Adoption of Mobile Money Transfer Technology: Structural Equation Modeling Approach

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Abstract

In recent years, rapid spread of mobile phones use in the developing countries is as a consequence of the introduction of prepaid cards and the fallen prices of mobile handsets. One of such uses is the use of mobile phones in financial services industry. This study investigates the key factors that influence the Ghanaian consumers' acceptance and use of mobile money transfer technology using key constructs from the Technology Acceptance Model (TAM) and Diffusion of Innovation (DoI) theory. We analyzed the data using a Structural Equation Modeling (SEM) to evaluate the strength of the relationship between the constructs. The results were consistent with the key TAM and DoI constructs.

Keywords: Technology Acceptance Model, Adoption, Mobile Money Transfer Technology, Diffusion of Innovation theory, Ghana.

1. Introduction
The introduction of prepaid cards and the fallen prices of mobile handsets have lead to a rapid spread of mobile phones in the developing countries (Orozco et al., 2007). This has opened up diverse opportunities for it to be used over and above voice communication. At the centre of this experience which comes from the convergence of advanced mobile communication technologies and the ability to use it for data services is mobile money transfer. There are currently over 2 billion mobile phone users

and thus exceeding the number of banked people in the developing countries (Hughes and Lonie, 2007).   The mobile money transfer (MMT) service is an aspect of a broader concept emerging in the electronic payment and banking industry referred to as Mobile Money. Even though mobile money has not been well defined in literature it can be said to include all the various initiatives (long-distance remittance, micro-payments, and informal air-time battering schemes) aimed at bringing financial services to the unbanked using mobile technology. However, Mobile Money can be defined as money that can be accessed and used via mobile phone (Jenkins, 2008). Mobile Network Operators (MNO) in most developing countries are at different stages of MMT implementations. Notably among the developing countries are Philippines, Kenya, South Africa, Tanzania, Nigeria, Ghana and Uganda. Whilst Safaricom's M-pesa has been hugely successful in Kenya, the adoption of similar implementations in Philippines, South Africa and Ghana have not enjoyed similar success.[1] Thus, this paper seeks to explore the key factors that affect consumer behavior towards the adoption and use of MMT in Ghana. Studies on MMT falls between two main mobile technologies related research areas, namely mobile payment and mobile banking. Whereas literature on the adoption of mobile banking (Cheng et al., 2006; Chen, 2008) and mobile payment (Wang and Lie, 2006) and the more broader scope of m-commerce (Dai and Palvia, 2008) although not quite exhaustive have enjoyed significant attention of many scholars in recent times, research on mobile money is at its formative stages. However, scholarly research on the new phenomenon of bringing financial services to the unbanked (Mobile Money) is generally said to be scarce (Maurer, 2008). Therefore, there is a need to understand users' acceptance of mobile Money and to identify the factors affecting their intentions to use mobile Money. This information can assist MNOs and service providers of mobile Money systems in creating services that consumers want to use, or help them discover why potential users avoid using the existing system. Hence, the main objective of this paper is to develop a model that tries to predict the factors that affect consumer behavior towards the adoption of Mobile Money transfer in Ghana. What are the key determinants of user acceptance of mobile money transfer?

To answer this question a theoretical model is developed by combining aspects of Technology Acceptance Model (TAM) (Perceived Usefulness (PU), Perceived Ease of Use (PEOU)), Diffusion of Innovation theory (DoI) (Relative Advantage (RA), Trialability) with additional constructs, Perceived Trust (PT) and Perceived Risk (PR), and empirically tested its ability in predicting user behavioral intention of Mobile Money. We analyzed the data using Structured Equation Model (SEM) to evaluate the strength of the relationship between the constructs. The results provide support of an extended TAM model with PU, PEOU, PR, PT, and Trialability as key determinants in predicting customers' intention of adoption and use of mobile money.

1.1 *Mobile Money Transfer Technology*

Many business transactions including cross country transactions are being conducted on mobile phones daily. The two fundamental attributes of the mobile phone which has lead to its flourished usage are mobility and immediate access (Leung and Wei, 2000). It was believed that electronic money will displace paper money and face-to-face transaction. This has not materialized yet. Will mobile money replace the need for cash? To answer this question we will need to understand the extent to which users are prepared to accept the electronic money as a means of exchange (Mas and Kumar, 2008). The two key functions of money are: as a store of value and a means of exchange[2]. Most of the emerging markets operate a cash economy with over 70% unbanked (Jenkins, 2008). Mobile phones ability to store value and be used as a means of exchange will depend on users' adoption of the technology. In many African countries such as Kenya mobile money transfer technology is the most popular means of money transfer (i.e., sending domestic remittance to family members, relatives and friends). Ghana, like most developing countries has a great number of households that depend on domestic remittance. An increase in urbanization in city centers and constant migration in Ghana means that the need for money transfer services have been quite

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[1] Safaricom's M-PESA (where "M" denotes mobile, and PESA denotes money in Swahili) in Kenya.

