Mobile Technology, Mobile Money and Financial Services in Emerging Economies

Bruno L. Yawe* & Jaideep Prabhu**

Abstract

We use data collected by the Financial Inclusion Insights (FII) research and knowledge-sharing program that is managed by InterMedia to investigate the uptake of mobile technology, mobile money and financial services in Bangladesh, India, Nigeria, Pakistan, Tanzania and Uganda. We also investigated by country the predictors of use of the most popular mobile money product for these six countries. It was not possible to undertake an econometric analysis for Kenya due to the lack of data on the dependent variable and some predictors. We can infer from the pooled cross-sectional data for Bangladesh, India, Nigeria and Pakistan that the following are significant predictors of using mobile money: (i) possession of a job or income source; (ii) possessing a mobile phone; (iii) possessing a bank account; (iv) degree of trust in mobile money services; (v) degree of trust in mobile money agents; as well as (vi) basic literacy.

Keywords: *financial inclusion, mobile money, financial innovation, 'know-do' gap, binomial logistic regression.*

1. Introduction

Mobile technology may be poised to change the field of development. Every month, cellular voice and data networks reach further into developing countries. Increasingly, many organizations are using mobile technology in their operations. In 2012 there were more than 6bn mobile phone subscribers compared to 2011 when there were a billion mobile broadband subscribers, and 75% of the world had access to mobile phones (Pact Inc., 2014).

Mobile phones not only enable communication; they also open up potentially revolutionary applications in a range of services, especially financial services. Noting the distinction between a good (something tangible that lasts, whether for a long or short time) and a service (a task that someone performs for you), Asmundson (2011) observes that a financial service is not a financial good itself (for example, a mortgage loan to buy a house or a car insurance policy); rather, it is something that is best described as the process of acquiring a financial good. It involves the transaction required to obtain a financial good. The financial sector covers many different types of transactions in such areas as real estate, consumer finance, banking, and insurance. Additionally, it covers a broad spectrum of investment funding, including securities.

*School of Economics, Makerere University: byawe@bams.mak.ac.ug; byawe@yahoo.com (*Corresponding Author*)

**Judge Business School, University of Cambridge, j.prabhu@jbs.cam.ac.uk; jcp31@hermes.cam.ac.uk

Mobile money is a financial service that comes under the category of mobile payments. Like Near Field Communication (NFC), the payment process is contactless.[1] However, while NFC only works at close range, mobile money also allows money to be sent over long distances using cell phones.

Several authors have recently noted that a well-deployed technology provides an opportunity to ensure that financial services reach the financially excluded (unbanked or underbanked). The Center for Financial Inclusion (CFI) (2013) has noted that the ability of technology to bring services at low cost to people, wherever they are and whenever they need them, is possibly today's biggest driver of full financial inclusion. In 2012 the World Council of Credit Unions (WCCU) observed that the increasing popularity of transaction and payment services through cell phones and mom-and-pop shops has revealed the tremendous potential to expand financial inclusion through mobile technology. Electronic money models have improved the lives of millions by reducing the need to spend time travelling over long distances to reach the nearest point of service or to carry cash (WCCU, 2012).

While the potential of mobile telephony to revolutionize financial (and other services) is undeniable, many research questions still remain unaddressed. Key among these are: (i) What evidence exists regarding the uptake of these solutions by people in emerging economies? (ii) What impact has this uptake had on financial inclusion in emerging economies? (iii) What are the potential drivers of mobile money use?

We explore these questions by analysing new comparative data on the uptake and use of mobile-enabled financial services across several emerging economies. Specifically, we use data collected by the Financial Inclusion Insights (FII) research and knowledge-sharing program, which is managed by InterMedia, and sponsored by the Bill & Melinda Gates Foundation. Launched in 2013, the FII is producing demand-side data and analysis based on nationally representative tracking surveys, and a range of qualitative studies to support work in financial inclusion— particularly in the mobile and digital areas. Countries currently covered by FII are: Bangladesh, India, Indonesia, Pakistan, Kenya, Nigeria, Tanzania and Uganda; with more likely to be added in due course. It should be noted that Indonesia was not surveyed in the first wave conducted in 2013.

FII's rich, comparable datasets delve deeply into the dynamics of access and use of mobile phones, mobile money, bank accounts and other financial products and services. They also explore the potential to expand digitization of payments in various forms—for example, government support payments to citizens, and wages paid by businesses to workers. Extensive demographic data for each survey respondent allows the data to be sliced and diced to highlight behaviours of particular segments, such as rural women or poor urban men.

---

[1] Near field communication is a set of ideas and technology that enables smart phones and other devices to establish radio communication with each other by touching them together or bringing them into proximity, typically a distance of 10cm (3.9in) or less.

The FII country datasets contain nationally representative data with sample sizes for each country presented in Table 1.

Table 1: Number of Surveys per Year and Interviews per Survey by Country

Country	Bangladesh	India	Kenya	Nigeria	Pakistan	Tanzania	Uganda
Surveys per year	2	1	1	2	1	2	2
Interviews per survey	6,000	45,000	3,000	6,000	6,000	3,000	3,000
Sample size	**12,000**	**45,000**	**3,000**	**12,000**	**6,000**	**6,000**	**6,000**

Source: Intermedia (2014)

The data cover the following areas:

(a) Demographics including age, gender, marital status, education, employment or occupation, literacy and numeracy, rural and urban location, geographical location (region/province/district), and poverty measure (Grameen progress out of poverty index).

(b) Core survey module covering mobile phone access, bank account access and use, mobile money access and use, product awareness, triggers or barriers to use, mobile money activities (transfers, payments, savings, etc.), mobile money business-to-business (B2B) activities, consumer experience with mobile money agents, consumer segmentation (active, lapsed, and non-users), and prevalence and potential for digital government-to-person (G2P) and donor-to-person (D2P) payments.

(c) Additional modules in the surveys for Bangladesh, Nigeria and Pakistan include use of digital/prepaid cards, payments habits, use of savings instruments, use of insurance instruments, as well as borrowing and lending habits.

(d) Finally, there are additional modules for surveys in the following specified countries: (i) influencers driving mobile money adoption for Tanzania and Uganda; (ii) assessing potential demand for interoperability of mobile money services for Tanzania and Uganda; (iii) technical skills assessment relating to mobile money use for Tanzania; (iv) opinions/attitudes about mobile network operator (MNO) fraud for Uganda; (v) use of over-the-counter mobile money services for Pakistan and Uganda; (vi) use of new digital financial services for Kenya; (vii) use of G2P programs and digitization potential for India; and (viii) financial behaviours for India.

