THE POWER OF SOCIAL NETWORKS TO DRIVE MOBILE MONEY ADOPTION

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EXECUTIVE SUMMARY

This paper is the first in a series exploring the use of data analytics to drive the take-up of mobile money (MM) by better understanding the characteristics of adopters. By comparing data from three countries, this study identifies and explores the key drivers of MM adoption. Innovative analytics and data mining techniques were used: a data set of 7 billion transactions (phone calls, SMS, data) performed by more than 10 million mobile phone users over seven months was processed.

The analysis revealed two key variables that indicate a higher propensity to adopt MM. The first variable is the social network and social interactions of the mobile user. That is, the number of MM users an individual is connected to (people whom the user connects to via phone or SMS). Individuals with five MM connections are over 3.5 times more likely to adopt MM than individuals with only one MM connection. In addition, the more active MM users are, the more likely their non-MM connections are to adopt MM. For instance, active MM users who do twice as many transactions as other users are likely to have double the number of MM adopters among their connections.

The second key variable is the user's telecom usage profile (most notably, the quantity and variety of telecom products used—SMS, data, electronic top-ups, and voice). Adopters tend to call twice as much as nonadopters, send twice as many SMS, rely more on electronic recharges than scratch cards for airtime credit (albeit via agents), and use more data than nonadopters. For the purposes of this paper we refer to this segment as "technology leaders". In addition, technology leaders' telecom expenditures are approximately three to four times higher than that of nonadopters.

The rate of MM adoption among poor people remains low. However, the mechanisms driving adoption are similar to those of other segments. In particular, the number of MM connections is also important for adoption among poor people; however, these individuals are typically much less connected to MM users than technology leaders.

These findings lead to several recommendations for mobile network operators (MNOs) that want to drive MM adoption. First, MNOs should analyze existing data to understand what drives adoption in a particular market. Second, MNOs should identify those customers who are most likely to adopt MM, and target them directly. Finally, MNOs should identify and target those customers that are most likely to influence others to adopt.

Several of these recommendations will be tested with pilot campaigns in various countries. For example, campaigns to drive MM adoption might include offering customers who are more likely to adopt MM free MM transactions, or offering influential users currency to send via MM to nonusers. The results of these campaigns will be described in a forthcoming paper.

1. INTRODUCTION

Over the past decade, mobile money (MM) has emerged as a promising instrument to help address financial exclusion. Mobile network operators (MNOs) and banks are increasingly rolling out MM services in developing countries. Some have taken root, but for most, growth has not been as fast as anticipated. According to GSMA's 2012 Global Mobile Money Adoption Survey, only six out of 150 live MM deployments reported more than one million active customers, with an additional eight having grown quickly since launch. For the remaining 90 plus percent of MNO deployments, on average only 0.9 percent of the mobile customer base was actively using MM 12 months after launch (compared to 8.9 percent for the 14 fast growing providers).[1]

Why did some deployments succeed while others lagged behind? By comparing data from three countries, this study identifies and explores the relative importance of the key drivers of MM adoption. In doing so, it highlights opportunities for providers to use existing customer data to increase the number of active MM users.

This report is part of a broader CGAP series exploring the use of data to advance uptake and usage of MM, particularly amongst poor people. Subsequent research will *(i)* analyze the spread of MM around the most active MM user of a deployment, *(ii)* examine the link between voice and MM corridors, and *(iii)* present the results from marketing campaigns that test the insights from this data analysis.

This report is organized as follows:

- Section 2 explains the study methodology
- Section 3 highlights the most prominent drivers of MM adoption
- Section 4 takes a deeper look into the mechanisms driving adoption of MM for poor people
- Section 5 summarizes the key findings and makes some recommendations for MNOs

2. METHODOLOGY: AN INNOVATIVE RESEARCH APPROACH

Numerous studies have already attempted to tackle the subject of MM adoption. Most of them have used a qualitative approach, structuring and developing frameworks to better understand the success factors in MM deployments. Few, however, have used a statistical approach to try to explain the disparities in adoption rates among different types of users, and to identify adoption drivers.

This study aims to identify the most powerful drivers of MM adoption that can be leveraged to increase take-up. Critically, this analysis highlights the potential of data that

Data Used in This Study

Seven months of data (December 2011 to June 2012) were collected from three African countries.

