of the

diagram represent MFI outreach. The resulting image depicting the three sets of

relationships is shown in Figure 9. The next step examines my research materials

through this template.

Figure 9 Pattern Matching Analysis Template
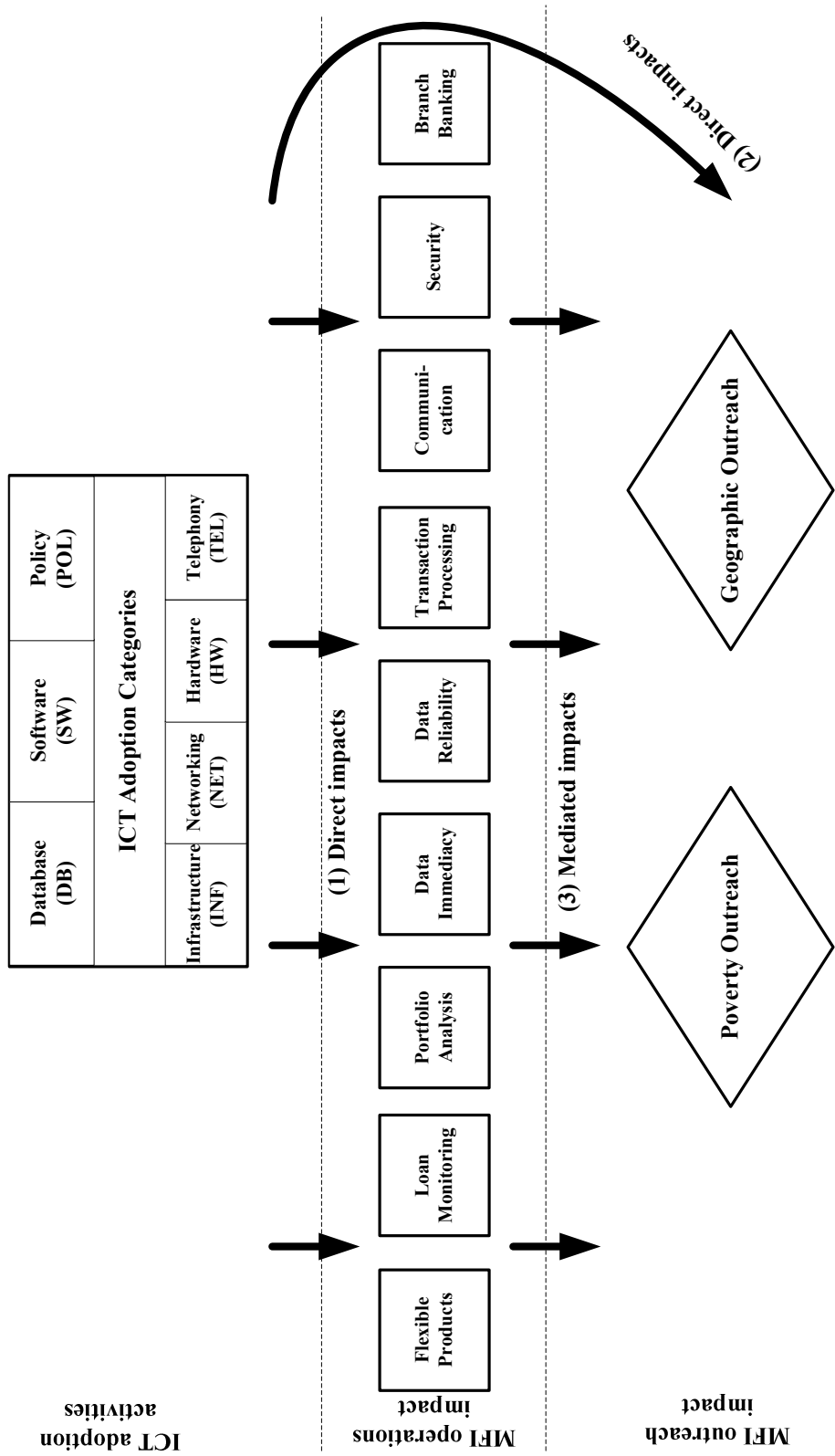
(4) Tabulating the frequency of different events, (5) Examining the complexity of such tabulations, (6) Putting information in chronological order or using some other temporal scheme. The rationale for the determination of mapping the relationships is laid out in this step. First, to determine if a relationship exists between an element of ICT adoption and an element of MFI operations, I considered the quantity of ICT adoption activities where I observed a relationship in my research materials. Consider the relationship between Infrastructure (INF) and Loan Monitoring as an example. Only one ICT adoption activity under Infrastructure, "nationwide centralized risk database", exhibited a high impact on improving loan monitoring. Now consider Data Immediacy, which was impacted at a high level by four ICT adoption activities under Infrastructure. I recognized that my categorization of ICT adoption activities into elemental categories sacrifices some of the granularity of my visual model. The sacrifice was made for the benefit of visual simplicity; a complete mapping incorporating all relationships can be reconstructed using the data from Table 11. The quantity of relationships between the ICT adoption categorical elements and MFI operations are shown in Table 12. High (H) and low (L) Cell values are separated with a '/'. The table can be interpreted as follows: The '4/1' in the top left cell reflects that 4 ICT adoption activities assigned to the Database category showed a high impact on Funding Access and 1 activity assigned to the Database Category had a low impact on Funding Access.

Table 12 Direct Relationship Mapping

	Funding Access	Loan Monitoring	Portfolio Analysis	Data Immediacy	Data Reliability	Transaction Processing	Communications	Security	Branch Banking
Database (DB)	4/1	3/2	5/0	3/0	4/3	2/0	0/4	1/2	1/4
Policy (POL)	4/1	3/2	5/0	6/1	3/3	3/3	3/5	1/2	3/4
Software (SW)	0/1	1/0	1/0	1/0	2/1	0/0	0/1	1/0	0/2
Infrastructure (INF)	0/0	1/1	1/0	4/0	1/2	4/0	3/1	1/0	3/1
Networking (NET)	0/0	0/2	0/0	7/1	4/1	5/3	6/2	2/2	4/2
Hardware (HW)	1/1	2/2	1/0	5/1	5/1	5/0	3/4	2/3	0/5
Telephony (TEL)	0/1	2/1	1/2	2/1	1/1	1/2	4/0	1/1	1/2
Total High (H)	9	12	14	28	20	20	19	9	12
Total Low (L)	5	10	2	4	12	8	17	10	20

(note: High/Low)

To map mediated relationships between MFI operations impacts and outreach, I followed a similar approach of research material analysis, i.e., based my inferences on convergent evidence from witnesses and field observation, as well as some "unspecifiable element of common sense" (Yin 2008, p. 58). In other words, I noted where responses connect an ICT adoption at their MFI with the changes that resulted from it. Rationale for these mediated relationships is shown in Table 13.

Table 13 Mediated Relationship Rationale

MFI operations impact	Mediated impact on poverty outreach	Mediated impact on geographic outreach
Flexible Loan Products	Many, flexible loan products can meet the specific needs of the poorest borrowers better than few, specific loan products	n/a
Loan Monitoring	Borrowers who repay loans do not put their collateral at risk and benefit from greater access to future loans	n/a
Portfolio Analysis	Protects borrowers from accepting loans to repay other loans or loans they cannot repay	n/a
Data Immediacy	Reduced loan application processing time leads to faster funds disbursement	Electronic fund transfers allow MFIs to lend to geographically remote regions as quickly as close regions
Data Reliability	Ensures that the right loans are made to the right borrowers and market analysis reveals which borrowers to target.	Market analysis reveals unbanked / low banked geographic regions to reach out to
Transaction Processing	n/a	Lending to distant borrowers is less cost-prohibitive
Communication	n/a	Lower time-cost of information exchange between MFI branch and distant borrowers
Security	n/a	Electronic transmission of funds is just as secure over long distances as short distances
Branch Banking	n/a	Borrowers have less distance to travel to conduct business at an MFI office

I present my research model populated with our findings in Figure 10. The grid of numbers in Figure 10 reflects the quantity of high impact mappings from ICT adoption categories to an MFI operations construct. The set of seven numbers in each MFI operations construct represents the direct causal relationships from each of the ICT adoption categories. These numbers follow the same pattern as the template in the ICT adoption categories at the top of the figure. For example, the '4' in the top-left cell of the Flexible Products operations construct represents

that four ICT adoption activities assigned to the Database category imposed impacts with a high (H) designation on Flexible Products. Similarly, the '1' in the bottom right cell of the Branch Banking operations construct represents that only one ICT adoption activity assigned to the Telephony category resulted in a high (H) impact on Branch Banking.

I employ categorical classification rather than using a numeric threshold to determine if a relationship exists between an ICT category and an element of MFI operations for several reasons. First, setting a numeric threshold would risk faulty interpretations of my findings. If I claim that two or three low impacts are equivalent to one high impact, I risk stating that a high impact is two or three times stronger than a low impact, which is an interpretation without any basis. Secondly, I avoid risking *over-quantifying my qualitative data*, which is a temptation when analyzing case studies and warned against in the methods literature (Myers 1997, Yin 2008).

Because outreach contains only two categories, I use grouped arrows to depict the relationships between MFI operations and outreach. The leftmost seven elements of MFI operations impact Poverty Outreach, the rightmost six elements impact Geographic Outreach, and the middle four elements influence both.

Figure 10 Research Model with Relationships

ICT adoption activities

Database (DB)	Software (SW)	Policy (POL)	
ICT Adoption Categories			
Infrastructure (INF)	Networking (NET)	Hardware (HW)	Telephony (TEL)

MFI operations impact

Flexible Products	Loan Monitoring	Portfolio Analysis	Data Immediacy	Data Reliability	Transaction Processing	Communication	Security	Branch Banking
4 4 0	3 3 1	5 5 1	3 6 1	4 3 2	2 3 0	0 3 0	1 1 1	1 3 0
0 0 1 0	1 0 2 2	1 0 1 1	4 7 5 2	1 4 5 1	4 5 5 1	4 6 3 4	1 2 2 1	3 4 0 1

MFI outreach impact

Poverty Outreach

Geographic Outreach

3.5.2. Findings

The populated research model in Figure 10 provides an informed framework for analyzing the nature of the impact of ICT adoption on MFI operations and outreach. My first observation uncovered that all of the impact of ICT adoption on outreach is mediated through MFI operations. Although some respondents said that when their MFI adopted a certain technology, it allowed them to extend their geographic or poverty outreach, follow-up questioning revealed this was because the ICT has some impact on an element of their operations that, in turn, enabled outreach improvements. This finding is interesting as it suggests that ICTs do not, and perhaps cannot, directly impact outreach and MFIs must first realize changes in their operations by leveraging ICTs before they can realize changes in outreach. These findings also lead me to favor the mediated model over the direct effects model. Proposition 2, which suggests a direct impact of ICT adoption on outreach, is not supported by my qualitative analysis. Overall, a strong case exists for MFIs to make appropriate changes to their operational processes resulting from ICT adoption. This, in turn, enables extension of geographic and poverty outreach.

Next, I determine from my model that different categories of ICT impact different operations and, in turn, different kinds of outreach. Database, Software, and Policy ICT adoption categories seemed to impact the five leftmost operations impacts more than the right four. These adoption categories strengthen financial flexibility and knowledge to a greater extent than the remaining four categories and thus lead to greater poverty outreach. The remaining ICT adoption categories

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(Infrastructure, Networking, Hardware, and Telephony), conversely, impact the six rightmost elements more than the left three. These categories share an ability to enable coordination and connectivity to a greater extent than the other three adoption categories and lead to greater geographic outreach. Data Immediacy and Data Reliability were unique with strong impacts from all of the categories in my analysis. I visually set the order of the MFI operations elements in a way to emphasize the differences in these categories. This is evident when looking at the numbers in the top row compared with the bottom row. The leftmost MFI operations elements have relatively larger top rows and relatively smaller bottom rows. As one moves from the left to the right, the relatively larger numbers swap places from the top row to the bottom row while the relatively smaller numbers swap places from the bottom row to the top row.

Similarly, I highlight areas for observation on MFI operations and outreach. The ICT adoption categories that I recognized as enabling financial flexibility and knowledge impacted the MFI operations that enable Poverty Outreach. One can relate to this finding because the greatest barriers of lending to poor clients include loan products that are not tailored to meet the needs of the poorest (such as disbursement and repayment schedules, interest accrual, penalties, collaterals, etc.). Likewise, ICT adoption categories I recognized as providing coordination and connectivity benefits demonstrated a greater impact on MFI operations that enable Geographic Outreach. This makes sense because the greatest barriers of lending to those who are geographically distant are difficulties in coordinating and connecting with these clients.

3.5.3. Tests for Robustness in Case Study Research

Qualitative research methods lack numerical tests for quality and strength such as degrees of freedom, p-values, R-squared values, or tests of heteroskedasticity. Despite the lack of these quantitative approaches, I can still determine the quality and robustness of our study based on the following four tests (Yin 2008).

Test #1: Construct validity. This is a test to determine if my study identified the correct operational measures. I took two steps to meet the test of construct validity. First, the nature of the initial change must be defined in terms of specific contexts. My study uses ICT adoption as the element of 'initial change,' and my method categorized these adoption activities using a version of Kroenke's (2012) elements of an information system modified for my specific context and research materials. Second, the operational measures must match the concepts. I cite other theories and studies throughout my research that inform my theory building. Also, using multiple sources of evidence, like the 14 MFIs in my research material collection, promotes construct validity.

Test #2: Internal validity. Since this research seeks to establish causal relationships between the elements in my model, a test of internal validity is critical (Cook & Campbell 1979). However, since I cannot directly observe all ICT changes and their consequences, I must develop inferences. Internal validity tests if I have made the correct inferences and if the evidence is convergent. I attempt to address internal validity requirements by specifically searching for some of the rival explanations. I acknowledge that other unobserved factors likely contribute to improvements in operations and outreach. ICT adoption is one of

several alternatives leading to improvements in the outreach capabilities of MFIs.