[2] David Birch's Digital Money Forum blog at http://www.digitalmoneyforum.com/blog.

significant. Informal methods of remitting funds within Ghana to families and relatives are quite established with diverse difficulties and challenges. One of the key factors in the choice of remittance services everywhere is accessibility. Until recently, the main methods of remittance in Ghana have been through the "Bus Driver".[3] Other informal methods were using visiting family and friends or travelling long distances to remit the funds whenever necessary. Thefts, armed robbery and accidents are a few of the challenges with these methods of remittance.

The rest of the study is organized as follows. Section 2 presents the theoretical framework. Section 3 presents the empirical application of the theoretical framework to mobile money transfer technology. Section 4 presents the results, while Section 5 presents the discussion of the results, and Section 6 provides the concluding remarks.

2. Theoretical Framework

2.1 Background Information on the Theoretical Framework

In Information Systems literature, Roger's (1995) diffusion of innovation theory (DoI), Davies' (1989) technology acceptance model (TAM), the extended technology acceptance model (Davis 1989), the theory of planned behaviour (Azjen, 1985) and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) have been used for the last two decades to explain possible consumer behaviour with respect to adoption and acceptance patterns of new technologies and innovations. Several researchers have sought to develop constructs that affect consumers' behaviour when deciding on the adoption of mobile services by applying these existing information system theories and models (Wu and Wang, 2005; Hung et al., 2004). Studies on mobile services have shown that the application of the above information system theories and models have extended to valued added mobile services (e.g., Carlsson et al., 2006; Chen, 2008). The most applied, tested and refined model is the TAM followed by (UTAUT), (DOI) and then Theory of Planned Behaviour (TPB).

2.2 Technology Acceptance Model (TAM)

Over the years TAM has been tested and applied in the prediction of future consumer behaviour (e.g., Legris et al., 2003), amongst others in the mobile services domain (e.g., Cheong and Park, 2005; Nysveen et al., 2005). The Technology Acceptance Model (TAM) is established on the premise that the contracts, perceived usefulness and perceived ease of use are fundamental determinants of system adoption and use (Davis, 1989). These two beliefs create a favorable disposition or intention toward using the IT that consequently affects its use. Perceived Usefulness (PU) is said to be the degree to which a person thinks that using a particular system will enhance his or her performance. Whereas Perceived Ease of Use (PEOU) is "the degree to which a person believes that using a particular system will be free of effort"(Davis, 1989). TAM has received praises from earlier researchers on its contribution towards our understanding into consumer behaviour. For instance, Lu et al., (2003, p.207) states that: "Throughout the years, TAM has received extensive empirical support through validations, applications and replications for its power to predict use of information systems". Also, Legris et al., (2003, p.202) conclude that "TAM has proven to be a useful theoretical model in helping to understand and explain user behaviour in information system implementation".

2.3 Innovation Diffusion Theory(DoI)

Another theory which has received similar attention by scholars in explaining consumer behaviour towards new technology is the Rogers' Innovation Diffusion Theory (Rogers, 1995). Innovation is defined as

> "an idea, practice or object that is perceived as new by an individual or another unit of adoption", while diffusion is "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995, p.10).

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[3] People visits the bus station of the village or town that their families are based and with a little incentive plead with the bus driver to send their remittances for them. If accepted by the bus driver, the remittance gets to the family within hours.

By these definitions, innovation diffusion is achieved by how a social system accepts and begins to use (adopt) an idea or a technology. Roger further states that the following are the characteristics of any innovation: *Relative Advantage*: the degree to which the innovation is perceived as being better than the practice it supersedes; *Compatibility*: the extent to which adopting the innovation is compatible with what people do; *Complexity*: the degree to which an innovation is perceived as relatively difficult to understand and use; *Trialability*: the degree to which an innovation may be experimented with on a limited basis before making an adoption (or rejection) decision; and *Observability*: the degree to which the results of an innovation are visible to others (Rogers, 1995).

3. Empirical Application of TAM and DOI to Mobile Money Transfer Technology

The various terms that relate to the use of mobile phones to access, store, and transfer or linked to an account; mobile banking (mobile banking), mobile payments (m-payment), mobile money transfer and mobile microfinance are collectively referred to as Mobile Money (MM) in this study. Research on adoption of MM can be seen as part of previous researches in mobile banking and mobile payments. Therefore, it could be argued that the determinants of adoption in m-banking and m-payment environment should be applicable to mobile money. TAM and DOI are considered to be extremely similar in some constructs and supplement one another (Wu and Wang, 2005). Some similarities can be drawn between RA and PU; Complexity and PEOU to the extent that some researchers identifies the TAM constructs as a subset of the Innovation Diffusion Theory (Wu and Wang, 2005). However, developing different measurements for RA and PU was found to be particularly important in MM adoption. Also, complexity and PEOU is considered to be too similar to be separated in this study.

