A Study of ICT Adoption and its Impact on Selected MFIs of Gujarat

Nityesh Bhatt [1]
Ritesh Patel [2]
Amandeep Kaur [3]

Abstract

The microfinance sector is considered as an important vehicle for financial inclusion in developing countries, including India. Despite significant efforts by various microfinance institutions (MFIs) and Government of India, microfinance penetration has grown little over 50% of the Indian population. Information and communication technology (ICT) has changed the scope and functioning of the microfinance industry and can play a catalytic role in its pursuits of social objective and sustainability. This paper presented a brief overview of the microfinance sector in India. It focused on the role of ICT in strengthening MFIs' operations. The Government of India's role in digital enablement was also discussed. Primary research was also conducted with the aim to study the adoption of ICT and measure its impact on the performance of selected MFIs of Gujarat State. It was found that ICT has been largely adopted by the MFIs and it was found to be beneficial for the core functions of the selected MFIs. However, there were some constraints in the adoption of ICT that need to be addressed.

Keywords : **financial inclusion, ICT, microfinance, MFI, JAM**

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Individuals of the low-income group are mostly devoid of the organised financial sector. Due to this, poor people are compelled to accept unorganized, community-based financial setups for their varying requirements. After independence, the Indian government started emphasizing on improving access to financial markets to fight against poverty. Based on feedback of All India Rural Credit Survey in 1950s, the government initiated measures to review the cooperative structure. This 'social banking' intervention paved the way for the establishment of Regional Rural Banks and National Bank for Agriculture and Rural Development (NABARD) in 1975 and nationalization of banks in 1969 and 1980. During the initial plans, lead was given to state-run banks to increase the outreach to poor with targeted low-priced loans (Reddy, 1999). However, they failed to shatter the presence of local moneylenders (Morduch & Rutherford, 2005). Provision of financial services to the excluded section can lead to attainment of poverty reduction. Moreover, the objectives of improved healthcare, hygiene, and education can be sustained with the increased earnings of households and control of financial resources (Littlefield, Morduch, & Hashemi, 2003). The study was conducted in September 2019.

[1] *Professor,* Institute of Management, Nirma University, S.G. Highway, Ahmedabad – 382 481, Gujarat. (E-mail : nityesh@nirmauni.ac.in) ; ORCID ID : 0000-0003-4215-2355

[2] *Assistant Professor (Corresponding Author),* Institute of Management, Nirma University, S.G. Highway, Ahmedabad – 382 481, Gujarat. (E-mail : ritesh@nirmauni.ac.in) ; ORCID ID : 0000-0003-1308-009X

[3] *Doctoral Student,* Institute of Management, Nirma University, S.G. Highway, Ahmedabad – 382 481, Gujarat. (E-mail : amandeepsidhu@nirmauni.ac.in)

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Grameen Bank in Bangladesh has made the 'finance for poor' a point of discussion for the whole world. The rise of the microfinance industry across the globe has overturned the idea of the low-income groups as consumers of financial services, including banks. Through its newly developed professional arm, the State-owned Rakyat Bank of Indonesia serves millions of rural and urban borrowers (Morduch & Rutherford, 2005). As per Reserve Bank of India's (RBI) report of 2005, microfinance is an economic development tool whose objective is to assist the poor to work their way out of poverty. It encompasses a gamut of offerings in the form of credit, savings, insurance, money transfers, and advisory services.

The concept of microfinance has evolved mostly from the efforts of non - government organisations (NGOs). There are various channels and models for providing microfinance services that have been deployed across the globe. Prominent among these are Grameen village, credit union, co-operatives, self-help groups (SHG), commercial banks, NBFCs, and NGOs. In India, it started with the SHG - bank linkage channel during the early 1990s by the efforts of NABARD. Afterwards, numerous NGOs and community-based organisations started delivery microfinance through SHGs. The MFI was introduced in India in 1974 with the establishment of SEWA Bank in Ahmedabad, but the concept became prominent in the 1990s only.