2. Methods

We source data from the Financial Inclusion Insights Program (FIIP), InterMedia's online data centre.[2] Datasets in SPSS as well as Microsoft Excel were provided to us for each of the program countries by the FIIP, Intermedia. We use a comparative analytical approach to examine the percentage distribution of respondents under the following broad three categories: (i) mobile technology; (ii) financial services;

---

[2] http://finclusion.org/datacenter/data-center/

and (iii) mobile money for the following countries in which we conduct these analyses: Bangladesh, India, Kenya, Nigeria, Pakistan, Tanzania and Uganda.

We conduct further comparative analysis under each broad category as follows. First, we decompose mobile technology into mobile phone ownership, mobile phone borrowing, and total mobile phone access (ownership plus borrowing/pay-for-use). Second, we decompose financial services into: bank account ownership, bank account access (including sharing), frequency of bank account use, and use of formal/informal financial institutions. Finally, we decompose mobile money into: awareness of mobile money, mobile money use, registered account use, and active registered account use. Wherever possible we present our findings graphically.

2.1 Econometric Analysis of Predictors of Use of Most Popular Mobile Money Product by Country

We perform econometric analyses of the predictors of the use of mobile money for the most popular mobile money product in two related steps. In step 1 we perform an analysis to identify the most popular mobile money product; and in step 2 we perform binomial/binary logistic analysis of the data for the most popular mobile product as identified in step 1.

Step 1: Identifying the Most Popular Mobile Money Product
We identify the most popular mobile money product by country and present the results of this process in Table 2.

Table 2: Most Popular Mobile Money Product by County as of 2013

Country	Mobile Money Product	Percentage
Bangladesh	bKash	21.7
India	Airtel Money	0.2
Kenya	Safaricom Mpesa	75
Nigeria	MTN Mobile Money	11
Pakistan	Telenor Easy Paisa Money	6.2
Tanzania	Vodacom Mpesa	32.4
Uganda	MTN Mobile Money	38.7

Source: Own computations using data tool at:
http://finclusion.org/datacenter/data-center/.

Step 2: Estimation of a Binomial or Binary Logistic Regression
We use a binomial or binary logistic regression to model the outcome of 'using' versus 'not using' mobile money. Binomial or binary logistic regression deals with situations in which the observed outcome for a dependent variable can have only two possible types (for example, 'using mobile money' versus 'not using mobile money'). A binomial logistic regression (often referred to simply as logistic regression) predicts the probability that an observation falls into one of two categories of a dichotomous dependent variable based on one or more independent variables that can be either continuous or categorical.

The use of mobile money services by a respondent is a binary or dichotomous outcome that we model to be dependent on the following respondent-specific factors: (i) having a job or source of income; (ii) possessing a bank account; (iii) distance to the nearest branch of a bank or microfinance institution; (iv) owning a mobile phone; (v) basic literacy; (vi) basic numeracy; (vii) degree of trust in mobile money services; and (viii) degree of trust in mobile money agents. As such, we estimate a binary logistic regression for the most popular mobile network operator in each country in our dataset.

2.2 The Logistic Regression Equation

While logistic regression gives each predictor a coefficient β that measures its independent contribution to variations in the dependent variable, the dependent variable can only take on one of the two values: 0 or 1. We want to predict from the knowledge of relevant independent variables and coefficients the probability (p) that the dependent variable is 1 rather than 0 (i.e., that it belongs to one group rather than the other). A further mathematical transformation, namely a log transformation, is needed to normalize the distribution. This log transformation of the p values to a log distribution enables us to create a link with the normal regression equation. The log distribution (or logistic transformation of p) is also called the logit of p or *logit(p)* (Burns & Burns, 2009).

Logit(p) is the log (to base e) of the odds ratio or likelihood ratio that the dependent variable is 1. Algebraically, it is defined as:

$$\log it \text{ of } (p) = \log_e \left[\frac{p}{1-p}\right] = \text{In} \left[\frac{p}{1-p}\right] \qquad (1)$$

While p can only lie between 0 and 1, *logit(p)* scale ranges from negative infinity to positive infinity; and is symmetrical around the logit of 0.5 (which is zero). Equation 2 shows the relationship between the usual regression equation ($\alpha + \Sigma\beta i x i$) (where $i = 1, 2, 3, \ldots n.$), which is the functional form of a straight line and the logistic regression equation.

The logistic regression equation takes the following form:

$$\log it [p(x)] = \log_e \left[\frac{p(x)}{1-p(x)}\right] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_n x_n \qquad (2)$$

This resembles a linear regression and although logistic regression finds a 'best fitting' equation, just as linear regression, the principles upon which it does this are different. Rather than use a *least-squared deviations* criterion for the best fit, it uses a *maximum likelihood* method, which maximizes the probability of getting the observed results given the fitted regression coefficients. Consequently, the goodness of fit and overall significance statistics used in logistic regression are different from those used in linear regression. The probability denoted by p is computed by means of Equation (3), which is simply another rearrangement of Equation (2):

$$p = \frac{e^{\alpha+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\cdots+\beta_n x_n}}{1 + e^{\alpha+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\cdots+\beta_n x_n}} \qquad (3)$$

where:
  p = the probability that a respondent uses mobile money services offered by the most popular mobile network operator;
  e = the base of natural logarithms (which is approximately 2.72);
  α = the constant of the equation; and
  β_1 = the coefficient of the ith predictor variable.

3. Results and Discussion

We discuss the results of our analysis under four broad categories: mobile technology; financial services; mobile money; and econometric analysis of predictors of use of the most popular mobile money product by country.

3.1 Mobile Technology

The use of mobile technology was measured by asking respondents whether they owned a mobile phone or borrowed a mobile phone. Total mobile phone access is the sum total of ownership plus borrowing and/or pay-for-use.

3.1.1 Mobile Phone Ownership

Table 3 presents the percentage distribution of mobile phone ownership in Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania. For the sampled countries, about 55% of the respondents own a mobile phone. Nigeria has the highest proportion of a population in possession of a mobile phone (92%); followed by Kenya (78%), Tanzania (74%), Uganda (63%), Pakistan (61%), Bangladesh (57%) and India (45%).