3.1 *Research Model and Hypothesis*

Figure 1 depicts the research model for our study. It includes the key determinants for the TAM (Perceived Usefulness & Perceived Ease of Use) and some aspects of the Diffusion of Innovation Theory (Triability, Relative Advantage). It is supported by other constructs such as Perceived Trust (PT), Transactional Cost (TC) and Perceived Risk (PR). Also Reliability and Perceived Privacy are

identified as antecedents of Perceived Trust
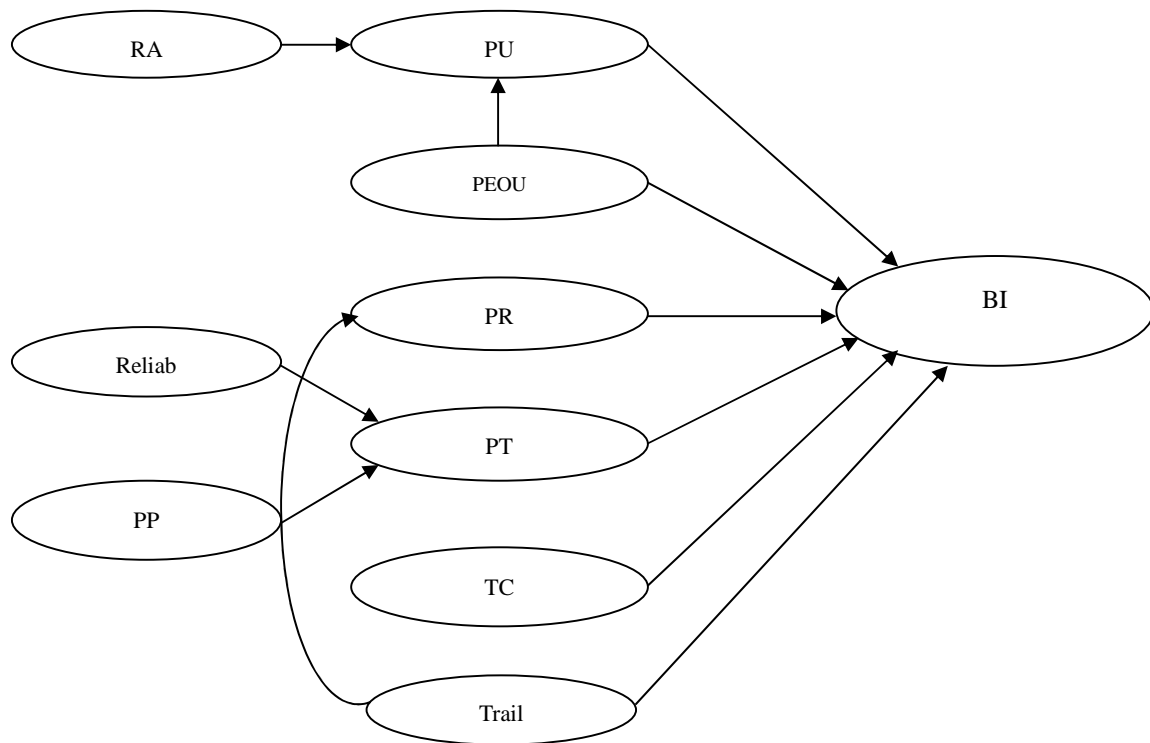
Figure 1: Research Model

   Perceived Usefulness: PU is said to be the degree to which a person thinks that using a particular system will enhance his or her performance. Whereas the initial definition stated was about the usefulness in performing a job function, PU in the adoption of mobile services is defined in a broader context to include how well consumers believes mobile services can be integrated into their daily activities (Kleijnen et al., 2004). And in a mobile payment context it can also be defined as the degree to which the consumer believes that the MM transfer will enhance his transaction (Chen, 2008). When this belief increases, the consumer's intention to use the MM transfer services will also increase. In consumer behavior analysis PU has been well tested as a determinant for a consumer's intention to use mobile services. Also, the extent to which a consumer finds the MM transfer useful may depend on the RA of the service.   If the mobility and easier accessibility characteristics of mobile services leads to a consumer belief that the MM transfer is better than its predecessors (other money transfer services) then that will affect its perceived usefulness. The ultimate reason people exploit MM transfer is that they find them useful (Luarn and Lin, 2005).

H1: Higher perceived usefulness will lead to higher behavioural intention to use MM.
H2: Higher Relative Advantage will lead to higher Perceived Usefulness
   Perceived Ease of Use: PEOU is "the degree to which a person believes that using a particular system will be free of effort" (Davis, 1989). In MM transfer, it includes registration procedures, ease of use of the payment procedure, easy access to customer services, minimal steps required to make a payment, appropriate screen size and input capabilities. Also, the availability of the MM transfer agents will increase the PEOU. Furthermore, it should be accessible on mobile phones with the most basic features and software. Previous studies have concluded that PEOU is a key determinant to consumer behavioral intentions (e.g., Venkatesh and Davis, 2000). In order to prevent the ''under-used'' system problem, MM transfer must be both easy to learn and easy to use (Luarn and Lin, 2004). And also the

original TAM posits that perceived ease of use has a direct effect on perceived usefulness (Davis, 1989).