For all users, we extracted the following:

- MM transactions
- Mobile phone activity (calls, SMS, and data)
- Top-up recharges
- Customer tariff plans
- Customer and agent demographics (where available)

All transactions were localized, either directly (originating calls, SMS, data, recharges) or by determining the location where the customers spend most of their time (terminating calls, MM transactions).

A layer of macroeconomic data was also added on top of subscriber behavior and demographics (UNdata.com).

[1] *State of the Industry: Results from the 2012 Global Mobile Money Adoption Survey*, by Claire Pénicaud (GSMA), 2013.

MNOs have at their disposal and the opportunities to leverage existing digital footprints to drive adoption.

Step 1. Defining the variables

We identified and created more than 180 variables that describe a series of patterns and behaviors that we believe influence MM adoption. These include (*i*) macro-level factors, such as national wealth, the vitality of the banking sector, and the level of investment from telecom operators, and (*ii*) individual drivers, such as the strength of the agent network in close proximity to a subscriber, and the subscriber's usage of different types of telecom products.

In addition to these common variables, we integrated social behavior variables, such as the following:

- Are mobile subscribers in touch with MM users?
- How many of mobile subscribers' friends have subscribed and are using MM?
- Do mobile subscribers frequently interact with MM agents to top up?

Step 2. Consolidating the dataset

To extract these variables and understand the patterns of adoption, we consolidated an exhaustive dataset of MM and phone activity for a period of seven months in three different countries; this included all 180-plus variables for each subscriber. The dataset included about 7 billion transactions (phone calls, SMS, data, and MM) performed by more than 10 million mobile phone users—that is, around 3 terabytes of data.

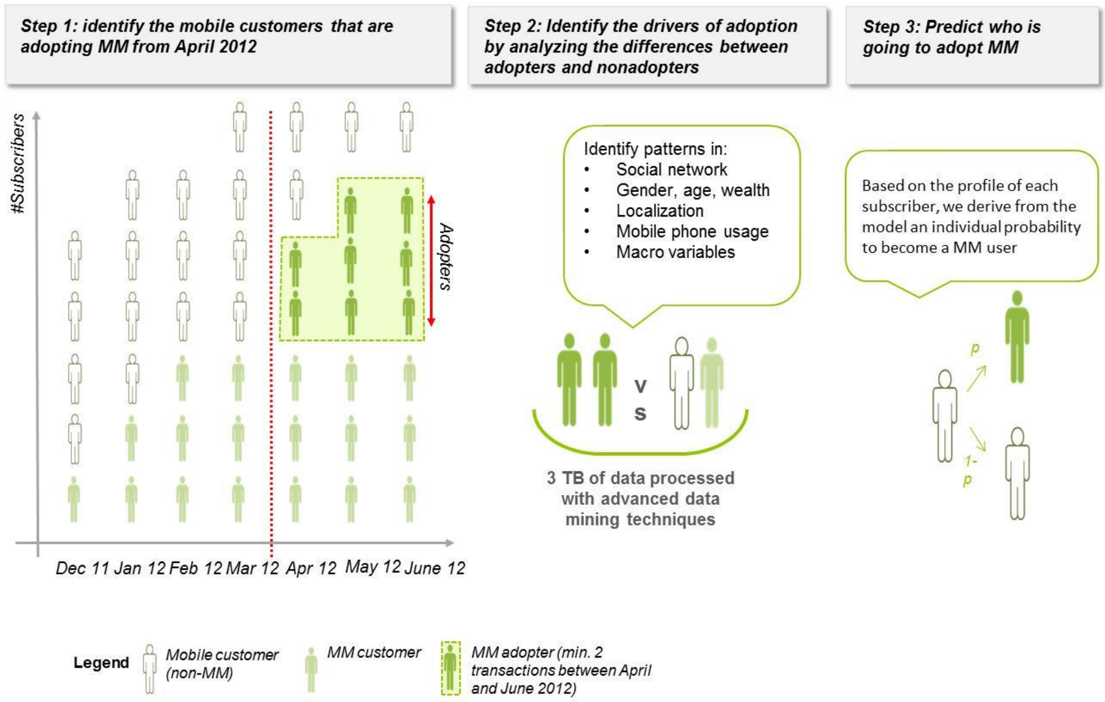
It is important to note that the three African countries included in the dataset represent different levels of MM maturity. In addition, activity rates (defined as the percentage of registered MM customers making at least one MM transaction in the previous three months) vary from below 5 percent to over 25 percent. The level of activity is significantly correlated to the number of months since the launch of the MM service. In this paper, we refer to a "lower activity rate" country when the activity rate is below 5 percent and to a "higher activity rate" country when the activity rate is above 25 percent.

