

MICROFINTECH: OUTREACHING FINANCIAL INCLUSION WITH COST-CUTTING INNOVATION

ABSTRACT

Microfinance is a renowned albeit controversial solution for giving financial access to the unbanked, even if micro-transactions increase costs, limiting outreach potential. Economic and financial sustainability of Microfinance Institutions (MFIs) is a prerequisite for widening a potentially unlimited clients base.

Automation decreases costs, expanding the outreach potential and improving transparency and efficiency. Customer-centric technological solutions range from branchless mobile banking to geo-localization of customers, digital/social networking for group lending, blockchain validation, big data, and artificial intelligence, up to “MicroFinTech” - FinTech applications adapted to microfinance.

This study examines these trendy solutions comprehensively, going beyond the existing literature and showing potential applications to the traditional sustainability versus outreach trade-off.

Keywords: financial inclusion, sustainability, scalability, Mobile banking, social networking, digital finance, big data; blockchains.

1. INTRODUCTION

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Going beyond traditional banking, microfinance is by now a consolidated and successful mean to provide credit to the neediest, helping the poor to sort out bank exclusion, which is one of the main misery traps (Collier, 2007; Moro Visconti, 2014) that prevents billions of underserved, especially women, from escaping atavistic poverty.

While the success of microfinance, since the pioneering intuition of Yunus, has gone beyond any expectation, its implementation is still typically subsidized and raises growing concerns. Self-sufficiency and economic sustainability represent in most cases a mighty goal, whose attainment would allow MFI to broaden their clientele (potentially unlimited, being represented by billions of unbanked poor).

Consistently with this view, Ghosh, 2013 claims that microfinance cannot be a silver bullet for development and profit-oriented MFIs are problematic (“better unbanked than unable to repay loans”). The business industry remains opaque, and mission drift is a constant temptation, especially in India (Saxena and Deb, 2014). Microfinance must be regulated and subsidized, and other strategies for viable financial inclusion of the poor and small producers must be more actively pursued. Financial inclusion is generally considered as a pro-growth strategy and improved access to (micro)finance reduces income inequality and poverty (Agyemang-Badu, 2018). Mader (2017) however claims that high expectations of financial inclusion serving as a core pro-poor, private-sector led development intervention lack justification. Bateman and Chang (2012) are even more skeptical, arguing that microfinance constitutes a powerful institutional and political barrier to sustainable economic and social development, and so also to poverty reduction.

Technology, starting from electronic payments, may foster financial inclusion and availability/affordability of financial services in developing economies, softening the perverse effects of microcredit (Dos Santos and Kvangraven, 2017).

While there is an impressive literature on microfinance (for a comprehensive introduction, Armendariz De Aghion and Morduch, 2010; for recent surveys, Garcia-Perez et al., 2017; Moro Visconti, 2016), and m-banking (Shaikh and Karjaluoto, 2015), little attention has been dedicated to other more innovative strands, as FinTech (Gai et al., 2018) or social networking applied to microfinance group-lending (Ali et al., 2016) and peer-to-peer (P2P) lending (Bruton et al., 2015). Whereas some studies examine the impact of technology on microfinance (Ashta, 2011; Moro Visconti and Quirici, 2014; Moro Visconti, 2015), little attention has been dedicated to “MicroFinTech”, a neologism that combines financial technology with microfinance, reshaping the delivery of financial services to make them more accessible and affordable. In emerging markets where financial inclusion is a challenge, FinTechs are helping bridge the exclusion gap. Rapid urbanization, mobile and internet penetration, and ease of use are driving individual demand for FinTech services. Leapfrog innovation can provide cutting edge solutions for the unbanked (Ernst & Young, 2019).

This study represents an advance in the debate about the trendy opportunities of microfinance. Consistently with this framework, the research question is the following: given the economic and organizational bottlenecks that prevent traditional microfinance in underdeveloped countries to outreach most of its potential clients, which is the impact on microfinance sustainability of technology-driven innovation?

The study is organized as follows: paragraph 2 contains a description of the concepts of sustainability and outreach that are often antithetical; paragraph 3 shows the main technological trends, as an introduction on the impact of technology on sustainability (paragraph 4). Risk factors are then examined in paragraph 5, before the analysis of the impact on the supply and value chain (paragraph 6). The main technological innovations are considered in the following paragraphs: Mobile banking (§ 7); group lending levered by digitalized social networks (§ 8); big data and artificial intelligence (§ 9); blockchains (§ 10). The overall combination of these innovative technologies brings to “MicroFinTech” (§ 11), a neologism that is related to the fintech revolution in banking. A discussion of the main findings (§ 12) precedes the conclusion (§ 13).

2. SUSTAINABILITY VERSUS OUTREACH

The success of microfinance does not imply that it can solve all the existing socio-economic problems which affect the poor. Such a false and simplified conviction is both dangerous and deceiving, as it generates exaggerated expectations that are going to remain mostly unsatisfied.

MFIs, according to their current tide, are limited in their ability to serve the poorest (this being a practical but also theoretical obstacle to optimal outreach), for many complementary reasons such as the poorest natural unwillingness to borrow - life is already risky enough without taking on debt - or exclusion (often self-exclusion) from group lending membership. The poorest also desperately need primary goods and services such as food, grants or guaranteed employment before they can make good use of financial products.

Highly subsidized safety net programs are what the destitute at the bottom of the economic ladder primarily need.

Microfinance business is often unprofitable or - in the luckiest cases - it offers only decent returns and consequently it does not readily attract ambitious and profit-maximizing managers unless they have a charitable background and are looking for “values” beyond money and success.

MFIs have a high-interest rate burden due to the small monetary amount and high operating cost per transaction. To ensure financial viability and to expand the depth and breadth of their operations, MFIs must adopt cost recovery interest rates. Hence MFIs must charge interest rate high enough, substantially higher than the bank loan risk-free interest rate. The main factors in determining the interest rate on microcredit are the cost of funds, operating costs, loan loss cost and capital for business expansion (Song et al., 2014).

Trendy strategies suggest privileging technological investments instead of opening new physical branches.

The key for a feasible and progressive solution of the main microfinance target - maximizing outreach and impact while preserving long term, possibly unsubsidized, sustainability - is to insist on the search for financial innovation, to find smart and unconventional solutions to unorthodox problems. Among the interchanging examples of financial flexibility and innovation, there are changing sizes in target groups, different loan maturities, individual rather than group lending, feasible *ad hoc* forms of guarantee (forcing deposits from retained earnings; pledging notional assets psychologically worthy for the borrower ...). Other characteristics are represented by the frequency of repayment installments, synergies between financial products (e.g., loans linked with deposits and insurances), specific methods of monitoring (from primary rural supervision to technology-driven devices).