H3: Higher perceived Ease of Use will lead to a higher Perceived Usefulness
H4: Higher perceived Ease of Use will lead to a higher behavioural intention to use MM.

Perceived Trust: Mobile Money transfer environment, like all business transactions require an element of trust. To become a viable unit of doing business MM transfer should overcome user distrust. And for the purpose of this study, trust is defined as a measure of consumer's level of assurance that the service will be provided with minimum possible hindrance. Research revealed that trust in mobile commerce can be differentiated into two categories: trust in mobile technology and trust in mobile vendors (Siau and Shen, 2003). The existence of local agents who are well integrated into the communities will be necessary for this level of trust to be obtained. Users would expect some level of privacy from the agents. In addition, overall network and service perceived reliability affect consumer's perceived trust in the service. The reliability can be measured by the successful utilization of the service over a period of time with little or no interference. Consumers need to have a belief that the network is reliable. Previous studies have found perceived trust as a significant determinant influencing consumers' behavior intention towards electronic commerce transactions (Mallat, 2007). Although, PEOU has been identified as an antecedent to perceived trust in prior e-commerce adoption research, this was seen as not applicable to MM transfer (Gu et al, 2009). The complexity of using the MM transfer applications will not necessary be attributed to the trustworthiness of the service provider. Thus, privacy and reliability are seen as antecedents to perceived trust. And Perceived Trust is expected to have a direct effect on behavioural intentions.

H5: Higher Perceived Trust will lead to a higher behavioral intention to use MM
H6: Higher Reliability will lead to a higher Perceived Trust
H7: Higher Privacy will lead to a higher Perceived Trust

Perceived Risk: A consumer's perceived risk was identified by the selected consumers and MM professionals interviewed as a significant barrier for MM transactions. Perceived Risk is defined as a consumer's belief about the potential uncertain negative outcomes from the mobile money transaction. Consumers' desire to minimize risk supersedes their willingness to maximize utility and thus their subjective risk perception strongly determines their behavior (Bauer et al., 2005). Thus, reducing uncertainty has been found to have a positive influence on consumers' intention to adopt electronic transactional systems (Chen, 2008).

H8: The higher the Perceived Risk will lead to a negative influence on behavioral intention to use MM.

Transactional Cost: TC includes transaction price, registration fee, or cost of a new device if one is needed to use the service. Consumers interviewed confirmed that transactional cost can influence their behaviour intention to use the MM transfer services. Given that the original TAM was developed in an organizational context, the transactional cost of using technology was not considered as a relevant variable since the consumer was not responsible for the payment of the technology.

H9: Higher Transactional Cost will have negative influence on consumer behavioral intention to use MM

Trialability: the degree to which an innovation may be experimented with on a limited basis before making an adoption (or rejection) decision (Agarwal and Prasad, 1997). Thus, the adoption of MM transfer is more likely if the technology is demonstrated to the user or if it can be used on a free-at-first-use. Past research argue that earlier adopters of an innovation perceive trialability as more important than do later adopters. More innovative individuals have no precedent to follow when they adopt, whereas later adopters are surrounded by others who have already adopted the innovation. Also, our initial consumer interviews indicated that users will adopt MM transfer if given the chance to trial the service for free.

H10: The greater the trialability of MM transfers service, the higher the influence on users behavioural intention to it.

3.2 Research Methodology

This study aims to predict the consumer behavior and intention to adopt Mobile Money Transfer services in Ghana by extending the TAM and DOI models with two extra constructs. The introduction of MMT services in Ghana has not enjoyed the successes experienced by other developing countries like Kenya and Philippines. A survey was developed for the data collection. The survey was conducted in Ghana. The data from the survey were tested using Structured Equation Model, and the unit of analysis was the prospective individual mobile money transfer customer in Ghana. In developing the model, we reviewed existing literature extensively and then interviewed Mobile Money professionals of telecom providers who have either launched or about to launch their products and a selection of consumers. Based on the results of the interviews we developed our survey instruments using a multiple-item, five-point Likert scale approach.

The items in the survey were developed by adapting existing measures validated by other researchers in mobile banking and mobile payment environment, or by converting the definitions of the construct into a questionnaire format. Some of the items for the constructs; PU, PEOU PP and PR were adapted from Chen (2008) and modified for mobile money transfer, others were created to suit the Ghanaian environment. The TC items were captured using three items derived from Constantinides (2002) and real world experience. The items for Perceived Trust construct were adapted from Stewart (2003) and Pennington et al., (2003) and modified accordingly. Items for Trialability, Relative Advantage, Reliability, TC, and BI were created from their respective definitions. In total 32 items for 10 variables were developed. The PU construct is measured using 3 items (PU1-3); the PEOU is measured by 4 items (PEOU1-4). For the determinants of PU, Relative Advantage is measured using 2 items (RA1-2). PT is measured using 4 items (PT1-4) and its determinants, PP 4 items (PP1-4) and Reliability 2 items (Reliability1-2). The PR construct is measured using 5 items (PR1-5), TC is measured using 4 items (TC1-4) and Trialability is measured using 3 items, (Trialability1-3) and the Behavioral Intention construct is measured using 2 items (BI1-2).