Table 3: Mobile Phone Ownership: Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania as of 2013

Base = 72,023	Total	Bangladesh	India	Kenya	Nigeria	Pakistan	Uganda	Tanzania
Yes	54.8	56.6	45.4	78.2	92	60.5	62.5	74.2
No	45.2	43.4	54.6	21.8	8	39.5	37.5	25.8
Sample size	72,023	6,000	45,024	3,000	6,002	6,000	3,000	2,997

3.1.2 Mobile Phone Borrowing

Respondents who do not own a mobile phone improvise by borrowing. Table 4 presents the percentage of respondents who borrow a mobile phone by country. Overall, 70% of the respondents borrow a mobile phone. Bangladesh leads in having borrowed mobile phone (about 89%); followed by Kenya (77%), India (70%), Uganda (66%), Nigeria (60%), Tanzania (60%) and Pakistan (50%).

Table 4: Mobile Phone Borrowing: Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania as of 2013

Base = 32,588	Total	Bangladesh	India	Kenya	Nigeria	Pakistan	Uganda	Tanzania
Yes	70	88.9	70.4	77.4	60.3	50.2	66.2	59.7
No	30	11.1	29.6	22.6	39.7	49.8	33.8	40.3
Sample Size	32,588	2,602	24,583	654	478	2,371	1,126	774

3.2 Total Mobile Phone Access (Ownership plus Borrowing/Pay-for-use)

Total mobile phone access (ownership plus borrowing/pay-for-use) for the sampled countries stands at about 86%. Table 5 presents the total mobile phone access (ownership plus borrowing/pay-for-use) for Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania. Nigeria leads on total mobile phone access (97%); followed by Bangladesh (95.2%), Kenya (95.1%), Tanzania (90%), Uganda (87%), India (84%) and Pakistan (80%).

Table 5: Total Mobile Phone Access (ownership plus borrowing/pay-for-use): Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania as of 2013

Base = 72,023	Total	Bangladesh	India	Kenya	Nigeria	Pakistan	Uganda	Tanzania
Yes	86.4	95.2	83.9	95.1	96.8	80.3	87.3	89.6
No	13.6	4.8	16.1	4.9	3.2	19.7	12.7	10.4
Sample Size	**72,023**	**6,000**	**45,024**	**3,000**	**6,002**	**6,000**	**3,000**	**2,997**

Comparing Tables 3, 4 and 5 reveals that total mobile phone access has increased in all countries when mobile phone borrowing is accounted for.

3.3 Financial Services

The uptake of financial services comprises: bank account ownership, bank account access (including sharing), frequency of bank account use, and use of formal/informal financial institutions. Table 6 presents information on bank account ownership. Overall, about 37% of the population in the sampled countries owns a bank account. India leads the sampled countries with 46% owning a bank account; followed by Nigeria (41%), Kenya (28%), Bangladesh (19%), Uganda (11.9%), Tanzania (11.8%) and Pakistan (7.9%).

Table 6: Bank Account Ownership: Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania as of 2013

Base = 72,023	Total	Bangladesh	India	Kenya	Nigeria	Pakistan	Uganda	Tanzania
Yes (Percentage)	36.6	19.4	46	28.2	41.3	7.9	11.9	11.8
No (Percentage)	63.4	80.6	54	71.8	58.7	92.1	88.1	88.2
Sample Size	**72,023**	**6,000**	**45,024**	**3,000**	**6,002**	**6,000**	**3,000**	**2,997**

3.3.1 Bank Account Access (Including Sharing)

Table 7 presents information relating to bank account access (including sharing). Overall, about 38% of the population in the sampled countries has bank account access (including sharing). In terms of bank account access (including sharing), India leads with about 47% of respondents reporting bank account access; followed by Nigeria (46%), Kenya (31%), Bangladesh (21%), Uganda (13.5%), and Tanzania (13%).

Table 7: Bank Account Access (including sharing): Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania as of 2013

Base = 72,023	Total	Bangladesh	India	Kenya	Nigeria	Pakistan	Uganda	Tanzania
Yes (Percentage)	37.9	20.9	46.6	30.7	46.1	9	13.5	13.1
No (Percentage)	62.1	79.1	53.4	69.3	53.9	91	86.5	86.9
Sample Size	**72,023**	**6,000**	**45,024**	**3,000**	**6,002**	**6,000**	**3,000**	**2,997**

3.3.2 Frequency of Bank Account Use
Frequency of bank account use was examined over the following continuum: (i) the day which preceded the survey; (ii) past seven days; (iii) past 30 days; (iv) past 90 days; (v) more than 90 days ago; and (vi) never. Table 8 presents the frequency of bank account use for the surveyed countries. In terms of the day that preceded the survey, Nigeria leads with 11.5%; followed by Kenya (6.1%), Uganda (4.9%), Tanzania (4.3%), Bangladesh (3%) and India (1.4%). Nigeria also leads in terms of the previous seven days (31%); followed by Kenya (22.5%), Uganda (20%), Tanzania (19.9%), Bangladesh (12.4%), Pakistan (10%) and India (5.3%).

Table 8: Frequency of Bank Account Use: Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania as of 2013

Frequency of Bank Account Use	Total	Bangladesh	India	Kenya	Nigeria	Pakistan	Uganda	Tanzania
Yesterday	2.8	3	1.4	6.1	11.5	3	4.9	4.3
In the past 7 days	9.3	12.4	5.3	22.5	30.6	10.1	20	19.9
In the past 30 days	31.8	33.5	29.8	36.6	38.3	59.4	36.5	34.9
In the past 90 days	15	15.3	15.9	10.5	9.7	12	15.8	13
More than 90 days ago	35.4	34.4	40.8	20.2	8.4	12.9	21.2	19.1
Never	5.6	1.5	6.7	1.8	1.5	2.6	1.5	1
Do not know	0.2	0	0	2.3	0	0	0	6.4
Not stated	0	0	0	0	0	0	0	1.3
Sample Size	**27,247**	**1,254**	**20,965**	**921**	**2,768**	**542**	**405**	**392**

In terms of the 30 days preceding the survey, Pakistan leads (59%); followed by Nigeria (38%), Uganda (37%), Tanzania (35%), Bangladesh (34%) and India (30%).