Outreach and sustainability are much concerned with the risk that may affect already tiny margins, especially for MFIs who are also enabled to collect deposits that can conveniently reduce their risk profile. This may happen both on an aggregate basis, matching assets (credits towards borrowers) with liabilities towards depositors, and on a single base, since many depositors are also borrowers, partially counterbalancing their overall exposure towards the MFI.

Cultural changes (Moro Visconti, 2014a: Ch. 9) and improvements are by far the most difficult and longest to look for since they entail a mentality shift that needs plenty of time - often measured by generations - to develop solid roots. The frantic and increasingly interlinked world we live in might speed up the process, but velocity tends to go along with superficiality whereas long-lasting deepness requires its due time.

Accounting and financial indicators such as the “financial self-sufficiency ratio”, which calculates the ability to generate enough revenues to cover running and fixed costs, can measure the threshold to profitability. Institutions serving poor customers charge higher interest rates and have fewer default rates than those addressing better-off clients.

The classical trade-off between outreach and sustainability stands as a real key point in microfinance issues. Maximum outreach and potential involvement of as many as possible between the poorest is a primary goal, and sustainability is a crucial element for its persistence over time.

Technical or social innovation, concerning also the creation and commercialization of new products, strategies, and management, has a deep impact on MFIs, contributing to reshaping their business model, with an impact on their overall risk profile.

Innovation ignites a Schumpeterian “creative destruction” that reengineers the business model, making it sounder and more resilient to external shocks, albeit requiring initial investments on both sides, concerning not only MFIs but also increasingly sophisticated clients. Innovation is accelerated by globalization and the deregulation of banking systems, and it promotes economic growth through improved allocation, efficiency and a reduction of financial service costs (Satya, 2013).

Technology stands out as a big disrupting factor, which segments haves from haves-not, so creating a market barrier among different MFI, where only the strongest are fit for upgrading.

3. TECHNOLOGICAL TRENDS

Technology is reshaping the banking industry mainly since the advent of IT applications as home banking. Spill-over effects on microfinance are reengineering old-fashioned business models and, in some cases, MFIs are pioneering change, as it happens for M-banking. Whereas technology typically originates in Western countries and then trickles down in poorer areas, with microfinance, emerging markets represent a pioneering lab for financial innovation (Sharma and Al-Muharrami, 2018).

Even if technology has many different applications, some strands are predominating the actual landscape. IT applications through the digital web are the bridging platform where technologies converge. This is the case for M-banking, social networks, FinTech applications, etc.

The impact on the different stakeholders, starting from the micro-borrowers, is meaningful, mainly because they face a transition from an oral to digital culture. In many backward environments, the oral tradition is seldom complemented by a written culture that is nowadays incorporated in a digital environment where data are created and stored. This cultural leap forward has profound, albeit under-investigated, socio-economic implications. And the very fact that technology has nonrival characteristics eases its spread and simultaneous use, boosting scalability and economies of experience.

Technology is possibly the most potent transmittable tool within a globalized world, subject to unprecedented movements of capitals, goods, people and their know-how, a common denominator which represents the “software” behind any “hardware” transfer, with a demiurgic impact that makes it a cornerstone of internationalized economic value.

Technology is also introducing new stakeholders as TLC operators or social networks, who respectively carry and intermediate data. Digital information is exchanged through web platforms and data carriers are becoming the dominant player, with possible abuses (threatening privacy, overcharging their services with the extraction of monopolistic rents, etc.).

In the globalization trend, technology is easier to spread than other factors, as it represents a cultural bridge among different experiences. An example is given by the penetration rate of smartphones that are readily accepted everywhere, much more than cultural differences in food, dressing, religion, etc.

The most common microfinance processing tasks, such as credit analysis, recording disbursements, payments, and monitoring, can be positively affected and re-engineered by ad hoc technology.

Innovation can concern either back-office or front-office activities. While the former involves the inside organization of the MFI, the latter interact with the end-users, typically with a mobile phone and connected digital platforms.

Technology can be easily customer-tailored, and its client-centricity attitudes are crucial in microfinance, driving to value co-creation that levers both sustainability and outreach.

4. THE IMPACT OF TECHNOLOGY ON ECONOMIC SUSTAINABILITY

Economic sustainability can be detected considering the income statement of a typical MFI (see European Central Bank, 2019) and the impact of technology that can disrupt and re-engineer existing business models, as shown in table 1.

Table 1. MFI Income Statement and Impact of Technology

traditional MFI income statement		impact of Technology
1. Interest income		savings in staff costs and loan delinquency (obtained combining product and process innovation) reduce unitary interest rate margins increasing volumes through expanded outreach
2. Interest expenses		
3. Net interest margin		
4. Net operating (non-interest) income	4.a. Fees and commissions receivable	
	4.b. Fees and commissions payable	
	4.c. Net profit or loss on financial operations	
	4.d. Other operating income	big data revenues ...
5. Contribution margin		
6. Operating expenses	6.a. Staff costs	automatization decreases staff costs; blockchains validate transactions clouding and dematerialization reduce branch costs
	6.b. Property costs	
	6.c. Other operating expenses	
7. Net income before provisions		
8. Net provisions	8.a. Provisions on loans	digitalized credit scoring reduces delinquency
	8.b. Other net provisions	
9. Income before tax		
10. Income tax		
11. Net income after tax		
template adapted from		https://stats.oecd.org/Index.aspx?DataSetCode=BPF1

The dynamic interpretation of Table 1 represents the canvas for the answer to the research question.

MFIs traditionally face high staff costs (6.a) and related operating expenses (6.c.) for their core credit scoring and lending activities. Delinquency from untrustworthy borrowers represents another significant cost that contributes to the economic and financial absorption of resources.

To the extent that technology contributes to decrease costs, economic marginality automatically improves. This surplus can be allocated, at least partially, to decreasing unitary interest rate margins, converging towards fair loan rates (Jarrow and Protter, 2018). MFIs may be tempted to cash in these extra margins, with a consequent mission drift from their original vocation; competition and the will of philanthropic shareholders may, however, minimize this risk, pushing towards a decrease in the level of interest rates. This reduction improves outreach, and so higher volumes of loans may partially compensate lower marginality, preventing sustainability concerns.

Technology can improve the supply and value chain on different layers, reducing the costs but also improving the revenues, not only with outreach-driven higher volumes but even with extra gains from innovative business models. For instance, digitalization of information from profiling customers produces big data that represent a worthy asset, whose revenues can be shared with the clients, following a value co-creation pattern.