The survey questionnaire consisted of four sections. Section A aimed at gathering information relating to respondent mobile phone usage. It was used to measure the respondent's mobile phone experience, which was based on the sum of the various usage indicated. Section B was limited to gathering information on the respondent's usage of money transfer service in the past. Section C was aimed at obtaining information on whether the respondent has used or intended to use mobile money transfer and what factors are likely to influence their adoption decision. The section is sub divided into the various constructs with a total of 32 items ranging between 2 and 4 items per construct. Section D was aimed at gathering demographic information about respondent, including, gender, age, employment status, education and income.

Data was collected using a self administered questionnaire to the general public at malls and other places. In total, 330 respondents were approached in the survey. A total of 302 accepted to participate and final 298 were collected. Since domestic money transfer is generally seen a one way transaction from the urban cities to the rural areas, responses were collected from the three main cities in Ghana; Accra, Kumasi and Takoradi. However, respondents were not distinguished by where they filled in the questionnaire. The questionnaires were distributed by personally approaching the respondents on the street, at the mall, in their offices and at the universities and colleges and requested to participate in a social research involving mobile money transfer. For the illiterate our team members translate the questionnaire from English to Twi (a prime native language).

4. Empirical Results

Based on the two-step approach recommended by Anderson and Gerbing (1988), we first analyzed the measurement model to test the reliability and validity of the survey instrument, and then analyzed the structural model using AMOS version 18 to test our research hypotheses. The Structure Equation Model (SEM) is most useful when assessing the causal relationship between variables as well as verifying the compatibility of the model used.

4.1 Descriptive Statistics

A total number of 288 respondents were used in the analysis (the data collected from 10 respondents had missing information; hence we used 288 instead of 298). The demographic profiles of the respondents are described in what follows. The sample was made up of 65.2% male and 26.5% female with 85.7% below 50 years of age and a mean age of 30 years. With regard to education, the majority were at least university graduates or equivalent (about 67.3% including the postgraduates (Masters and Doctorates)). With regard to employment, company employees comprise the majority, at 44.3%, 28.8% students both full time and part time whereas 15.6% were self-employed. To make it simpler for the respondent, the local currency was used for the study. At the time of the study, $1 was exchanged for 1.4 Ghana Cedis, approximately. Thus, about 43.5% of the respondents earn more than $300 per month.   According to annual income and educational levels, the majority of the respondents appear to belong to the lower middle class of the Ghanaian Society.

The respondents were largely mobile phone users (97%) with 49.3% belonging to more than one network provider. Over 60% of the respondent uses a combination of MTN and one of the five network providers currently operating in Ghana. However, respondents that use MTN only accounted for 33% of the sample. This confirms MTN as the largest Mobile Network Provider in Ghana based on this sample. With regard to the various uses of mobile phone, 35% of respondents use their mobile phone for receiving and making calls, SMS and listening to music. Only 15.2% of the respondents use their phones for only making and receiving calls. Other uses identified include internet (53%), SMS (87.5%), banking, game and music. Apart from the traditional usage of the phone, the respondent report and phone for some value added services.

The most popular form of money transfer identified was through bank transfer with 74% reporting to have used the bank for money transfer. Regarding knowledge of any MMT in Ghana, 85% of the respondents said yes with 93% answered to have heard of the MTN Mobile Money Transfer through advertisements. However, only 10% claimed to have used the service. Knowledge of the service was not reflective of its usage. The intention to use Mobile Money Transfer was found to be below average with 48.4% responding in the affirmative, 28.3% no and 23.3% unsure.

4.2 Construct Reliability and Validity Analysis

Cronbach alpha in SPSS version 16 was used to test the reliability of each of the multiple-item constructs that form the survey instrument. It is the most popularly used measure of internal consistency. As a rule of thumb, a reliability coefficient of 0.70 or higher is considered "acceptable" in social science research (Nunnelly, 1978). This meant that all but three constructs Reliability, Perceived Privacy and Transactional Cost did not meet the reliability test. The reliability of each construct is illustrated in Table 1 below. However, the Perceived Privacy (PP) construct was considered acceptable for use because of its closeness to 0.70 rule of thumb and Reliability and Transactional Cost (TC) were removed from the model and were not used in further analysis. There was little or no consistency between the items used for these constructs. The data was subjected to exploratory factor analysis to establish convergent and discriminant validity of the proposed MMT uniqueness using Principal Component Analysis (PCA) as the extraction method and Varimax rotation with Kaiser Normalisation as the rotation method.   Two rounds of factor analysis were conducted. Initially, a ten-factor structure was suggested and the results showed seven orthogonal factors with eigenvalues above 1.0 and three others very close to 1.0 (.983, .954, .923).   A further factor analysis was conducted with only the seven contructs identified with cronbach alpha above .70 and seven factors with eigenvalues above 1.0 was generated. This analysis eliminated Perceived Privacy (PP) construct as well. The seven factors were maintained for the model and further analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy was found to be 0.857. Thus, the application of factor analysis was deemed appropriate. The factors selected explain 72% of the variances of the variables and a commonality ranging between .853 and .555. Items for PR, PT, RA, Trialability, and BI loaded at greater than 0.4 on their respective factors and are thus deemed valid (as in Tan and Teo, 2000). However, PU loaded on two factors above .40. Correlation analysis reveals that these are still distinct constructs, as the coefficient between them is only 0.30. This finding does reveal,