Challenges Faced by the Microfinance Sector

A unique challenge for MFIs is to provide social service while meeting their financial goals. MFIs mostly work with the assistance of donors' money. The MFIs are required to achieve self-sufficiency to run successfully in the end. This also helps them to expand their scope of activities and increase the outreach. Louis, Seret, and Baesens (2013) found a significant relationship between financial performance and outreach. MFIs have to search for sustainable business models after having new entrants in the market, which may cause a shift in their mission from outreach to obtain financial results (Serrano - Cinca & Gutiérrez - Nieto, 2014). In India, as per the MFIN report (2016), spread of cost of funds ranged from 9.94% –18.87%, which is too high to meet the dual goal of social service and sustainability.

Now, traditional banks, for expanding their customer base, have also started to explore the feasibility of serving the low-income group credit needs (Rangan, Quelch, Herrero, & Barton, 2007). Initially, major focus of MFIs was on entrepreneurial lending, which still remains important (Nourse, 2001). This, however, has improvised to offer complementary services like personal loans, saving accounts, insurance, and business awareness and training. Woller (2002) argued that MFIs need to customize their offerings as per the customers' needs.

Managing money is a serious issue for poor people (Ruthven, 2002). If they are able to manage money, they get a good chance to improve their livelihood. The financial condition of the poor is highly vulnerable to both micro and macro-economic conditions. They want financial services to be reliable, convenient, continuous, and flexible to meet their vulnerable financial needs (Morduch & Rutherford, 2005).

The major characteristic that differentiates microfinance from formal financial sector is that microcredit is mostly extended without traditional collateral because of the inability of the poor to provide the same. Because of the absence of physical capital amongst the borrowers, the community takes the responsibility for loan payment in case of default (Wenner, 1995).

The feasibility of micro enterprise and capabilities to make it viable are difficult to measure. Moreover, rural people's inability to provide collateral, no credit history, and scattered over distant locations make them unattractive for MFIs and involves a huge risk in serving them. These markets are underserved due to their remote location, low population density, and small size of transactions. Therefore, MFIs are mostly focused on urban areas to cover large markets.

Sravani (2013) studied the impact of technology in microfinance industry in India. The researcher found that the use of information and communication technology (ICT) has made the Indian microfinance industry efficient

and effective. Riggins and Weber (2016) studied the impact of ICT on microfinance in Africa and concluded that the ICT has led to better management of MFIs as a whole. Adebayo, Ademola, Olufemi, and Chidozie (2017) also found a positive impact of ICT on the performance of MFIs in Nigeria.

ICT and Microfinance

ICT is providing a big boost to economic development in developing countries (Dewan & Riggins, 2005). United Nations (UN) declared the Millennium Development Goals in 2000 and one of the goals is to "create a global partnership for economic development." The role of ICT in economic development and social inclusion is reflected in the actions taken by the United Nations, The World Bank, and NGOs in partnership with developing economies to bridge the digital divide among its citizens (Warschauer, 2004). This also involves cooperation with the private sector to provide the benefits of new technical innovations to promote economic development (Kauffman & Riggins, 2012).

MFIs leverage ICT to increase their outreach and survive in a competitive environment. ICT largely helps the MFIs to increase their operational efficiency and expand their outreach by including new customers through better risk analysis. The capital investment in ICT in developing countries at the macro level can only be productive if other complementary capabilities like supporting infrastructure are available (Dewan & Kraemer, 2000).

Major problems faced by MFIs to serve rural clients are information exchange and management and smooth flow of money (Parikh, 2006). The computerization, smart cards, and supporting software system help the MFIs to track the loan, make the assessment of the repayment of loans, and management of branch information, which further reduce the cost and reach distant clients more efficiently (Cecchini & Scott, 2003). The factors that influence the adoption of ICT in microfinance are cost of implementation, regulatory environment, development stage of the financial sector, supporting infrastructure, population density, ICT literacy of staff, and reliability of the system (Singh & Padhi, 2015). Globally, ATM technology is widely used in the MFI sector followed by POS, Internet banking, and mobile banking as shown in Table 1.