Business models extensions can also derive from the interaction with complementary activities and stakeholders. For instance, digital group lending through social networks eases the convergence with peer to peer lending, as shown later.

A core component of sustainability is represented by the business' scalability that represents the capability to handle growing revenues, dramatically improving economic marginality, so contributing to making the business profitable.

5. TECHNOLOGY AND MICROFINANCE RISK FACTORS

Technology has an impact not only on the economic marginality of the MFI (increasing revenues and reducing costs) but also on the resilience of its supply chain that becomes less volatile and so less risky. This is for instance due to the impact of big data that provide instant feedback about the dynamic evolution of lending activities, reducing information asymmetries between the MFI and its borrowing clients.

Microfinance providers are taking progressive steps to embrace digital finance, often starting with the digitization of existing products, services and operations, either by using mobile devices, partnering with a digital financial service provider or developing a proprietary agency network. Although this triggers benefits for both clients (convenience, security, faster transactions and creation of a digital footprint) and microfinance providers (increased operational efficiency, diversification of customer base with value-added products, rural outreach at a lower cost), digital finance comes with certain challenges and risks, and can sometimes represent a threat if not leveraged appropriately (AFI, 2018).

Microfinance risk considers possible unpleasant events that may prevent the MFI from achieving its goals, up to the point of threatening its going concern continuity. Technology has an impact on the risk that can be either mitigated or exacerbated by innovation.

According to CSFI (2011) "the problem of getting technology right is moving up the risk scale. MFI face tough decisions on the management of their IT systems and their delivery strategies soon. Do they have the know-how and resources to get them right? Some of our respondents thought these were among the most difficult issues facing MFI today: failure could put an MFI out of business. A microfinance analyst said it was a case of «Invest in technology or cease to exist in five years»".

The impact of technology on the main microfinance risk factors is summarized in table 2.

Table 2. Impact of Innovation on Microfinance Risks

Microfinance Biggest risks	Impact of innovation and management technology
Credit risk	IT technology can have a significant impact in detecting and monitoring credit quality, with credit scoring and sharing of information. Credit scoring algorithms based for instance on social media footprints can be used to optimize lending.
Competition	Technology creates a digital divide between haves and have-nots; competition increases with comparability, speediness and other innovative products and processes. Early innovators get a competitive lead and may disrupt older players.
Management quality and staffing	Technology increases skills and productivity, improving HR quality and reducing time and cost- absorbing routine tasks.
Mission drift	Temptation to reach wealthier clients may increase with the digital divide.
Profitability	Technology and digital procedures may actively contribute making the business model more scalable, cutting variable costs (with an increase in fixed IT costs, which may raise the break-even point) and easing monitoring; productivity should also improve.
Back office	The “dirty job behind” is likely to be profoundly changed by technology and computerized systems of recording; it may also be centralized and dematerialized, with economies of scale and experience.
Transparency	Written and recordable paperless IT procedures are a key starting point for transparency and softening of information asymmetries.
Strategy	Technology and innovation may have a profound impact on management, reshaping and rethinking strategies, reconsidering the whole value chain, target products, and clients, etc.
Liquidity	Technology improves awareness and accountability, with a potential impact even on liquidity, which may be better handled and foreseen.
Fraud	Fraud is linked to (lack of) transparency and may be more easily detected with IT procedures, allowing for better monitoring. As mentioned earlier, the speed of movement of money may make fraud detection more difficult and too late. Blockchains may soften transaction recording concerns.
Product development	New products and especially innovative product delivery (e.g., M-banking and its by-products) may be conceived as a result of innovation.
Interest rates	They do not depend on technology but again may be better detected and handled. If costs reduce, NGO MFIs, at least, may cut interest rates, driving down industry rates.

6. THE IMPACT OF TECHNOLOGY ON THE SUPPLY AND VALUE CHAINS

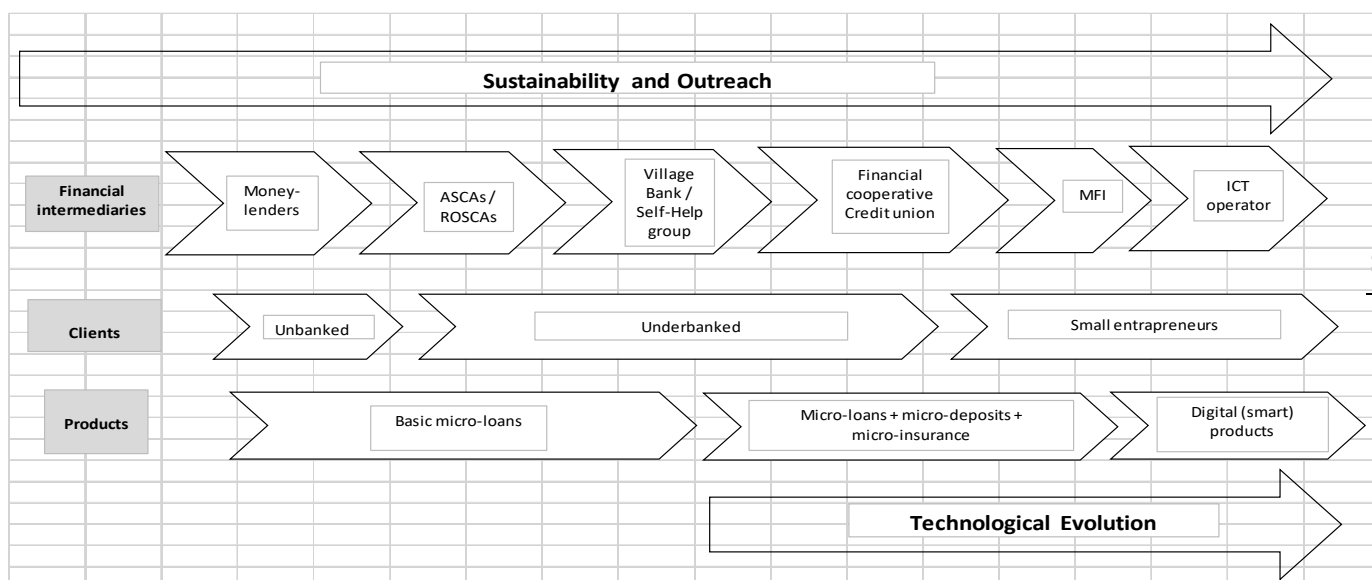
A microfinance supply chain is a network between the ultimate client and its suppliers to distribute microloans (or to get microdeposits), representing the steps it takes to get the service to the customer.

The value chain of microfinance typically consists of four levels: investors, microfinance fund, MFIs, and micro-entrepreneurs (Fanconi and Scheurle, 2017).