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however, that PU and PEOU are closely linked in the minds of respondents. Table 2 illustrates the validity of the constructs and their respective factor loading.

Table 1: Reliability of the model constructs (n=288)

Construct	Cronbach alpha	Mean	SD	# of Items	Construct	Cronbach alpha	Mean	SD	# of Items
PU	.904	10.919	2.725	3	Trialability	.844	11.860	2.406	3
PEOU	.907	15.131	3.254	4	Reliability	.503	8.150	1.515	2
PR	.863	15.390	4.832	5	Relative Advantage	.852	7.244	1.866	2
PT	.788	13.696	3.191	4	Perceived Privacy	.675	11.268	2.316	3
TC	.365	14.320	2.610	4	Behavioral Intention	.807	7.495	1.643	2

Table 2: Rotated Component Matrix

	Component						
	Perceived Ease of Use	Perceived Risk	Perceived Trust	Trialability	Perceived Usefulness	Relative Advantage	Behavioral Intentions
PU1					.641		
PU2					.695		
PU3					.749		
PEOU1	.775						
PEOU2	.727						
PEOU3	.791						
PEOU4	.808						
Risk1		.855					
Risk2		.854					
Risk3		.854					
Risk4		.872					
Risk5		.511					
Trust1			.684				
Trust2			.724				
Trust3			.829				
Trust4			.680				
RA1						.791	
RA2						.817	
Trial1				.813			
Trial2				.842			
Trial3				.868			
BI1							.752
BI2							.776

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with

Kaiser Normalization.

4.3 *Structural Model Test*

SPSS Amos 18 was used to generate the common model-fit indices. Structural modeling evaluates whether the data fit a theoretical model. The following common model-fit measures were used to estimate the measurement model fit; chi-square/degree of freedom (χ^2/df), the comparative fit index (CFI), root mean square error of approximation (RMSEA), the normed fit index (NFI), Incremental Fit Index (IFI), and the Tucker Lewis coefficient (TLI). Table 4 shows the estimates from AMOS structural modeling. According to Gerbing and Anderson (1992), the criteria for an acceptable model are as follows: RMSEA of 0.08 or lower; CFI of 0.90 or higher; NFI of 0.90 or higher. The fit between the data and the proposed measurement model can be tested with a chi-square goodness-to-fit (GFI) test where the probability is greater than or equal to 0.9 indicates a good fit (Hu and Bentler, 1999). The GFI of this study was 0.87 close to the recommended 0.90 or greater. Although the model does not show a perfect fit in the goodness-to-fit index used within the sample size of 288, the other measures fitted satisfactorily; CFI=0.92, TLI=0.90, IFI=0.92 and NFI=0.87 with χ^2/df < 3 at 2.51 and the RMSEA=0.07 (Bagozzi and Yi, 1988).

Table 3: Fit Indices

Fit Indices	Results	Recommended Values
chi-square/degree of freedom (χ^2/d.f.)	2.51	<5 (Bagozzi and Yi, 1988)
comparative fit index (CFI)	.0.92	Approaches 1
root mean square error of approximation (RMSEA)	0.07	>0.06 (Joreskog and Sorbom, 1996)
normed fit index (NFI),	0.87	
Tucker Lewis coefficient (TLI)	0.90	Approaches 1(Byrne, 2001)
Incremental Fit Index (IFI)	0.92	Approaches 1

4.4 *Hypothesis Analysis*

Given the satisfactory fit of the model, the estimated path coefficients of the structural model was evaluated to test the hypothesis identified earlier (see table 4). Multicollinearity was ruled out because the correlations between independent variables are all less than 0.8 as shown in table 6 below. Note that after the reliability test, the number of hypothesis tested was reduced to 7 because Transactional cost, Privacy and Reliability was eliminated from further analysis. Based on the results from the Amos 18, the results are presented as predicated by the conceptual model path in Figure 1.