3.3.3 Use of Other Formal/Informal Financial Institutions
A question about the use of other formal/informal financial institutions was included in the questionnaires for Bangladesh, Nigeria, and Pakistan. The other formal or informal financial institutions comprised of cooperatives, microfinance institutions, village-level savings groups, a money guard or someone in the workplace or neighbourhood that collects and keeps savings deposits on a regular basis, post office, savings collectors, and Hawla/Hundi networks (Table 9).

Table 9: Use of Other Formal/Informal Financial Institutions: Bangladesh, Nigeria and Pakistan as of 2013

Base=18,002	Total	Bangladesh	Nigeria	Pakistan
Cooperatives	3.6	4.7	6.1	0
Micro Finance Institution (MFI)	12.7	19.3	9.2	9.7
Village-level savings group	1.6	1.7	2.9	0.1
A money guard/ someone in workplace or neighbourhood that collects and keeps savings deposits on a regular basis	0.4	0.1	0.9	0.2
Post office	2	0.8	4.7	0.4
Savings collectors	0.7	0.1	2	0.1
Hawla/Hundi networks	0.3	0.9	0	0
Other	0.3	0.4	0.4	0
Sample Size	**18,002**	**6,000**	**6,002**	**6,000**

Nigeria leads in terms of cooperatives (6%), followed by Bangladesh (4.7%). By way of microfinance institutions and Hawla/Hundi networks, Bangladesh leads (respectively, 19.3% and 0.9%); followed by Pakistan (9.7%) and Nigeria (9.2%). In terms of village-level savings groups, Nigeria leads (2.9%), followed by Bangladesh (1.7%).

3.4 Mobile Money
The uptake of mobile money was measured by assessing: (i) awareness of mobile money; (ii) mobile money use; (iii) registered account use; and (iv) active registered account use.

3.4.1 Awareness of Mobile Money
Table 10 presents findings regarding awareness of mobile money in Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania. In terms of awareness of mobile money, Kenya leads (96.9%); followed by Tanzania (94.6%), Uganda (90.5%), Bangladesh (88.1%), Pakistan (64.1%), Nigeria (12.3%) and India (5.1%).

**Table 10: Awareness of Mobile Money: Bangladesh, India, Kenya, Nigeria,
Pakistan, Uganda and Tanzania as of 2013**

Base = 72,023	Total	Bangladesh	India	Kenya	Nigeria	Pakistan	Uganda
Yes (Percentage)	28.6	88.1	5.1	96.9	12.3	64.1	90.5
No (Percentage)	71.4	11.9	94.9	3.1	87.7	35.9	9.5
Sample Size	**72,023**	**6,000**	**45,024**	**3,000**	**6,002**	**6,000**	**3,000**

What might explain the wide differences in percentages regarding awareness of mobile money between the two categories of countries (Bangladesh, Kenya, Pakistan, Uganda and Tanzania) and (India and Nigeria)? The information paints a picture about the mobile payments model adopted in each category. Merritt (2010) has observed that three mobile payments business models (bank-led, mobile-operator-led, or partnership-led) have emerged, depending on the applicable regulatory climate, consumer culture, and demographics. In the bank-led model, the financial institution controls the customer relationship, and provides mobile services primarily as a new channel to existing services. The mobile-operator model provides a channel for domestic transfers and international remittances conducted by a financial institution.

A mobile network operator-led business model limits or eliminates the involvement of a financial institution in payment delivery, clearing, and settlement. Mobile-network-operator models thrive in developing markets because of their ability to reach large numbers of unbanked people in physically remote locations beyond the presence of bank and landline infrastructures. Finally, in the partnership model, financial institutions, mobile network operators and third-party service providers that make up the ecosystem, partner and collaborate to provide payment services. In this model it may be possible to capitalize on each organization's respective strengths in terms of providing customer service, introducing innovation, and ensuring an environment of sound regulatory compliance.

3.4.2 *Mobile Money Use*

Table 11 presents mobile money use in Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania. In terms of mobile money use, Kenya leads (79.7%); followed by Tanzania (46.1%), Uganda (43.5%), Bangladesh (21.1%), Pakistan (7.1%), Nigeria (0.3%) and India (0.2%).

Table 11: Mobile Money Use: Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania as of 2013

Base=72,023	Total	Bangladesh	India	Kenya	Nigeria	Pakistan	Uganda	Tanzania
Yes (Percentage)	9.6	21.1	0.2	79.7	0.3	7.1	43.5	46.1
No (Percentage)	90.4	78.9	99.8	20.3	99.7	92.9	56.5	53.9
Sample Size	**72,023**	**6,000**	**45,024**	**3,000**	**6,002**	**6,000**	**3,000**	**2,997**

A comparison of mobile money use (Table 11) with awareness of mobile money (Table 10) reveals a 'know-do' gap. A 'know-do' gap refers to the gap between today's scientific advances and their application; between what we know and what is actually being done (WHO, 2006; IDRC, 2011). But what might explain the discrepancy between awareness and use of mobile money? Some authors have tried to explain this discrepancy in terms of the innovation assessment lag: namely, the time required between initial awareness and actual use of a technology (Thirtle & Rhutan, 2001). Table 12 presents the 'know-do' gap with regard to mobile money use for Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania. In terms of the 'know-do' gap, Bangladesh leads (67%); followed by Pakistan (57%), Tanzania (48.5%), Uganda (47%), Kenya (17.2%), Nigeria (12%) and India (4.9%).

Table 12: Awareness of Mobile Money versus Mobile Money Use: Bangladesh, India, Kenya, Nigeria, Pakistan, Uganda and Tanzania as of 2013

	Total	Bangladesh	India	Kenya	Nigeria	Pakistan	Uganda	Tanzania
Awareness of mobile money	28.6	88.1	5.1	96.9	12.3	64.1	90.5	94.6
Mobile money use	9.6	21.1	0.2	79.7	0.3	7.1	43.5	46.1
'Know-do' gap	19	67	4.9	17.2	12	57	47	48.5
Sample Size	**72,023**	**6,000**	**45,024**	**3,000**	**6,002**	**6,000**	**3,000**	**2,997**

Comparing bank account access (Table 7) with mobile money use (Table 11) reveals a negative relationship between bank account access and mobile money use. This is because India, with a bank account access of 46.6%, has a mobile money use of 0.2%; Nigeria with a bank account access of 46% has a mobile money use of 0.3%; Kenya with a bank account access of 30.7% has a mobile money use of 79.7%; Bangladesh with a bank account access of 20.9% has a mobile money use of 21.1%; Uganda with a bank account access of 13.5% has a mobile money use of 43.5%; Tanzania with a bank account access of 13.1% has a mobile money use of 46.1%; and Pakistan with a bank account access of 9% has a mobile money use of 7.1%. Notwithstanding the negative relationship between bank account access and mobile money use, the two modes of enhancing financial inclusion are more complementary and not substitutes, especially with growing interoperability and agent banking. This has been stressed

by Davidson (2011) by noting that it is impossible for a bank to offer mobile money without an operator. This is because an operator must provide the data channel that allows customers and agents to initiate transactions using their handsets. Similarly, it is impossible for a mobile network operator to offer mobile money without a bank. This is due to the fact that a bank must hold the deposits that back the electronic value stored in customers' and agents' wallets.