One such rival explanation is that wealthier MFIs are able to invest in technology

and dedicate more capital lending stock toward poor and distant clients, resulting

in correlation between the two elements, but not necessarily causation. Another

explanation is that outside funders share an increasing tendency to fund MFIs

with a proven track record of strong outreach performance. In my research

materials I did not observe support for these rival explanations. Interviewees

responded that outreach came about by improvements in operations that were

only possible through the adoption of certain ICTs. Part of my inference is based

on not only what interviewees said, but also on what they did not say.

Respondents did not openly declare that their MFI's impetus for improving their

outreach performance was due to pressure from outside funding agencies. A

second method of establishing internal validity is to use a pattern-matching mode

of analysis, like the one utilized in this study, where I relied on the frequency of

observed cause-effect relationships (Yin 2008).

   Test #3: External validity. Through the research process, I determined how

ICT changes flow to operations and outreach changes at the level of the MFI. I

have evidence that this is true for the 14 MFIs I investigated, but what about the

other thousands of MFIs around the world? What about other industries that have

geographic and poverty barriers to their client base? This test reveals if my

findings apply outside of my case study pool of MFIs (Yin 2008). The key to

demonstrating external reliability is through generalizability. I collected research

materials at several MFIs spread over multiple continents. When pooled and

placed into the framework of my model, the research materials fit into common patterns. Future research replicating my study may find results that deviate from ours, but given my sizeable and geographically diverse representation of MFIs, I anticipate more overlap from one replication to another. I address these concerns further in the limitations section of my conclusion. It is incorrect to treat case studies as records in a statistical dataset where a sample generalizes to a larger population since qualitative research relies on statistical generalization, mentioned earlier in Section 3.2.

Test #4: Reliability. The goal of reliability is to ensure that future researchers should arrive at the same conclusions if conducting the same case study at a later time. The objective of this test is to minimize errors and biases within my study (Yin 2008). I address reliability by documenting my procedures, asking the same questions at each MFI and with each respondent, and assigning equal weight to each interviewee's responses. Moreover, maintaining a case study database of not merely the list of the people and organizations visited, but also field notes, a narrative organizing findings, citations, and interview responses by question (as I have done) also contributes to reliability (Bickman and Rog 1997).

3.6. Three Anecdotes

This section narrates three anecdotes from my research materials to demonstrate how they led to the elements and relationships that exist in my research model. These anecdotes exemplify how a specific ICT adoption activity at an MFI impacts operations and outreach.

3.6.1. Anecdote #1: Daily data CD deliveries at HKL

HKL has a mission of commitment to long-term social and financial sustainability to its Cambodian clients and accomplishes this by providing loans, savings accounts, and other financial services to women and low-income rural families. FAO-GTZ Microbanker Project, an international NGO, developed HKL's MIS system in 2006, an upgrade from their previous Microsoft Excel-based system. The system, *Microbanker Window*, was offline requiring all data not entered directly on the server to be exported to CD-Rs and imported into the MIS server's database. HKL's network of 105 branches (48 of which are service offices and have no computer systems) wrote data to CD-Rs and sent the media with company drivers on a daily or weekly basis for transport to headquarters for import.

In 2011, HKL replaced Microbanker Window with a core banking system from an American software developer. This new software allows HKLs branches to read and write MIS data in real-time, making the CD-R data exports obsolete. In terms of my research model, this particular ICT adoption activity consists of both database and software elements. I assign it to the Venn diagram intersection between these two ovals. Since implementing the new software, HKL is experiencing greater data immediacy and reliability. Managers at HKL's headquarters in Phnom Penh have an immediate and accurate view of loans outstanding, and payments received. Branches also have a more immediate view into the MIS system of funds for distribution to borrowing clients. This has lowered the waiting period for borrowers. Immediacy of funds is more important

to the poorest borrowers since they have fewer funds available for emergencies. Their new linked database core banking system also allows HKL to open more branches in remote areas where the costs of regularly transporting CD-Rs were prohibitively high. Branch banking, in turn, enables MFIs to lend to clients who live in these remote areas, supporting geographic outreach.

3.6.2. Anecdote #2: PDAs for loan officers at Cooperativa San José

Cooperativa San José (CSJ) in Ecuador is a credit union giving borrowers membership and voting rights in organizational decisions. Investments in Ecuador are considered risky since the country experienced a $10 billion foreign debt default in 2008. As a result, MFIs like CSJ struggle to receive outside funding and asked to pay higher interest rates than their South American counterparts in other countries.

Recently, CSJ invested in a technological initiative providing PDAs to their loan officer staff. These PDAs replace previous paper-based tasks associated with visiting borrowers in the field. Before this investment, loan officers prepared for an outing by collecting printed repayment schedules, payment receipt forms, and deposit forms at headquarters before departing to visit borrowers. If an unexpected encounter occurred with a borrower, the loan officer returned to headquarters to collect their documentation. After investing in the PDA technology, CSJ can receive payments, savings deposits, and withdrawals instantly without requiring their borrowers to visit a branch office. The PDAs are also equipped with embedded Bluetooth printers to provide receipts to customers on demand.

With this new technology, CSJ experiences reduced transaction cost. The time and costs associated with completing transactions in the field both decrease. It increases communication between loan officers and their branch office or headquarters through real-time connectivity. Up-to-date and accurate data is available to loan officers during their meetings with clients revealing an improvement in data reliability and data immediacy. Whereas before, the data was only as up-to-date as the time of printing in the office, and any handwritten information was more prone to human error. Each of these operations impacts improves CSJ's capacity for both poverty and geographic outreach for the reasons stated in Table 13.

3.6.3. Anecdote #3: Increased Internet bandwidth at VisionFund Cambodia

Developing countries suffer from poor Internet bandwidth availability. Even for those organizations willing to pay, service is either unavailable or slow and intermittent. VisionFund Cambodia recently increased their bandwidth from 128kb/s to 512kb/s. (Compare this with standard home Internet service for personal use in America, which ranges from 12Mb/s to 20Mb/s.) Since implementing the change, they can now provide more active and rich content to funders and on their Internet profiles. They communicate with their Western funders and partners on Skype videoconferences when previously they had to rely on expensive international voice-only phone calls with less media richness (Daft and Lengel 1984, Daft et al. 1987).

In a developing economy like Cambodia where vehicles and gasoline are relatively more expensive than labor as compared with Western countries,

transportation costs account for a greater percentage of operational expenses. Skype replaced many face-to-face meetings between VisionFund branches and headquarters which previously required the time and expense of vehicular transport. Staff members now e-mail large attachments, reducing the costs of printing and shipping paper documents. Branches also currently receive information more quickly and by being more attractive to funding organizations, VisionFund has subsequently more funds to lend to poor and distant borrowers with shorter delays.

These few examples of improvements caused by ICT result in broader outreach. Other interesting anecdotes worth mentioning include (1) adopting of new software allowing customizable loan products at VisionFund Cambodia, directly impacting the flexibility they offer to their poorest clients, (2) mining regional socioeconomic data at Kredit Microfinance to determine which regions and villages in Cambodia are the poorest and farthest from bank branches, (3) IT staff resolving branch computer issues remotely from headquarters using remote desktop networking, resulting in considerable transportation and time cost-savings at Kredit Microfinance, (4) equipping loans officers with camera-enabled cellphones ($20 more than a non-camera equipped mobile phone) instead of a separate, more expensive digital camera at Banco D-MIRO enabling them to conduct business in unsafe neighborhoods avoided by most financial institutions, and (5) implementing a nation-wide electronic credit risk database, Central de Riesgos in Ecuador, lowing over-indebtedness and providing documentable credit history accessible by MFIs operating within the country.

3.7. Future Research

In this section, I propose a quantitative study at the level of analysis of the MFI informed by the findings of my qualitative study. If the data support the hypotheses suggested below, my claims strengthen through *triangulation* where two methodologies converge on the same finding (Myers 1997). The proposed research model, depicted in Figure 11, mimics the qualitative study, where MFI operations performance acts as a mediator between ICT adoption and MFI outreach. Hypotheses for this proposal stem from the same theoretical logic stated in the qualitative study and refined from the results of my qualitative analysis. My pattern matching analysis recognized patterns from policy, database, and software ICT adoption to poverty outreach and their respective MFI operations mediators. In the same regard, I recognize patterns from infrastructure, networking, hardware, and telephone ICT adoption to geographic outreach and their respective mediators. Table 14 shows these constructs and suggests variables for measurement.

Table 14 Qualitative Constructs to Quantitative Variable Mapping

Qualitative construct	Suggested quantitative measurement variables
Flexibility and knowledge ICTs (ICT adoption categories: Policy, Database, Software)	• Loan system integrated with accounting system (dummy) • MIS system maturity: paper, spreadsheet, in-house software, or off-the-shelf software (categorical) • # pages of IT documentation • Disaster recovery plan (dummy)
Coordination and connectivity ICTs (ICT adoption categories: Infrastructure, Hardware, Networking, Telephony)	• Internet bandwidth (kb/sec) • # servers per staff member • # computers per staff member • Branch connectivity with headquarters: paper, data dump, or active connection (categorical) • # phone lines per staff member • % of staff with e-mail access
MFI operations: Flexible Products, Loan Monitoring, Portfolio Analysis	• # of loan products offered • # of reports generated per month per staff member
MFI Operations: Data Immediacy, Data Reliability	• # days to recognize a past due loan payment • data errors per month / transactions processed per month
MFI Operations: Transaction Processing, Communication, Security, Branch Banking	• # days to process a transaction • # interactions with client per month • # of branches • % of funds transmitted electronically
Poverty Outreach	• % of borrowers below poverty line • % of loans which are 'small loans' (<= 30% GNI per capita)
Geographic Outreach	• % of clients from rural areas • % of clients from underdeveloped areas

Note: level of analysis = MFI

Based on the mediated relationships recognized in my pattern matching analysis of the case study research materials, I group ICT adoption constructs into two categories, and MFI operations constructs into three categories. The elements for poverty and geographic outreach remain unchanged from the original research model presented earlier.

Hypotheses for the quantitative study are inferred from the theoretical justification for the propositions in this study along with the method by which the research materials fit my qualitative model. If the empirical model matches my

qualitative findings, I expect hypotheses one and three to be positive and significant. Since my qualitative model showed all impact of ICT on outreach mediated through MFI operations, I hypothesize that coefficient estimates for H2a and H2b will be insignificant. The proposed quantitative research model and applicable hypotheses are as follows in Figure 11:

Figure 11 MFI Outreach and Performance Research Model and Hypotheses
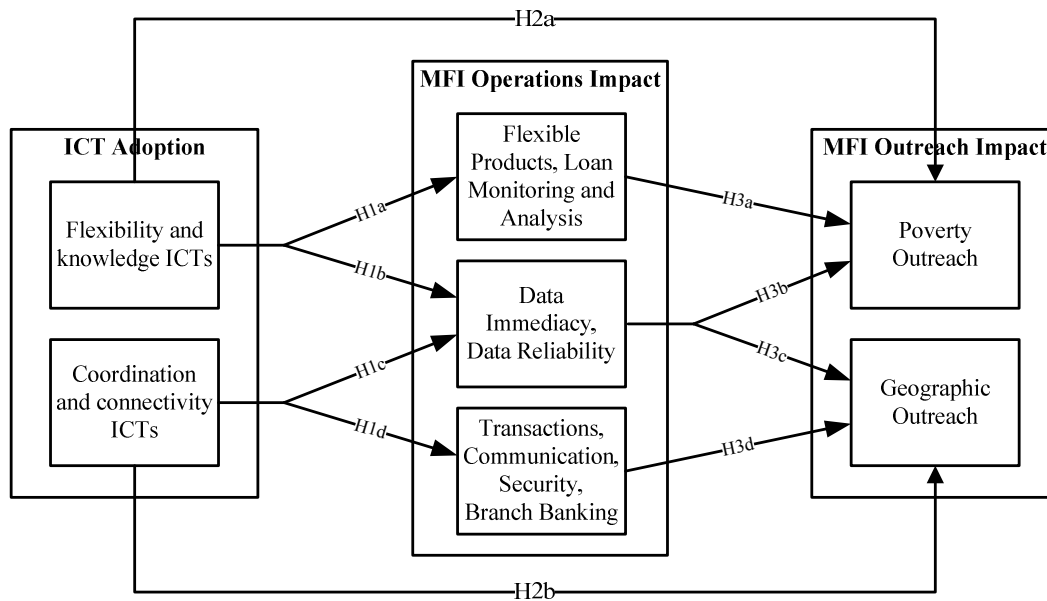
To the knowledge of the authors of this paper, there is no dataset with the required variables to conduct this quantitative analysis. Researchers would need to conduct surveys of microfinance institutions. For outreach impact variables, CERISE created a refined Social Performance Indicators (SPI) survey instrument. It has been administered to over 250 MFIs[33]. In addition, Kiva recently required

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[33]http://www.cerise-microfinance.org/-impact-and-social-perfomance-#art_232

all of its field partners to complete the CERISE SPI survey[34]. For ICT adoption and MFI operations variables, data needs to be collected and then matched.

The quantitative analysis for this study requires a mediated model approach since the model suggests a set of variables (ICT capability) impacting an outcome (outreach) mediated by a second collection of variables (operations impact). A Sobel (1982) test reveals if the impact of ICT adoption on outreach is mediated by MFI operations. I recognize that other factors may influence MFI operations and outreach, so I propose including several control variables. Regional dummies and country-level ICT penetration (e.g. Internet users per 1,000 population, mobile phone subscriptions per 1,000 population, etc.) will account for certain regions that are wealthier or already have ICTs and infrastructure in place to make ICT adoption more feasible. MFI size variables (e.g. number of clients, number of branches, number of outstanding loans, size loan portfolio) will account for larger organizations with more capital to dedicate to social performance or more branches to reach a broader geographic client base. MFI classification (bank, credit union, NGO, non-banking financial institution, rural bank) will account for discrepancies with respect to organizational goals whether profit-maximizing or social performance maximizing.

