



FINANCIAL SERVICES ASSESSMENT

Water Delivery through Payment Platform – M-PESA Pushes the Rural Frontier

Sherri Haas and Geetha Nagarajan
IRIS CENTER, UNIVERSITY OF MARYLAND

July 2011

Financial Services Assessment project can be found on the web at <http://www.fsassessment.umd.edu/>

ABOUT THE PROJECT

The *Financial Services Assessment* project is designed to examine the impact of financial services on the lives of poor people across the developing world. This project is funded by the Bill & Melinda Gates Foundation, which is committed to building a deep base of knowledge in the microfinance field. The IRIS Center at the University of Maryland, College Park, together with its partner, Microfinance Opportunities, will assess a diverse range of innovations in financial services. The results of this project will shed light on the design and delivery of appropriate financial products and services for the poor and the potential to scale up successful innovations to reach larger numbers of low-income households.



FUNDING

The *Financial Services Assessment Project* is funded by a grant from the Bill & Melinda Gates Foundation.



REPORT SERIES

This report is part of a series that will be generated by the *Financial Services Assessment* project. The reports are disseminated to a broad audience including microfinance institutions and practitioners, donors, commercial and private-sector partners, policymakers, and researchers.

CONTACT IRIS

IRIS Center
University of Maryland
Department of Economics
3106 Morrill Hall
College Park, MD 20742 (USA)

E-mail: info@iris.umd.edu
Phone: +1.301.405.3110
Fax: +1.301.405.3020
Web: www.iris.umd.edu

CONTACT MICROFINANCE OPPORTUNITIES

1701 K Street NW
Suite 650
Washington, DC 20006 (USA)

E-mail: info@mfopps.org
Phone: +1.202.721.0050
Fax: +1.202.721.0010
Web: www.microfinanceopportunities.org

ABOUT THE AUTHORS

Ms. Sherri Haas is a program specialist with the IRIS Center and with five years of experience in technical research, implementation of quantitative and qualitative field research, and project management. She conducted five months of field research in Kenya to gather in-depth information on the community-level effects of M-PESA. She is experienced in all aspects of international development project management and has managed several long term projects. She graduated *summa cum laude* from Illinois Wesleyan University with research honors in economics as well as a second major in political science.

Dr. Geetha Nagarajan is Associate Director at the IRIS Center, serving as Research Director, Economist and Monitoring and Evaluation Specialist. She designed and directed this study in Kenya for the Financial Services Assessment project. Dr. Nagarajan is a highly experienced researcher, advisory assistance provider, and author of several peer reviewed publications. She has worked in 21 developing countries in Asia, Africa and Eastern Europe. Dr. Nagarajan has evaluated economic development programs, and conducted field based research to identify causes of poverty to design policy and programs to address them, especially in conflict and disaster affected environments. An expert in small and micro and small enterprise development, and rural and microfinance, she has a wide range of experience in developing, measuring, and implementing activities to ensure program effectiveness to reach the target population.

ABSTRACT

This paper provides a more comprehensive understanding of innovative ways in which the M-PESA platform could facilitate outreach and development in rural areas even without the presence of an M-PESA agent in close proximity. It examines the use of M-PESA's payment system as it is combined with the Grundfos LIFELINK water delivery system to provide access to a safe source of water in a semi-arid environment. This study shows that M-PESA can successfully foster partnerships that build on the M-PESA platform to provide valuable services in remote rural areas, even without the direct presence of an agent shop. The resulting outcomes are beneficial for both individual users and the community as a whole.

ACKNOWLEDGEMENTS

The authors would like to thank Grundfos LIFELINK Kenya as well as the Safaricom M-PESA staff for their assistance in conducting this study. We thank Lila Khatiwada and Megan Plyler at The IRIS Center whose field work in Kenya considerably benefited us. We would also like to recognize the contribution of our local research assistants from the Kitui community who conducted the focus group discussions, case studies and interviews. Special thanks also go out to The Kitui Development Centre, which helped facilitate the research, and Tobin Jones, our Nairobi-based research assistant. We thank Dr. Dennis Wood at IRIS for his helpful comments on the drafts, and the program managers of the FSA team for their logistical support.

TABLE OF CONTENTS

TABLE OF CONTENTS	2
ACRONYMS	3
TABLE OF FIGURES	4
STUDY LOCATION.....	5
SUMMARY	6
I. INTRODUCTION	7
II. WHY ARE THERE FEW M-PESA AGENTS IN RURAL AREAS?	8
III. BUILDING GRUNDFOS LIFELINK ON THE M-PESA PLATFORM.....	9
IV. STUDY FINDINGS.....	10
FINDING 1: DEMAND FOR M-PESA-BASED WATER DELIVERY SYSTEM EXISTS.....	11
FINDING 2: DEMAND FOR M-PESA BASED WATER SYSTEM, HOWEVER, COULD BE DAMPENED BY LACK OF ACCESS TO WATER KEYS.....	12
FINDING 3: M-PESA ENHANCED WATER DELIVERY SYSTEM BENEFITS INDIVIDUAL USERS	13
FINDING 4: M-PESA ENHANCED WATER DELIVERY SYSTEM ALSO BENEFITS THE COMMUNITY.....	15
CONCLUSIONS	17
REFERENCES.....	20
STUDY BACKGROUND	21