Technology-driven sustainability of the MFI value chain contributes reshaping the supply chain leveraging outreach. Specialization of intermediaries increases the offer of financial products that accompanies multi-stage growth, following a developmental pattern that has already occurred in Western countries.

Figure 1 shows the evolution of the microfinance providers that goes together with the technology-driven upgrade of the clients. This evolution is consistent with the theory that larger MFIs can distribute its fixed costs better, requiring lower interest rates (de Oliveira Leite et al., 2019).

Figure 1. Technology-driven microfinance development



An optimized supply chain results in lower costs and higher operational efficiency. Technology can help re-engineer the supply chain, making it shorter (with less intermediating passages) and more resilient to external occurrences. Efficiency gains can save costs, increasing the marginality of the MFI and its outreach potential.

The supply chain can be represented even in terms of the value chain (Fanconi and Scheurle, 2017: Ch. 3), whereas each stakeholder (investors; microfinance fund; MFIs; micro-borrowers) presides over a segment of the chain and extracts value from it.

Funding investors are essential to subsidize MFI, not only in their start-up stage but also later, till they are unprofitable. Equity-holders may not seek economic returns if they have philanthropic targets that are less subject to mission drift temptations.

Incentives to adopt technology are vital for its successful implementation and so need to be properly activated. Resistance to innovation adoption is normal, especially from consumers

(see Reinhardt et al., 2019) or unskilled employees of the MFI that are afraid of being replaced by automation.

Motivation so needs to involve all the stakeholders that preside over the supply and value chain:

- Equity-holders that are often frustrated about negative returns and unsustainability of the business model that may bring to dissatisfaction; the central thesis of this study is that innovation can help to cut costs, reach an economic break-even and then broaden the client base, targeting sustainable outreach;
- Employees of the MFI can upgrade their skills and replace routine activities with smarter tasks, for which they need proper training;
- Customers can improve their value for money, getting better services at lower costs.

The adoption of technology needs to be subsidized and may follow Results-Based Financing strategies where payments depend on performance (P4P – pay for performance). This strategy largely developed in the healthcare industry (Paul et al., 2018), may well be adapted even to microfinance.

Intermediation of funds along the supply/value chain adds value in terms of economic marginality, and this effect is represented in the income statement of the MFI if economic and financial margins are positive.

Being the supply chain a network, it can be represented even in terms of the network theory that technology makes digital, with Internet platforms where stakeholders virtually meet to exchange information, goods, and services.

The impact of technology across the supply/value chain must consider not only the transformations in the business model of the MFI but also the access of borrowers to innovation. This may represent a bottleneck if the underserved micro-borrowers do not possess digital devices (a mobile phone with a decent network coverage is the entry-level instrument).

7. MOBILE BANKING

Mobile phones are nowadays spreading everywhere, with increasing network coverage that is progressively reaching even isolated rural areas. They represent the first bridging device between the digital MFI and the client. Mobile phones need to be cheap and user-friendly, with customized functions, like Mobile Apps that interact with the MFI and facilitate basic operations (micro-loans, micro-deposits, remittances, up to preliminary e-commerce functions) that are digitally recorded within the MFI, fuelling big data sourcing and artificial intelligence processing.

According to the Global Findex, 1.7 billion adults do not have an account at a financial institution or through a mobile money provider. Vast disparities exist between high-income economies and developing economies, with the latter having lower inclusion rates. A significant gender gap also persists in financial account ownership in emerging economies, currently standing at an average of 9 per cent, leaving around 980 million women without an account. Unbanked adults are disproportionately young, demonstrating an age inequality in financial inclusion around the world. Despite these inequalities, mobile money continues to play a significant role in driving financial inclusion with over 866 million registered accounts

across 90 countries, transforming the financial services landscape in many developing markets (GSMA, 2019).

Table 3 shows the main financial access indicators, evidencing a progressive worldwide improvement in most parameters, which however still far from reaching a comfort zone. Mobile money indicators on average grow more than commercial bank parameters.

Table 3. Financial Access Survey

Key Indicators	2013	2014	2015	2016	2017
Automated Teller Machines (ATMs) per 100,000 adults	0.71	0.76	0.93	1.07	1.27
Branches of commercial banks per 100,000 adults	2.28	2.33	2.19	2.14	2.14
Depositors with commercial banks per 1,000 adults	157.39	174.90	183.57	184.60	174.58
Borrowers at commercial banks per 1,000 adults	3.77	3.03	2.96	3.05	3.30
Outstanding deposits with commercial banks (% of GDP)	18.34	19.02	19.30	19.29	20.44
Outstanding loans with commercial banks (% of GDP)	4.14	3.76	3.70	3.12	3.23
Outstanding loans with comm. banks: of which SMEs (% of GDP)	0.26	0.16	0.17	0.20	0.18
Mobile money agent outlets: registered per 1,000 km ²	1.17	1.65	2.35	2.19	2.98
Mobile money accounts: registered per 1,000 adults	81.49	79.28	12.02	21.35	27.42
Mobile money transactions: value (% of GDP)	0.31	0.33	0.34	0.69	1.09

Source: International Monetary Fund - <http://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C&sId=1460043522778>

The increasing use of mobile phones and the use of the internet has changed many industries, including banking. Mobile banking has advanced to today's payment with the help of mobile phones anywhere and anytime, and mobile phone manufacturers have had to meet the growing needs of users for simpler and easier banking transactions. A revolutionary step forward in this area was the production of smartphones, which made contactless payments. The development of mobile technologies has thus affected changes in banking operations, with the primary goal of providing new distribution channels for banking services. All this led to intensive cooperation between mobile operators and banks. The lower costs of mobile banking, as well as more accessible services in time and place of banking transactions, have contributed to the number of users of mobile banking services constantly increasing in the world (Tomic and Stojanovic, 2018).

Many MFIs are experimenting with innovative delivery channels to reduce costs, facilitate greater outreach to hard-to-reach areas, and increase customer value for money. Mobile phones could be used to reach many more customers at a lower cost than any other delivery channel, introducing a branchless banking strategy. M-banking is also potentially ubiquitous, operating anywhere and anytime. Since transactions are digitally recorded, they fuel a big database that can be used to create a history tracking of payments and provide other useful information.

M-banking, shortening the organizational chain with its space-less and timeless virtual branches, stands out as an exciting device to soften the human resources bottleneck, tackling technological risk, even if it needs a substantial investment background and cooperation with ICT actors.

Substantial penetration of mobile money accounts present opportunities for innovative MFIs to explore expansion in areas including alternative lending, cross-border transfers, personal

finance, and remittances. Collaboration with local financial players can help FinTechs navigate this market (Ernst & Young, 2019).