Future researchers can expand on my body of knowledge by addressing the exploratory research question, "How should MFIs adopt technology?" My research provides evidence for patterns connecting ICT adoption to outreach but omits discussion on what processes MFIs should follow in their adoption of ICT,

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[34] http://kivanews.blogspot.com/2010/03/2010-social-performance-baseline-for.html

what structural changes need to be made, what partnerships should be forged, which ICTs need to be adopted and in what order. The first essay in this dissertation illuminates some of these topics, namely how electronic-enabled intermediation has and will change how the data and funds flow throughout the microfinance industry.

3.8. Conclusions

This research contained herein demonstrates that ICT adoption enables MFIs to extend their outreach and provide financial services to very poor and very distant borrowers in the long tail of banking. The microfinance industry, if properly enabled by the appropriate technologies, holds great potential for reducing global poverty. This industry is in a state of change and is presently in earlier stages of ICT adoption than many other industry counterparts. Likewise, MFIs are also in the midst of an industry shift from a sustainability focus to an outreach focus. This final section summarizes my findings, lists some limitations, and suggests future research.

3.8.1. Limitations

One of the common concerns expressed by case study methodology critics is that it offers little basis for scientific generalization (Yin 2008). Case studies, by definition, are not samples that generalize to a population but are generalizable to theoretical propositions. My findings are based on research material collected from the 14 MFIs I studied. Another researcher could visit a different set of MFIs and arrive at conclusions that vary from the ones I present. I anticipate these differences would not be significant since my analysis revealed multiple MFIs

experiencing similar linkage between ICT adoption changes, MFI operations, and outreach. Another limitation is that of the 14 MFIs represented in my research materials, 6 are Cambodian MFIs and are also the only MFIs where in-depth interviews and fieldwork were personally conducted by one of the authors. Kiva Fellows in other countries were relied upon in other countries to collect similar research material and, to some extent, resulted in less detailed research material from those countries. Cambodia is representative of many other developing nations with an active microfinance industry; an ideal situation would have allowed for a less ethnocentric collection of first-hand research materials from more countries.

The sources of evidence used to collect my research materials came with their own limitations, which are quite common in case studies. Interviews can suffer from bias with poor questioning, responses of what the interviewer "wants to hear," and recall inaccuracies. Observations are time consuming, resource-intensive, and tend to bias outcomes when staff members know they are being observed. Documentation, like e-mail, suffers from selection bias, reporting bias, and deliberately withheld responses (Yin 2008). To overcome these limitations, I approached the case studies and performed my analysis using a thorough and structured approach based on accepted guidelines by experienced case study methodologists (Yin 2008, Myers 1997).

Another limitation is that since these findings are pooled into a single research model, I cannot look at how the relationships differ for, say, African MFIs, MFIs with more than 100 staff members, or MFIs with loan portfolios under $100,000.

Finally, the model fails to designate the strength of relationships or specific ICT adoption activities. As an example, the model will not reveal which of two options for ICT investment will yield the greater measurable impact on branch banking or geographic outreach.

A final limitation is that the ICT adoption activities and categories do not appear in isolation in reality. For example, networks and software must be in place before hardware PDAs can be utilized by field staff. An MFI will not adopt software without first adopting hardware. Similarly, country-level infrastructure must be advanced before MFIs can adopt mobile payment options for borrowers. This means that there are some conditional dependences between ICT adoption changes which are not fully modeled in our research.

3.8.2. Implications

Traditionally, researchers use large data sets to explain reality. While that approach nets coefficients revealing correlations and relationships, this approach often overlooks the 'real stories' associated with a change, such as ICT adoption. A qualitative approach enabled me to 'dig into the weeds' to understand what is happening at MFIs around the world. This approach also allows me to work at a very granular level with my findings to the point where I could trace the impacts of individual ICTs adopted at MFIs with their impacts on geographic and poverty outreach.

To answer my research questions, I employ a qualitative case study approach. I collect and pool research materials from 14 MFIs in 8 countries. Through the analysis method of pattern matching, I map ICT adoption categories to MFI

operations change and outreach performance. This process reveals certain technologies that impact poverty outreach and others impacting geographic outreach. My analysis discovered that software, database, and policy ICT adoption impacts poverty outreach mediated through financial performance and loan portfolio improvements. On the other hand, infrastructure, hardware, and telephone ICT adoption impacts geographic outreach mediated through security and branch banking operations improvements. Furthermore, ICT-enabled improvements in transaction processing, communications, data immediacy, and data reliability impact both poverty and geographic outreach.

These research findings offer many implications for practitioners involved in the microfinance industry. Policy makers who want to encourage greater outreach can establish programs making it easier and cheaper for MFIs to adopt and receive training on technologies. An MFI interested in improving its geographic outreach now has a basis for understanding that technologies related to connectivity and infrastructure are a better investment than technologies dealing with financial capabilities, flexibility, and information processing. MFIs also need to make concerted changes to their operations before they can expect to see improvements in outreach. MFIs should focus on their reporting and analysis capabilities, product flexibility, data processing and storage to maximize the impact on poverty outreach. I described this in the previous anecdote of HKL. They found that the ability to fund client loans more quickly improved their ability to reach poorer borrowers. On the other hand, a focus on transaction processing, communication, security, opening more branches, data processing and

storage will allow MFIs to maximize their impact on geographic outreach. VisionFund Cambodia experienced improved geographic outreach by opening more branches and increasing communication channels to remote branches and borrowers.

Transparency promoters, like MixMarket and MFTransparency, are placing increased importance on social performance among MFIs in their databases. Knowing how much they impact operations and outreach, tracking the technological investments and capabilities of their MFIs should be an option. Commercial banks and mobile service providers considering entering the microfinance industry as MFIs can leverage their ICT advantages over smaller MFIs not only for financial gain but for outreach gains as well.

Since this document suggests a new and creative means for modeling the relationships between technology and outreach performance, academics will benefit. I proposed future research to strengthen the claims of this research and build new knowledge. The industry shift toward a more socially-driven mission gives researchers in the IS discipline myriad opportunities for interesting studies on how the use of technology affects outreach change. I encourage similar studies among other disciplines including management (e.g. How can MFI leadership best align their staff to a new social mission?), finance (e.g. What assets can an MFI leverage to experience social performance alongside operational sustainability?), marketing (How should MFIs cost-effectively market their products to poorer and more distant clients?), and supply chain (How can resources be most efficiently allocated at MFIs with a large geographic scope?). A

new library of research on microfinance social performance from multiple

business disciplines can serve as a strong instigator to industry improvements and

poverty reduction.

Three anecdotes enlightened the research model with specific examples

from the research materials. I modified my research model based on my

qualitative findings and proposed a quantitative study with testable hypotheses.

This proposed research suggests an alternative method to determine if the results

triangulate and converge on the same findings as my case study research.

It is important to note that poverty outreach and geographic outreach rarely

occur in isolation. I recognize that many of the poorest MFI clients are also some

of the most rural MFI clients. There are obvious exceptions to this: namely the

urban slum dweller or the rural plantation owner. But for the most part, the more

rural one is, the poorer one is. A simple linear regression between % urban

population[35] and logged GDP per capita[36] for 168 countries reveals a negative

coefficient with a 0.52 coefficient of correlation. This means that the more rural a

country's population, the poorer it is. Although this mini-analysis looks across

countries, I would expect in-country data analyses to exhibit similar patterns. An

MFI's effort to expand their geographic outreach must, to a large extent, coincide

with an effort to extend their poverty outreach and vice versa.

Although the microfinance industry is very unique, the findings of my study

could be generalized to other industries serving clients that are geographically

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[35]http://www.nationmaster.com/graph/peo_rur_pop_percap-people-rural-population-per-capita
[36]http://www.nationmaster.com/graph/eco_gdp_per_cap_ppp_cur_int-per-capita-ppp-current-international

distant or poor. I do this by bringing my theory, model and the findings of my research from the microfinance industry to another industry. One such example is Proctor and Gamble[37] (P&G), which manufactures single-use packs of toiletry and cleaning products for clients who cannot afford a large purchase like a gallon of liquid laundry detergent or a quart of shampoo. They use various technologies to determine the pricing and quantity for these products to make them affordable to poor individuals and utilize a network of distribution centers and suppliers to sell their products to rural villagers in developing countries. One client I visited during my Kiva Fellowship operates a small shop in a rural village and sells several products from P&G's single-use product line. P&G, among other goods and service providers, can be expected to exhibit similar patterns from ICT adoption to impact on operations and eventually outreach. Prahalad (2005) refers to this phenomenon in his book *Fortune at the Bottom of the Pyramid*. He posits that the world's poor are a neglected market segment and with technological advancements, I should expect to see more global organizations marketing their products and services to a poorer market segment. This not only reduces wealth and opportunity variance between the wealthy and poor, but it can also be a profitable endeavor for the organizations providing these products.

As the industry continues to face challenges and suspicion due to negative press stories and the actions of some profit-hungry MFIs, the industry must respond with increased social performance and outreach. I found in this paper that ICT adoption enables MFI outreach through operations mediators. Moreover, I

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[37]http://www.pg.com

hope that research like this and those to come will guide MFIs in their quest to

alleviate poverty and reach more of the worlds unbanked.

Chapter 4. The Impact of Information and Communication Technologies on Microlending Decision Rights

4.1. Introduction

Communication-enabling technologies like the Internet are changing the way people bank. They also afford new opportunities to the world's poor population in developing countries by linking them to Western, philanthropically-minded microlenders. This new model, which I refer to as P2P social microlending, results in an increased level of personalization and allows lenders to specify who should receive capital for a loan request based on the description of the loan, an image, name, biography, and gender of the entrepreneur, along with the name and location of the MFI administering the loan. An MFI is typically located in the same city or village as the entrepreneur, and should therefore possess knowledge on the performance potential of loan requests with respect to (1) loan repayment rate – will the individual pay back his/her loan? and (2) poverty reduction – how successful is the loan in moving the borrower out of poverty? This knowledge is not known by or shared with the Western lender who makes the capital funding decisions on microloan requests.

Prior to advanced Internet technologies, there was little need for intermediation in the microfinance industry, and players were largely limited to MFI organizations (lenders) and client borrowers. Today, as the industry has grown and technologies have advanced, the industry has witnessed new entrants of intermediaries. These intermediaries include regulators, *infomediaries* (information intermediaries), and P2P social lenders (Riggins and Weber 2011a).

Search costs, matching costs, transaction costs, and enforcement costs involved in P2P transactions have decreased in the wake of technologies like the Internet (Parameswaran et al. 2001, Oram 2001). With communication-enabling technologies, a couple in San Francisco can now lend money to an entrepreneur tailor in Vietnam at low transaction costs through P2P social microlenders and loan administering MFIs. As more of the world's population becomes "connected," I expect this P2P lending trend to grow.

Problems arise when an MFI holds an information advantage over an Internet microlender. First, loans are not funded on the potential success of the loan being repaid and the success of moving the borrower out of poverty. Second, since MFIs have an opportunity to cherry-pick which loans to fund through Internet-based social lending platforms, they have the opportunity to shift financial risk from their portfolio to the portfolio of Internet microlenders. These inefficiencies create a dead weight loss resulting in less economic activity and typically a reduction in total economic welfare. This paper proposes a new *ICT-enabled social lending theory* to explain the gap that exists between social loan funding decision-makers and microloan success. Explanations include: (1) information asymmetries between local MFIs and lenders resulting in opportunism for MFIs to select riskier loans to be funded through P2P social microlenders and (2) identification-biased funding decisions fueled by the Internet-based platform of social lending websites. In this paper, *identification bias* is defined as an affective influence on a microloan funding decision because of the emotional connection a lender feels with a borrower (Schervish and Herman 1988). The results of this

study demonstrate that identification biases due to gender and occupation are significant.

The data for this empirical study are loans made in the past five years through Kiva[38], an online lending platform connecting Western lenders with third-world entrepreneurial borrowers. Preliminary observations detected the existence of empirical irregularities leading me to look further into this issue. Table 15 displays 99,138 completed Kiva loans from 2005 to 2010 with the average number of days lenders take to fund the loan, the average loan amount, and the default rate grouped by sector. One would expect to see loans that are fully funded in the shortest amount of time exhibiting the lowest default rates. The data, however, reveal that loans in the transportation sector have one of the longest average funding durations although they exhibit the lowest default rates. Loans in the agriculture sector fund more quickly than the average yet exhibit one of the highest default rates. Sectors with the largest discrepancies between funding time and default rate are in bold text.

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[38]http://www.kiva.org

Table 15 Kiva Loans by Sector

Sector	# Loans	Avg. Amount	Avg. Days to Fund	Default Rate
Agriculture	16,495	$637	**1.54«**	**4.69%«**
Arts	3,044	$632	0.61«	2.63%«
Clothing	8,516	$726	2.52«	4.72%«
Construction	2,348	$714	2.14«	2.26%«
Education	157	$866	0.36«	3.18%«
Entertainment	93	$614	2.77«	4.30%«
Food	29,748	$632	1.41«	3.21%«
Health	961	$832	0.38«	3.54%«
Housing	1,034	$621	**2.59«**	**2.22%«**
Manufacturing	1,423	$651	**0.55«**	**3.79%«**
Personal Use	198	$705	3.36«	0.00%«
Retail	23,341	$715	2.35«	3.16%«
Services	8,749	$790	1.93«	3.90%«
Transportation	2,624	$651	**2.54«**	**1.52%«**
Wholesale	407	$799	1.65«	1.72%«
Total/Average	99,138	$682	1.81«	3.60%

An initial cursory glance at the information above reveal that lenders are either ill-informed (they don't have the right information to make an informed lending decision) or irrational. Irrational lenders will choose which loans to fund based on elements unrelated to potential loan success. The Kiva platform allows users to form lending teams or groups based on common interests, locations, and beliefs among others. Two of these groups that are exemplars of irrational lending behavior are *Women in Hats!* and *Women Who Lend to Shirtless Men*. The lending page for *Women in Hats* reveals, "We like women in hats, caps, scarves, veils, crowns, beanies – you name it! We like men wearing that stuff too!"[39] Similarly, the lending page for *Women Who Lend to Shirtless Men* states that "we loan because we can't resist."[40] Group leaders enhance these explanations with clever emoticons. Unless there is a logical connection between hats and shirts to

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[39]http://www.kiva.org/team/women_in_hats
[40]http://www.kiva.org/team/women_who_lend_t_shirtless_men

loan success, I consider these loan funding decisions irrational. These are only two examples of lending groups where lenders choose loans based on physical attributes of a photograph instead of potential loan success.