Table 1. Technology Channels Used by Microfinance Institutions Globally

Technology Channels	Number of Institutions
ATM	46
POS	35
Internet Banking	26
Mobile Phone Banking	10

Source : Ivatury (2006)

In developing countries, mobile based banking has helped MFIs to reach large customer base because of higher tele-density (Kauffman & Riggins, 2012). Increase in usage of PDAs by the field staff also increases the speed of loan fulfilment request of rural customers (Silva, 2002). ICT based initiatives in the form of online record keeping, contact management tools, mobility solutions etc., can also facilitate the MFIs in their outreach initiatives.

ICT Intervention and Microfinance in India

There are many initiatives taken by the Government of India as well as the private sector to augment the adoption of technology at the bottom of the pyramid and to overcome the digital divide. The Wireless Interoperability

for Microwave Access (WIMAX) broadband facility of Bharat Sanchar Nigam Limited (BSNL) gives Internet access to rural people at affordable prices. It facilitates the formation of Internet kiosks for providing e-services to the rural population. Rural ICT infrastructure created under various government to citizen (G2C) e-governance initiatives by successive Union and State governments has empowered rural citizens both socially and economically. Since 2005, 'financial inclusion' has been the focus of RBI and Government of India. Jan Dhan - Aadhaar - Mobile (JAM) trinity is the new buzzword in financial inclusion that has received a lot of thrust from Govt. of India. JAM has been instrumental in curbing leakages and enhancing the efficiency of direct benefit transfer (DBT) programmes. Prime Minister's Jan Dhan Yojana is the scheme for opening bank account for each household in the country. Apart from bank account and DBT, insurance and access to credit are also inbuilt with it. Until February 2019, 34.14 crore Jan Dhan accounts were opened under this scheme ("Total deposits in Jan Dhan accounts set to cross ₹ 90,000 crore," 2019).

Under Aadhaar, the Unique Identification Authority of India (UIDAI) gives a unique identity to each individual in the country. It is a biometric enabled identity system, which opens up a new world of opportunities. As the existing databases like voter list, ration card, driving license, etc. are in dismal state, Aadhaar has brought rationality by removing duplicates and by bringing uniformity of basic demographic and address metadata. The centralised Aadhaar database is also going to benefit with anytime, anywhere online verifiable identity check (e-KYC). The rise of Aadhaar is faster than the exponential mobile subscriber revolution; it is expected to provide a platform to digitally overcome the physical infrastructure hurdles (*Microfinance Vision Report, 2013* as cited in Nair & Tankha, 2013). As on July 8, 2019, 123.939 crore Aadhaar numbers were generated.

M in JAM refers to mobile banking. With exponential growth in tele-density, and decreasing prices of mobile phones and call rates, the private sector as well as government organisations have started offering many services on mobiles. As per the April 30, 2019 report of Telecom Regulatory Authority of India (TRAI), telecom penetration in India has increased to 90.05 % with 1183.77 million subscribers ; whereas, rural density increased to 56.94 %. It has opened up new avenues of reduction in distribution cost, which was not imaginable earlier.

With mobile banking, MFIs can maintain profitability by reducing transaction costs by limiting physical network and service personnel. It also improves availability of financial information. Mobile phone is also leveraged to provide digital credit services. Digital credit is differentiated from conventional loans, as they are instant, automated, and remote. They are easy to access and tailored to meet short-term liquidity requirements of borrowers. It has significant financial inclusion implications. Digital credit has significant presence in African countries. There are many successful cases of providing digital credit globally like M-Pesa and M-Shwari in Kenya, EcoCashLoan in Zimbabwe, M-Pawa and Timiza in Tanzania, and Instaloan in Philippines (Hwang & Tellez - Merchan, 2016). Unified Payment Interface (UPI- a payment system that facilitates transfer of money between any two bank accounts through a smart phone) initiative will make the electronic payment infrastructure more robust.