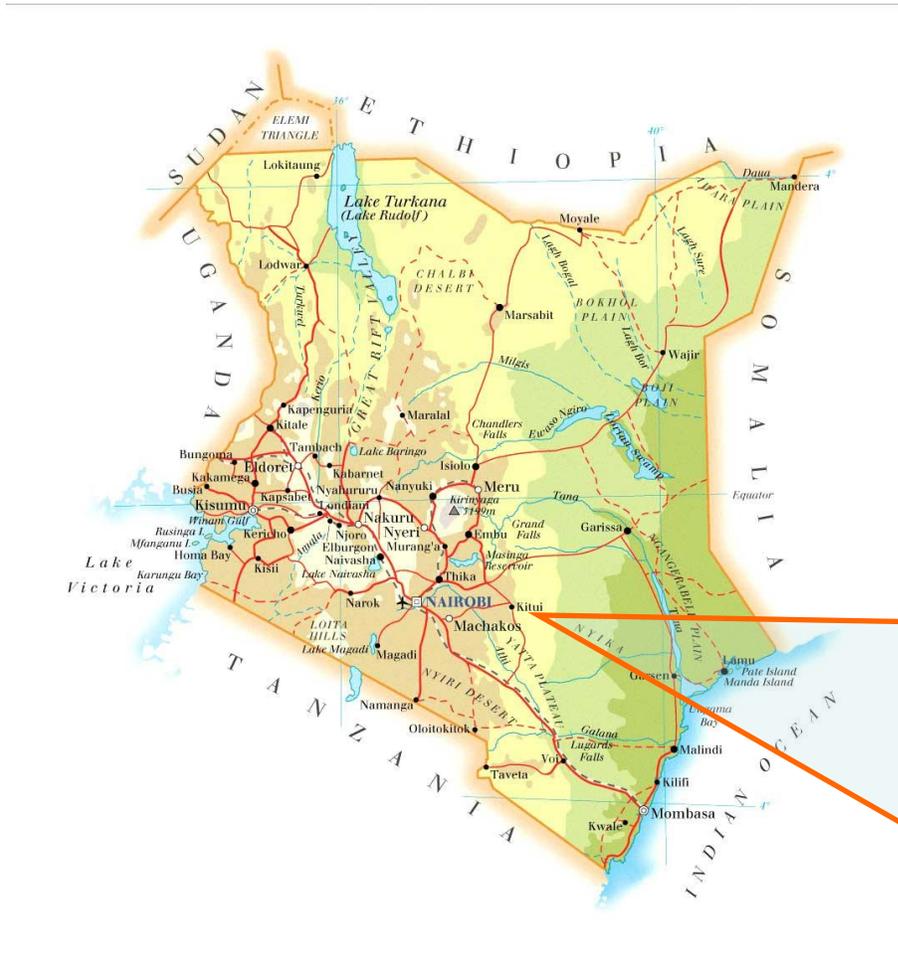
ACRONYMS

FGD	Focus Group Discussion
KSH	Kenyan shilling
KWP	Katitika Water Project
M-PESA	Mobile money, an e-money transfer system pioneered by Safaricom, Kenya's largest mobile service provider.
NGO	Nongovernment Organization

TABLE OF FIGURES

Figure 1 - Katitika LIFELINK tank and solar panels	8
Figure 2 - Katitika water dispenser	8
Figure 3 – Water key in dispenser	9
Figure 4-- Katitika Water Pump Monthly Consumption Dec. 2009-Feb. 2011	11
Figure 5 - Filling up at the water pump	13
Figure 6 - Fetching water from the river bed	15

STUDY LOCATION



Katitika

SUMMARY

M-PESA, an agent-assisted, mobile phone-based, person-to-person payment and money transfer system serves nearly a third of Kenya's 41 million residents through 23,000 agent outlets spread nationwide. But, in areas with very limited M-PESA agent network could M-PESA be still used as a platform to provide a variety of services in areas and create values for Kenyans? This paper, based on the study conducted by the IRIS Center from April - June of 2010 in Katitika, Kenya, examines the use of M-PESA's payment system as it is combined with the Grundfos LIFELINK water delivery system. It provides a more comprehensive understanding of innovative ways in which the M-PESA platform could facilitate outreach and development in rural areas even without the presence of an M-PESA agent in close proximity. Katitika village is one of many rural communities in Kenya that do not currently have an M-PESA agent because of its low population and remote location. In 2009, a borehole was installed by Grundfos in the village which dispenses water by payment through an M-PESA-enabled water key.

We explain how population and location limit where M-PESA agent shops can successfully operate, and how the Katitika Water Project is an example of using the M-PESA system as a platform for service provision with very limited agent intermediation. We discuss the strengths and limitations of the water system built on the M-PESA platform and also the direct effects of the water project for the users of the system as well as the indirect effects for other members of the community. We show that the bill payment functionalities of M-PESA that do not require much agent intermediation have the potential to prove useful in providing services in remote areas and facilitating development.

I. INTRODUCTION

“M-PESA will continuously seek strategic partnerships with key service providers in other industries in our endeavor to come up with innovative products and services to meet the requirements of our customers and business partners.” – Former Safaricom CEO Michael Joseph at the launch of the Katitika Water Project in Kitui, Kenya, 2009.

M-PESA, an agent-assisted, mobile phone-based, person-to-person payment and money transfer system, was launched in Kenya on March 6, 2007. It allows users to store money on their mobile phones in an e-account and to deposit or withdraw money in the form of hard currency at one of M-PESA’s numerous agent locations. Since its inception in 2007, M-PESA has expanded its outreach quickly, serving nearly a third of Kenya’s 41 million residents as of December 2010. The service is now considered to be a remarkable technological innovation, providing several types of financial services to the poor in a fast, reliable and cost-effective way.

The growth of the M-PESA agent network has been astounding – over 23,000 agent outlets were reported countrywide as of December 2010. While numerous in urban areas, agents are sparsely scattered in remote and rural locations, and have operating procedures and constraints which differ from those in urban settings due to their locations. Rural stores face what Eijkman, et al. (2010) describe as a “triple whammy”: lower commissions due to fewer transactions of smaller size; less opportunity for transactions to offset costs due to the heavily cash-out nature of M-PESA in rural areas; and higher transportation costs (pertaining to time as well as monetary expenses) to transact with bank branches to maintain adequate cash balances to pay to clients, as they tend to be located much further away.

The sparse rural outreach of M-PESA agents leaves many rural households with very limited access to M-PESA services. However, this may not mean that M-PESA’s outreach has to be limited only to areas with an agent. M-PESA can be used as a platform to provide a variety of services, starting with payment services. Mas and Radcliffe (2010) suggest that M-PESA may illustrate a third approach to financial inclusion (the first two being “credit-led” or “savings-led”), namely to “focus first on building the payment ‘rails’ on which a broader set of financial services can ride.” In this paper, we illustrate a case in Katitika, Kenya where we show that M-PESA can facilitate outreach and development in rural areas even without the presence of a local M-PESA agent in close proximity. In Katitika, local population use M-PESA’s payment feature in a flexible, simple and innovative way for accessing water in a drought-prone area.

This paper, based on the study conducted by the IRIS Center at the University of Maryland in College Park from April – June of 2010 in Katitika, examines the use of M-PESA’s payment system in combination with the Grundfos – LIFELINK water delivery system (hereafter referred as KWP) to provide a more comprehensive understanding of innovative ways in which the M-PESA platform could facilitate outreach and development in rural areas even without the presence of an M-PESA agent. Katitika village is one of many rural communities in Kenya that do not currently have an M-PESA agent because of its low population and remote location. The village is approximately 26 km and about a 45-minute drive over rutted dirt roads from the town of Kitui in Eastern Province. This paper also discusses the direct effects of the Katitika water project (KWP) for the users of the system as well as the indirect effects for other members of the community.¹

¹ Note that in using the M-PESA platform in combination with the Grundfos LIFELINK system, M-PESA is not itself seen as creating the household and community effects, rather, it is a facilitator of an environment that can produce (and multiply) outcomes at the household and community levels.