Data is derived from 167,000 loans over 5 years made on Kiva.org. I employ logistic regression models to test my hypotheses. The knowledge gained from this research can (1) inform MFIs and other peer-to-peer (P2P) lending services of information asymmetries and how to address them and (2) determine if technology microloans perform well compared with non-technology microloans. Although the context of this study is international social lending, the same concepts and theories benefit from external validity and can be applied in other P2P lending environments in the growing U.S. market with sites like Prosper.com and LendingClub.com.

Research Questions

- (RQ1) Is there a gap between microloan funding time and the loan default rate? If so, what explanations exist for this gap?

- (RQ2) Does an information asymmetry exist between Western lenders and the MFIs that administer international P2P microloans?

- (RQ3) Does the amount of information provided to microlenders affect their ability to fund successful loans?

- (RQ4) Are microlending funding decisions biased by identification links between lender and borrower?

The paper is organized in the following manner. In section 2, theoretical perspectives are used to build the *ICT-enabled social lending theory* and propose

hypotheses. Section 3 describes the Kiva research context and justification for its use. Section 4 presents the data and variables and Section 5 discusses estimation models and research techniques. Section 6 presents the results of the empirical study. And finally section 7 concludes with the contributions that this study makes to the literature and theory of ICT-enabled social lending.

4.2. Theoretical Background and Hypotheses

Information asymmetry, agency theory, identification theory, and IT productivity form the theoretical bases for my analysis of technology microloans. These theories work together to build the ICT-enabled social lending theory.

Information asymmetry and agency theories. *Information asymmetry* occurs when one party possesses more information than another in an economic transaction. The classic *market for lemons* (Ackerlof 1970) example of this involves a used car salesman who withholds information about a vehicle's accident history to a buyer. This information is used to the seller's advantage, who can sell the car for more than it is worth. The buyer, on the other hand, experiences adverse effects from this information asymmetry and purchases the car for more than it is worth. The seller is not always the party with greater information. Consider a buyer who is aware that a certain vehicle in a used car lot is a rare model sought by collectors. If the seller is unaware of this, then the adverse and beneficial effects are traded from the previous example. *Agency theory* and the *principal-agent problem* state that problems arise when the goals of the principal conflict with the goals of the agent. These problems are difficult and costly to resolve (Alchian and Demsetz 1972). IS researchers discovered that

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information and communication technologies (ICTs) reduce principal-agent costs through electronic monitoring, timekeeping, and incentive programs (Gurbaxani and Whang 1991).

Agency costs have unique implications in the microfinance industry. MFIs face a *moral hazard problem* – they cannot ensure that borrowed money will be used in a productive manner or that the use of the funds will align with the proposed loan request. Traditional lending institutions with wealthier borrowers rely on financial or asset collateral to mitigate these agency costs, but many microloan recipients do not possess traditional collateral. A second MFI agency cost is *adverse selection problem* – the MFI cannot determine the riskiness of its pool of loan applicants (Sengupta and Aubuchon 2008). This is due to the information asymmetry between MFIs and their clients. Traditional banks rely on credit scores and demographic data to assess risk. MFIs lack this approach since their clients do not have credit scores. MFIs mitigate these agency costs through different means of group lending and social collateral. Instead of financial or asset collateral, MFIs rely on social collateral, where assurances are not formed with financial means, but through group lending and accountability (Morduch 1999). To take advantage of social collateral, borrowing groups materialize voluntarily and agree to contract terms. Muhammed Yunus' Grameen Bank in Bangladesh relies heavily on lending groups, and their contract terms include clauses stating that if one member defaults, the MFI will deny subsequent loans from all individuals in the group (Besley and Coate 1995). Table 16 summarizes approaches to agency costs by traditional banks and MFIs.

Table 16 Agency Costs at Traditional Banks and MFIs

Agency Cost	Traditional Lending Institution	Microfinance Institution (MFI)
Moral Hazard	Require borrowers to produce proof of financial or asset collateral. In the event of a loan default, the lending institution can repossess assets from the borrower.	In the absence of financial and asset collateral, MFIs rely on social collateral. Individuals within a group hold each other accountable for repayment since one member's failure to repay negatively impacts all members of the group.
Adverse Selection	Analyze riskiness of loan candidates through credit scores, demographic data, and rating algorithms. This allows the lending institutions to either deny unsafe borrowers or charge them higher interest rates.	With no means to separate the risky borrowers from the safe borrowers, the MFI would charge higher interest rates to safe borrowers relative to risky borrowers. Group lending practices pool individual borrowers with different levels of unobservable risk.

The discussion up to this point has focused on agency costs between MFIs and borrowers. In the context of this study, I argue that information asymmetries result in agency costs between microloan lenders (principals) and the MFIs (agents) who administer those loans. In this relationship, adverse effects occur from information asymmetry. If microloans are funded on imperfect information, I can expect to see loans funded that do not end in repayment or poverty reduction. This, in turn, results in no capital returned to the lender and no interest earned by the MFI. A long-term pattern of microloan funding based on imperfect information results in fewer loans made and funded due to uncertainty. Finally, if the loan defaults, then it is likely that the loan will fail to move the borrower out of poverty. More effective poverty reduction occurs when capital decisions on microloans are made in the presence of better information. The local loan-administering MFI holds greater information than the Western lender, yet it is the

lender making the capital investment decisions. In other words, decision rights for microloan funding can be held by either the MFI or the lender. The amount and quality of information shared from the MFI and lender vary. If funding decisions are made by MFIs, there is no need to transfer information. If funding decisions are made by lenders, inefficiencies will exist unless information flows exist from the MFI to the lender.

The MFI also has opportunities to gain from their information-advantaged position. This is referred to as *opportunism* - "an effort to realize individual gains through a lack of candor or honesty in transactions" (Williamson 1973 p.317). Prior to the entrance of new P2P social microlending platforms, MFIs funded all loans through using available funds. While they may have had outside support, it is likely that the MFI still held decision rights for which loans to fund. Now, MFIs do not operate solely with capital provided from Kiva lenders, many of their loans are funded using internal accounts. At P2P social microlending intermediaries like Kiva, up to 25% of an MFI's loan portfolio can be funded by Kiva, per Kiva's regulations. MFI losses from internally funded defaulted loans consist of both principal and interest, but with loans funded by Kiva, financial losses are limited to potential interest earned. Since information about potential loan success is known to the MFI, but not shared with the lender, MFIs can selectively decide to fund their riskier loans through Kiva lenders and fund their less-risky loans internally. MFIs will not engage in recklessly risky behavior, since they are still interested in receiving interest payments on Kiva-funded microloans. Also, a high default rate on loans funded through Kiva would result in jeopardizing their

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relationship with Kiva, which to them is an interest-free and risk-free source of funding.

This situation poses a unique principal-agent dilemma. Typically the costs of the principal-agent problem are due to transmitting information from the principal to the agent so the agent makes decisions in the best interest of the principal. If I consider the principal to be the Western capital-providing lender and the agent to be the MFI loan administrator, information needs to flow from the agent to the principal to achieve optimal lending decisions. Traditional information agency costs are due to transmitting unique knowledge from the principal to the agent so the agent can effectively act on behalf of the principal. This maximizes the effectiveness of the economic activity, in this case business operations. The story changes when I consider Kiva's information agency costs. The agent (MFI), not the principal, possesses unique knowledge. To maximize the effectiveness of microfinance and move individuals out of poverty, this unique information needs to flow from the agent to the principal, even though the MFI is working on behalf of the lender.

Identification theory. Traditional economic literature on philanthropy finds that altruism, exchange, and *warm glow* (psychological benefit) are strong motivators for charitable giving (Munnell and Sunden 2003). *Identification theory* is a broader approach and is defined by Schervish and Herman (1988) in a study of 130 millionaires. The authors determine that (1) philanthropy is a manifestation of care and (2) the major impetus for philanthropy is identification with others and identification with the needs of others (rather than selflessness). Individuals

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recognize that the needs or lives of others are similar to their own lives, needs, or experiences. This is also a motivation for P2P social microlending. Meeting needs of individuals where identification links exist elicits satisfaction on the part of charitable individuals (Havens et al. 2006). Identification theory has been empirically validated. Some example findings from the Boston Area Diary Study (BADS) included (1) donors to schools were involved in childhood education or university research, (2) donors to environmental causes were involved in outdoor and hiking activities, and (3) donors to oncology medical centers were more likely to have loved ones who died of cancer (Schervish and Havens 2002).

While the majority of P2P social microlenders receive their capital investments returned to them in full, intermediaries like Kiva do not allow lenders to receive any of the interest that borrowers incur when repaying their loans to the administering MFIs. The time value of money states that one dollar today is worth more than one dollar tomorrow due to opportunity costs and inflation costs, among others. So even though P2P social microlenders receive their payments back, their investments are still charitable and sacrificial. Although identification-based charitable decision-making appears benign, my findings reveal that it does not align with the end-goal of microfinance – bringing individuals out of poverty. Identification theory offers an explanation as to why P2P microlenders may make suboptimal lending decisions. Identification theory states that identification with borrowers, rather than the poverty reduction goal of microfinance, is the most influential factor on borrowers making charitable lending decisions. P2P social microlending is a unique charitable model since it provides a direct connection

between donors (lenders) and the lives they wish to change (borrowers). In donations to other aid organizations like United Way or Salvation Army, the donor is usually uninvolved in determining where his or her donation will be allocated. With P2P social microlending, there is a greater opportunity for identification with borrowers and this is very likely to play a role in funding decisions. Lenders are given access to a name, location, biographical sketch, and photo of the borrower and requested loan use. Traditionally, lenders rely on signals such as interest rates to assess risk, but when interest rate information is unknown to lenders, funding decisions are more likely to be identification-biased.

Following this logic, more money will be lent through P2P social microlending intermediaries, although used less efficiently until a point where the detriment of unsuccessful loans due to information asymmetries overshadows the identification benefit that lenders receive. Whereas other charitable organization models receive less money since donors do not benefit from strong identification ties with recipients, the funds are delegated to causes based on the decisions of aid workers involved with the aid recipients.

Provision of personal information to potential donors is not a new phenomenon. Aid organizations such as World Vision[41] and Compassion International[42] have child sponsorship programs in which donors can choose a child from a selection of physical photographs after a public presentation through a website. The difference between adopt-a-child programs and Kiva loans is that

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[41]www.worldvision.org
[42]www.compassion.com

at the time the photograph of the child is made available for potential child

sponsors, the child is already being served by the aid organization. The $30 per

month that these organizations request to sponsor a child are not earmarked for

the child, but used as general aid funds to assist children like the one selected

from a set of candidates[43]. At P2P social microlending intermediaries like Kiva,

funds are not made available to the borrower until the loan is fully funded[44].

Based on the way these aid models are set up, the impacts of choosing one

microloan candidate over another are greater than the impacts of choosing one

child to sponsor over another.

Media richness theory (Daft and Lengel 1984, Daft et al. 1987) states that

rich mediums reduce uncertainty and equivocality. *Media richness* ranges from

unaddressed text-base documents (low) to face-to-face communication (high).

Technologies like the Internet and increasing bandwidth allow for richer media

consumption by end-users. P2P social microlenders benefit from rich media when

browsing through borrower profiles. Images, and sometimes video, accompany

the text descriptions of loan requests and borrower biographies. At Kiva, this

media is captured by Kiva's staff and volunteers, not by the MFI. Kiva recognizes

the power of media and aim to photograph borrowers at their place of work since

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[43]According to http://www.worldvision.org.uk/server.php?show=nav.2623, "the money you give doesn't go directly to your sponsored child or family." In addition, when a sponsor ceases their payments, "the [sponsored child] will still be included within the community projects until a new sponsor can be found." Similar statements can also be found on Compassion International's web site.

[44] Although this is not the case with*pre-disbursed* loans, which are loans whose funds were released to the borrower before the loan was posted on Kiva's website. It is important to note that pre-disbursed loans carry the same risk implications as non-pre-disbursed loans – borrower default results in no payment returned to the lender. Kiva discloses if funds for a loan are pre-disbursed.

it is a preference of Western lenders (Flannery 2007). Rich media has greater potential to influence loan funding decisions based on identification links, since rich media is a more effective means of transmitting emotion-laden messages (Trevino et al. 1987, Lengel and Daft 1989).

ICT-Enabled Social Lending Theory. In Internet-based social microlending platforms, since a rich media channel communicates personal information of borrowers that microloan lenders access along with a lack of local business knowledge, lenders will base their funding decisions on personal identification with borrowers, not on potential loan success. Western countries where microloan lenders reside are more technologically advanced. Individuals in these countries use technology more frequently for personal and business use than lesser-developed countries. This logic suggests the following hypotheses:

Information asymmetry hypothesis (H1). *As loan description length increases between the MFI and the lender, lenders will be more successful in predicting loan repayment potential. This is measured by the relationship between (1) the amount of time it takes for a Kiva loan request to be fully funded and (2) loan default rate.*

Identification bias hypothesis (technology) (H2a). *An identification bias exists in P2P social microloan funding decisions. Technologically advanced lenders will make more funding contributions to technology loans than less technologically advanced lenders.*

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Identification bias hypothesis (agriculture) (H2b).*Lenders in agricultural careers will provide more funding contributions to agriculture sector loans than lenders in non-agricultural careers.*

Identification bias hypothesis (gender) (H2c).*Female lenders will provide more capital to female borrowers than will male lenders.*

If these hypotheses are supported, the *ICT-enabled social lending theory* will be supported: A gap exists between social lending funding decisions and microloan success because (1) information asymmetries exist between local MFIs and lenders and (2) the Internet-based platform of social lending websites encourages identification-biased funding decisions.