3.4.3 Registered Account Use

In June 2013, there were over 203m registered mobile money accounts worldwide. In Sub-Sahara Africa alone, there were 98m registered accounts by June 2013: this was more than twice the total number of Facebook users in the region. East Africa accounts for a particularly large portion of mobile money accounts globally, representing 34% of the total registered accounts. These are in Cameroon, the Democratic Republic of Congo, Gabon, Kenya, Madagascar, Tanzania, Uganda, Zambia and Zimbabwe. In these markets the mobile money industry has made financial services accessible to more people than the traditional banking industry ever did. All these markets are in Sub-Sahara Africa, a sign of the transformational power of mobile money in this region, where banking penetration remains very low (Pénicaud & Katakam, 2013).

3.4.4 Active Registered Account Use

In spite of the growing number of registered accounts, activating customers remains a challenge for a large number of services. Globally, only 29.9% of registered accounts were active as of June 2013. A customer's journey from awareness of mobile money, to registration, and finally to regular usage is quite complex. Notwithstanding customers' awareness, they may not necessarily understand how they would benefit from using the service. Using mobile money represents a significant behavioural change in economies where almost all payment transactions are conducted in cash (Pénicaud & Katakam, 2013). Fig. 1 compares the percentages of registered account use to active registered account use.
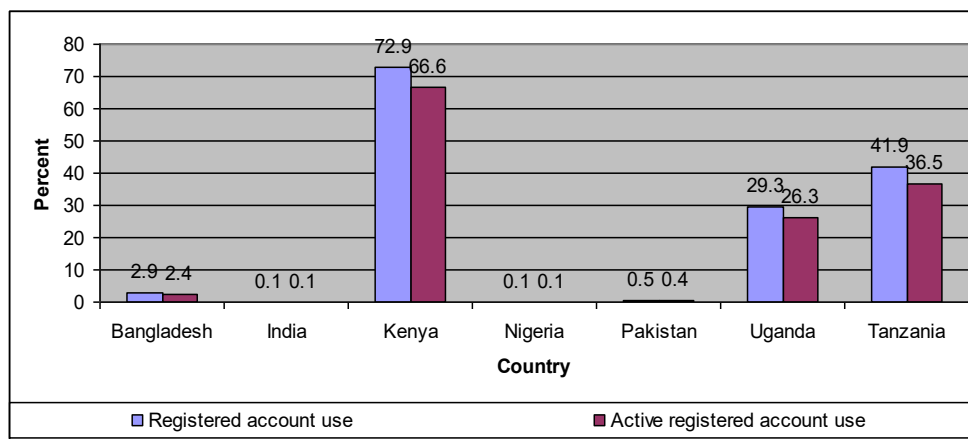

Figure 1: *Registered Account Use versus Active Registered Account Use*

As seen in Fig. 1, Kenya leads in terms of both registered account use (72.9%) and active registered account use (66.6%); followed by Tanzania (41.9% versus 36.5%), Uganda (29.3% versus 26.3%), Bangladesh (2.9% versus 2.4%), Pakistan (0.5% versus 0.4%), India and Nigeria (0.1% versus 0.1%).

4. Econometric Analysis of Predictors of Use of the Most Popular Mobile Money Product by Country

This section presents, by country, the predictors of the use of the most popular mobile money product for each of the following countries: Bangladesh, India, Nigeria, Pakistan, Tanzania, and Uganda. It was not possible to undertake an econometric analysis for Kenya due to the lack of data on the dependent variable and some predictors.

4.1 Bangladesh

Table 13 presents the binomial logistic regression results predicting the use of bKash in Bangladesh. All predictors of using bKash are significant with the exception of: possession of a bank account, distance to the nearest bank branch with an ATM, and the degree of trust in mobile money services. Possession of a job or income source, ownership of a mobile phone, degree of trust in mobile money agents, basic literacy and basic numeracy are significant predictors of the use of bKash.

Table 13: Binomial Logistic Regression Results Predicting the Use of bKash

Explanatory Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for Lower	Upper
Possession of a Job or Income Source	0.586	0.126	21.763	1.000	0.000	1.798	1.405	2.300
Owning a Mobile Phone	0.487	0.188	6.740	1.000	0.009	1.628	1.127	2.352
Possession of a Bank Account	-0.271	0.228	1.411	1.000	0.235	0.763	0.488	1.192
Distance to Nearest Bank Branch or MFI with ATM	0.001	0.046	0.001	1.000	0.976	1.001	0.915	1.096
Degree of Trust in Mobile Money Services	-0.070	0.070	1.008	1.000	0.315	0.932	0.812	1.069
Degree of Trust in Mobile Money Agents	0.189	0.070	7.217	1.000	0.007	1.208	1.052	1.386
Basic Literacy	0.594	0.198	8.991	1.000	0.003	1.812	1.229	2.672
Basic Numeracy	0.660	0.276	5.724	1.000	0.017	1.935	1.127	3.324
Constant	-2.817	0.464	36.865	1.000	0.000	0.06		

The logits or log odds of using bKash change by 0.586 for a one-unit change in the possession of a job or income source, holding other factors constant. Equivalently, the odds of using bKash change by a factor of approximately 1.8 for a one-unit increase in the possession of a job or income source, when all other predictors are held constant. This implies that persons with jobs or income sources are more likely to use bKash, and vice versa.

The logits or log odds of using bKash change by 0.487 for a one-unit change in the possession of a mobile phone, holding other factors constant. Equivalently, the odds of using bKash change by a factor of approximately 1.6 for a one-unit increase in the possession of a mobile phone, when all other predictors are controlled. This implies that persons with mobile phones are more likely to use bKash, and vice versa.