The data for the study were gathered from April through June of 2010, using a combination of short surveys, focus group discussions and case study interviews with both users and non-users of the KWP, as well as users and non-users of M-PESA separately from the water system. Additionally, information was obtained through key informant interviews with a variety of sources including shopkeepers, the water project management committee, and Grundfos and M-PESA representatives. A total of 12 focus group discussions (FGDs), 44 short surveys with FGD participants, 8 case studies and 12 key informant interviews (KIIs) were conducted.

II. WHY ARE THERE FEW M-PESA AGENTS IN RURAL AREAS?

In 2010, from our comparison across three locations in Kenya, we found that agents operating in urban and large towns completed an average of 80-134 transactions per day while agents in more rural locations (small market centers) conducted 51-86 transactions per day on average (Haas, Plyler, and Nagarajan, 2010). Eijkman et al. (2010) looked at five rural market M-PESA shops located in small towns with an approximate population size of at least 5,000 and found that they conducted just over 50 transactions per day. M-PESA agent shops in rural locations also have a significantly higher amount of withdrawals as a percentage of total daily transactions than shops in larger towns or urban settings. Rural shops showed withdrawals averaging 80 - 97% of total daily transactions, compared to 60% in larger Kitui town, and 46% in urban Kibera (Haas, Plyler, and Nagarajan, 2010).²

Achieving financial success as an M-PESA agent requires keeping costs low and the number of transactions high. Agents reported needing to receive cash at least every other day, either by delivery or traveling to a bank. They often had to get cash every day so that they could sustain high levels of withdrawals (Haas, Plyler and Nagarajan, 2010). Most agents operated in town centers where the majority of commercial banks are located, making cash management easier. Pickens et al. (2009) found that the primary expense for M-PESA agent shops was liquidity management, which represented 30% of total expenses.³ Pickens et al. (2009) also showed that a typical agent had around \$1,600 invested in their business. It follows that the more remote and less densely populated an area, the more difficult it will be to run a successful M-PESA shop. When operating in rural areas, the low volume of transactions, high withdrawals and liquidity management costs often mean substantial initial investments with low potential for breaking even. This situation is what Eijkman, et al. (2010) describe as a “triple whammy in rural areas”: lower commissions due to fewer transactions of smaller size; less opportunity for transactions to offset costs due to the heavily cash-out nature of M-PESA in rural areas; and higher transportation costs (pertaining to time as well as monetary expenses) to transact with bank branches to maintain adequate cash balances to pay to clients, as they tend to be located much further away.

The sparse rural outreach of M-PESA agents leaves many rural households with very limited access to M-PESA services. Additionally, many rural residents who do not have someone to send them cash through M-PESA do not see the system as having any value for them. However, M-PESA also has the capability to set up “pay bill” accounts with businesses and NGOs, allowing a user to make payments or purchases on their phone through M-PESA. The functionalities of M-PESA that do not require much agent intermediation have the potential to prove useful in providing services in remote areas and facilitating development.

² Eijkman, Kendall, and Mas (2010) similarly found rural-located M-PESA agents in their study to have an average rate of client transactions to be 90% cash out.

³ The cost included transportation costs, bank fees, and aggregator charges (aggregators help in e-float/cash management).

III. BUILDING GRUNDFOS LIFELINK ON THE M-PESA PLATFORM

The partnership between M-PESA and Grundfos (a worldwide water pump manufacturer) in the LIFELINK water projects is one clear example of how the M-PESA platform can be used to benefit a community, despite the absence of an M-PESA agent in the village and despite receiving a low volume of remittances. The Grundfos LIFELINK System⁴, initiated in early 2009, uses a variation on M-PESA's bill-paying function, in combination with a "water key" card and Grundfos dispenser, to allow rural communities to access safe water from an automated water system. This innovative water delivery system is an important breakthrough in how the M-PESA system can be used to facilitate the delivery of essential services to rural areas, without an M-PESA agent at the location.



Figure 1- Katitika LIFELINK tank and solar panel

There are now 13 LIFELINK water projects that operate with the M-PESA – Grundfos partnership in Kenya, most of which are in areas with low agent outreach. The water project located in Katitika village in Kitui District is the earliest of the 13 water projects currently in operation. The Katitika village is located within the Kavuta Sub-location and Itoleka Location in Kitui District, Kenya. Kitui District is a semi-arid region in the Eastern Province of Kenya, with its main town, Kitui, located approximately a three-hour drive east from the capital of Nairobi. The region is prone to poor rains, and was severely affected (as was much of Kenya) during a two-year drought that ended in late 2009. Outbreaks of waterborne disease, significant shortfalls in maize production, and

breaks in food aid pipelines have contributed to high levels of food insecurity in the region. Kitui's food production is 6,661 metric tons, with food demand reaching 82,839 metric tons (USAID, 2009). Moreover, water shortage has become acute for both drinking and irrigation purposes, with the average distance to the nearest water source being five kilometers (ibid).



Figure 2 - Katitika water dispenser

The Katitika Water Project (KWP) began operation in the village in September 2009. Katitika village is one of many rural communities in Kenya that do not currently have an M-PESA agent due to low population and remoteness to sustain a shop. Case study respondents reported using M-PESA on average only one time per month or less. According to a baseline study commissioned by Grundfos, the community and villages in the vicinity of the water project together contain approximately 1,800 individuals (Grundfos, 2009).

The KWP, nicknamed as *maji ya compiuta* (literally "computer water") was initiated on September 4, 2009 as a collaboration between Safaricom / M-PESA and Grundfos. The project is ultimately intended to become community-owned

⁴ For additional information please see <http://www.grundfoslifelink.com/>.

through repayment of an initial loan of 1,780,000 KSH (approximately \$22,250USD) from Grundfos over a period of five years. The funding for each LIFELINK system can vary, with some installed in other locations in Kenya in partnership with aid organizations which contribute to the cost of the system. The LIFELINK water pump was installed using a non-functional borehole originally dug by the Japanese International Cooperation Agency (JICA) in 2001. Prior to installation of the LIFELINK system, residents had only the Tiva River – a one-hour or more walk from their homes – to access water. During the dry season, the river runs dry and residents must dig shallow wells in the riverbed. Due to the distance on rugged terrains, donkeys are essential for fetching water from the river.