Synergies between microfinance and m-banking have proved difficult since inception: “there are fundamental reasons why MFIs are generally not positioned to get into m-banking early on. Most m-banking deployments provide transfers, a service that very few MFIs provide. Indeed, MFIs and successful m-banking businesses occupy different worlds today. The MFI world is focused on credit and maybe some savings, while the m-banking world is focused on transfers and payments. The MFI world largely uses unsophisticated backend systems while the m-banking world uses some of the most sophisticated backend systems we know today (even better than some banks). The MFI world focuses on creating low-cost, human-driven infrastructure, while the m-banking world is tied into and uses payment systems infrastructure. It is not surprising then that these two worlds have not yet aligned” (Kumar et al., 2010).

Statistics of M-banking are reported in Table 4, showing the potential for a catch-up and outreach.

Table 4. M-banking Statistics

Banking on the phone

A traditional bank account may be out of reach for most Africans, but a phone has given millions access to mobile money service.

		 Sub-Saharan Africa	 Low and Middle Income	 High Income
 Bank or mobile money account (% of population ages 15+)		43	63	94
 ATMs (per 100,000 adults)		6	27	68
 Commercial bank branches (per 100,000 adults)		5	9	20
 Fixed broadband subscriptions (per 100 people)		1	9	31
 GDP per capita, PPP (current international \$)		3,730	10,345	45,789
 Mobile cellular subscriptions (per 100 people)		73	96	126
Source: World Bank, World Development Indicators database.				
Note: Data are 2017 or latest available.				

Spurce: See <https://blogs.imf.org/2019/02/14/fintech-in-sub-saharan-africa-a-potential-game-changer/>

8. DIGITAL GROUP LENDING AND SOCIAL NETWORKS

Group lending – not a novelty of microfinance, since it was extensively used in the 19th century by mutual banks and insurance companies – is a much-celebrated idea to overcome the lack of collateral, which represents one of the biggest obstacles to credit access for the poor. MFIs generally lend a small individual loan to a household belonging to a group of usually 5 to 20 people that guarantee for him and intervene in the case of delinquency. Group lending with joint liability is the standard contract used by MFIs (Altinok, 2018).

Transaction cost is incurred in forming the group, and so group lending has emerged as a useful tool in reducing this cost by transferring its burden on the group (Sharma et al., 2017).

Should the individual borrower prove reliable, the MFI might extend credit to other members of the group. The essence of group lending is to transfer responsibilities from bank staff to borrowers, who contribute to the selection and monitoring of debtors, helping in the enforcement of contracts. In exchange, customers get otherwise inaccessible loans.

Group lending with joint liability is seen as an effective instrument to circumvent information asymmetries because it incentivizes group members to use their social ties to screen, monitor, and enforce loan repayment on their peers (Moro Visconti, 2014b). The social relations embed social capital and facilitate the collective actions of group members, allowing them to coordinate their repayment decisions and cooperate for their mutual benefit (Postelnicu et al., 2014).

Monitoring takes place with weekly meetings between the MFIs and group members, and the repayment status of the borrowers is publicly checked, minimizing screening costs by meeting debtors in groups, multiplying savings and loan transactions, with economies of scale that reduce transaction costs for the MFI and consequent interest charges for the borrowers.

Even group lending has shortcomings since it mainly works in rural areas where social control is tighter and smart individuals belonging to an unreliable group might be severely damaged by lack of flexibility (a typical group-loan might be unfit for one of its components, often the smartest). Adverse selection occurs when the lender finds it challenging to discriminate between risky and safer borrowers, so applying to anybody the same interest rates, with an undeserved implicit subsidy to the worst borrowers, which in many cases disincentivizes honest ones from asking for loans. Reduction of information asymmetries, with real customers being able to send a believable signal to the MFI about the reliability of potential joiners, might contribute to a decrease of unfair surcharges.

Honest individuals also have a powerful incentive in directly selecting fair partners within the group. Groups are encouraged to form on their own with assortative matching, even if strong clan or family ties in many rural areas are an obstacle to discrimination according to merit. In case of delinquency, bank officers might be reluctant to sanction good borrowers who have the bad luck to be part of unreliable groups.

A robust internal incentive for monitoring within the group arises in collective lending, even if this cannot prevent any problem; social sanctions hardly prove efficient outside small rural areas where everybody knows others, and this problem grows along with the urbanization process that is taking place almost everywhere. However, even in small villages, the threat of social sanctions between close friends and relatives is hardly credible (Armendariz De Aghion, Morduch, 2010). Attending and monitoring group meetings can prove expensive in

dispersed areas; frequency of meetings is another implicit cost. Borrowers' behavior might also prove collusive against the bank, undermining its ability to exploit social links as proper collateral.

Benefits of group lending are counterbalanced by costs that emerge when borrowers are risk-averse, and borrowing is expensive; costs also grow together with the scale of lending, since default amounts rise, and growing businesses - with a smart borrower going far beyond his peers - suffer from credit rationing issues.

Groups are efficient if not correlated among them – since they allow for risk diversification and reduction – but do not work well when a generalized systematic crisis occurs (such as the periodical floods which devastate Bangladesh and have masterminded the first Grameen bank model).

For many, particularly the smartest and wealthiest, individual lending is more flexible, even if it lacks group guarantees and collective monitoring. This approach is, however, hardly ever available to the poorest and does not fit rural areas where clan affiliation prevails over individualism.

Dynamic incentives, such as the threat of not being refinanced if the group defaults, can bring to a better group selection, particularly for risky borrowers that are more stimulated to have a safe borrower as a peer.

This background describes traditional group lending, a key aspect of microfinance that can be revolutionized by technology.