The Indian private sector has also facilitated digital enablement in rural areas benefiting the MFI sector. ICICI promoted FINO has installed a complete ICT based data backbone that facilitates MFIs to use data management systems, smart cards interface, and ATM technologies at lower cost. This facilitates the MFIs on their core task of serving the poor strata of society. Since the year 2010, FINO has been offering microfinance in rural areas through its own NBFC, Intrepid as well as BC channel on behalf of other financial institutions. Paytm has also started exploring microfinance services with organisations like Arohan and others.

In June 2016, TransUnion Credit Information Bureau of India Ltd. (CIBIL) set up a new division called the CIBIL Microfinance Credit Information Bureau, specifically for microfinance institutions. It announced that it will partner and provide information solutions to small and micro lenders to help them make better lending decisions, grow their customer base, and drive credit penetration. The CIBIL Microfinance Report is a first-of-its-kind universal report that enables MFIs to make better-informed credit decisions. With a robust search-and-match

algorithm, the report provides with a 360-degree view of customers, including those in the unbanked population – to enable financial inclusion (Transunion CIBIL Limited, n.d.).

ICT Benefits and Challenges for MFIs in India

Due to entry of multiple technology players in the microfinance space, technology intervention has increased since 2004. The success rate has also increased, but they need to further ramp-up infrastructure and bridge knowledge, skills, and attitude gaps at various levels for ICT adoption. Microfinance Institutions Network (MFIN) 2017 report concluded that over 60% of the NBFC - MFIs in India have adopted cashless methods (NEFT, IMPS, ECS, etc) for disbursement leading to operational efficiency and staff productivity. Remaining MFIs have already started pilot projects for the same ("Rise of cashless economy. NBFC - MFIs go high on e-payments," 2017). Mishra and Chowbwy (2015) found that with the adoption of technology in microfinance, the productivity of employees and branches had increased. Technology has also helped the MFIs to increase client satisfaction by quick transfer of funds, loan processing, and by improving other financial services.

Covering the large number of small people scattered in large geographical areas by MFIs is a highly cost intensive proposition. The adoption of technology ensures that costs remain in limits. Large MFIs have already adopted technology solutions in operational and control processes to contain the costs. As per the survey of Nair and Tankha (2013), almost 80% of MFIs have some system in place to manage their information system ; 19% of MFIs used ATMs for their businesses ; 10% of MFIs used PDAs with their personnel as a means of transacting and communicating transactions ; 8.5% of MFIs were using smart cards and biometrics ; 42% of MFIs were spending less than 5% of their annual expenditure on technology up gradation. However, most of the MFIs were lagging behind in technology adoption and they needed to expedite the internal technology adoption process.

In case of transaction failure, inappropriate and inadequate grievance management are the big challenges to be dealt by MFIs. Apart from this, sending a short message service (SMS) written in English in lieu of paper receipt creates some anxiety about the security of transactions amongst illiterate clients. Patel, Patel, and Patel (2018a) found impact of microfinance on women empowerment. Patel, Patel, and Patel (2018b) revealed the positive impact of microfinance on social benefits. Microfinance uplift the society in various terms (see studies of Arora & Singh, 2015 ; Das & Patnaik, 2015 ; Kavita & Suman, 2019).

Uniqueness & Research Gap Addressed

↳ Uniqueness of this research is the blend of primary research (interviews of MFI officials & ICT experts and observation) and secondary research for collecting the data. We also used quantitative and qualitative research methods.

↳ In terms of research gap, this paper provides a reasonable status of adoption of ICT and its impact on the performance of selected MFIs of Gujarat state.