In the LIFELINK system, users can access a steady and convenient water supply by depositing money from their personal M-PESA accounts onto water keys, which are then inserted into the water pumping system to release water (see depiction of the system in annex). The water keys allow for real-time remote monitoring of the water delivery system by Grundfos and also for M-PESA to track funds collected through water sales. For instance, Grundfos can immediately see how much water is being drawn from any of the boreholes, and respond quickly if any maintenance problems occur. Grundfos LIFELINK shares the water usage information through its website, where anyone can see the water usage of a particular LIFELINK borehole.⁵



Figure 3 - Water key in dispenser

IV. STUDY FINDINGS

One of the primary differences between the KWP and many other pay-for-use water pumps is the manner by which customers purchase the water. Most fee-based water pumps require cash payment at the kiosk at the time of use. The KWP uses a water key which is pre-paid through the M-PESA system. One must either own a water key or have access to borrow a water key from another person to use the system. Water keys cost 115 Kenya shillings (approximately \$1.44), and come with 100 shillings of water credit preloaded on the card. The jerrycan (a 20 liter plastic jug) is the primary unit used for hauling household water, and therefore is often what the water is priced by. The individual water key can be used down to a balance of zero, and water can be purchased at 3KSH for one jerrycan at the same rate in increments as small as one liter. Any time the account holder wants to add value to the account, a minimum of 100KSH must be added to the account plus a 15KSH transfer fee. Adding value to a water key must be done through the M-PESA system using its pay bill function. Funds can be added to any water key account by anyone with an M-PESA account, and the M-PESA account holder does not need to be the same as the water key account holder. Therefore, if a friend or relative wished to send “water money” to someone in Katitika, that person could do so as long as he or she knew the account number for the KWP and the individual’s water key. In the Katitika area, there were multiple reasons given why some households were non-users of the KWP, the primary two being that they did not have enough funds to acquire the water key and purchase water, or that they did not have adequate knowledge of when and where to obtain the water key.

⁵ http://www.grundfoslifelink.com/int/o8_installations_kenya_katitika.html

FINDING 1: DEMAND FOR M-PESA-BASED WATER DELIVERY SYSTEM EXISTS

Approximately 200 water keys were distributed during the ten months since the initiation of the project. At baseline, Grundfos determined that approximately 1,800 individuals lived in the KWP service area. Most study participants who were KWP users felt more secure in their access to water because of the installation of the water kiosk. On average, users of the KWP also reported using more water per day (approximately eight jerrycans) compared to non-users (four jerrycans). The average of eight jerrycans per day reported by KWP users is also higher than the average daily water use found by the baseline study commissioned by Grundfos prior to installation of the water system, which found that, at baseline, three-quarters of households in the area used between 40-120 liters (2-6 jerrycans) per day, and less than 10% of households reported using more than 6 jerrycans per day (Grundfos, 2009).

KWP demand was found to be somewhat dependent on finances and weather variations. Although the original cost (5KSH per jerrycan) was reduced to 3KSH to boost demand, some were still unable to afford to pay the price of water for regular use. Seasonal effects also dampen the demand for KWP water. As seen in Figure 1 below, use of the water pump changes significantly over the course of the year, with peak usage corresponding to the long dry season from July through September. There is increased demand for water from the pump during the dry season for activities such as watering kitchen gardens and brick-making. But, during rainy periods, water is more readily available for free from rain catchment at individual homes and hauling water for plants or animals is less necessary.

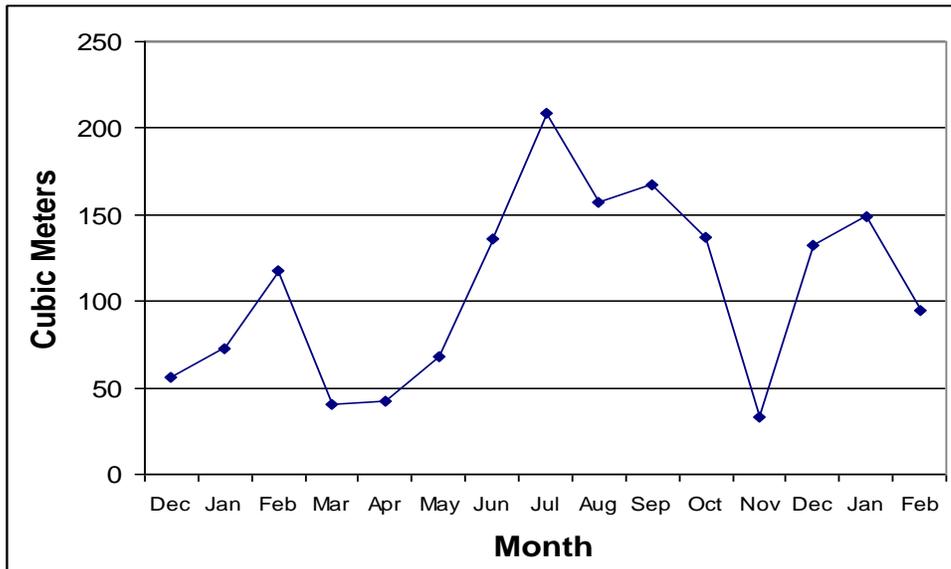


Figure 4- Katitika water pump monthly consumption Dec. 2009-Feb. 2011

FINDING 2: DEMAND FOR M-PESA BASED WATER SYSTEM, HOWEVER, COULD BE DAMPENED BY LACK OF ACCESS TO WATER KEYS

The primary bottleneck for increased use of KWP appears to be in access and use of water keys used to pump water at KWP.

1. Obtaining water keys

The LIFELINK system presents some challenges to its use that do not occur with a simple cash payment water pump. These challenges include the initial purchase of the water key, topping up the value in minimum 100 shilling increments, and the requirement to use M-PESA for top-up. The initial step of procuring a personal water key is one that has proved difficult for a number of community members in the Katitika area. Water keys have not always been readily available for purchase, and some case study participants reported that one might have to wait months after paying the 115KSH to receive the water key.⁶ Community members also were unclear about the procedures to obtain a water key – there was confusion as to whether a water key could be obtained on demand, or if the cost had to be paid up front with an indeterminate waiting period to receive the key.

2. Cost of water key

For some residents of the Katitika area, 115KSH (US\$1.44) is a significant sum to save and they are not comfortable paying without knowledge of when the water key will be received. In addition, topping up presents the same financial challenge to some Katitika residents as did the initial purchase of the key, because the same 115 KSH amount is required.