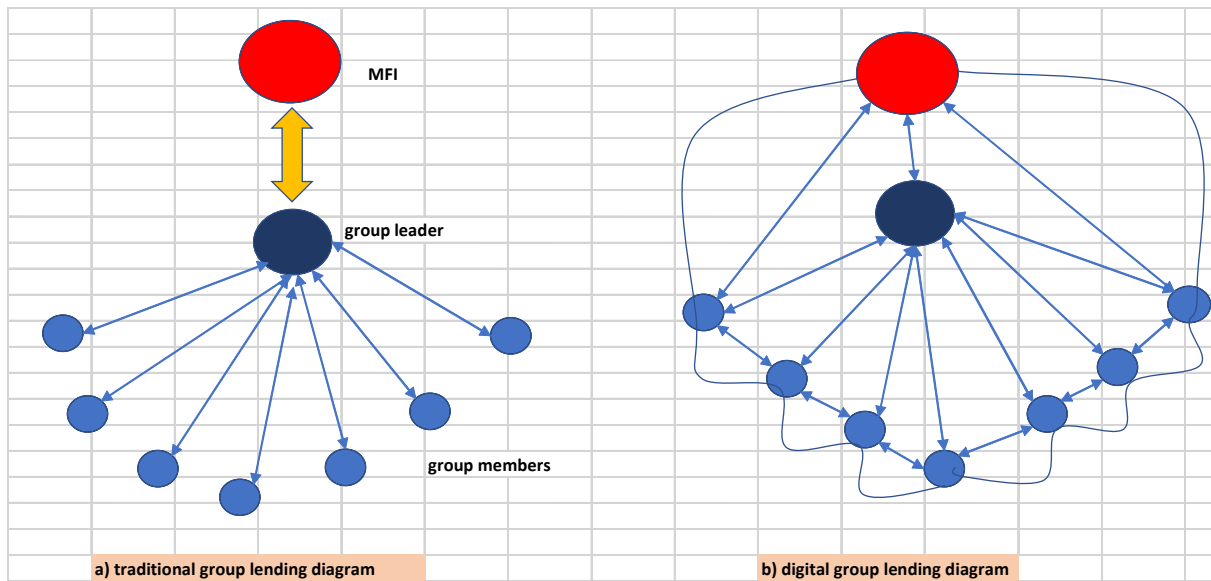
Social networks acting through digital platforms reshape the composition of the group and its operativity. Members can be in touch in real time through dedicated chats via WhatsApp or other applications, and they can exchange information or financial services. M-banking can be used collectively through digitalized group-lenders and borrowers, with benefits that range from immediacy to traceability and savings in transactions. Digital platforms enhance virality and consequent scalability of operations.

Social networks are based on network theory that studies graphs as a representation of (a)symmetric relations between discrete objects. In computer science and network science, network theory is a part of graph theory: a network can be defined as a graph in which nodes and/or edges have attributes (e.g., names). An interdependent network is a system of coupled networks where nodes of one or more networks depend on nodes in other networks. Developments in modern technology enhance such dependencies. Networks represent a fundamental characteristic of complex systems whose connected structure may give an innovative interpretation of the interactions among (linked) stakeholders like MFIs and micro-borrowers.

A graphical representation of group lending shows how they can be intuitively linked to networks. Whereas traditional group lending shows limited links between each group member and the group leader who acts as a hub connected to the MFI, in digital group lending patterns linkages increase and the disintermediation directly connects each member to the MFI, so decreasing the role of the group leader.

Figure 2 does not show the full dynamics of the digital interactions that work everywhere on a 7/24 basis (seven days a week, all day long), whereas traditional group lending faces consistent physical barriers. Enhanced connectivity among different nodes increases the overall value of the network, leveraging both sustainability and outreach.

Figure 2. Traditional versus Digital Group Lending



Social networks can represent a digital base for peer to peer (P2P) lending or crowdfunding. Micro-equity stakes levered by collective lending can usefully complement micro-loans, supporting startups and digital entrepreneurship.

9. BIG DATA AND ARTIFICIAL INTELLIGENCE

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Big data is the term for any gathering of large-volume information sets from multiple sources and is so expensive, fast-changing, and complex that can become hard to process. The difficulties incorporate investigation, catch, duration, inquiry, sharing, stockpiling, exchange, perception, protection infringement and quantification of financial value. The explosive growth of data in almost every industry and business area is driven by the rapid development of the web, Internet of Things (IoT), and cloud computing (Jin et al., 2015).

Whereas data have always existed, big data represent a novelty that has seldom been associated with microfinance. Big data represent an unprecedented informative set that can be used for many applications, as credit scoring (learning from credit history and current trends, to extrapolate payback patterns) or customer habits, captured through SMS, chats or other social network applications.

Big data are exchanged primarily through digital platforms, the virtual marketplace where buyers and sellers exchange products and services, often through B2B, B2C or C2C e-commerce transactions. As such, digital platforms are the virtual places where data are traded and collected, thus feeding the high volume of information that will be analysed with data mining.

Social networks or Mobile Apps mainly represent the digital platforms that are consistent with the microfinance framework.

Big data and IoT sensors are closely linked to artificial intelligence, the theory, and development of computer systems able to perform tasks usually requiring human knowledge, such as visual perception, speech recognition, decision-making, and translation between

languages. Big data feed artificial intelligence with timely and massive information that is consequently processed with a machine learning approach.

Data are increasingly considered as a worthy asset: as African economies become increasingly 'digital', data will become a source of power in economic governance. African citizens may benefit from their data as a source of revenue, knowledge, and power (Mann, 2018). Data appropriation from digital intermediaries and social media data intermediaries have however become a concern (see the Facebook/Cambridge Analytica data scandal of 2018).

ICT and data analytics help in efficiently tracking the demand for microfinance products. MFI can so focus on better demand forecasting, using artificial intelligence patterns for optimal planning and probabilistic reasoning (Russel and Norvig, 2015).

Digitalized microfinance produces an enormous and continuous flow of data that can be collected and processed. Whereas big data represent the input source, artificial intelligence presides over the processing of data that are increasingly perceived as a valuable asset.

10. BLOCKCHAINS

The blockchain is a decentralized and distributed digital ledger that corresponds to an open database with a pattern of sharable and unmodifiable data that are sequenced in chronological order.

Blockchains increase transparency with automated compliance and significantly reduce interest rates. They do so because of their decentralized nature, meaning that they can assist several microfinancing bodies without the need for mediators or central authorities. Furthermore, smart contracts make loan repaying easier by creating a bond based on the terms and conditions specified for repayment.

Blockchain can help promote transparency, build trust and reputation, and enhance efficiency in transactions (Kshetri, 2017). Digitization is catalysed by the synergistic interaction of blockchain technology and artificial intelligence.

Blockchains can foster financial inclusion with a branchless model (<http://pubdocs.worldbank.org/en/710961476811913780/Session-5C-Pani-Baruri-Blockchain-Financial-Inclusion-Pani.pdf>) that combines no regulation, instant settlement, digital payments, and low fees, supporting smart and secure transactions that eliminate error handling with a shared ledger database. Examples are represented by:

- blockchain-powered digital Economic Identity (e.g., <https://banqu.co/>; <https://onename.com/>; <https://shocard.com/>);
- Blockchain-powered services for refugees and migrants (e.g., <https://ripple.com/>; www.worldremit.com).

Caveats include integration concerns with existing systems, experimental drawbacks, uncertain regulatory status, initial costs, security and privacy issues.

Applications of blockchain technology to microfinance are still pioneering. Mattila (2017) reports the case of Stellar & Oradian, an open-source platform that allows users to create financial products and services amongst themselves using blockchain architecture.