Step 3. Using a data-mining model to identify the key drivers of adoption

To identify the most prominent variables that indicate a higher probability to adopt, a breakthrough data-mining approach was used that leveraged a multivariate predictive model. For the purposes of this analysis, adoption was defined as those customers who successfully register and conduct a minimum of two transactions in the first two months following registration.

Predicting the key elements that influence adoption requires two distinct periods of time: a "learning" period, in this case four months, to test the variables and a "test" period, in this case three months, where we identify new adopters from which we learn adoption patterns. Exhibit I illustrates this process.

Exhibit I: The predictive analytics approach



The multivariate data-mining model gives a prediction of the most important explanatory variables for adoption. This paper focuses on the two most important variables of the model, while the other, less significant, variables found in the model are not further detailed (e.g., including proximity to the nearest active agent, the number of agents in the region, and the customers mobility pattern).

3. WHO IS MOST LIKELY TO ADOPT MOBILE MONEY?

Two variables emerge as the most prominent to influence adoption: (*i*) the social network and social interactions of the mobile user (i.e., the number of people the user connects with via phone or SMS that are active MM users) and (*ii*) the individual's telecom usage profile (most notably, the quantity and variety of telecom products used—SMS, data, electronic top-ups, and voice).

Social network drives adoption more than anything else

Among the more than 180 variables in the model, the number of MM connections that a user has is by far the most important factor for MM adoption in each country.[2] Using only this variable, we can predict four to five times more adopters than when using a random model—that is, a model that randomly selects users without any predictive variables. This conclusion holds true across each of the countries studied.

This indicates that the social virality of MM is critical: like other technologies with network effects, the more people you can exchange and transfer money with, the more interested in MM you are likely to be. Adoption is, therefore, likely to follow an exponential curve along time, but only if an inflection point is reached.

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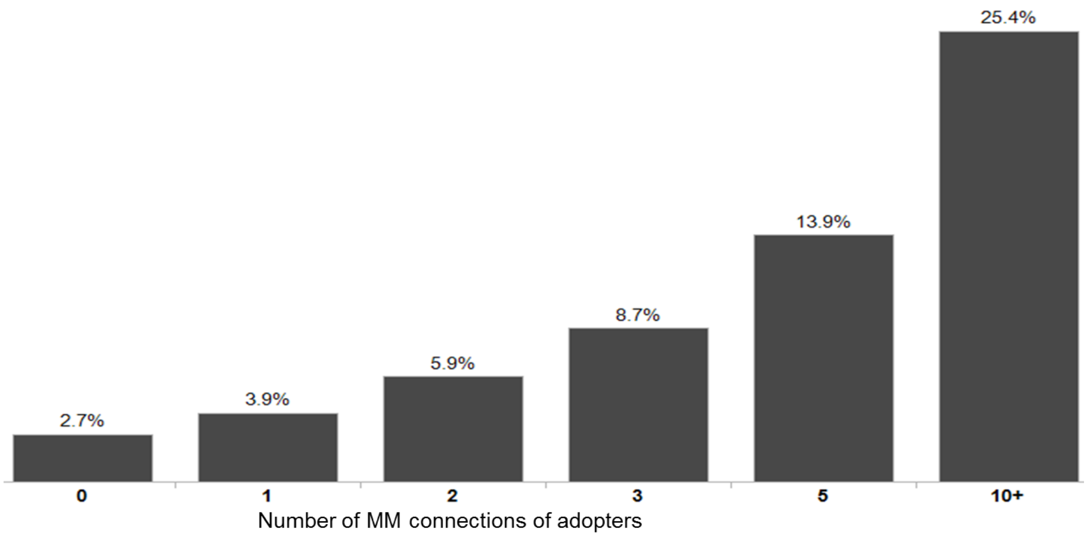
[2] An MM connection is defined as an MM user with whom the individual has exchanged at least one phone call or text message in the "learning" period of four months.

Looking at the distribution of adopters against their number of MM connections (Exhibit II), we discover that the relative probability of adoption increases with the number of connections. For instance, individuals with five MM connections are over 3.5 times more likely to adopt MM than individuals with only one MM connection, while individuals with two MM connections are more than twice as likely to adopt MM as individuals with no MM connections.