Research Methodology

The study was conducted on four MFIs located in the state of Gujarat. The selection of MFIs was done as per the purposive sampling method based on the criteria that MFIs should be using the ICT tools from the last 5 years (2015 – 2019). This paper aims to study the adoption of ICT and measure its impact on the performance of selected MFIs of Gujarat state. Data related to ICT adoption (hardware, networking, software) and its impact and constraints in ICT implementation were collected by conducting personal interviews with the officials of selected

MFIs using a structured questionnaire. We also used the observation method to validate the ICT adoption at different facilities of selected MFIs. Qualitative research was also performed as detailed inputs were sought from officials of MFIs related to ICT adoption and its impact on MFI operation. In addition, we conducted in-depth interviews of two ICT experts from Mumbai and Chennai, having domain experience of more than 15 years in the MFI sector. The details regarding the respondents of MFIs and their responses are shown in the Appendix tables (Tables A1 - A5).

Data Analysis and Results

(1) Extent of ICT Adoption : The extent of technology adoption was measured by the availability of ICT equipment, networking, and software in selected MFIs. MFIs were asked about availability of basic computing equipment like desktop, laptop, personal digital assistants (PDA), mobile phones, landline phone, biometric technology, camera, CCTV, and scanner at their headquarters, branches, and with field staff. Except PDAs, all other equipment were being used at the headquarters of all MFIs. No branches were found to have laptops and biometric systems. It is noteworthy to mention that PDAs were not being used anywhere. The field staff were found to be using only mobile phones. Promoter of MFI 2 provided reason for the same :

> ICT facilities are needed only at office for data storage, processing, and reporting. The job of the field staff is to visit different geographies to generate new business, collect instalments as well as disbursements to customers, which does not require a computer. Each one of them carries a cell phone, which is sufficient for coordination.

(2) Networking Status at MFIs : We also collected data about the status of networking like local area network (LAN), wireless LAN, broadband Internet, dial up Internet, and remote access of network at the MFIs. It was found that all HQs had LAN, wireless LAN, and broadband Internet. At various branches of MFIs as well as at the level of field staff, only broadband Internet was used. A manager of one of the MFIs provided the following reason for the same :

> Our branch operations are very small in scale and are manned by one to maximum four personnel. Majority of these places have only one desktop. We use broadband Internet facility of smart phone owned by our employees. Initially, we had dial up Internet connection, which was replaced by mobile broadband facility in last three years due to its ease of accessibility and affordability.

It is interesting to find that dial up Internet and remote access facility were not used anywhere.

(3) Extent of Software Adoption : The MFIs were asked to provide information about availability of different application softwares. Accounting software, payroll management software, inventory software, and financial software were used by all the MFIs to manage their internal operations. None of the MFIs was found using human resource information system (HRIS). All MFIs used MS - Excel for MFI specific activities such as asset and liability management, management of client database, field transactions, and loan tracking. Three of the MFIs also had customised software to perform some of these activities.

(4) Impact of ICT Usage : Through ICT tools, MFIs were able to keep track of the records of clients including their demographics, payment history, and outstanding payment. All MFIs found the impact of ICT to be highly beneficial for client management. Promoter of one MFI shared the following benefits from ICT adoption :

> The ICT tools are highly beneficial for the client management as these enable the faster recovery of loans, client database management, loan processing, etc. Moreover, ICT has resulted in reduced field visits by our field staff leading to reduction of cost. It has also facilitated MFIs' efforts of documentation and liasoning.

ICT was also found to be highly beneficial for loan recovery and , therefore, in reducing the loan defaults. From the perspective of cost containment, ICT proved to be beneficial for three MFIs. Last MFI could not realise any cost benefits from ICT implementation. One official from this MFI reasoned in the following words :

> The ICT tools did not reduce our staff overheads as well as follow-up cost. Technology cannot give a personal touch to a customer. Nature of our industry demands personal regular visits by our field staff.

The MFIs were equally divided between 'beneficial' and 'not beneficial' categories with respect to compliance with government regulations and business expansion. The ICT adoption did not result in any benefits for the marketing of products. A senior official of a MFI echoed his insights as follows :

> The ICT tools are not useful for marketing of products due to non-techno-savvy customer base, largely coming from rural and sub-urban areas, but it remains beneficial in preparation of various reports as well as for statutory compliance.