4.3.   Research Context

These hypotheses will be tested in the context of Kiva, the largest international social lending platform. Kiva, Swahili for 'unity,' is one of many Internet-based international P2P microlending websites that started over the past decade. Other similar sites include Global Giving, Wokai, Microplace, Zidisha and MyC4, but none of these have as large of a geographic scope or participant list as Kiva. Since Kiva's incorporation in 2005, they have facilitated $300 million in loans to 390,000 borrowers[45] (Kiva 2010).

Kiva's lending operations are shown in Figure 12. Lenders that log onto Kiva's website are presented with hundreds of brief bios, business plans, capital requirements, and photos of applicants around the globe collected by any of their 112 field partners representing 53 countries. Kiva uses the term "field partners"

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[45]http://www.kiva.org/about/stats

when referring to MFIs in their network. Kiva borrowers are all entrepreneurs in developing countries who require a loan to start or maintain their businesses. Lenders have the opportunity to lend money, in full or in part, toward the borrower's entrepreneurial objective. As the borrower pays back the loan with interest to the field partner, the lender receives funds in accordance with a repayment schedule. Interest paid by the borrower to the MFI is not transferred from the MFI to Kiva or lenders[46]. MFIs retain all of the interest earned. Kiva lenders can then choose to relend, donate, or withdraw (via Paypal) these received payments.

Figure 12 Kiva Operations (source: www.kiva.org)

4.4. Data and Variables

Data come from Kiva.org and date from its inception in March 2005 through January 2010. KivaData.org offers dumps of the database, which are imported

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[46]This is due to current U.S. banking laws, but Kiva is applying for the privilege for lenders to earn interest. The topic is debated heavily among Kiva participants and an 18-page forum thread is dedicated to the debate at Kivafriends.org, an online community for Kiva lenders. (http://www.kivafriends.org/index.php/topic,215.0.html).

into Microsoft Access and modeled with Stata[47] data analysis and statistical

software. The dataset contains 167,470 loans made in 53 countries funded by

576,768 lenders and administered by 141 MFIs. All of the 53 countries in the data

are developing countries with the exception of the United States, which only

accounted for 118 loans. The loans in which the borrower was located in the

United States were removed from the dataset. Loans in 'fundraising' status were

also omitted from the dataset, since both duration of time to fund the loan and

default status are unknown for these loans. The microloan is the unit of analysis

for this study and the observed variables are listed in Table 17.

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[47]www.stata.com

Table 17 Dataset Variables for Information Asymmetry Model

Variable	Description	Comments
TECHLOAN	Technology loan	0 = non-technology loan 1 = technology loan
AGRILOAN	Agricultural loan	0 = non-agricultural loan 1 = agricultural loan
DAYSTOFUND	Amount of time (in days) from when the loan was available on Kiva's website until it was fully funded	
DEFAULTED	Loan default status	0 = borrower repaid the loan 1 = borrower defaulted on the loan
DESCLENGTH	Number of characters in the "Loan Description" field	
AMOUNT	Amount of the loan in $USD	
GENDERB	Gender of the borrower	0 = Male 1 = Female 0.00 to 1.00 = percentage of female borrowers in group loans[48]
GROUP	Group loan status	0 = loan administered to an individual 1 = loan administered to a group
R_AFRICA	Africa region dummy (Benin, Cameroon, Cote D'Ivoire, Ghana, Kenya, Liberia, Mali, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, Sudan, Tanzania, The Democratic Republic of the Congo, Togo, Uganda)	0 = Non-Africa region 1 = Africa region
R_ASIA	Asia region dummy (Afghanistan, Azerbaijan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Tajikistan)	0 = Non-Asia region 1 = Asia region
R_EASTEUR	Eastern Europe region dummy (Bosnia and Herzegovina, Bulgaria, Moldova, Ukraine)	0 = Non-Eastern Europe region 1 = Eastern Europe region
R_LATINAM	Latin America region dummy (Costa Rica, Dominican Republic, Guatemala, Haiti, Honduras, Mexico, Nicaragua)	0 = Non-Latin America region 1 = Latin America region
R_MIDEAST	Middle East region dummy (Armenia, Gaza, Iraq, Lebanon, Palestine)	0 = Non-Middle East region 1 = Middle East region
R_SEASIA	Southeast Asia region dummy (Cambodia, Indonesia, Philippines, Samoa, Vietnam)	0 = Non-Southeast Asia region 1 = Southeast Asia region
R_SOUTHAM	South America region dummy (Bolivia, Chile, Colombia, Ecuador, El Salvador, Paraguay, Peru)	0 = Non-South America region 1 = South America region

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[48]For loans in which the recipient was not an individual borrower, but a group of borrowers, the gender value is calculated as # of females in the group divided by total # of individuals in the group.

Tests of the identification link hypotheses (H2) use the *loan funding transaction* as the unit of analysis and consider additional variables of the lender. These are shown in Table 18. A loan funding transaction occurs every time a lender provides any amount of capital to a loan request. Most lenders choose to partially fund several loans rather than fully fund a single loan, resulting in many loan transactions for every loan request. While the database contains only 167,000 loans and 577,000 lenders, there are 3.5 million loan funding transactions.

Table 18 Dataset Variables for Identification Bias Models

Variable	Description	Comments
PERSONALURL	Existence of lender personal URL in profile	0 = no personal URL exists in profile 1 = personal URL exists in profile
TECHOCCUP	Lender lists a technology occupation	0 = lender lists a non-tech occupation 1 = lender lists a tech occupation
AGRIOCCUP	Lender lists an agricultural occupation	0 = lender lists a non-agri occupation 1 = lender lists an agri occupation
GENDERL	Gender of the lender	0 = Male 1 = Female

DAYSTOFUND is an appropriate outcome variable that can reveal both (1) the relative faith a lender has that the loan will be repaid and move the borrower out of poverty and (2) the identity link between the lender and borrower. Previous research using the same dataset reveals that "lenders showed unambiguous preferences according to region, gender, and business type: Africans first, women first, and agriculture first. A female African fruit seller? Funded in hours. Nicaraguan retail stand? Funded in days. A Bulgarian taxi driver? Funded in weeks" (Flannery 2007, 50). Kiva lenders give preferences to loans based on region, gender, group loans, and amount (Ly and Mason 2010), so these variables

(*REGION, GENDERB*, *GROUP*, and *AMOUNT*) are included as control variables.

The same amount of data is listed for each loan (borrower's name and photo, location, MFI, activity, and sector). The only fields that vary from loan to loan are the length of the *loan use* (*USELENGTH*) and *loan description* (*DESCLENGTH*) fields. These variables represent the variance in amount of information provided to lenders. Loan use is typically a one-sentence statement of what the loan will be used for (e.g. "To expand his pay phone business"), while loan description describes the borrower, his/her business, and plan for success (e.g. "Marcelo lives in his parent's house on Marcelo Quiroga Santa Cruz Street in the Pasankeri area of the city of La Paz. Marcelo gets his income from an Internet stand, which is located in his own home. The loan he is asking for is to buy a server. That way he can improve service for his customers and also stabilize his source of work."). The loan description field often consists of several sentences, but can also be several paragraphs long. I choose this field as my measure for information provision since (1) it varies from loan to loan, and (2) the field usually contains information that lenders can use to better assess the chance of loan success. For example, loan description fields contain valuable market information that would otherwise remain unknown (e.g. amount of competition, changes in market condition, timing of planting/reaping/tourist seasons).

For the purposes of this study, a *technology microloan* is defined as a small amount loan administered to an impoverished entrepreneur for the purpose of purchasing, using, reselling, providing a service, or receiving training on

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technologies (e.g. computers, phones, software, hardware, photocopiers, digital cameras, audio/video). *Non-technology microloans* are used for any other purpose (e.g. goats, textiles, tools, seeds). Determination of which loans in the original database were technology loans is not straightforward, since the activity sector field value for technology loans differ with respect to loan purpose. For loans in which the technology is a product to be resold, the sector is categorized as retail. For loans in which the technology is used to provide a service to paying customers (e.g. Internet cafes, phone booths), the sector is services. For loans where the technology is used to support an existing or new business, the sector can be any of the 17 possibilities, depending on the entrepreneur's business. To overcome this and determine the *TECHLOAN* status of the loans in the dataset, a keyword search of 37 technology keywords[49] was utilized on the [loan use] database field. Keywords which had no matches in the [loan use] field were removed in addition to most containing the keyword *hardware*, since upon visual inspection, most of the loans using the keyword referred to non-technological hardware. Technology loan classification was performed by a team consisting of 4 PhD students in addition to two of the authors. A team collectively decided the category of the loans that classifiers marked as ambiguous.

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[49]The initial 37 keywords included: phone, computer, hardware, video, printer, copier, internet, copy machine, digital camera, scanner, toner, audio, software, cyber, computadora, network, keyboard, web, technology, ordinateur, online, webcam, technologies, xerox, database, mp3, skype, A/V, hdd, lcd, crt, dvr, multimedia, linux, unix, ipod, and microsoft,

To determine the *TECHOCCUP* status of loans in the dataset, a keyword search of technology occupation phrases[50] was performed on the [Lender.Occupation] database field. If the occupation field contained any of the phrases in the keyword list, the occupation was classified as technology (*TECHOCCUP* = 1). Determination of the AGRIOCCUP status used the same method, although with a different keyword list[51]. It is important to note that not all Kiva borrowers list their occupation in their profile. All data analyses that compare occupations considered only the borrowers with non-null occupation fields. 386,328 out of 576,768 (67%) Kiva lenders in the dataset list an occupation. Gender of the lender is not available in a database field, but filtering the name field with the 30 most common female names and 30 most common male names achieves a satisfactory alternative. For data analysis that involves the gender of the lender (testing hypothesis H2c), only names in the male and female list were considered. The 30 most common names in each gender accounted for 106,474 out of 576,768 (18.46%) lenders in the database. A text field existed in the original dataset for location of the lender. Unfortunately, this text field was not validated and entries ranged from full addresses (e.g. 4260 College Ave.), to states (e.g. Arizona), to countries (e.g. Canada). Kiva publishes figures claiming that lenders reside in 218 different countries[52].

Table 19 below provides descriptive statistics for all loans in the dataset while Table 20 provides descriptive statistics for all lenders in the dataset.

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[50]Keywords for technology occupations included: computer, software, programmer, database, web, blogger, IT consultant, 'it %', information technology, information systems

[51]Keywords for agricultural occupations included: farm, agri, botany, botanical, landscape

[52]http://www.kiva.org/about/stats

Table 19 Descriptive Statistics for Loans

Variable	Min	Max	Mean	StDev
DAYSTOFUND	0.0008	84.01	1.813	4.159
DEFAULTED	0.00	1.00	0.036	0.185
DESCLENGTH	81.00	10,730.00	799.988	464.066
AMOUNT	25.00	6,000.00	681.529	598.058
GENDERB	0.00	1.00	0.795	0.397
GROUP	0.00	1.00	0.108	0.311
TECHLOAN	0.00	1.00	0.012	0.107
AGRILOAN	0.00	1.00	0.167	0.373
R_AFRICA	0.00	1.00	0.286	0.452
R_ASIA	0.00	1.00	0.122	0.327
R_EASTEUR	0.00	1.00	0.024	0.152
R_LATINAM	0.00	1.00	0.128	0.334
R_MIDEAST	0.00	1.00	0.013	0.114
R_SEASIA	0.00	1.00	0.204	0.403
R_SOUTHAM	0.00	1.00	0.224	0.417

Notes: n=97,150

The descriptive statistics reveal that my sample size to test the information

asymmetry hypothesis is 97,150 out of the original 167,000. The majority of the

non-included observations were either in fundraising or loan repayment status.

For those observations, default rate and/or funding length is not yet observed. The

average loan takes 1.81 days (1 day, 19 hours, and 26 minutes) from the time it is

available on Kiva's website until it is fully funded. For males, the average

increases to 4.94 days. For females, the average is only 1.488 days. This

difference is significant even after controlling for loan amount. Kiva loans to

males average $692 while loans made to females average $607. 3.6% of Kiva

loans in the dataset defaulted. Again these differ by gender. Males have a default

rate of 4.6% while females only defaulted on 3.4% of their loans. Loan amounts

ranged from $25 to $6,000, but very large loans are rare. Only 1.6% of the loans

in the dataset exceed $3,000. 79.5% of all Kiva borrowers are female, which is

typical for microfinance. 10.8% of the loans were administered to groups with the

remaining administered to individuals. Agricultural loans accounted for 16.7% of all loans in the dataset (n = 16,272) and technology loans accounted for 1.2% of all loans (n = 1,134). Descriptive statistics on the regional dummies show the geographic dispersion of the loans in the dataset. Africa, Southeast Asia, and South America are the largest of these and together account for 71.4% of all loans.

Table 20 Descriptive Statistics for Lenders

Variable	Min	Max	Mean	StDev
PERSONALURL	0	1	0.0538	0.2256
TECHOCCUP	0	1	0.0341	0.1814
AGRIOCCUP	0	1	0.0036	0.0602
GENDERL[1]	0	1	0.3771	0.4847

Notes: n=576,768
[1]Gender of the lender is not representative of all Kiva lenders. Of the 30 most common female names and 30 most common male names, 37.71% of these are females. Gender identification bias hypotheses had n = 106,474.