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Table 4: Estimated path coefficients of the structural model

			Estimate	S.E.	C.R.	P	Results of Hypothesis testing
PU	<---	RA	0.22	0.05	5.02	0.01	Supported
PU	<---	PEOU	0.76	0.07	11.08	0.01	Supported
BI	<---	PU	0.27	0.08	2.75	0.01	Supported
BI	<---	PEOU	0.30	0.1	3.09	0.00	Supported
BI	<---	Trial	0.17	0.07	2.51	0.01	Supported
BI	<---	Risk	-0.02	0.04	-0.39	0.69	Not Supported
BI	<---	Trust	0.19	0.07	2.75	0.01	Supported

S.E. is an estimate of the standard error of the covariance.

C.R. is the critical ratio obtained by dividing the covariance estimate by its standard error.

In support of H1, we found a significant and positive relationship between perceived usefulness of mobile money transfer and consumers' intention to use the service (0.27 $p<0.01$). This confirms the original TAM relationship between perceived usefulness and intention to adopt new technology. Also the path coefficient of 0.22 ($p<0.01$) points to a strong positive relationship between Relative Advantage and Perceived Usefulness. Hence, H2 is also confirmed. The path coefficient between Perceived Ease of Use and Perceived Usefulness was the highest at 0.76 ($p<0.01$) indicating a strong relationship between the two factors. Thus H3 is supported. In addition the relationship proposed in H4 is also supported; that is, perceived ease of use also predicts users' intention to use mobile money transfer services (0.30 $p< 0.01$). Further, the structural link between Trust and BI and also Trial and BI were both found to be significant with path coefficient of 0.19 and 0.17 respectively at a significant level of 1%. Thus, consumers' trust in Mobile Money Transfer and their ability to trial the product will significantly affects their intention to use the service. Also, it is worth noting that H8: The higher the Perceived Risk will lead to a negative influence on behavioral intention to use MM; is somewhat supported by the negative sign of the path coefficient (-0.2), but not significant. This finding is contrary to the results earlier studies where perceived risk significantly influences behavioural intention.
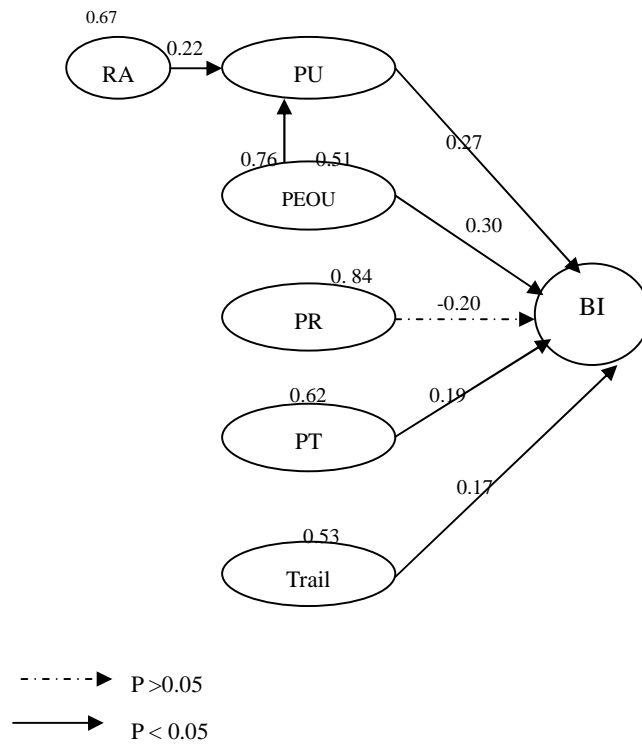
Figure 4: Standardized path coefficients the Research Model

Table 5: Correlations matrix of the variables

	Trust	Risk	Trial	RA	PEOU	PU	BI
Trust	1						
Risk	-.140**	1					
Trial	.350**	.083	1				
RA	.661**	-.109*	.399**	1			
PEOU	.629**	-.153**	.386**	.587**	1		
PU	.582**	-.192**	.336**	.626**	.835**	1	
BI	.634**	-.133*	.460**	.596**	.742**	.714**	1

**. Correlation is significant at the 0.01

level (1-tailed).

*. Correlation is significant at the 0.05

level (1-tailed).

5. Discussion of Empirical Results

The general feeling of the sample about mobile money can be summed up as "I have heard about it but not used it". As indicated above, 93% of the respondents reported to have heard about mobile money through advertisements. As at the time of the study, MTN's mobile money and Airtel's ZAP were the only two mobile money transfer services available in Ghana. MTN had launched its mobile money transfer with huge advertisement campaign (including billboards, radio, TV commercials) both in the cities and rural areas. Despite all the promotion and direct publicity, the adoption of the service was very low with only 10% claiming to have used the service. More than 18months after MTN's launch and there is still no signs of significant uptake of the service. It was therefore necessary to model the factors that predict the Ghanaian consumers' adoption of the service.