(5) Constraints in ICT Usage by MFIs : Despite varying degree of benefits realised from ICT adoption, MFIs face many constraints in ICT usage. All MFIs considered the cost of hardware and software as major constraints in adoption of ICT.

> Prarthna (name disguised), an IT employee, working in the headquarters of one MFI, asserted that, "to buy a desktop along with the licenced software and Internet facility, it costs ₹ 50,000 approximately, which is too much for the MFI operating on a small scale. Along with this, there are significant recurring costs. Due to shoestring budget, convincing management for investment in upgradation/ addition of IT systems is a challenging task.

Change management is also a major challenge for MFIs as employees lack educational and technical competencies. In addition, majority of them do not possess positive attitude towards learning technological tools. They feel more comfortable in traditional methods of working. Lack of expertise to maintain systems was not found to be a constraint for MFIs. Three out of four MFIs considered ICT literacy of field/branch staff, reliability/authentication of ICT system, infrastructure issues, regulatory issues, and ethical issues as minor constraints in adoption of ICT. One MFI did not find these factors as a constraint :

> A senior official of the last MFI summarized it lucidly. ICT literacy of staff is not a bottleneck for us as they need only basic IT knowledge. Even at the headquarter, we do not need highly educated and skilled IT personnel as we are engaged in basic database management, transaction processing, and reporting, which can be learnt in 10-15 days. Maintenance of computer systems is generally outsourced, therefore, it does not pose a challenge for us.

HR Manager of another MFI described the challenge of change management in following manner :

> Majority of our employees are in middle or senior age groups. They come from rural background and are not even having a graduation degree. Even training has not provided much benefit. One employee even considered changing the job when pressure to learn software application intensified.

Ankita Prajapati (name disguised), IT executive of one MFI narrated her experience for IT infrastructure management in the following words :

> We never faced infrastructure related issues at our headquarters and branches due to availability of smart phones with all employees. In Gujarat, electricity is available almost throughout the year. However, as we store many financial details about our clients, the ethical issue has assumed paramount importance in recent years. Therefore, we have started sensitising our employees about privacy and security of customers' information.

In addition to the primary research carried out among the four MFIs, we also conducted in-depth interviews of two ICT experts from Mumbai and Chennai with over 15 years of experience in the MFI sector. Insights shared by them have been presented below :

Ms. Mehjabeen Taj Aalam, with 15 years of technology experience in different sectors including BFSI, asserted that digitization of the entire lending cycle by MFIs, that is, underwriting, lending, collection and not just back-office operations, can reduce the cost of service delivery and bring in quality business. With the financial inclusion agenda in place, there is a huge market waiting to be tapped. However, lack of infrastructure facilities in low tier cities present a major roadblock in implementation. In addition, often, MFI - ICT solutions are proprietary softwares, and hence, are not very affordable for small MFIs. Lack of localization in software and digital literacy amongst rural consumers pose a substantial challenge in uptake of these services. Government support is sought in providing infrastructure and educating the rural poor as part of The National Digital Literacy Mission.

Anand Sharma, CTO - Asirvad Microfinance with over 23 years of experience in the FinTech industry opined that looking at the nature of MFI business (unsecured & cash), people involved (customers & field officers), risk & frauds, and restrictions on interest spread (10%), the ICT tools provide strategic support to all MFIs in performing environment analysis before expanding into a new geography. ICT also facilitates the MFIs in acquiring customers by multiple validations, disbursing loan as per RBI norms in bank account, collecting loan amount (by sending reminder SMS in vernacular language, capturing geo-location of transactions, providing authenticated receipt, sending instant transactional SMS, monitoring cash-in-hand at branches, reconciliation of transactions on a daily basis, and follow-up SMS to the customers who have not paid the instalment). Technology also assists in measuring and enhancing the field officers' productivity by dynamic route map automation solution. Automated systems also enable monitoring of portfolio at risk (PAR). He also said that a robust e-Audit system is required to ensure that specified processes are being followed, various statutory requirements are being fulfilled, and frauds are identified.