Appendix B contains pairwise correlation matrices between the variables used in the models. The largest pairwise correlation between any two variables (*GROUP* and *AMOUNT*) is .558 and all correlations are within an acceptable range for OLS estimation (Greene 2003). Checks of the variance inflation factors and tolerance values revealed no values above 10 or below 0.1 respectively, suggesting that multicollinearity does not bias the parameter estimate results. Appendix C contains descriptive statistics on occupation, loan use, and gender for loan funding transactions.

4.5. Estimation Models

The hypotheses are tested by several empirical estimation models. The descriptions and equations for these models are contained in the following section.

4.5.1. Models to Test the Information Asymmetry Hypothesis (H1)

A logistic regression model tests the information asymmetry hypothesis. An advantage of using logistic regression is it is not affected by the way the data are obtained. In this case the data are all retrospective. The outcome variable in this model is the probability that the loan will default. Statistical insignificance of *DAYSTOFUND* in the model provides further evidence to the information asymmetry hypothesis. This model is shown in Equation 1.

$$(1) \quad Log\left(\frac{p_{DEFAULTED=1}}{p_{DEFAULTED=0}}\right) = \beta_0 + \beta_1 DAYSTOFUND + \beta_2 AMOUNT + \beta_3 GENDERB + \beta_4 GROUP + \beta_5 AGRILOAN + \beta_6 TECHLOAN + \beta_7 REGION + \beta_8 DESCLENGTH$$

The variable of interest is *DAYSTOFUND* while controlling for *AMOUNT*, *GENDERB*, *GROUP, AGRILOAN, TECHLOAN*, and *REGION*. The parameter estimates of β_1 through β_6 represent the relative change in the probability of loan default for a unit change in the explanatory variables certeris paribus. β_7 is a categorical variable and a set of dummies for each of the seven geographical regions. β_0 is a intercept and the model includes no error term, since it does not model the loan, but a probability. Data are stratified on the amount of information given to the lender, measured by *DESCLENGTH*. The information asymmetry hypothesis can be supported in one of two ways. First, if the parameter estimate for *DAYSTOFUND* is negative and smaller as DESCLENGTH increases, this

indicates an increasing ability for lenders to make funding decisions based on potential loan success. Second, if the parameter estimate for *DAYSTOFUND* is statistically insignificant in stratifications of low information, and negative and significant in stratifications of high information, this indicates that lenders are unable to accurately predict loan success with small amounts of information shared. This ability increases when lenders have access to more information.

4.5.2. Models to Test the Identification Bias Hypotheses (H2)

To test the identification bias hypotheses, I employ logistic regression techniques. The unit of analysis in these models differs from the rest and is the loan funding transaction. Logistic regression models the mean of a binary distribution. The binary distribution in this case is the probability of the loan being a technology loan versus a non-technology loan.

$$(2)\ Log\left(\frac{p_{TECHLOAN=1}}{p_{TECHLOAN=0}}\right) = \beta_0 + \beta_1 PERSONALURL + \beta_2 TECHOCCUP + \beta_3 GENDERB + \beta_4 AMOUNT + \beta_5 GROUP$$

Equation 2 states that the probability of the loan being a technology loan is dependent on an intercept, β_0, which is the estimated logit of *TECHLOAN*=1 holding all explanatory values at 0. It is also dependent on the *PERSONALURL* and *TECHOCCUP*. *GENDERB* and *AMOUNT* are controls. Each of the explanatory variables has a β coefficient. A positive and significant parameter estimate for *PERSONALURL* and *TECHOCCUP* will support the technology identification bias hypothesis.

The logistic regression that tests the agricultural identification bias hypothesis is similar to the model for technology but it (1) does not consider the

PERSONALURL variable and (2) uses the *AGRIOCCUP* variable in place of the

TECHOCCUP variable. Determination of *AGRILOAN* comes from the [sector]

field in the Kiva database. The model is shown in Equation 3. A positive and

significant parameter estimate for AGRIOCCUP will support the agriculture

identification bias hypothesis.

(3) $Log\left(\frac{p_{AGRILOAN=1}}{p_{AGRILOAN=0}}\right) = \beta_0 + \beta_1 AGRIOCCUP + \beta_2 GENDERB + \beta_3 AMOUNT + \beta_4 GROUP$

A final logistic regression model tests the gender identification bias

hypothesis. The dependent variable is the gender of the borrower, *GENDERB*. A

positive and significant parameter estimate for *GENDERL* will support the gender

bias hypothesis. This model is shown below in Equation 4.

(4) $Log\left(\frac{p_{GENDERB=1}}{p_{GENDERB=0}}\right) = \beta_0 + \beta_1 GENDERL + \beta_2 AMOUNT + \beta_3 GROUP$

4.6. Results and Discussion

This section provides empirical results from the models and discusses their

implications.

4.6.1. Estimation Results for the Information Asymmetry Hypothesis (H1)

The base information asymmetry logistic regression model incorporates all loans

in the dataset, regardless of loan description length. The model is significant, as is

each variable within it with the exception of *TECHLOAN*. The base model

excludes regional dummies for Asia, Eastern Europe, Middle East, and Southeast

Asia, since these regions did not exhibit sufficient loan defaults to result in

accurate parameter estimates. The included regional dummies (Africa, Latin

America, and South America) account for 63.8% of loans in the dataset. Table 21

shows estimation results for the base information asymmetry logistic regression

model.

Table 21 Estimation Results for Base Information Asymmetry Logistic Regression Model

Variable	Odds Ratio	Coefficient	Std. Err.
DAYSTOFUND	0.9458	-0.0558***	0.00788
AMOUNT	1.0002	0.0002***	0.00004
GENDERB	0.7672	-0.2650***	0.04332
GROUP	0.1928	-1.6460***	0.10568
AGRILOAN	3.0923	1.1289***	0.04705
TECHLOAN	1.1001	0.0954	0.14830
R_AFRICA	699.2379	6.5500***	0.37920
R_LATINAM	330.5348	5.8007***	0.38148
R_SOUTHAM	195.5925	5.2760***	0.38051
DESCLENGTH	1.0005	0.0005	0.00003

Notes:

Model: Logistic regression

Dependent variable: $Log\left(\frac{p_{DEFAULTED=1}}{p_{DEFAULTED=0}}\right)$

N = 97,150, LR chi^2 = 5,287.43

AIC = 24,634, BIC = 24,739

Significance: * = p < .1, ** = p < .05, *** = p < .01

The negative coefficient for *DAYSTOFUND* reveals that for all loan

description lengths, greater funding time is associated with a lower probability of

loan default. This is a surprising finding. It suggests that the loans which fund

more quickly (in other words, the loans that are more desirable to lenders)

actually have a greater likelihood to default. Not surprisingly, the positive

coefficient for *AMOUNT* reveals that larger loans are more likely to default. The

negative coefficients for *GENDERB* and *GROUP* indicate that loans made to

women and loans made to groups are both less likely to default. A positive

parameter estimate for *AGRILOAN* reveals that agricultural loans have a greater

default rate than non-agricultural loans. Positive estimates for each of the regional

dummies show that loans made to Africa, Latin America, and South America are more likely to default.

To determine if the amount of information provided to lenders influences the ability for lenders to fund more successful loans, I stratified the loans according to the length of their loan description fields and analyze how the estimates compare each other and the base model. Rank orders were assigned to each loan based on the length of its loan description field, which ranged from 81 to 10,730 characters. Quintiles were created based on these rank orders. Loans in the top two quintiles were designated as "high information" (806-10,730 characters) loans in the bottom two quintiles were designated as "low information" (81-633 characters), and the middle quintile (634-805 characters) was discarded.

This stratification allows me to test the information asymmetry hypothesis, which states that as more information is provided, lenders will be more successful in predicting loan repayment potential. In the presence of low information, I expect that lenders will be less successful in predicting loan repayment success. The data would show this finding with an insignificant parameter estimate for DAYSTOFUND, indicating that in the presence of low information, lenders cannot predict loan repayment potential. In the presence of high information, I expect that lenders will be successful in predicting loan repayment success. The data would show this finding with a positive and significant parameter estimate for DAYSTOFUND, indicating that in the presence of high information, loans with a greater assessed success potential by lenders will not default. Lenders reveal their preferences and success potential by funding these loans more

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quickly, hence the use of DAYSTOFUND as a variable of interest. Table 22

shows the estimation results for the low information quintiles and Table 23 shows

the results for the high information quintiles.

Table 22 Estimation Results for "Low Information" (81-633 Characters) Logistic Regression Model

Variable	Odds Ratio	Coefficient	Std. Err.
DAYSTOFUND	0.9789	-0.0213	0.0187
AMOUNT	0.9980	0.0021***	0.0002
GENDERB	0.7399	-0.3013***	0.0969
GROUP	0.0566	-2.8715***	0.7108
AGRILOAN	5.7570	1.7504***	0.1095
TECHLOAN	0.4420	-0.8165	0.5841
R_AFRICA	718.3542	6.5770***	0.7118
R_LATINAM	835.2340	6.7277***	0.7161
R_SOUTHAM	257.2367	5.5500***	0.7223
DESCLENGTH	1.0003	0.0003	0.0004

Notes:

Model: Logistic regression

Dependent variable: $Log\left(\frac{p_{DEFAULTED=1}}{p_{DEFAULTED=0}}\right)$

N = 38,934, LR chi^2 = 1,350.15

AIC = 5,216, BIC = 5,310

Significance: * = p < .1, ** = p < .05, *** = p < .01

In the low information stratification, the signs of the statistically significant

coefficients remain unchanged from the base analysis. The key difference is an

insignificant *DAYSTOFUND* parameter estimate. This suggests that in the

presence of low information, there is no correlation between funding time and

loan repayment rates.

**Table 23 Estimation Results for "High Information" (806-10,730 characters)
          Logistic Regression Model**

Variable	Odds Ratio	Coefficient	Std. Err.
DAYSTOFUND	0.9716	-0.02874***	0.0187
AMOUNT	1.0004	0.00048***	0.0002
GENDERB	0.5548	-0.58906***	0.0969
GROUP	0.1507	-1.89262***	0.7108
AGRILOAN	2.4190	0.88333***	0.1095
TECHLOAN	1.1369	0.12828	0.5841
R_AFRICA	447.0675	6.10271***	0.7118
R_LATINAM	101.2300	4.61740***	0.7161
R_SOUTHAM	76.5909	4.33848***	0.7223
DESCLENGTH	0.9999	-0.00003	0.0004

Notes:

Model: Logistic regression

Dependent variable: $Log \left(\frac{p_{DEFAULTED=1}}{p_{DEFAULTED=0}} \right)$

N = 38,811, LR chi^2 = 3,139.52

AIC = 13,051, BIC = 13,145

Significance: * = p < .1, ** = p < .05, *** = p < .01

In the high information stratification, I again see no changes in the signs of the statistically significant coefficients. The key difference is a significant *DAYSTOFUND* parameter estimate. However, the sign is negative. As with the base case, I am faced with a puzzling conclusion: in the presence of high information, there is a significant negative correlation between funding time and loan repayment rates. I added another variable to the model to proxy for lender confidence in the loan. The variable was number of lenders per $1,000 funded. The idea is that fewer lenders per $1,000 funded means that few borrowers are contributing large amounts to fully fund the loan and are therefore more confident in the potential success of the loan, since risk is spread across fewer lenders. More lenders per $1,000 funded means that many borrowers are contributing small amounts to fully fund the loan and are therefore less confident in the potential success of the loan, since risk is spread across more lenders. This variable was

significant in the model, but had a negative parameter estimate, suggesting that as confidence increases, default rate increases. Other controls were considered, including the amount of competing loans available at the same time as the target loan and Kiva publicity events, such as a feature on Kiva aired on the Oprah Winfrey show in September 2007 (Ly and Mason 2011). Neither of these exhibited any significant changes in the model or other parameter estimates.

Based on my analysis, I can confidently state that with Kiva's current model, lenders are unable to predict successful microloan repayment. On the contrary, lenders fund more rapidly and show more confidence in loans that eventually default in the presence of more information, but not in the presence of less information after controlling for several factors including amount, gender, group, purpose, and region. The information asymmetry hypothesis (H1) is not supported by my analysis of the data.

I conducted a sensitivity analysis on the results by running models containing the first and fifth quintiles independent of the second and fourth. Appendix D contains the tabled results of these two new stratifications. It is interesting to note that the fifth quintile reveals an insignificant impact of *DAYSTOFUND* on default rate in the 'very high information' stratified model, which deviates from the results from the top two quintiles. The first quintile had an insignificant parameter estimate for *DAYSTOFUND*, which aligns with the findings using the bottom two quintiles.

There is a plausible alternative explanation for the inverse relationship between loan funding time and loan default rate. Not only does the loan

description field have the potential to reduce information asymmetries between lenders and MFIs, it can also strengthen identification biases. As an example, not only can a long description inform a lender about a change in the competitive climate that indicates the potential success of the loan, it can also describe that the lender is trying to increase their revenues to send their child to school. The text referring to the competitive climate indicates loan success potential to the lender and the text referring to the education of their child has no bearing on loan success, but it can lead to decisions influenced by identification biases.

It is interesting to note that of the 97,150 loans in the dataset, 3,497 of them defaulted. This Kiva loan repayment rate of 96.4% is lower than the 98-99% microfinance repayment rates that other studies claim (Turnell 2005, Armendariz de Aghion and Morduch 2000, CSFI 2011). Grameen Bank in Bangladesh boasts a 98.35% repayment rate (Yunus 2007a). The average (weighted on loan portfolio size) loan repayment rate for 1,026 MFIs listed on MixMarket.org in 2009 was 98.52%[53]. Since all of these repayment rates are greater than Kiva's, this suggests evidence of opportunism: MFIs are taking advantage of their information-advantaged status by selectively choosing riskier loans to list on Kiva.

4.6.2. Estimation Results for the Identification Bias Hypotheses (H2)

Separate logistic regression models were run to test the technology, agriculture, and gender identification biases.