Exhibit II: The relative probability of adoption increases with the number of MM connections

Weighted distribution of MM adopters as a function of the number of MM connections, across all three countries



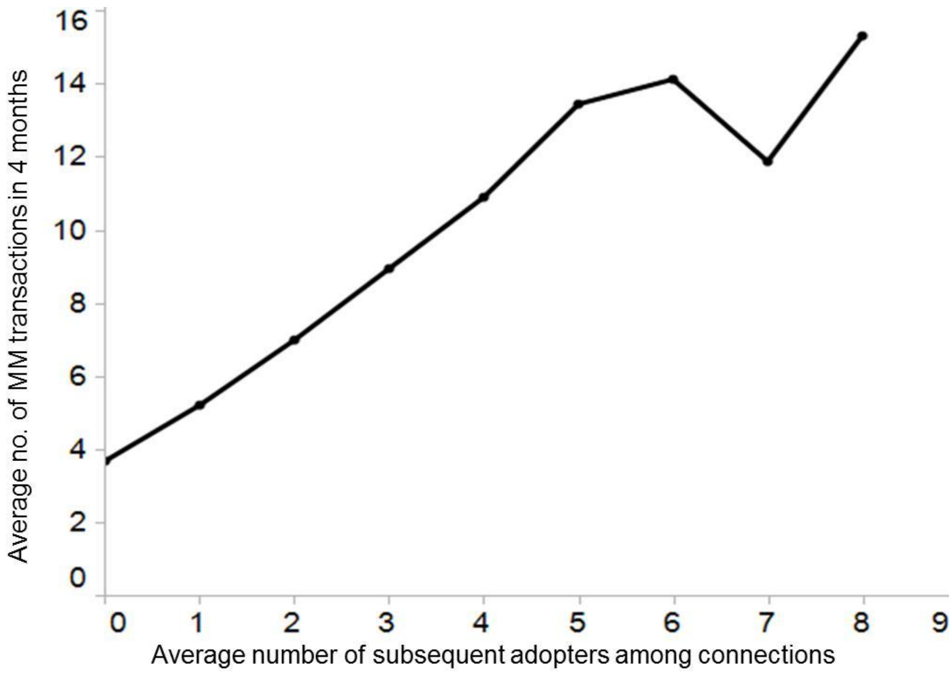
Note: Total distribution equals 100%, but not all data points are shown (i.e., 4, 6, 7, 8, and 9 are excluded).

Adoption is even more viral when the MM user is more active

We also find that the number of people adopting MM around an existing MM user directly correlates with the level of activity of that user. A user who makes double the number of MM transactions will expect to see twice the number of MM adopters among his or her connections over time. Hence, virality highly depends on the level of usage of MM adopters (Exhibit III).

Exhibit III: MM virality is directly correlated with the user's level of activity

Average number of MM adopters among connections as a function of the average number of MM transactions made over a four-month period[1]



1 For existing MM users at the start of the dataset

MM adopters spend more money on more types of telecom services

Our research also shows that not only are the individuals most likely to adopt MM most connected to other MM users, but that they also use more of the full spectrum of telecom services (Exhibit IV).