Some residents are able to circumvent the cost of purchasing a water key by using a friend's or neighbor's water key. One case study respondent reported that she does not have her own phone, M-PESA account, or water key. Instead, she is able to borrow a friend's water key, and pays her cash for the amount of water withdrawn.

3. Using M-PESA to top up

In Katitika, accessing M-PESA is not simply a matter of walking a few minutes to the nearest agent, as it would be in a town or city. If money is already on the user's M-PESA account, then the transfer to the water key is simple and does not require a visit to an agent. However, the cell phone used for that transfer must have power, and with no electricity in Katitika, the owner must travel to a market with power to charge it. Similarly, if a user wants to deposit cash into his/her M-PESA account he/she must go to an M-PESA agent, which is at least an hour by foot. One case study respondent reported that, while she would like to have her own phone and M-PESA account, she is not able to afford one. She instead gives her 115KSH to a neighbor, who then transfers the funds to her water key.

Although the additional steps to pay for water at the KWP laid out above may seem to add too many costs to the users, only one case study participant (of eight KWP users and non-users) stated that she would prefer a borehole with a standard cash payment system. The most common reason given for preference of the water key system to cash payment was that the money, once on the water key, could only be used for water. Funds, once in a water key account, cannot be transferred out of the account or redeemed for cash. Although an outside observer might expect that it would be preferable to have access to funds in the case of unexpected expenses, KWP users saw the security of having money designated as being exclusively for water as a particular benefit of the system.

⁶ Our discussion with Grundfos on this issue revealed that they send an engineer once a month with water keys for distribution. They reported that they sent one three days before our visit but no resident purchased a key. The engineer cannot leave the keys with the water committee at Katitika since the keys need to be calibrated before use, and because Grundfos also wants to reduce misuse of water keys by the local water committee.

Another reason given by some respondents for preferring the water key system to a cash payment scheme is the reduction in opportunity for corruption. One respondent, who had moved to Katitika from a location with a cash payment water pump, reported that she encountered water attendants in that area who overpriced the water; they would fill half the jerrycan but would collect payment for the full amount. Also, the water keys provide a transparent and real-time tracking of funds deposited into the pump and volume of water dispersed from the well to monitor depletion of ground water (see Box. 1). This feature is especially important in areas where corruption and depletion of natural resources is high.

Box 1. Tracking Transfers

We were turned down for an interview in July 2010 with the water management committee at Katitika Water Project (KWP) in Kitui, Kenya. The reason given was that we had presumably defaulted on our promise to transfer a small honorarium to the committee water key for the last interview held with them in November 2009. We were certain, however, that the amount was transferred on time as per mutual agreement, into the joint account held by the community, and had received the confirmation message from M-PESA. The management committee reported that the funds did not arrive to the account.

With some persuasion, the water committee showed us their account ledger, which did not have any credits made by us in the last six months. We contacted M-PESA and Grundfos to try to get to the bottom of the discrepancy.

M-PESA assured us that, despite the absence of an electronically saved message with the transfer confirmation, they could still trace the transfer if we provided the phone number and account holder's ID from which it was transferred. They asked us to first check with Grundfos since it would be faster for them to trace the transfer. Grundfos tracks all of the transfers made through M-PESA into the water key accounts that have been distributed at each of the LIFELINK pumps in Kenya.

Upon contacting Grundfos, they were able to solve the issue on the spot and reconcile the account. With the phone number, date and amount of transfer, Grundfos quickly found it on their ledgers. The amount was transferred on time for the agreed amount into the account number we had been told belonged to the water key held by the committee. The issue lay in a small error the water committee made in providing us with the account number that contained both letters and numbers. They typed zero instead of the letter "O" for one of the nine digits on the account number. Therefore, the money was transferred by M-PESA on time to an account that does not exist and sat there until Grundfos traced it and transferred the amount into the correct account. The process of correcting the error took less than ten minutes and within another fifteen minutes we received a call from the KWP committee chair issuing the invitation for an interview with them. In this process, Grundfos learned that several others had erred in the zero vs. letter "O" entry, and has now discontinued using these characters to avoid future problems.

The reputation of the system for its reliability was restored, thanks to the features in M-PESA that allow for the transparent and efficient transfer of funds, which helps to ensure the continuation of essential services, and to the built in tracking system at Grundfos. For the poor, every dollar is precious, and in the case of the Katitika Water Project, losing one dollar means losing over 520 liters of clean, safe water.

FINDING 3: M-PESA ENHANCED WATER DELIVERY SYSTEM BENEFITS INDIVIDUAL USERS

Our case studies with five users in the KWP area showed that in addition to the benefit of access to clean water, the reduction in time and resources spent in fetching water was one of the main benefits of the water kiosk. In general, users of KWP participating in the FGDs reported spending about 30 minutes per day on water collection. Non-users reported that their households spent between two to four hours collecting water from the river per day. The Grundfos baseline study (2009) reported that, prior to the KWP installation, 70% of their

respondents spent three to four hours per trip to the river, and that households often made two trips per day.

One of our case study participants, who now uses the KWP, reported walking to the river for an hour to fetch water whereas the KWP borehole is just 10 minutes away. She now makes one trip per day to the river and one to the borehole, saving money on the first and time on the second. Before the borehole, she used to make two trips to the river daily, and still does on days that she does not have sufficient funds available. She is now able to devote the time saved from using the water project to her household chores. Multiple KWP users cited time savings as a significant benefit of the water project. In Kenya, on average, women work 13 hours per day compared to an average of about 8 hours for men (World Bank, 2007). As in many developing countries, women in Katitika are primarily responsible for collecting water. One of the respondents noted that her donkey died during the drought, but with the KWP nearby, she was still able to fetch water when she needed it because she was able to carry it on her back.