The logits or log odds of using bKash change by 0.189 for a one-unit change in the degree of trust in mobile money agents, holding other factors constant. Equivalently, the odds of using bKash change by a factor of approximately 1.2 for a one-unit increase in the degree of trust in mobile money agents, when all other predictors are controlled. This implies that efforts that enhance the degree of trust in mobile money agents are likely to increase the use of bKash, and vice versa.

The logits or log odds of using bKash change by 0.189 for a one-unit change in basic literacy, holding other factors constant. Equivalently, the odds of using bKash change by a factor of approximately 1.8 for a one-unit increase in basic literacy, when all other predictors are controlled. This implies that efforts that enhance basic literacy are likely to increase the use of bKash, and vice versa.

The logits or log odds of using bKash change by 0.7 for a one-unit change in basic numeracy, holding other factors constant. Equivalently, the odds of using bKash change by a factor of approximately 1.9 for a one-unit increase in basic numeracy, when all other predictors are controlled. This implies that efforts which enhance basic numeracy are likely to increase the use of bKash, and vice versa.

4.2 India

Table 14 presents the binomial logistic regression results predicting the use of Airtel Money in India. All predictors of using Airtel Money are non-significant with the exception of the degree of trust in mobile money services. The logits or log odds of using Airtel Money change by 0.7 for a one-unit change in the degree of trust in mobile money services, holding other factors constant. Equivalently, the odds of using Airtel Money change by a factor of approximately 2 for a one-unit increase in the degree of trust in mobile money services, when all other predictors are controlled. This implies that efforts that enhance the degree of trust in mobile money services are likely to increase the use of Airtel Money, and vice versa.

Table 14: Binomial Logistic Regression Results Predicting the Use of Airtel Money

Explanatory Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for Lower	Upper
Possession of a Job or Income Source	0.163	0.381	0.184	1.000	0.668	1.177	0.558	2.485
Owning a Mobile Phone	-0.007	0.660	0.000	1.000	0.991	0.993	0.272	3.619
Possession of a Bank Account	-1.112	0.833	1.783	1.000	0.182	0.329	0.064	1.683
Distance to Nearest Bank Branch or MFI with ATM	-0.097	0.121	0.645	1.000	0.422	0.907	0.715	1.151
Degree of Trust in Mobile Money Services	0.691	0.154	19.997	1.000	0.000	1.995	1.474	2.701
Degree of Trust in Mobile Money Agents	0.114	0.132	0.746	1.000	0.388	1.120	0.866	1.450
Basic Literacy	16.556	5320.884	0.000	1.000	0.998	15502309.879	0.000	
Basic Numeracy	16.971	8379.972	0.000	1.000	0.998	23467647.311	0.000	
Constant	-31.674	9926.517	0.000	1.000	0.997	0.000		

4.3 Nigeria

Table 15 presents the binomial logistic regression results predicting the use of MTN Mobile Money in Nigeria. All predictors of using MTN Mobile Money are non-significant, with the exception of the degree of trust in mobile money services, as well as the degree of trust in mobile money agents. The logits or log odds of using MTN Mobile Money change by 0.9 for a one-unit change in the degree of trust in mobile money services, holding other factors constant. Equivalently, the odds of using MTN Mobile Money change by a factor of approximately 0.4 for a one-unit increase in the degree of trust in mobile money services, when all other predictors are controlled. This implies that efforts that enhance the degree of trust in mobile money services are likely to increase the use of MTN Mobile Money, and vice versa.

Table 15: Binomial Logistic Regression Results Predicting the Use of MTN Mobile Money

Explanatory Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for Lower	Upper
Possession of a Job or Income Source	-0.386	0.759	0.259	1.000	0.610	0.679	0.154	3.006
Owning a Mobile Phone	-14.901	5587.036	0.000	1.000	0.998	0.000	0.000	
Possession of a Bank Account	-15.399	2748.039	0.000	1.000	0.996	0.000	0.000	
Distance to Nearest Bank Branch or MFI with ATM	0.193	0.225	0.737	1.000	0.391	1.213	0.780	1.886
Degree of Trust in Mobile Money Services	0.869	0.269	10.443	1.000	0.001	0.419	0.248	0.710
Degree of Trust in Mobile Money Agents	0.426	0.229	3.459	1.000	0.063	1.531	0.977	2.339
Basic Literacy	-15.016	3482.529	0.000	1.000	0.997	0.000	0.000	
Basic Numeracy	-15.606	2543.854	0.000	1.000	0.995	0.000	0.000	
Constant	57.054	7574.028	0.000	1.000	0.994	60023876799171100000000000.000		

Conversely, the logits or log odds of using MTN Mobile Money change by 0.4 for a one-unit change in the degree of trust in mobile money agents, holding other factors constant. Equivalently, the odds of using MTN Mobile Money change by a factor of approximately 1.5 for a one-unit increase in the degree of trust in mobile money agents, when all other predictors are controlled. This implies that efforts which enhance the degree of trust in mobile money agents are likely to increase the use of MTN Mobile Money, and vice versa.

4.4 Pakistan

Table 16 presents the binomial logistic regression results predicting the use of Telenor Easy Paisa Money in Pakistan. All predictors of using Telenor Easy Paisa Money are non-significant, with the exception of the degree of trust in mobile money services. The logits or log odds of using Telenor Easy Paisa Money change by 0.6 for a one-unit change in the degree of trust in mobile money services, holding other factors constant. Equivalently, the odds of using MTN Mobile Money change by a factor of approximately 0.6 for a one-unit increase in the degree of trust in mobile money services, when all other predictors are controlled. This implies that

efforts that enhance the degree of trust in mobile money services are likely to increase the use of Telenor Easy Paisa Money, and vice versa. It should be noted that, here, data were missing on ownership of a mobile phone.