Another example is represented by Uulala (<https://uulala.io/>), a blockchain-powered FinTech company for financial transactions, such as instant money transfers and remittances, paying

utility bills, etc. The platform will record the transactions on a blockchain based ledger for immutable verification the transactions took place. By using its proprietary algorithm to track its users' transactions, the app can effectively forecast its clients' true financial abilities and creditworthiness. In turn, it can offer low-interest microcredit offers with a proven track record that it will be repaid.

Blockchain microfinance can assist in reducing the rate of interest borne by the micro-borrowers providing decentralized financial services and removing the need for mediators or the centralized trust authorities.

11. MICROFINTECH

Financial technology (FinTech) is a new technology that uses software and digital platforms to deliver financial services to consumers (Schüffel, 2017). These digital tools often disrupt well-established business models by creating new and efficient means of providing services. The use of smartphones for mobile banking, investing services and cryptocurrency are examples of technologies aiming to make financial services more accessible. FinTech is related to complementary businesses as InsurTech or RegTech that may both interact with microfinance, due to its contiguity with microinsurance or with regulatory issues (especially for deposit-taking MFIs, supervised by Central Bank authorities).

There are two main reasons for the emergence of fintech companies (Saksonova and Kuzmina-Merlino, 2017). First, the global financial crisis of 2008, has vividly demonstrated to consumers the shortcomings of the traditional banking system that led to the crisis. Second, the emergence of new technologies that helped provide mobility, ease of use (visualization of information), speed and lower cost of financial services (Anikina et al., 2016).

FinTechs are ventures that leverage technology to develop new and augment existing capabilities for the discovery, distribution, operations, and servicing of financial products and services. Banks across continents are partnering with and investing in FinTechs across the bank value chain to drive efficiencies, offer new products and augment customer experience, resulting in rising demand for business-to-business (B2B) solutions (Ernst & Young, 2019).

FinTechs compete with traditional financial methods in the delivery of financial services, and have the potential to improve the reach of financial services to the broader public and facilitate the creation of a credit record, especially in the developing world (Davradakis and Santos, 2019).

As FinTech technology expands with new products and services, financial inclusion can dramatically improve. Micro-services can be provided ubiquitously, with higher speed and efficiency, especially for consumers that live in backward environments, where physical bank branches are not present.

FinTech advancements may impact on microfinance (creating the neologism "MicroFinTech") with electronic loan applications and banking services that allow for fast credit decisions and loan disbursement. They can also foster remittances, disintermediating the money transfer market that is expensive for the customers and physically anchored to local branches.

FinTech can also fuel big data, helping to build up personalized credit histories (of m-phone payments, for instance) that help avoiding opportunistic temptations as multiple borrowing and represent a useful track record of each customer trustworthiness.

FinTech can also ease cashless digital payments that are traceable in real time. Security gains in poor environments where thefts routinely occur are significant, together with transparency improvements in the fight against money-laundering or tax evasion.

Adaptation of advanced FinTech applications to microfinance must be carefully fine-tuned, considering the peculiarities and necessities of microfinance. For example, innovation concerning asset management strategies for high net worth individuals is evidently out of scope.

Other applications are however interesting. For example, FinTech landscape in India is largely dictated by digital wallets and money transfers. According to the Federation of Indian Chambers of Commerce & Industry, about 46% of Indian FinTechs are focused on payment and trade processing (Mittal, 2019).

FinTech is reported to be a game changer even in Sub-Saharan Africa (<https://blogs.imf.org/2019/02/14/fintech-in-sub-saharan-africa-a-potential-game-changer/>), a region that is the global leader in mobile money innovation, adoption, and usage.

12. DISCUSSION

Technology is the most critical catalyser of cost-cutting strategies in microfinance, with positive impacts on the business model of MFI. Implications for their overall sustainability and the consequent ability to extend outreach to underserved customers are meaningful and promising.

There are however some caveats and pitfalls that need to be carefully considered:

- a) Technology is not neutral, and its governance implications may favour stronger stakeholders, as TLC operators (who run and control digital platforms and networks) or social network companies, always looking for cheap data to acquire and use, often bypassing privacy concerns;
- b) Technology is a big disrupting factor, which segments haves from haves-not, so creating a market barrier among different MFI, where only the strongest are fit for upgrading. Sponsoring equity-holders increasingly acknowledge the importance of IT contributions and technical/managerial training but there is still an enormous effort to make, involving thousands of small and unskilled MFI, too unsophisticated and fragile for scaling up unless properly assisted;
- c) The selection of the right technology is often uneasy, especially for small MFI with limited economies of scale and experience. And technology might be unaffordable or too sophisticated for poor customers that lack skills and experience;
- d) Threats to the security of the system, represented by phishing or cyber-attacks, are likely to grow exponentially with the market. Information security poses a growing challenge;

- e) Digital divide issues represent a further discriminatory factor for the bottom of the pyramid households if they are too poor to have access to the web (and TLC operators may be unwilling to invest in godforsaken areas, especially if scatterly populated);
- f) Innovation typically follows a top-down approach that is mastered by providers, not clients, so developing the prevailing interest of the former;
- g) Geographical scalability and the worldwide introduction of innovation can be hindered by local adaptation to unconventional environments;
- h) Technical integration of microfinance service providers (increasingly mastered by TLC operators) is uneasy and may create opportunistic rents where MFIs represent the weakest component of the supply chain;
- i) Big data concerning personal habits of underserved customers are collected, processed and sold often without any explicit consent of the client, who is unaware of the value of these data and is not given the opportunity to share this value. Privacy issues are likely to grow exponentially, reproducing in a grey zone where information asymmetries may create unprecedented abuses;
- j) Technology-driven savings could cause a mission drift in the MFI if these extra resources are used to address wealthier clients, rather than extending outreach to the unbanked;
- k) Technology and the financialization of microcredit (Aitken, 2013) reduce the geographical segmentation between local MFIs and global financial markets that has prevented many underserved micro-borrowers to be hit by the global financial crisis. Risk of contagion consequently grows.