This study aims to predict the intention to adopt mobile money transfer service in a convenience sample of Ghanaian citizens, who were asked to complete a questionnaire that was based on relevant adoption research and theories. To the best of our knowledge, this is one of the first studies to empirically test consumers' intention to use mobile money transfer. As an extension to TAM, we included items for Perceived Risk, Perceived Trust, Trialability, and Transactional Cost as key

determinants to consumers' intention to use mobile money transfer services. Furthermore, we suggested that Perceived Privacy and Reliability are antecedents to Trust whereas Relative Advantage and PEOU affect PU. However, Perceived Privacy, Reliability and Transactional Cost did not pass the validity and reliability test and were excluded from the model.

In general the structural equation modeling with AMOS 18 in this study supports the results of previous extended TAM research (e.g., Wang and Benbasat, 2005) with perceived ease of use ($\beta=0.30$), perceived usefulness ($\beta=0.27$), Perceived Risk ($\beta=-0.20$) and Perceived Trust ($\beta=0.19$) as key determinants of behavioral intention. Perceived usefulness is directly affected by perceived ease of use ($\beta=0.76$) and relative advantage ($\beta=0.22$). Perceived ease of use is the most significant construct on perceived usefulness and affects behavioral intentions both directly and indirectly through perceived usefulness. This is consistent with previous research (Gu et al., 2009). The results therefore suggest that mobile money transfer providers should consider how to make the use of the services easily. Also, the trialability construct showed a significant effect on Behavioral intentions ($\beta=0.17$) and suggests that there should be opportunities for customers to trial and test the mobile money transfer service and even see demonstrations of how it works. This would raise awareness, and give people a greater understanding of the technology.

Another point of interest in this study was how perceived risk and perceived trust affects behavioral intention in mobile money transfer services. The results show that perceived trust ($\beta=0.19$) has significant effect on consumers' behavioral intentions. We were expecting an even higher path coefficient for perceived trust because of the nature of mobile money transfer service. From the descriptive statistics, most of the respondents use some form of money transfer regularly with most of it being through banks or friends and family. The trust level for existing money transfer services seem to be quite significant. Furthermore, from a theoretical perspective, it seemed reasonable that a higher perceived risk in MMT service will lead to a lower rate of intention to use. Furthermore, perceived risk was believed to be a predictor and barrier to Mobile money transfer services, and expected to negatively influence consumer's behavioral intent. This was supported not supported by the study ($\beta=-0.20$, $p>0.05$), as the p-value of 0.69 was not significant. Since majority of the respondent and the populace of Ghana had no prior experience of electronic transactions we expected a significant negative relationship between perceived risk and behavioral intentions? The findings of our initial interviews before the survey did not reflect in the actual survey results. The Antecedents of Trust, Privacy and Reliability and also risk were perceived to be the most important determinants of consumers' intention to use mobile money transfer. How can we rely on network providers to transfer our money when their network is always down? What happens to our money when the network is down for a day or two? And who is ultimately responsible, the merchant or the network provider, were some of the questions that was asked during those interviews.

This study intended to be a valuable source for further empirical and conceptual research on mobile money transfer services. Besides its general contribution of identifying, conceptualizing and operationalizing the key factors that predicts its acceptance and adoption in the emerging markets, the results can be used for further investigation into the success and/or failure of other mobile money related services. It provides further understanding into the attitude of the Ghanaian consumer towards mobile data services in general and the use of mobile phones for financial services specifically. A further qualitative study into why the update in Ghana has not been overly successful with specific emphasis on early adopters may be necessary in the future. Also, the developmental impact of mobile money transfer in the developing countries will be significant for further development of this service.

Although our study provides some interesting insights into factors affecting the intention to use mobile money transfer, it has some limitations. First, the exposure to mobile money transfer in Ghana is still at its infant stages, and we had to explain to most respondents what it is. Insufficient understanding of mobile money transfer and its applications does affect consumers' intention to use the service. Also a number of our respondents were illiterate and the translation of the questionnaire may affect their understanding and interpretation. Finally, the survey was conducted in the main cities of Ghana and may not be a perfect representation of the entire population.

6. Concluding remarks

This study sought to model the antecedents of consumer behavior towards the adoption of Mobile Money Transfer in Ghana. Since the introduction of mobile money by MTN in Ghana, other telecom network providers have been investigating the possible impact of this MTN new service to their customer base in Ghana. For example Airtel the most recent provider in the country has just launched their version of mobile money called ZAP. The provisions of both services are quite similar in principle. The impact of mobile money in the first few years of introduction in Kenya has raised the expectations of network providers towards similar introductions in the emerging markets.

The conclusions from the study are as follows. In support of TAM, Perceived Ease of Use and perceived usefulness were found to be the most significant determinants of Behavioural Intention to use mobile money transfer in Ghana. Perceived Trust, Trialability and Perceived Risk were also found to significantly affect Behavioural Intention. As part of financial services, the adoption of mobile money transfer is dependent on consumers' perception on Trust and Risk. Thus, the findings support the traditional view on the effect of risk and trust on usage of financial services. Furthermore, the need for potential consumers to trial the service before adoption was significantly confirmed.

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