Table 16: Binomial Logistic Regression Results Predicting the Use of Telenor Easy Paisa Money

Explanatory Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for	
							Lower	Upper
Possession of a Job or Income Source	-0.002	0.433	0.000	1.000	0.997	0.998	0.427	2.333
Owning a Mobile Phone								
Possession of a Bank Account	-1.205	0.695	3.001	1.000	0.083	0.300	0.077	1.172
Distance to Nearest Bank Branch or MFI with ATM	0.071	0.103	0.479	1.000	0.489	1.074	0.877	1.315
Degree of Trust in Mobile Money Services	0.590	0.169	12.262	1.000	0.000	0.554	0.398	0.771
Degree of Trust in Mobile Money Agents	-0.125	0.151	0.692	1.000	0.406	0.882	0.657	1.185
Basic Literacy	-19.444	9336.364	0.000	1.000	0.998	0.000	0.000	.
Basic Numeracy	0.000	0.712	0.000	1.000	1.000	1.000	0.248	4.033
Constant	20.906	9336.364	0.000	1.000	0.998	1200031247.683		

4.5 Tanzania

Table 17 presents the binomial logistic regression results predicting the use of Vodacom Mpesa in Tanzania. All predictors of using Vodacom Mpesa are non-significant, and data were missing on the degree of trust in mobile money services, as well as the degree of trust in mobile money agents.

Table 17: Binomial Logistic Regression Results Predicting the Use of Vodacom Mpesa

Explanatory Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for	
							Lower	Upper
Possession of a Job or Income Source	-0.172	0.471	0.133	1.000	0.715	0.842	0.335	2.120
Owning a Mobile Phone	21.503	21562.353	0.000	1.000	0.999	2180995425.644	0.000	.
Possession of a Bank Account	0.961	0.787	1.491	1.000	0.222	2.614	0.559	12.216
Distance to Nearest Bank Branch or MFI with ATM	0.126	0.095	1.758	1.000	0.185	1.134	0.941	1.367
Degree of Trust in Mobile Money Services								
Degree of Trust in Mobile Money Agents								
Basic Literacy	1.182	0.993	1.417	1.000	0.234	3.260	0.466	22.821
Basic Numeracy	0.644	0.614	1.099	1.000	0.295	1.903	0.571	6.342
Constant	-25.360	21562.353	0.000	1.000	0.999	0.000		

4.6 Uganda

Table 18 presents the binomial logistic regression results predicting the use of MTN Mobile Money in Uganda. All predictors of using MTN Mobile Money are significant, with the exception of the possession of a job or income source and basic numeracy. Data were missing on the degree of trust in mobile money services, as well as on the degree of trust in mobile money agents.

Table 18: Binomial Logistic Regression Results Predicting the Use of MTN Mobile Money

Explanatory Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for	
							Lower	Upper
Possession of a Job or Income Source	0.197	0.632	0.097	1.000	0.755	1.218	0.353	4.206
Owning a Mobile Phone	1.815	0.552	10.800	1.000	0.001	0.163	0.055	0.481
Possession of a Bank Account	0.797	0.446	3.193	1.000	0.074	0.450	0.188	1.080
Distance to Nearest Bank Branch or MFI with ATM	-0.171	0.084	4.204	1.000	0.040	0.842	0.715	0.992
Degree of Trust in Mobile Money Services								
Degree of Trust in Mobile Money Agents								
Basic Literacy	0.797	0.366	4.740	1.000	0.029	0.451	0.220	0.924
Basic Numeracy	0.748	0.531	1.981	1.000	0.159	0.473	0.167	1.341
Constant	5.874	1.153	25.936	1.000	0.000	355.518		

The logits or log odds of using MTN Mobile Money change by 1.8 for a one-unit change in the possession of a mobile phone, holding other factors constant. Equivalently, the odds of using MTN Mobile money change by a factor of approximately 0.2 for a one-unit increase in the possession of a mobile phone, when all other predictors are controlled. This implies that persons with mobile phones are more likely to use MTN Mobile Money, and vice versa.

The logits or log odds of using MTN Mobile Money change by 0.8 for a one-unit change in the possession of a bank account, holding other factors constant. Equivalently, the odds of using MTN Mobile Money change by a factor of approximately 0.5 for a one-unit increase in the possession of a bank account, when all other predictors are controlled. This implies that efforts that enhance the possession of bank accounts by the populace are likely to increase the use of MTN Mobile Money, and vice versa.

The logits or log odds of using MTN mobile money reduce by 0.2 for a one-unit increase in the distance to the nearest bank branch or microfinance institution, holding other factors constant. Equivalently, the odds of using MTN mobile money change by a factor of approximately 0.8 for a one-unit decrease in the distance to the nearest bank branch or microfinance institution, when all other predictors are controlled. This implies that efforts that reduce the distance to the nearest bank branch or microfinance institution are likely to increase the use of MTN mobile money, and vice versa.

The logits or log odds of using MTN mobile money change by 0.8 for a one-unit change in basic literacy, holding other factors constant. Equivalently, the odds of using MTN mobile money by a factor of approximately 0.5 for a one-unit increase in basic literacy, when all other predictors are controlled. This implies that efforts that enhance basic literacy are likely to increase the use of MTN mobile money, and vice versa.

5. Results Using Pooled Cross-Sectional Data for Bangladesh, India, Nigeria and Pakistan

Cross-sectional variation is ordinarily substantially greater than time-series variation. Thus, pooled estimates usually have the desirable property of being

derived from a wider space of variation than estimates based solely on time-series data (Bass & Wittink, 1975). We have pooled data for a common set of variables for Bangladesh, India, Nigeria and Pakistan. It should be noted that Kenya, Tanzania and Uganda have been excluded from the pooled dataset because of missing variables. Below are the results obtained by estimating a binomial logistic regression predicting the use of the most popular mobile money product.

Table 19 gives the overall test for the model that includes the predictors. The chi-square value of 595.5, with a *p*-value of less than 0.0005, tells us that our model, as a whole, fits significantly better than an empty model (i.e., a model with no predictors).

Table 19: Omnibus Tests of Model Coefficients

	Chi-square	**df**	**Sig.**
Step	595.512	8	0.000
Block	595.512	8	0.000
Model	595.512	8	0.000

Table 20 presents the coefficients, their standard errors, the Wald test statistic with associated degrees of freedom and *p*-values, and the exponentiated coefficient (also known as the odds ratio). The binomial logistic regression results presented are the predictors of using the most popular mobile money product (using the pooled cross-sectional dataset) for Bangladesh, India, Nigeria and Pakistan.