Discussion

ICT has no doubt facilitated the MFIs in increasing their outreach at significantly lower costs. However, at present, there is no information sharing amongst various MFIs about the success or failure of technology adoption. Therefore, there is a need to create an information sharing platform (sector specific knowledge management) among the Indian MFIs that can capture and disseminate success stories. It will also help them in identifying the problems faced by other MFIs in implementing the technologies and facilitate the exchange of ideas and

experiences. Already, there are few initiatives like connecting MFIs with CIBIL, as shown above.

Given the size of the Indian rural market, the technology intervention can play a significant role, but MFIs and technology service providers need to collaborate for real-time information exchange. In addition, technology should be made relevant to local context and its features should be robust enough that correspond to the needs of end-users. The Government of India's focus on rural development through various programs like Digital India, rural electrification programme, that is, Deendayal Upadhyaya Gram Jyoti Yojana, Bharat Nirman, Skill India, etc. are likely to overcome the infrastructural problems and skill gaps faced by MFIs and common men. The MFI sector can also benefit from GOI's thrust on digital payment systems (IMPS, BHIM etc.).

In order to solve the skill gap, appropriate training at regular intervals can be provided by MFIs to the employees. In addition, new recruitment at MFIs should emphasize on computer knowledge and certification also. Paytm AshaKiran, an initiative by Paytm Payments Bank and Grameen Foundation for Social Impact (GFSI, have entered into a partnership to provide self-employment opportunities in banking and finance to rural women & youth. For its first phase, a pilot has been planned for the Nagpur district of Maharashtra that will potentially reach to over 300,000 people and educate them about financial education and digital financial literacy by the end of the current financial year. Grameen Foundation will leverage G-LEAP (Grameen Learning Platform) – an Android- based mobile learning platform and Grameen Guru, an augmented reality based chatbot application, to help train and equip people. Paytm Payments Bank will render its holistic banking and entrepreneurship training to help these individuals and promote self-employment ("Paytm AshaKiran partners with Grameen Foundation to enable rural women & youth with self-employment opportunities, " 2018).

Conclusion

The MFIs were using ICT tools majorly at their respective headquarters only. ICT usage at the branches was found to be limited. It was found that all MFIs were using software in the areas of accounting, payroll, inventory, and financial management. The usage of ICT proved to be highly beneficial for client management, loan recovery, and reduction of loan defaults. MFIs largely benefited from ICT usage in terms of cost containment, compliance with government regulations, and business expansion. Cost of hardware & software and change management were found to be the major constraints in adoption of ICT. Other factors were considered as minor constraints.

Limitations of the Study

- This research was conducted within the geographical scope of Gujarat only.
- We approached more than 20 MFIs of Gujarat, but only four of them accorded permission for the study. Therefore, the results cannot be generalized for MFIs of the whole country.

Future Research Possibilities

- Researchers can undertake detailed ICT impact assessment study in the microfinance sector. ICT impact can be assessed in the form of access, outreach, cost to serve, recovery rate, collaboration with other MFIs, etc.
- A comparative study about ICT adoption in the microfinance sector can be conducted between two or more regions of India.
- On the model of Grameen Bank, researchers can perform a case based research on prominent MFIs of India. Case studies should be prepared both for successful as well as failed ICT implementations in MFIs.

- A study can also take place about adoption of social networking sites in the MFI sector.