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[53]http://www.mixmarket.org/mfi/indicators

Table 24 Technology Identification Bias Logistic Regression Results

Variable	Odds Ratio	Coefficient	Std. Err.
TECHOCCUP	1.2346	0.2107***	0.0187
PERSONALURL	1.1375	0.1289***	0.0002
GENDERB	0.4410	-0.8188***	0.0969
AMOUNT	1.0003	0.0003***	0.7108
GROUP	0.3822	-0.9617***	0.1095

Notes:

Model: Logistic regression

Dependent variable: $Log\left(\frac{p_{TECHLOAN=1}}{p_{TECHLOAN=0}}\right)$

N = 2,544,571, LR chi^2 = 16,504.47

AIC = 386,370, BIC = 386,446

Significance: * = p < .1, ** = p < .05, *** = p < .01

Table 24 shows estimates for the technology identification bias model. The positive and significant coefficients for *TECHOCCUP* and *PERSONALURL* reveal that lenders with technology occupations and lenders with personal URL fields in their Kiva profile are more likely to fund technology loans. Lenders with technology occupations are 24% more likely to fund technology loans and lenders with personal URL fields are 14% more likely to fund technology loans. This finding supports hypothesis 2a. The control variables in the model indicate that technology loans are on average less likely to be requested by female borrowers, are larger in amount, and are less likely to be made to a group.

Table 25 Agriculture Identification Bias Logistic Regression Results

Variable	Odds Ratio	Coefficient	Std. Err.
AGRIOCCUP	2.5128	0.9214***	0.020774
GENDERB	0.5941	-0.5207***	0.003904
AMOUNT	0.9999	-0.0001***	0.000002
GROUP	0.9508	-0.0504***	0.005173

Notes:

Model: Logistic regression

Dependent variable: $Log\left(\frac{p_{AGRILOAN=1}}{p_{AGRILOAN=0}}\right)$

N = 2,544,571, LR chi^2 = 25,150.74

AIC = 2,282,774, BIC = 2,282,838

Significance: * = p < .1, ** = p < .05, *** = p < .01

Table 25 shows estimates for the agriculture identification bias model. The positive and significant coefficient for *AGRIOCCUP* reveals that lenders with agricultural occupations are more likely to fund agricultural loans. Lenders with agricultural occupations are 2.5 times more likely to fund agricultural entrepreneurs on Kiva. This finding supports hypothesis 2b. While all four of the explanatory variables are significant, they are together explaining only 1% of the variance in *AGRILOAN*. The control variables in the model indicate that agricultural loans are on average less likely to be made to female borrowers, are smaller in amount, and are less likely to be made to a group.

Table 26 Gender Identification Bias Logistic Regression Results

Variable	Odds Ratio	Coefficient	Std. Err.
GENDERL	1.8472	0.6137***	0.008566
AMOUNT	0.9994	-0.0006***	0.000007
GROUP	159.6318	5.0729***	0.007842

Notes:
Model: Logistic regression
Dependent variable: $Log\left(\frac{p_{GENDERB=1}}{p_{GENDERB=0}}\right)$
N = 404,950, LR chi^2 = 68,858.20
AIC = 373,726, BIC = 373,769
Significance: * = p < .1, ** = p < .05, *** = p < .01

Table 26 shows estimates for the gender identification bias model. The positive and significant coefficient for *GENDERL* reveals that female lenders are more likely to fund female borrowers than male borrowers. The odds ratio indicates that female lenders are 1.85 times more likely to fund female borrowers than male borrowers. This finding supports hypothesis 2c. The control variables in the model indicate that loans made to females are smaller in amount and more likely to be made to a group than loans made to males.

All three H2 hypotheses are supported by the data with positive and significant parameter estimates. There is evidence that identification links between lenders and borrowers influence microloan funding decisions. To determine if the outcomes of loans funded with identification bias differ from those funded without identification bias, I compared sets of lender and loan characteristics from the technology identification bias hypothesis sample. Using a subsample of 1.05 million loan funding transactions, I found that loans funded by lenders with identification links to the borrowers experienced higher default rates. I also find that less technologically-savvy lenders fund more successful technology loans than technology-savvy lenders. The difference (5.48% to 4.80%) amounts to an improvement of 14.2%. These findings are presented in Table 27.

Table 27 Default Rate Effects of Identification Bias

Lender Characteristics	Loan Characteristics	ID Link Exists?	Default Rate
$TECHOCCUP = 1$	$TECHLOAN = 1$	Yes	3.80%
$TECHOCCUP = 1$	$TECHLOAN = 0$	No	2.79%
$PURL = 1$	$TECHLOAN = 1$	Yes	4.51%
$PURL = 1$	$TECHLOAN = 0$	No	2.88%
$TECHOCCUP = 1$ AND $PURL = 1$	$TECHLOAN = 1$	Yes	5.48%
$TECHOCCUP = 1$ AND $PURL = 1$	$TECHLOAN = 0$	No	2.57%
$TECHOCCUP = 0$ AND $PURL = 0$	$TECHLOAN = 1$	No	4.80%

Identification bias in P2P social microlending introduces loan funding decision inefficiencies. Although Kiva could implement business model changes to eliminate identification bias, there are other factors to consider. Identification theory (Schervish and Herman 1988) states that identification with others and the needs of others is the primary motivation for charitable giving. If that identification bias is removed, donations will decline. Although identification bias

reduces effectiveness, it may result in a greater overall amount lent to borrowers on Kiva (Riggins and Weber 2011b).

4.7. Conclusion

This section summarizes the findings of the paper, presents contributions to both theory and practice, and notes some of the limitations of the study.

4.7.1. Contributions to Theory

The newly introduced ICT-enabled social lending theory draws from information asymmetry and information theories. The theory is supported by data from loans made on Kiva.org. Data fit to logistic regression models reveal that borrowers do not make lending decisions on the potential success of the loan. Lending decisions are biased on identification links between lenders and borrowers. The biases are occupation-based and gender-based. These findings are discouraging to the cause of microfinance. If the goal of microfinance is poverty reduction, then loan funding decisions should reflect that and the data would reveal connections between funding decisions and loan success. That is unfortunately not the case with Kiva, which may be a reason for its default rate which is higher than the microfinance industry average estimates. The findings in this paper permit me to make recommendations to Kiva and peer-to-peer social microlending. Kiva uses a unique approach to bringing Western participation to poverty reduction and some minor changes may help Kiva accomplish more global poverty reduction.

The ICT-enabled social lending theory exhibits external validity to other forms of social lending, not just international aid-based microlending. Consider LendingClub.com, which is an online P2P lending site in which both lenders and

borrowers reside in the U.S. Similar to Kiva, lenders can make capital funding decisions based on loan use and a bio of the borrower. There is anecdotal evidence that identity theory plays a role in funding decisions at LendingClub. A recent article cites an example of a LendingClub borrower who surprisingly found that most of her lenders had ties to Davis, CA, where she attended college (Bogoslaw 2009).

4.7.2.   Contributions to Practice

Based on these findings, I recommend that better information should be offered on Kiva's website that allows individuals to base funding decisions on loan success or poverty reduction potential instead of mere personal identification with lenders. Simply adding more information would not mitigate the problem, since the data reveal that more information results in poorer loan funding decisions. What I suggest here would increase *transparency* in the microfinance market. Transparent markets are characterized by complete and unbiased information (Porter 2001, Granados et al. 2006, 2010). Organizations like MixMarket (www.mixmarket.org) have organizational goals to increase transparency among microfinance institutions, but I suggest that transparency should be a characteristic of other intermediaries like P2P social microlenders. Metrics could be made available based on past success of loans with respect to loan use, activity, sector, country, gender, and the administering MFI. This will have the effect of selecting loans that are more likely to be repaid and ultimately reduce poverty. Today, the only non-biographical information readily available and presented on the loan request page is the loan repayment rate of the administering MFI. Future

researchers can test if the diminishing of information asymmetries between the lender and the MFI reduce the influence of identification bias through experimentation and thus determine if reducing information asymmetries between MFIs and lenders aids lenders in making more effective funding decisions. I recognize that MFIs in particular may oppose a rating system.

Also based on these findings, I recommend that Kiva should allow lenders to receive a portion of the interest paid to MFIs. This for-profit model exists at Denmark-based MyC4 (www.myc4.com). Not only would interest earned increase the incentive to use Kiva, but it also provides more incentive for a lender to make optimal capital decisions. Rates of return could vary from loan to loan with respect to risk-levels. This can differentiate lenders into risk-takers and risk-averse, which would add value to future research. Also, 80% of payments to Kiva lenders are *re-loaned* to new borrowers. "This means that eight out of ten lenders choose to reinvest their loan funds into a new business after they are repaid by a borrower on [Kiva's] site" (Flannery 2007, p53). If interest is earned by lenders, the re-loan amount can be higher still. This was a part of Kiva's original business plan (a for-profit model) and still the desire of Kiva founder and CEO, Matt Flannery. Unfortunately, this desire is not shared among Kiva lenders. In a recent survey, Kiva revealed that 50% of current lenders would cease to provide capital for Kiva loans if they had the opportunity to receive interest payments along with loan repayments (Flannery 2007).

An alternative to charging interest is for Kiva to regulate the portfolio of loans for which the MFI opts to fund through Kiva. Kiva can ensure that the loans that

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the MFIs opt to fund themselves possess the same risk profile as the loans funded through Kiva. This would have the effect of reducing opportunism due to information asymmetries, while not punishing the MFIs in riskier markets who have larger default rates by nature.

4.7.3. Limitations

My study only tested the identification bias in select context. The identification link hypothesis could be tested by future research in areas other than gender and occupation. Nationality, race, income level, and geographic location of the lender among other traits may influence lending decisions. It could be determined that African-American lenders lend to African entrepreneurs or lenders in desert climates lend to entrepreneurs living in desert climates themselves. Another limitation of this research is a lack of data on the ultimate effectiveness of the loan on poverty reduction. Loan repayment rate acts as a proxy for poverty reduction success since only repaid loans have potential for poverty reduction, but the proxy is not a strong predictor of poverty reduction. Another dataset is required to incorporate elements of poverty reduction into the study. My data also lacks information on how funding decisions relate to loan performance in the presence of perfect information and lack of identification theory biases. A large effort of manual coding would be necessary to determine if the loan description field indicates loan success potential, enhances identification-biases, or both. Many of the technology loans are listed for multiple purposes (e.g. "To purchase more utensils, rechargeable phone cards, and clothes to sell"). The success of these loans is not solely dependent on the portion of the loan used to designate it

as a technology loan, but in my analysis, I treat them as if they are. A final

limitation is that some loans listed on Kiva's website are *pre-disbursed*, meaning

that Kiva funds were already released to the borrower before the loan was posted

on Kiva's website for potential lenders to browse. Kiva discloses when funds for a

loan are pre-disbursed, but this suggests that lenders are less responsible for

capital funding decisions.

Reviewers challenged my use of funding time as a variable of interest,

pointing out that its variance is minimal and the practical difference to a borrower

of waiting 1.2 days vs. 3.8 days for a loan to be fully funded and distributed to

them is minimal. The larger issue is that the current market mechanism for

funding P2P microloans has fallacies. The system favors loans which are more

likely to fail. Another point to consider is that Kiva is working to add more field

partners and incorporate more loans on their website due to their exponential

growth. Loans may fund in an average of 1.8 days when there are only 100 loans

available on the website at any given time, but consider if 1,000 loans were

available at any given time. It is likely that the duration to fund loans would

increase in a direct relationship with the number of loans available for lenders to

browse. The suggested 1.2 days to 3.8 gap will increase to, for example, a 5 day

to 40 day gap. In this case, the practical issues of a longer funding duration are

more likely to be felt by borrowers waiting for their dispersed loan funds.

4.7.4. Future Research

In the development cycle for this paper, I recognized areas where additional

research could benefit the microfinance industry. A manual coding effort of the

loan description text for Kiva loans could reveal how the quality of information provided to lenders alters loan funding decisions. On the lender's side, P2P social microlending portfolio analysis can reveal patterns of lending and categorization of risk seeking versus risk averse lenders. There may be lenders who will fund a loan regardless if it is doomed to failure or lenders who are extremely selective in their funding decisions. Furthermore, lenders could be surveyed to determine their motivation for lending and motivation for lending to specific loans. P2P social microlenders could incorporate surveys of this nature on their websites and collect data from a sample of lenders who have just completed a lending transaction.

Kiva itself recognizes that they do more than simply facilitate loans between lenders and entrepreneurs; they also create an experience for users browsing their site. Identification links are more likely to be an impetus for return visitors than poverty reduction. Kiva's product philosophy states, "Every time you load our website, it should be different. Every minute, loans are being purchased and repaid, and stories are being told about the borrowers. This can lead to a dynamic where philanthropy can actually become addictive" (Flannery 2007). Consider a Kiva user who spent a week in Phnom Penh and visited an Internet café daily. She browses on the site to a woman entrepreneur in Cambodia wishing to start up an Internet café. Identification-rich experiences like these will more likely lead to a *flow* (Csikszentmihalyi 1975) state of mind suggested in Kiva's product philosophy than metrics about poverty reduction potential. I understand and accept that Kiva relies on identification links to create a rich experience and even fund loans, but I suggest that offering lenders more information on loan

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repayment and poverty reduction potential can provide a necessary balance to

loan funding decisions.

Chapter 5. Summary and Conclusions

The three essays included in this dissertation aim to illuminate how changes in ICT impact the microfinance industry. Each study proposes and answers detailed separate research questions. These research questions build upon the general research question: What are the impacts of ICTs on the microfinance industry? I understand from this research that the impacts are far-reaching and impact many different market players in different ways.

5.1.   Summary of Findings

The first study occurs at the industry level and answers the question: What is the impact of ICT on intermediation in the microfinance industry? Through an analysis of past, current, and future predicted intermediation structures, I find that the traditional market structure was simple. Information flowed from right to left and the market was supply-driven. ICTs cause the market to become more demand driven, shift intermediation towards information instead of only funds, and adds complexities and new players to the industry, such as mobile service providers, correspondent banks, transparency promoters, P2P social microlenders, and commercial banks.