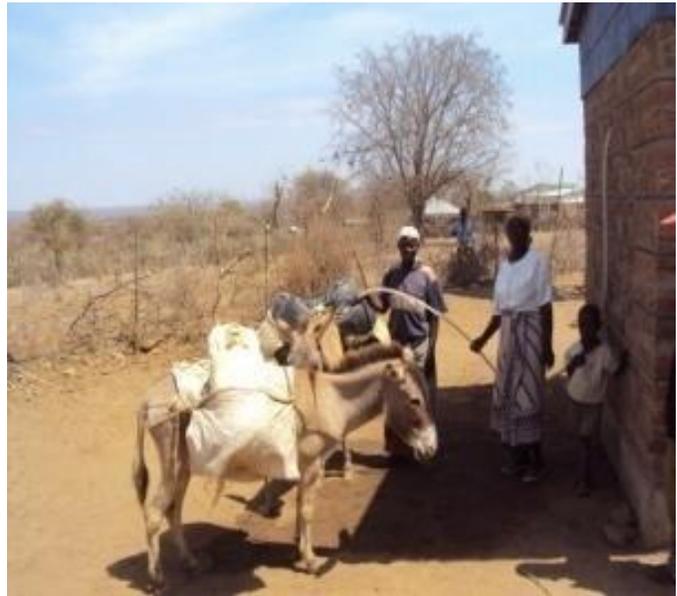


Figure 5 - Filling up at the water pump

The trade-off between time and cost was clear to the users of the KWP. The reduction in loss of productive time due to transactions costs to access water was found to contribute to food security. The time saved allowed household members, often the female members, to spend more time working on the farm or in income-generating activities to buy more good quality food. Many study respondents noted that the access to water from the KWP has allowed community members to sustain small vegetable gardens and start growing fruit trees that they otherwise would not have been able to maintain.

There were also increased opportunities to make profits from the water project. We observed some users who purchase water from KWP for 3KSH in order to sell it in the community for 7KSH, at a 4KSH profit. One seller reported using the profits to purchase food for her household. Another local resident was able to start a successful brick-making business, spending approximately 2,500KSH on water input to produce 7,000 bricks sold at 6KSH per brick.

There were also reports of reduction in waterborne diseases due to use of clean water. Additionally, reduction in waterborne illnesses could lead to increased human capital of the families by keeping children healthy and in school. To make the river water safe for drinking, one must either boil it, or treat it with WaterGuard (a chlorine treatment to make water safe for drinking), at an approximate cost of 20KSH per 50 jerrycans.

Box. 2. Profile of a Katitika Water Project User

Sarah is a widow with four children who uses both M-PESA and the KWP. It is raining as we conduct the case study, and it's a blessing. Sarah describes the numerous decisions that go into obtaining and using the household's water. She can get water from three different sources; the river, the KWP borehole, or rainwater. She is able to catch and store approximately 100 liters (five jerrycans) of water, if there is enough rainfall, which will last the family at most one week. When she has rainwater, she uses it for all purposes (rather than just drinking water, as some people do), because she is so relieved not to have to go to the river.

She receives money from her sisters via M-PESA occasionally, some of which she will keep on her account rather than withdrawing as cash, so that she can transfer the money to her water key. As long as she has money available on her water key she uses the borehole when her rainwater runs out. It is only when she is out of stored rain water and funds that she uses the river as a water source. When using the river water she uses WaterGuard, a chlorine solution, to treat it to be safe for drinking.

She has to economize with her water, as she does not feel that she has enough for all needs. A trip to the river is a long distance, and since she does not own a donkey, she must find one to borrow. She brings back some water for herself, and some for the donkey owner, and the next time the owner goes to the river she shares some of it with Sarah. If she is not able to get enough, she has to decide which need goes unmet, such as watering the animals and washing clothes. She can also save water by giving the animals the old wash water to drink. When she has money on her water key she continues to use the water sparingly, so as to stretch it out.

She values the proximity and cleanliness of the KWP water and feels more secure in her access to water for her family. In the dry season she and her family dig shallow wells in the riverbed to reach water. With the borehole available she has seen a decrease in the queue to fetch water from the riverbed. She also found it easier to borrow a donkey, now that fewer in the village are traveling the long distance to the river. She reports that she would be deeply affected if the borehole were to cease operating, because she knows that she is able to get clean water whenever she has money. For her, the water key system is preferable to cash, because she can put money on it and know that it will be dependable.

The positive effects of the water project described above on individual users are not unexpected. These users self-select into using the KWP over other sources of water. The sustainability of the KWP project, which involves natural resources and is community-managed, however, requires a larger network effect and larger community effects. These effects must be able to benefit the majority of the people –users and non-users– in the community. If only a small or elite section of the community were to have access to a natural resource it could create conflicts in the community.⁷ The next section explores if the positive effects noticed at the individual level spill over into the larger community of users and non-users.

FINDING 4: M-PESA ENHANCED WATER DELIVERY SYSTEM ALSO BENEFITS THE COMMUNITY

The effects felt at the community level appear to indicate a spillover of individual effects.

1. Time savings due to reduced congestion at the rivers

Access to river water for non-users improved due to the KWP, because of the reduction in demand for shallow wells in the river, and the consequent shortening of queues to retrieve

⁷ A network effect (also called network externality) is the effect that one user of a good or service has on the value of that product to other people. When a network effect is present, the value of a product or service increases as more people use it.

water from the shallow wells. During the dry season, occurring annually from July to September, it is common for the river to run dry, requiring community members to dig wells (generally four to five feet deep) in the riverbed to reach water. With the availability of the Grundfos kiosk, fewer people were queuing at the riverbed wells, so fetching from them took less time than previously (see Box 3 for collecting water from the river bed).

Box 3: Collecting Water from the River Bed

The rivers used by the study area residents are normally dry and have running water only during rainy seasons. Therefore, users generally dig a shallow hole on the river bed to collect water. They wait for water to seep into the hole and collect it using a plastic or tin mug. Then they pour it into a jerrycan that can be loaded onto a donkey, bicycle, or their shoulders for hauling. The water holes can be reused and could recharge after every collection; However, people generally let their animals drink the stagnant water in the hole and drain it completely, then wait for fresh water to collect for their home consumption. We observed the process to take about 30 minutes in July, a normal period to collect four jerrycans of water. The users said that this process takes about an hour in dry seasons.

2. Availability of donkeys for non-users

Donkeys are essential in Katitika for hauling water. The severe drought suffered by the area was particularly harmful to the community’s ability to access water from the river. First, because of the lack of water itself, and second, because of the toll the drought and corresponding lack of fodder took on the donkeys (and other animals). Residents reported many deaths of donkeys in the area over the course of the two-year drought, and, at the time of the study, lacked the capacity to replace the lost animals. Many residents count on being able to borrow a donkey from a neighbor or relative to haul water, and, during the dry season, some found it harder to borrow an animal. Owners were concerned about the donkeys getting overworked when there was neither enough water nor fodder to sustain them. That said, the willingness of friends and neighbors to share animals plays an important role in access to water in Katitika. Sometimes the animal is given freely for use, sometimes it is expected that the borrower will bring back some water for the owner in return.