Table 20: Binomial Logistic Regression Results Predicting Use of Most Popular Mobile Money Product (for the Pooled Cross-sectional Dataset) in Bangladesh, India, Nigeria and Pakistan

Explanatory Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for Lower	Upper
Possession of a job or income source	0.951	0.073	168.691	1.000	0.000	2.588	2.242	2.988
Owning a mobile phone	1.862	0.159	137.692	1.000	0.000	6.434	4.715	8.781
Possession of a bank account	-0.835	0.165	25.647	1.000	0.000	0.434	0.314	0.599
Distance to nearest bank branch or MFI with ATM	-0.060	0.029	4.178	1.000	0.041	0.942	0.890	0.998
Degree of trust in mobile money services	0.369	0.035	111.173	1.000	0.000	0.691	0.645	0.740
Degree of trust in mobile money agents	0.371	0.036	106.716	1.000	0.000	1.449	1.350	1.554
Basic literacy	0.805	0.142	32.339	1.000	0.000	2.236	1.695	2.951
Basic numeracy	0.463	0.163	8.043	1.000	0.005	0.629	0.457	0.867
Constant	-3.604	0.317	128.894	1.000	0.000	0.027		

All predictors of using the most popular mobile money products in Bangladesh, India, Nigeria and Pakistan as a group are significant, with the exception of the distance to the nearest bank branch and basic numeracy. The logistic regression coefficients give the change in the log odds of using mobile money for a one unit increase in the predictor variable as follows. For every one unit change in possessing a job, the log odds of using mobile money (versus non-use) in Bangladesh, India, Nigeria and Pakistan taken together increase by 0.951, holding other factors constant. The log odds of using mobile money (versus non-use) in these countries, taken together, increase by 1.862 for every

one unit change in the possessing a mobile phone, holding other factors constant. Holding other factors constant, the log odds of using mobile money (versus non-use), in these countries, taken together, decrease by 0.835 for every one unit change in possessing a bank account. For every one unit change in the degree of trust in mobile money services, the log odds of using mobile money (versus non-use) in the three countries, taken together, increase by 0.369, holding other factors constant. The log odds of using mobile money (versus non-use) in these countries, taken together, increase by 0.371 for every one unit change in the degree of trust in mobile money agents, holding other factors constant. Finally, holding other factors constant, the log odds of using mobile money (versus non-use), in Bangladesh, India, Nigeria and Pakistan, taken together, increase by 0.805 for every one unit change in basic literacy.

4. Conclusion

The following conclusions emerge from this study. First, in the sampled countries, more than half of the population owns a mobile phone. Individuals without a mobile phone improvise by borrowing. Total mobile phone access (ownership plus borrowing/pay-for-use) for the sampled countries stands at about 86%. About 37% of the population in the sampled countries owns a bank account, and this figure rises to 38% when account-sharing is considered. In Bangladesh, Nigeria and Pakistan, there are other formal or informal financial institutions—namely, cooperatives, microfinance institutions, village-level savings groups, a money guard or someone in a workplace or neighbourhood—that collects and keeps savings deposits on a regular basis, post office, savings collectors, and Hawla/Hundi networks.

In terms of awareness of mobile money, as well as mobile money use, Kenya leads followed by Tanzania, Uganda, Bangladesh, Pakistan, Nigeria and India. A comparison of mobile money use with awareness of mobile money reveals a 'know-do' gap. In terms of the 'know-do' gap, Bangladesh leads; followed by Pakistan, Tanzania, Uganda, Kenya, Nigeria and India. Comparing bank account access with mobile money use reveals a negative relationship between bank account access and mobile money use. In spite of this negative relationship, it is noteworthy that the two modes of enhancing financial inclusion are more complementary and not substitutes, especially with growing interoperability and agent banking.

In spite of the growing number of registered accounts, activating customers remains a challenge for a large number of services. Kenya leads in terms of both registered account use and active registered account use; followed by Tanzania, Uganda, Bangladesh, Pakistan, India and Nigeria.

We also investigated, by country, the predictors of use of the most popular mobile money product for Bangladesh, India, Nigeria, Pakistan, Tanzania and Uganda. It was not possible to undertake an econometric analysis for Kenya due to the lack of data on the dependent variable and some predictors. For the pooled cross-sectional data for Bangladesh, India, Nigeria and Pakistan, it can be inferred that the significant predictors of using mobile money are: (i) possession of a job or income source; (ii) possessing a mobile phone; (iii) possessing a bank account; (iv) degree of trust in mobile money services; (v) degree of trust in mobile money agents; as well as (vi) basic literacy.

References

Asmundson, I. 2011. What are Financial Services? *Finance & Development (March 2011) pages 46-47.*

Bass, F. M. & D. R. Wittink. 1975. Pooling Issues and Methods in Regression Analysis with Examples in Marketing Research. *Journal of Marketing Research,* 12(4): 414-425.

Burns, R. P. & R. Burns. 2009. *Business Research Methods and Statistics using SPSS.* London: SAGE Publications Ltd.

Center for Financial Inclusion (CFI). 2013. Technology Enables Full Financial Inclusion. Retrieved on 17th April 2015 from: https://centerforfinancialinclusionblog.files. wordpress. com/2013/10/technology1.pdf

Davidson, N. 2011. Mapping and Effectively Structuring Operator-Bank Relationships to Offer Mobile Money for the Unbanked. Retrieved on 18th April 2015 from: www.gsma.com/ .../wp.../mappingandeffectivestructuringfinal2643.pdf.

InterMedia. 2014. Uganda Digital Pathways to Financial Inclusion 2014 Survey Report**.** Retrieved on 06th March 2015 from: http://finclusion.org/country-pages/uganda-country-page/.

International Development Research Centre (IDRC). 2011. *The Knowledge Translation Toolkit: Bridging the Know-Do Gap: A Resource for Researchers.* Ottawa: International Development Research Centre.

Merritt, C. 2010. *Mobile Money Transfer Services: The Next Phase in the Evolution in Person-to-Person Payments*. Federal Reserve Bank of Atlanta.

Pact, Inc. 2014. *Mobile Technology Handbook*. Washington, DC: Pact, Inc.

Pénicaud, C. & A. Katakam. 2013. State of the Industry 2013 Report: Mobile Financial Services for the Unbanked. Retrieved on 18th April 2015 from: http://www.gsma.com/ mobilefordevelopment/wp-content/uploads/2014/02/SOTIR_2013.pdf.

Thirtle, C. G. & V. W. Ruttan. 2001. *The Role of Demand and Supply in the Generation and Diffusion of Technical Change*. Taylor & Francis Group.

World Council of Credit Unions (WCCU). 2012. Using Mobile Technology to Expand Financial Inclusion: The Credit Union Experience.

World Health Organization (WHO). 2006. *Bridging the "Know–Do" Gap*. Geneva: World Health Organization.