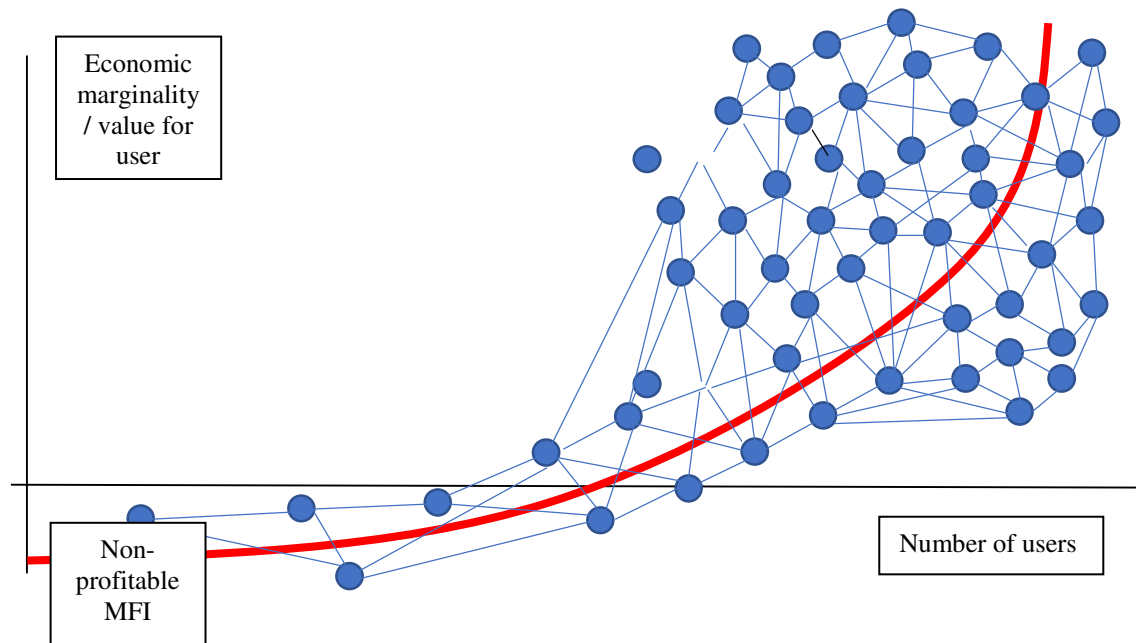
Some peculiar drawbacks concern m-banking. According to the Economist (2018) “Mobile money, which offers the equivalent of a basic bank account to almost anyone with any sort of phone, has long been a boon for financial inclusion. So recent evidence that it is leaving problems in its wake is causing dismay. Digital credit through mobile phones is leading in some places to overborrowing, hardship and - horror of horrors - even more, financial exclusion”.

It should also be noted that “diffusion of technology is easier in crowded towns, where there is critical mass for infrastructures and networks but maybe somehow even more useful in underpopulated rural areas, in the middle of nowhere. “To increase the outreach of MFIs, institutions will have to go a step further and start their operation in the rural areas. Implementing sustainable IT infrastructure in such areas is a challenge with numerous obstacles” (Astha, 2011: Ch. 3). Rural environments so face further challenges that exacerbate their vulnerabilities.

The potential for outreach is enormous, but it must be properly supported, especially if tackling the poorest, who suffer for an increasingly harmful digital divide, and consequent lack of opportunities.

Technology is possibly the biggest catalyzer of scalability that improves both economic marginality (up to self-sustainability and profitability) and outreach potential. Figure 3 shows how growing networks (consistent with higher outreach) improve overall sustainability, following the Metcalfe’s law, according to which the value of a network is proportional to the square of the number of connected users of the system (n^2).

Figure 3. Value for the User according to Metcalfe's Law



13. CONCLUSION

This study starts from the consideration that outreach is severely impaired in most MFIs by negative economic marginality. Since costs mostly concern staff and provisions for delinquent loans, technology can be useful in improving sustainability if it tackles these core bottlenecks. More sustainable MFIs can expand their clientele, boosting outreach with a reduction in interest rate charges. Traditional patterns of firms that compensate lower marginality with higher volumes may, however, be unfit for MFIs whose main “product” is represented by risky micro-loans.

Preliminary evidence (concerning already established M-banking) shows that innovation can actively contribute to cut costs. Confirmation of the combined synergies of technological devices and processes is still wanted, especially for what concerns the latest innovations. Among these, the re-engineering process of traditional group lending through digitalized social networks stands out as a promising pattern for outreach optimization through interest rate discounts.

Digitalization is a powerful catalyst of efficiency, especially in backward environments passing from oral culture to straightforward conversion in digital form. Big data represent a valuable by-product of this process, contributing to making microfinance a business of scale. Technology needs being conceived, designed and implemented with a mixed approach, both top-down and bottom-up and with horizontal integration of the MFI with external IT/ICT providers, with synergistic and scalable outsourcing.

Out-of-the-pocket technology (smartphones with germinating apps are like mobile phones some years ago, originally unaffordable but then rapidly and cheaply spreading) is an entry barrier for both providers (MFI, backed by their technological partners) and clients (users).

Any technological device that can soften information asymmetries, increasing consciousness, is likely to bring strategic added value, even with cost reduction. Examples may include real-time information on the MFI's conditions (interest rates; the size of loans and repayment schedule, etc.), benchmarking comparisons regarding both credit institutions (alternative MFI, branch locations, etc.) and market trends in the specific industry sponsored by MF loans. Even if MF apps are still to be proposed, as soon as smartphones and tablets will reach enough critical mass, the pattern will rapidly change and scale up.

M-banking diffusion in developing countries witnesses that there is a greater stimulus for innovation in harder environments with more compelling survival needs. The economic and social impact of branchless M-banking still needs further investigation, also considering innovative aspects such as information asymmetries reduction, which may have a positive impact even on final clients, strengthening their business models and so enabling micro-borrowers to establish better links with their sponsoring MFI. We may think, for instance, about a real-time device (linked to mobile phones, new generation smartphones, etc.) to communicate in real time wholesale and retail prices of tradable commodities, key information for farmers, small shop owners, etc., which may shorten the whole intermediation chain, to the advantage of producers and consumers. Even peer to peer (P2P) microlending (Ashta and Assadi, 2009; Powers et al., 2008; Stetenfeld, 2008; Freeman and Zopa, 2006) increasingly depends on technological platforms.

The role of big ICT players needs to be further investigated, considering the potential positive impact of their partnering for development in Telco-led M-banking but also the possible – likely – abuses that naturally characterize stronger players.

Booming social networks are likely to reshape group lending composition – a core characteristic of traditional microfinance, following the scalability potential obtainable by leveraging social technology.

Technology is spread through a cross-pollination, from developed to catching up economies and back (as witnessed by M-Pesa mobile solutions in Kenya). Top-down application of innovative devices (smartphones, etc.) and processes merge with bottom-up empirical evidence, grass-rooted in the emerging countryside. Start-ups are ubiquitous, and lever exponential technological applications.

Among the technological advances, fintegration stands out as the trendy innovation behind MicroFinTech, due to the simultaneous interaction of usability, the velocity of innovation, accessibility, and security.

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