Figure 6 - Fetching water from the river bed

Some residents reported the KWP having an effect on the use of donkeys in the area. One of the case study participants noted that before the water kiosk it was harder to borrow a donkey to haul water because everyone was going to the river. She reported that her household would sometimes have to go without water because all of the donkeys were in use or the owners did not want them to get too tired. This is less of a problem now that the KWP water kiosk is operating because the animals are travelling a much shorter distance than when they went to the river. The water kiosk increases the health and availability of donkeys in the community, which benefits the water security of community members. KWP non-users benefit in that more healthy animals are available for borrowing which makes it easier for residents to access water for their households, be it from the water kiosk or the river.

3. Safe source of clean water for all

The primary school near the Katitika Water Project was able to purchase water from the KWP borehole to fill the school tank during the dry season using funds provided in their budget from the government. The students carried the water the short distance from the borehole to the school. Before the KWP project, the school asked parents to bring water when the rain

water ran dry, which required a 14km roundtrip trek to the river and the use of donkeys. Additionally, the school did not treat the river water in the tanks after it was collected. The presence of the KWP (and the availability of funds to purchase water from it), means that the tank is filled faster and with safer water. The water is then used for all children at the school, providing benefit to them regardless of whether or not their families are able to or chooses to use kiosk water in their households.

While it is not possible to show a direct link from the study between access to a borehole and reduced waterborne illness, respondents throughout the study areas perceived borehole water to be healthier for themselves and their families. Even if residents used a combination of water sources (KWP along with river and rain water) study respondents overwhelmingly stated that the borehole water was prioritized for drinking. Additionally, the head teacher of the local school noted that the school and students had more health problems prior to the installation of the borehole.

CONCLUSIONS

An M-PESA agent shop may not be a viable option in all communities, especially in more remote areas with small populations. This study shows that M-PESA can, nonetheless, successfully foster partnerships that build on the M-PESA platform to provide valuable services in remote rural areas, even without the direct presence of an agent shop. The resulting outcomes are beneficial for both individual users and the community as a whole.

Having an additional safe source of water has allowed the community residents to weigh the costs and benefits of fetching water from the various sources, and has given them the ability to make the choices which were right for them on any particular day. For some, the water project was the last option, due to cost, but they still appreciated its presence. For others, the water project was the source for all their household needs, and they preferred to spend the money and conserve time, rather than use one of the free sources. Many, however, fell somewhere in between, prioritizing the use of the KWP water for drinking and using the river or rainwater for other uses, or using the water project only when they felt they had sufficient funds to be able to justify the purchase.

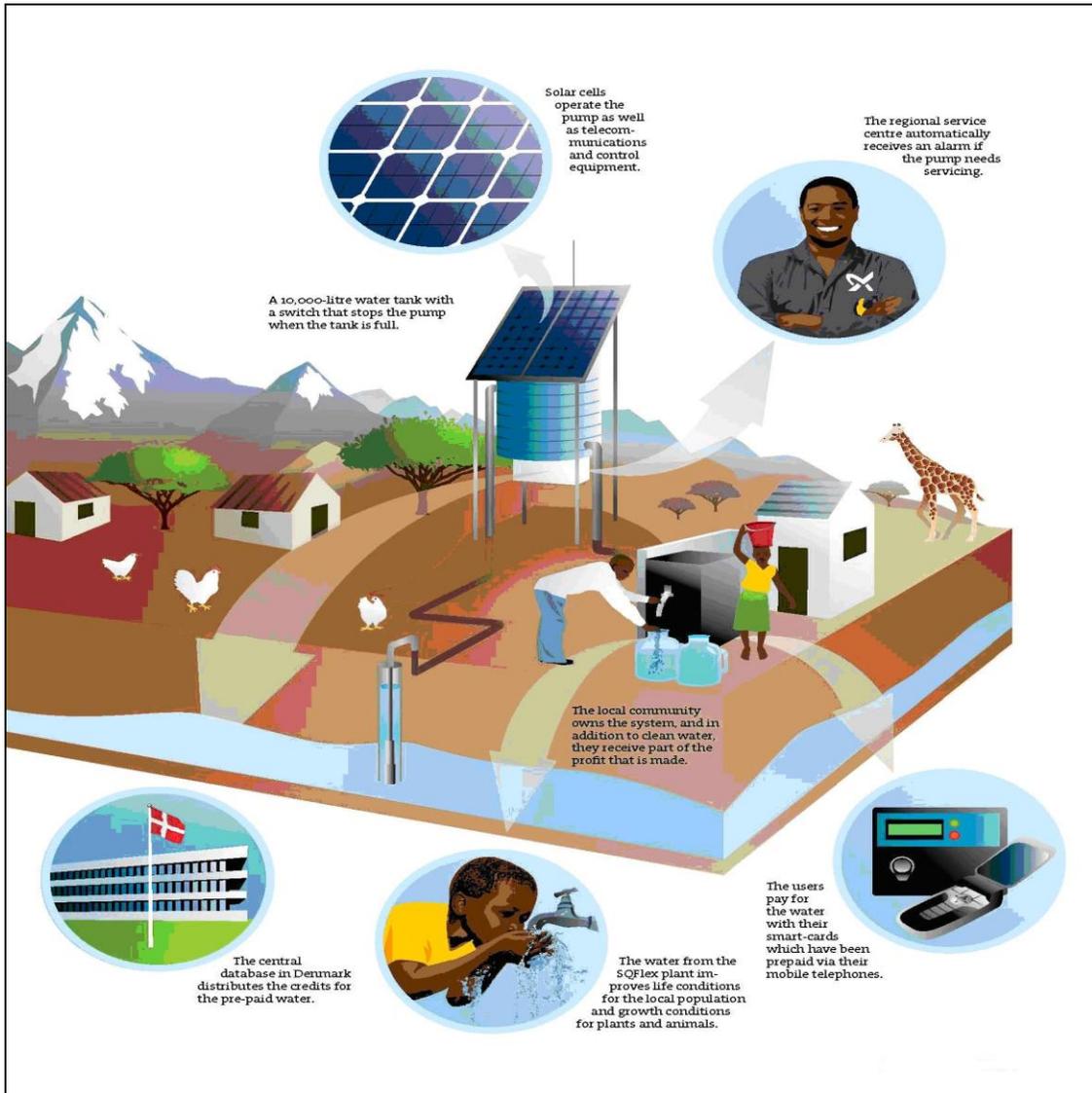
The partnership is a win-win situation for both M-PESA, that was limited in its outreach in remote areas, and the residents in rural areas with very low access to M-PESA due to sparse agent network and low demand for regular remittance services. The Grundfos LIFELINK water project that functions through partnership with M-PESA has the potential to benefit both the direct users of the system, as well as the community at large, through spill-over effects. While the type and strength of benefit varies among the users and non-users, positive results of the system were seen across the community. To the extent that the reason some residents do not use the system is an inability to afford the KWP, spill-over effects which benefit them is a particularly important result of the system. Members of the Katitika community saw access to a close and clean water source as a valuable asset in terms of time savings, means to generate income, and improved food security and health. With the responsibility for fetching water for the household primarily lying with women, they also are likely to see the most benefit from time savings as a result of the water system. For M-PESA, the partnership has provided a way to increase the outreach potential of M-PESA in ways that do not require the presence of an agent shop in the village.