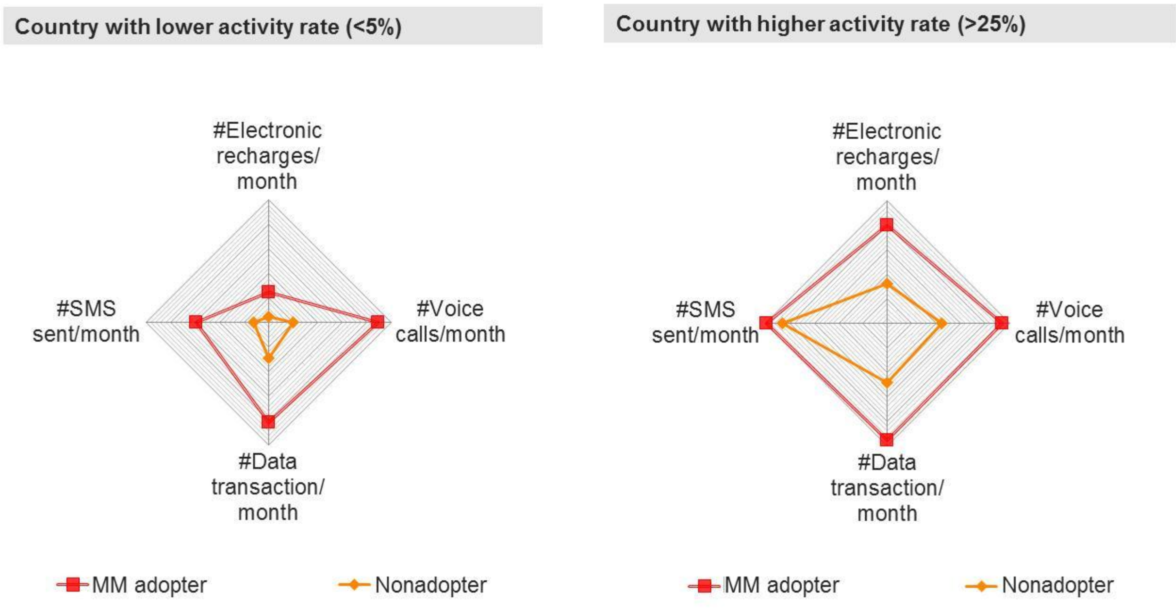
Exploring this group of variables in a lower activity rate country highlights a typical telecom usage pattern: adopters tend to call twice as much as nonadopters, send twice as many SMS, rely more on electronic recharges than scratch cards for airtime credit (albeit via agents), and use more data than nonadopters. The wide variety of services used by the subscriber is, therefore, highly predictive of adoption patterns. For the purposes of this paper we refer to these users as "technology leaders," that is, individuals who use the full spectrum of telecom services and frequently top-up electronically instead of using scratch cards.[3]

This profile is particularly true in the lower activity rate country studied. In the higher activity rate country, the technology leader profile of adopters is less differentiated, yet we still find that people who use their phones to make calls more are more likely to adopt the product.

[3] A technology leader is identified according to the share of transaction volume of each telecom service. These shares for each service are defined differently for each country, depending on the level of maturity and usage of telecoms and MM. It ranges between 10 percent and 95 percent or more of electronic recharges among all recharges, 2.5 percent or more of SMS transactions among all transactions, and 0.3 percent or more of data transactions among all transactions.

Exhibit IV: MM adopters use the full spectrum of telecom services more than nonadopters

Telecom usage mix between MM adopters and nonadopters



Not surprisingly, MM adopters also tend to spend more on telecom services. Data from the lower activity rate country shows that the median monthly expenditure on telecom services for MM adopters is over 3.6 times more than the US$5 per month spent by nonadopters. In the higher activity rate country, the median monthly expenditure on telecom services for MM adopters is approximately 2.7 times more than that of nonadopters.[4]

4. DEEP-DIVE INTO THE MECHANISMS DRIVING ADOPTION FOR THE POOR

If MM is adopted by savvy subscribers who spend more money on more types of telecom services, does that mean that it is missing its social goal of financial inclusion for poor people? We find that, while adoption of MM among poor people remains low, the number of MM connections is still a significant driver of adoption among the poor. However, holding all else equal, a poor person would need to have more MM connections to have the same probability of adopting MM as a technology leader. This is in line with expectations.

Adoption of MM among poor people remains low

Comparing the technology leader to the profile of individuals estimated to be below the poverty line,[5] we find that the MM adoption rate is up to 6.8 times higher for technology leaders. Poor individuals (who form 60 percent to 90 percent of the total mobile phone user base) still adopt MM, but at a much lower rate than their technology leader counterparts. The level of maturity of the MM deployment does not seem to influence this finding.