Authors' Contribution

Dr. Nityesh Bhatt generated the idea of usage of ICT in the microfinance industry. Dr. Ritesh Patel added a concept of qualitative based analysis on the implication and usage of ICT in the microfinance industry. Dr. Bhatt and Amandeep Kaur searched for relevant papers and worked on Introduction, Literature Review, and Research Methodology. Dr. Patel conducted interviews of the respondents. Dr. Bhatt and Dr. Patel performed the analysis on the collected information. All the authors worked on the final writing of the manuscript.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

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Appendix

Table A1. Extent of Technology Adoption

Availability of Network Communication	MFI 1			MFI 2			MFI 3			MFI 4		
	Head quarters	Branches	Field Staff	Head quarters	Branches	Field Staff	Head quarters	Branches	Field Staff	Head quarters	Branches	Field Staff
Desktop	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N
Laptop	Y	N	N	Y	N	N	Y	N	N	Y	N	N
PDA	N	N	N	N	N	N	N	N	N	N	N	N
Mobile Phone	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Landline Phone	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N
Biometric Technology	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Camera	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N
CCTV	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N
Scanner	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N

Source: Field Survey, Y= Yes, N= No.

Table A2. Networking Status at MFIs

Availability of Network Communication	MFI 1			MFI 2			MFI 3			MFI 4		
	Head quarters	Branches	Field Staff	Head quarters	Branches	Field Staff	Head quarters	Branches	Field Staff	Head quarters	Branches	Field Staff
LAN	Y	N	N	Y	N	N	Y	Y	N	Y	N	N
Wireless LAN	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Broadband Internet	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dial up Internet	N	N	N	N	N	N	N	N	N	N	N	N
Remote Access of Network	N	N	N	N	N	N	N	N	N	N	N	N

Source: Field Survey, Y= Yes, N= No.

Table A3. Extent of Software Adoption

Software	MFI 1	MFI 2	MFI 3	MFI 4
Accounting Software	Y	Y	Y	Y
Payroll Management Software	Y	Y	Y	Y
HRIS	N	N	N	N
Financial Software	Y	Y	Y	Y
Inventory Software	Excel Only	Y	Excel and software both	Y
MFIs Specific Software	Excel	Excel	Excel	Excel
- Asset & Liability Management				
- Client Database	Excel	Y	Excel and software both	Excel
- Field Transactions	Excel	Excel	Excel	Y
- Loan Tracking	Excel	Excel	Excel and software both	Excel

Source : Field Survey, Y= Yes, N= No.

Table A4. Impact of ICT Usage (All Four MFIs)

Impact	Highly Beneficial	Beneficial	Not Beneficial
Client Management	All MFIs		
Loan Recovery	All MFIs		
Reduction of Loan Defaults	All MFIs		
Cost Containment		MFI 1, 2, & 4	MFI 3
Compliance with Government Regulations		MFI 1 & 2	MFI 3 & 4
Marketing of Products			All MFIs
Business Expansion		MFI 1 & 4	MFI 2 & 3

Table A5. Constraints in ICT Usage by MFIs

Description	Major	Minor	No Constraint
Cost of Hardware	All MFIs		
Cost of Software	All MFIs		
ICT Literacy of Field/Branch Staff		MFI 1, 2, & 3	MFI 4
Lack of Expertise to Maintain Systems			All MFIs
Reliability/Authentication of ICT System		MFI 1, 2, & 4	MFI 4
Infrastructure Issues		MFI 1, 3, & 4	MFI 2
Regulatory Issues		MFI 2, 3, & 4	MFI 1
Ethical Issues		MFI 1, 3, & 4	MFI 2
Change Management (Employees are not ready generally)	All MFIs		
Other - Attitude of staff towards the adoption of ICT	All MFIs		

About the Authors

Dr. Nityesh Bhatt is a Professor of information management area at Institute of Management, Nirma University. In his academic career of 20 years, he has authored a number of papers, cases, and has co-edited 13 books. He was the recipient of 'Dewang Mehta Best Teacher of Information Technology Award' in 2009. Three of his students have already been awarded Ph.D.

Dr. Ritesh Patel is an Assistant Professor at Institute of Management, Nirma University, Ahmedabad, Gujarat. His teaching areas include investment and portfolio management, financial management, and financial services. He has published papers in ABDC ranked international journals of repute and is serving as a reviewer in international journals.

Amandeep Kaur is a Doctoral Student at Institute of Management, Nirma University, Ahmedabad.