The Katitika case adds to the growing number of service providers who have started to build on the M-PESA platform to address the financial and other service needs of the poor. Such examples include NGOs now piloting the provision of microfinance and crop insurance by integrating M-PESA into their service delivery models. M-KESHO, a joint product of Safaricom and Equity Bank, provides a bank account integrated with M-PESA and includes

micro-credit and personal accident insurance products. Nuru International is integrating M-PESA into its microfinance services, and Kilimo Salama is using the system for provision of crop insurance. These examples of innovative partnerships build on the M-PESA platform and push the boundary of the rural frontier and help serve people where agents may not be available. With more people using M-PESA services through such partnerships, the agents may be lured in the future to serve untapped areas.

Currently, there are very few studies, including this one, that have studied such innovative developments using systematic methods to understand the impact of M-PESA at both the household and community levels. It is important that such studies are conducted in multiple contexts to fully explore ways to effectively provide services using cell phones in rural and remote areas. Such studies should also examine the differential effects of such innovative partnerships on women and the poor who may be left out or less served by development-oriented initiatives.

ANNEX 1 – GRUNDFOS LIFELINK SYSTEM



Source: Grundfos LIFELINK

REFERENCES

- Eijkman, Frederik, Jake Kendall, and Ignacio Mas. 2010. Bridges to Cash: The Retail End of M-PESA, The Challenge of Maintaining Liquidity for M-PESA Agent Networks. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1655248
- Grundfos LIFELINK Installation Data: Kenya, Katitika. March, 2011. http://www.grundfoslifelink.com/int/o8_installations_kenya_katitika.html
- Grundfos. 2009. Katitika Baseline Report: For Implementation of Grundfos LIFELINK System.
- Haas, Sherri, Megan G. Plyler, and Geetha Nagarajan. 2010. Outreach of M-PESA System in Kenya: Emerging Trends. The IRIS Center, University of Maryland, College Park. Available at <http://fsassessment.umd.edu/publications.html>
- Kilimo Salama. <http://kilimosalama.wordpress.com/>
- Mas, Ignacio and Daniel Radcliffe. 2010. Mobile Payments Go Viral: M-PESA in Kenya. Part of the “Yes Africa Can: Success Stories from a Dynamic Continent” series from the World Bank. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1593388
- Nuru International. 2011. Savings-led Microfinance Mobile Banking in Kenya with Mifos and M-Pesa. <http://www.nuruinternational.org/blog/news/savings-led-microfinance-mobile-banking-in-kenya-with-mifos-and-m-pesa/>
- Pickens, Mark, Sarah Rotman, Ignacio Mas, and Olga Morawczynski. 2009. Agent Economics: M-PESA. CGAP. <http://technology.cgap.org/technologyblog/wp-content/uploads/2009/09/m-pesa-agent-economics-cgap-2009.pdf>
- Pickens, Mark. 2009. Understanding What Drives Profits for Agents – M-PESA. CGAP. <http://technology.cgap.org/2009/09/08/understanding-what-drives-profits-for-agents-m-pesa/>
- Plyler, Megan G, Sherri Haas, and Geetha Nagarajan. 2010. Community-Level Economic Effects of M-PESA in Kenya: Initial Findings. The IRIS Center, University of Maryland, College Park. <http://fsassessment.umd.edu/publications.html>
- Safaricom 2011. M-PESA Statistics. http://www.safaricom.co.ke/fileadmin/M-PESA/Documents/statistics/M-PESA_Statistics_Jan2011.pdf
- Safaricom Press Release. M-PESA in Partnership with Grundfos for Rural Water Provision. Sept. 4, 2009. <http://www.safaricom.co.ke/index.php?id=745>
- USAID. 2009. Food Security District Profile: Kitui District, Eastern Province.
- World Bank. 2007. Gender and Economic Growth in Kenya. [http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/p_GEM_GenderandEconomicGrowthinKenya/\\$FILE/Gender+and+Economic+Growth+in+Kenya.pdf](http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/p_GEM_GenderandEconomicGrowthinKenya/$FILE/Gender+and+Economic+Growth+in+Kenya.pdf)

STUDY BACKGROUND

The Financial Services Assessment project is designed to examine the impact of financial services on the lives of poor people across the developing world. This project is funded by the Bill & Melinda Gates Foundation, which is committed to building a deep base of knowledge in the microfinance field. The IRIS Center at the University of Maryland, College Park, together with its partner Microfinance Opportunities (MFO), assesses a diverse range of innovations in financial services. The results of this project will shed light on the design and delivery of appropriate financial products and services for the poor, and on the potential to scale up successful innovations to reach larger numbers of low-income households

In 2009, the Bill & Melinda Gates Foundation commissioned studies on the effect of M-PESA (a mobile phone-based, agent-assisted money transfer system) at the household and community levels in Kenya. The household effects are examined through financial dairies conducted by MFO while community-level effects are examined by IRIS. The IRIS field study to examine community-level effects of M-PESA was conducted in two phases between August 2009 and July 2010. The study results showed that M-PESA affects the economic outcomes of community members, both users and non-users of M-PESA, through varying degrees of direct and indirect effects. The major economic effects that affected all community members – users and non-users of M-PESA- were identified as: (i) local economic expansion in terms of employment, (ii) food, physical and financial security, (iii) capital accumulation in the form of savings, and (iv) business environment in the form of transparency in operations.⁸

The research findings of the study – household and community effects - are disseminated through a series of topical reports that highlight different aspects of the study. Collectively these studies will allow us to understand the outcomes of M-PESA use. This paper is one of several topical papers in the series.

⁸ See Haas, Plyler, and Nagarajan (2010), and Plyler, Haas and Nagarajan (2010) for details.