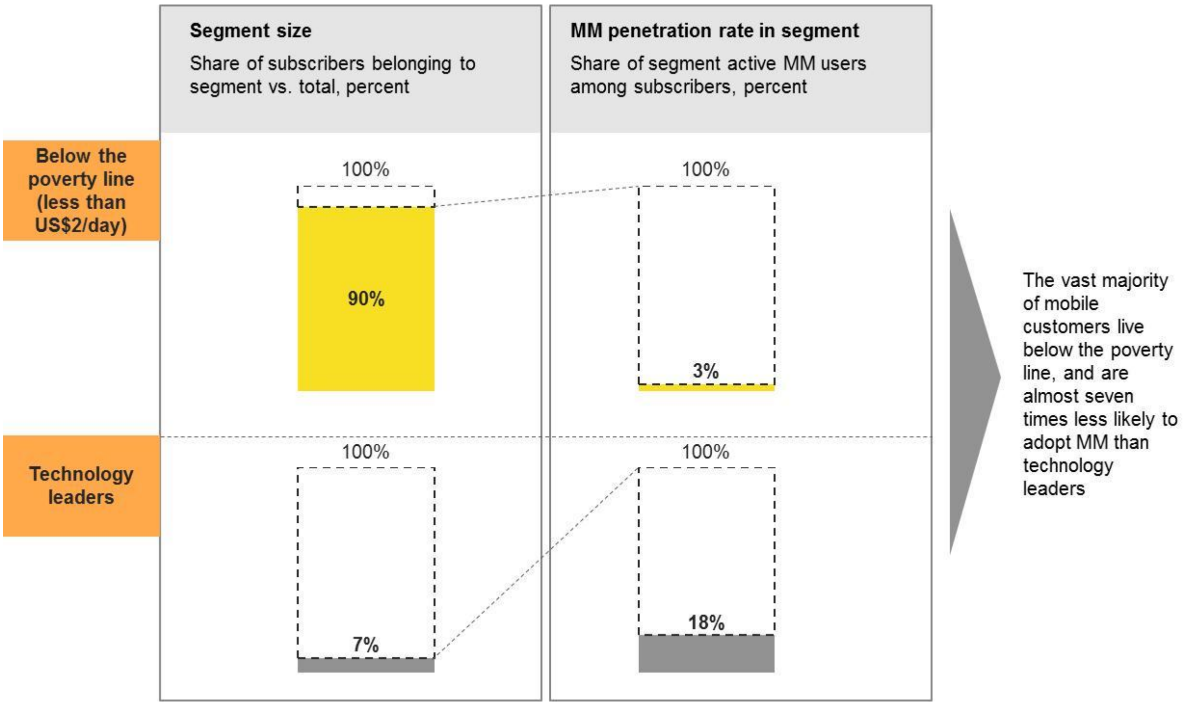
[4] Although the amount spent on telecoms is strongly correlated to the volume of different types of telecom services used, it is important to distinguish between these variables because they can also influence adoption of MM independently of each other. For example, a person who spends more money on only one telecom service (such as SMS) might also have a higher probability of adopting MM, even if not as high as the individual who spends more money on a variety of different telecom services.

[5] For the purposes of this analysis we included all those whose telecom expenditure is below US$6 per month as below the poverty line. This is based on a poverty line of US$2 per day, and the typical national telecom expenditure of approximately 10 percent of income. This assumption has been cross-checked with existing country-level poverty data from the United Nations and was found to be a relatively good estimate for the purposes of this paper.

Exhibit V illustrates this point in a country with a higher activity rate. That is, less than 3 percent of those estimated to earn under US$2 per day (90 percent of the MNO's subscribers) are active MM users, while over 18 percent of technology leaders are active MM users.[6] However, the experience of M-PESA in Kenya suggests that this discrepancy can decrease over time. That is, between 2008 and 2011 the proportion of poor people living outside of Nairobi that used M-PESA increased from 20 percent to 72 percent.[7]

Exhibit V: Penetration is significantly lower among poor people

Percentage of mobile phone users, and penetration of MM, per segment; country with a higher activity rate



The number of MM connections is also a strong driver of adoption among poor people

To better understand the specific drivers of adoption among poor people, we let our data mining model run on the two separate segments (i.e., those below the poverty line and the technology leaders). The use of different telecom services and social interactions with MM users are still the most important drivers of adoption. However, a poor person would need more MM connections to have the same probability of adopting MM as a technology leader. For example, 68 percent of technology leader adopters have five or more MM connections, whereas 77 percent of poor MM adopters have five or more connections. This highlights the importance of MM connections, as well as the increased level of effort required to drive adoption among poor people.

Poor people have limited connections with MM users

By definition, we find that individuals below the poverty line tend to spend less[8] on telecom products and have a less diversified telecom portfolio. However, we also find that poor people are much less connected