The second study is at the organizational MFI provider level and answers the question: How does ICT impact MFI operations? The study uses quantitative methods and pattern matching analysis of interview, e-mail, and observational research materials to determine how MFI operations mediate the relationship between ICT adoption and two types of outreach: poverty and geographic. Policy, database, and software-related ICT adoption activities impact poverty outreach

due to their support of flexibility and information. Infrastructure, networking, hardware, and telephony ICT adoption activities impact geographic outreach since these areas support connectivity.

The final study is at both the microloan and microloan funding transaction level. It asks the question: How does ICT impact decision rights in P2P social microlending? This study finds through quantitative empirical analysis that a gap exists between loan funding decisions and loan default rate, revealing that lenders are unable to predict potential loan success. Lenders also base their loan funding decisions with an element of identification bias based on perceived connections with borrowers.

Collectively, these studies reveal that ICTs impact the microfinance industry at three levels of analysis (industry, organization, and loan). Theorists will benefit from this research since I proposed two new theories. First, I proposed the *ICT-enabled MFI outreach theory* in Chapter 3. This theory states that ICT adoption among MFIs will result in direct improvements to MFI operations, which serves as a mediator between ICT adoption and outreach impact. In Chapter 4, I proposed the *ICT-enabled social lending theory*, demonstrating that in Internet-based social microlending platforms, lenders access a rich media channel with personal information of borrowers. Since lenders have a lack of local business knowledge, lenders will base their funding decisions on personal identification with borrowers, not on potential loan success.

Kauffman and Riggins (2012) recommend that future research is necessary on the impact of ICT in microfinance at the level of the customer, donor, MFI, and

industry. This dissertation addresses all of these areas of future research concerns, albeit with admittedly minimal content dedicated to the impact on customers (borrowers). Chapter 2 primarily addresses industry issues, Chapter 3 primarily addresses MFI issues, and Chapter 4 addresses lender, loan, and P2P social microlender issues. As end-user customers adopt more advanced technologies such as mobile banking and smartphones with Internet connectivity, research on their impacts will be of great importance. Figure 13 summarizes the dissertation with information on each of the three main chapters along with their findings. The inverted triangle graphically depicts the flow of my research from broad to specific with space left at the bottom of the triangle for future research on customer impact.

Figure 13 Summary of Dissertation Research and Findings

Microfinance Industry Level
(Chapter 2)

RQ: What is the impact of ICTs on market structure and intermediation in the microfinance industry?
Method: Exploratory market structure analysis
Finding: ICTs have added many new players to the market, shifted the roles of many intermediaries, and disintermediated some player roles. Risks currently facing the microfinance industry will create ICT-enabled opportunities for new market participants.

MFI Organizational Level
(Chapter 3)

RQ: What is the impact of ICTs on MFI outreach?
Method: Qualitative case studies with pattern matching analysis
Finding: ICTs that strengthen financial flexibility and knowledge impact poverty outreach. ICTs that enable coordination and connectivity impact geographic outreach. All impacts are mediated through MFI operations.

Loan/Lender Level
(Chapter 4)

RQ: What is the impact of ICTs on decision-making rights among P2P social microlenders?
Method: Logistic Regression
Finding: Lending decisions in P2P microlending websites are biased by identification links between lenders and borrowers

Customer Level

(Reserved for future research)

5.2. Future Research

This research is by no means an exhaustive study of ICT's impact in the microfinance industry. Since this is a newly forming topic among researchers, especially in the IS discipline, it can be used as a springboard for many other studies.

The predicted model in essay #1 can be refined by utilizing sources beyond an industry risk analysis that would inform changes in intermediation market structures. Another future study could look at the spillover effects of ICT-enabled market structures changes into other related industries. The findings in essay 2 can be triangulated with a separate quantitative study to determine the strength of ICT adoption activities on MFI operations and outreach. Future researchers can also expand on this body of knowledge by exploring *how* MFIs should adopt technology. Since the end-result of microfinance is poverty alleviation, the research presented in essay #3 can be expanded by exploring the impact of loan funding decisions on end-user impact. Another interesting study would look at the nature of the relationship between Kiva lender activity and the type and amount of information provided to lenders.

5.3. Conclusions

This research makes some initial and important contributions to several disciplines: information systems, IT value, development, philanthropy, and psychology. The main finding of this research is that ICTs have been a powerful force to many players in the short history of the microfinance industry. It has

increased the complexity of the industry, enabled MFIs to extend their outreach, and shifted decision rights to lenders. Each of these changes comes with its own benefits and challenges.

Given the infancy of the industry and that many microfinance players are behind other industry counterparts in traversing stages of technology adoption, the timing is appropriate for a ramp up of academic research. I hope this will set the stage for a new stream of research that will provide value to theorists, academics, practitioners, and ultimately add value to the poor and aid the microfinance industry in its quest to alleviate global poverty though empowering the world's poor.

5.4. Reflections

I found the dissertation process challenging, rewarding, and of course frustrating at times. I take great pride in what I have researched and discovered. Surrounding myself with a supportive committee and family were paramount to my completion. My wife spent the past four years as our breadwinner and as my 'sugar mama.' She was a sounding board for my frustrations and even edited several of my papers. Although she did recently state that after seeing me go through this PhD process, she would never want the experience for herself!

Prior to my dissertation research, all of the knowledge I possessed about microfinance was gleamed from books, articles, and conversations. I came to the realization that I needed firsthand experience in the microfinance industry to frame the literature I was reading. Due to this knowledge gap, I served in the Kiva Fellows Program in Fall 2011. This experience afforded me the opportunity to

work directly with two MFIs in Cambodia. Furthermore, this process allowed me to observe operations at MFIs, meet with borrowers, and build relationships with MFI staff. Regardless of one's dissertation topic, I believe it is vital to understand problems from the perspective of industry participants and work with non-academic outsiders. I see this strategy employed by my fellow PhD colleagues and I respect their approach to research.

Frequent meetings with my committee members, Fred Riggins, Uday Kulkarni, and Jane Carey were another key component of my dissertation process. It often took me verbalizing my thoughts to one of my committee members to be able to understand and state my thoughts more clearly. They asked me thought-provoking questions and each one of my three essays is shaped and positively changed as a result of their challenges and recommendations. There were many times when I thought my work was 'good enough' yet they challenged me to go further and improve my research in the process.

I also found many technologies helpful in my dissertation. I shudder to think about writing my dissertation and citing as many sources as I did if each of those citations meant a trip to the library to check out a book or copy an article. I am coddled by statistics software, *Google Scholar*, *Google Books*, other web resources, and separate monitors for PDF viewing, web browsing, and document creation. Although I am biased as an information systems student, I would encourage other PhD students to learn and make use of technologies that save time and improve productivity.

The microfinance industry is truly unique and special, but there is much that academics and practitioners still need to learn about the microfinance industry. It is my hope that someday my dissertation will sit among thousands of other PhD student dissertations on microfinance, each providing unique insights to aid MFIs and other industry players mitigate poverty. Although I am glad that I only have to write one dissertation in my life, I am glad to have chosen my specific topic and will look back on the process as a life-shaping experience.

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APPENDIX A

LIST OF PREPARED QUESTIONS FOR IN-DEPTH INTERVIEWS

LIST OF PREPARED QUESTIONS FOR IN-DEPTH INTERVIEWS

1. Do you feel limited by your MFI's technological capabilities? In what ways?

2. What internal processes are improved by investments your MFI has made in technology?

3. What is a technology you would like to see used at your MFI? What is it and how would it help?

4. Which staff members at your MFI rely most on ICT and which ones rely the least on ICT?

5. What changes in ICT have you seen in your tenure at your MFI?

6. How has ICT enabled your MFI to lend to poorer borrowers?

7. How has ICT enabled your MFI to lend to more geographically distant borrowers?

8. How are you planning on using ICT to lend to poorer borrowers?

9. How are you planning on using ICT to lend to more geographically distant borrowers?

10. How do you anticipate your MFI's loan portfolio changing due to changes and investments in ICT?

11. How has your MFI's loan portfolio changed due to ICT used at your branch?

12. How has your MFI's loan portfolio changed due to your borrowers' use of ICT?

13. How do you anticipate your MFI's loan portfolio changing due to your borrowers' use of ICT?

APPENDIX B

CORRELATION MATRIX OF VARIABLES IN KIVA LOAN DATA

CORRELATION MATRIX OF VARIABLES IN KIVA LOAN DATA

	daysto~d	loan_a~t	female	group	agriloan	techloan	textle~h
daystofund	1.0000						
loan_amount	0.3074	1.0000					
female	−0.0939	−0.0670	1.0000				
group	0.1844	0.5579	0.1001	1.0000			
agriloan	−0.0288	−0.0328	−0.0971	−0.0422	1.0000		
techloan	0.0002	0.0063	−0.0493	−0.0166	−0.0475	1.0000	
textlength	−0.0010	0.1024	0.0274	0.1647	0.0150	−0.0025	1.0000
r_africa	−0.0432	0.0722	0.0438	0.1230	−0.1447	0.0174	−0.0984
r_asia	0.0708	0.0417	−0.2196	−0.0407	0.1376	0.0014	−0.0947
r_easteur	0.0132	0.0549	−0.0186	−0.0543	0.0106	0.0032	0.0296
r_latinam	0.0180	−0.0302	−0.0098	0.0005	−0.1323	−0.0186	0.0435
r_mideast	0.0095	0.0586	−0.1390	−0.0344	−0.0415	0.0178	−0.0729
r_seasia	−0.0475	−0.1556	0.1260	−0.0631	0.2486	−0.0440	−0.0591
r_southam	0.0154	0.0275	0.0558	−0.0116	−0.0780	0.0314	0.2125

	r_africa	r_asia	r_east~r	r_lati~m	r_mide~t	r_seasia	r_sout~m
r_africa	1.0000						
r_asia	−0.2362	1.0000					
r_easteur	−0.0987	−0.0581	1.0000				
r_latinam	−0.2423	−0.1426	−0.0596	1.0000			
r_mideast	−0.0730	−0.0430	−0.0179	−0.0441	1.0000		
r_seasia	−0.3204	−0.1885	−0.0788	−0.1934	−0.0583	1.0000	
r_southam	−0.3399	−0.2000	−0.0836	−0.2052	−0.0618	−0.2713	1.0000

APPENDIX C

DESCRIPTIVE STATISTICS FOR LOAN FUNDING TRANSACTIONS

DESCRIPTIVE STATISTICS FOR LOAN FUNDING TRANSACTIONS

There were 2,545,226 loan funding transactions used to test the occupation

identification bias hypotheses (H2a and H2b). Of these, 181,727 contained

lenders with technological occupations and 39,020 were funding transactions for

technology loans. The dataset has 3,507 occurrences of lenders with technology

occupations lending to borrowers with technology-purposed microloans.

Additionally, there are 7,586 occurrences of lenders with personal URL fields in

their profiles lending to borrowers with technology-purposed microloans.

Considering agriculture, there were 10,564 loan funding transactions with

lenders in agricultural occupations and 428,757 agriculture microloans. The

dataset has 3,588 occurrences of lenders in agricultural occupations lending to

agricultural microloans.

A different dataset was used to test the gender identification bias hypothesis

(H2c) with 405,505 loan funding transactions. The table below summarizes the

gender of the lenders and borrowers in this dataset.

		Lenders	
		Male (n = 252,295)	Female (n = 152,760)
Borrowers	Male (n = 96,006)	68,985	27,021
	Female (n = 264,181)	154,315	109.866

This sample is biased toward male lenders, sice the determination of lender

gender was based on a keyword search of the 30 most common male names and

30 most common female names. Since male names have less variety, the sample

shows more males lenders than females. The converse is true for the population.

There are actually more female lender participants on Kiva than males. After

normalizing the table to give equal weight to males and females among both

lenders and borrowers, I summarize the data into percentages. The table indicates

that females have a greater bias of lending to borrowers of their own gender than

males.

		Lenders	
		Male	**Female**
Borrowers	**Male**	29.3%	18.9%
	Female	23.8%	28.0%

APPENDIX D

SENSITIVITY ANALYSIS OF STRATIFIED MODELS

SENSITIVITY ANALYSIS OF STRATIFIED MODELS

Estimation Results for 1st Quintile "Very Low Information" (81-472 Characters) Logistic Regression Model

Variable	Odds Ratio	Std. Err.
DAYSTOFUND	1.0236	0.0243
AMOUNT	0.9961***	0.0004
GENDERB	0.2832***	0.0394
AGRILOAN	5.1689***	1.2558
TECHLOAN	0.6073	0.4427
R_AFRICA	125.0997***	91.13211
R_LATINAM	223.9053***	170.8992
R_SOUTHAM	125.5799***	110.9546
DESCLENGTH	0.9871***	0.0009

Notes:

Model: Logistic regression

Dependent variable: $Log\left(\frac{p_{DEFAULTED=1}}{p_{DEFAULTED=0}}\right)$

N = 18,565, LR chi^2 = 822.74

Significance: * = p < .1, ** = p < .05, *** = p < .01

Estimation Results for 5th Quintile "Very High Information" (1,054-10,730 Characters) Logistic Regression Model

Variable	Odds Ratio	Std. Err.
DAYSTOFUND	0.9910	0.0102
AMOUNT	1.0004***	0.0001
GENDERB	0.4259***	0.0324
GROUP	0.1868***	0.0274
AGRILOAN	1.7872***	0.1612
TECHLOAN	1.1601	0.2611
R_AFRICA	181.7482***	81.8771
R_LATINAM	62.7097***	28.7625
R_SOUTHAM	36.3607***	16.4673
DESCLENGTH	0.9999***	0.0001

Notes:

Model: Logistic regression

Dependent variable: $Log\left(\frac{p_{DEFAULTED=1}}{p_{DEFAULTED=0}}\right)$

N = 19,457 LR chi^2 = 1,508.52

Significance: * = p < .1, ** = p < .05, *** = p < .01