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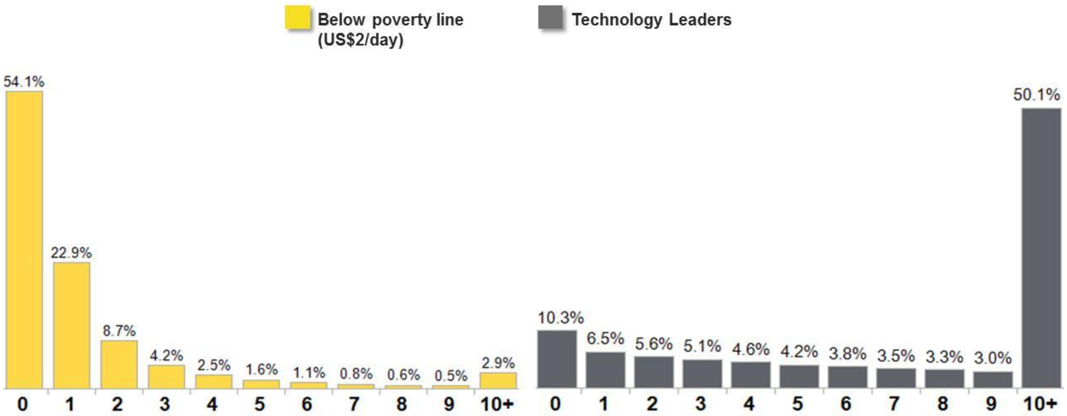
[6] To avoid confusion, this refers to less than 3 percent and over 18 percent of the total poor and technology leader segments, respectively—not the typical measure for active customers (i.e., not a percentage of registered MM customers).
[7] *Reaching the Poor: Mobile Banking and Financial Inclusion*, by Tavneet Suri and Billy Jack, February 2012.
[8] This follows directly from using expenditure on telecom services as a proxy for income.

to MM users than technology leaders (Exhibit VI)—less than 15 percent of poor people know more than two MM users, compared to 78 percent for technology leaders. Coupled with the previous finding that poor people tend to need more MM connections to drive adoption, this would seem to support the evidence from Kenya and elsewhere. That is, poor people will eventually adopt a successful MM offering but generally as a following segment; presumably after a critical mass of MM users who are connected to poor people have been reached. Note that this result is valid for all the countries studied.

Exhibit VI: Less than 15% of those living below the poverty line have more than two MM connections

Distribution of the subscriber base as a function of the number of MM connections



5. HOW CAN MNOS INCREASE THE LEVEL OF TAKE UP AND USAGE OF MM?

I. **Social networks and virality are key.** The level of interaction with active MM users is the main driver of MM adoption. In addition, the more active MM users are, the more likely their non-MM connections are to adopt.

II. **Early adopters tend to be technology leaders**. Adopters tend to spend more money on more types of telecom services: they call twice as much as nonadopters, send twice as many SMS, rely more on electronic recharges than scratch cards for airtime credit, and use more data than nonadopters. In addition, their telecom expenditure is approximately three to four times higher than nonadopters.

III. **Poor people tend to be a follower segment.** MM adoption rates among poor people remain low. However, the drivers of adoption for poor people are similar to those of other segments. In particular, the number of MM connections is a significant driver of adoption. The fact that poor people are typically much less connected to MM users compounds the challenge of reaching this segment.

The following are recommendations for MNOs to foster MM adoption:

I. **Analyze existing data to understand what is driving MM adoption.** Use data analytics techniques to segment the target population and identify those mobile customers who have a higher probability of adopting MM.

II. **Identify those customers who are most likely to adopt MM and target them directly.** Our analysis indicates that a higher marketing return on investment should be expected from those customers who are technology leaders and who also have a high number of connections with active MM users. While customers who have both of these characteristics will be the prime target for direct marketing campaigns, customers who are either technology leaders or who are connected to many active MM users are also worth targeting. For example, the targeted campaign might include offering these customers several free MM transactions.

III. **Identify and target those customers who are most likely to influence others to adopt.** This indirect approach involves incentivizing existing users to get new users to adopt, in particular those users who have strong connections to mobile subscribers with a higher probability of adoption. For example, these users could be given money to transfer to several unregistered connections.

From a business case perspective, MNOs should target the above segments as a matter of priority, to gain the direct impact of increased usage, as well as to gain the indirect benefits from the increase in network effects. Assuming progress with these campaigns, MNOs could then progressively target the next most likely segments to adopt. Given the lower probability of adoption among poor people, specific campaigns targeting this segment are likely to get deprioritized. This could be an area where donor funds are used, for example, to target those MM users who have the characteristics identified as being important to drive adoption, but who also have a significant number of strong connections with poor people. On the other hand, a bulk payment strategy might be more effective for this segment (such as promoting government-to-person payments to be made over MM).

Several of these recommendations will be tested in field campaigns in the pilot countries. The outcome of these campaigns will be described in a forthcoming paper.

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