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## Acceptance and use of mobile banking: an application of UTAUT2

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#### Abstract

**Purpose** – Mobile banking (m-banking) can be defined as a service offered by a bank or any other financial institution that allows the customers of such establishments to carry out a variety of banking operations via a mobile device, such as a mobile phone, tablet or personal digital assistant. The purpose of this paper is to examine factors that influence customers to adopt and subsequently use m-banking services in Ghana using the unified theory of acceptance and use of technology 2 (UTAUT2) model with age, educational level, user experience and gender as moderators.

**Design/methodology/approach** – Using questionnaire survey, the study sampled 300 users of m-banking services in Ghana as respondents. The primary data collected were analyzed using SmartPLS software.

**Findings** – Findings of the study indicate that Habit, Price Value and Trust are the main factors influencing adoption and use of m-banking in Ghana. Individual differences of gender, age, educational level and user experience responded differently as they moderate the relationship between UTAUT2 constructs and use bahaviour. The applicability of UTAUT2 model was confirmed in the context of the research.

**Practical implications** – M-banking is a new phenomenon in Ghana's financial industry, thus it is imperative to understanding the customer adoption behavior. The outcome will aid financial institutions to develop strategies that will sustain the interest of consumers to embrace m-banking.

**Originality/value** – This paper is among the first ever known attempts to examine m-banking adoption in Ghana using UTAUT2 model.

Keywords Ghana, Adoption, Mobile banking, UTAUT

Paper type Research paper

#### Introduction

The capability of an organization to innovate is increasingly regarded as the most significant in developing and sustaining competitive advantage in this technological age (Tidd *et al.*, 2001). Innovation seeks to use emerging or proved technologies, such as information communication technology (ICT), to do things differently, in better ways that result in adding value, superior quality or improved productivity. ICT as an enabling technology has significantly influenced every facet of human endeavor. It has also changed the way traditional banks operate their businesses, where Mobile banking (m-banking) happens to be the latest trend in the banking industry. M-banking can be defined as a service offered by a bank or any other financial institution that allows the customers of such establishments to carry out a variety of banking operations via mobile devices, such as mobile phones, tablets or personal digital assistants (Georgi and Pinkl, 2005). M-banking can also be referred to as executing financial services via mobile devices facilitated by a mobile communication technique (ITU, 2011).

The rapid growth of these disruptive technologies that has displaced an established technology and shakes up the industry creating a completely new industry has attracted traditional banks' interest. Previously, most clients perform their banking operations inside the bank, or by using the automated teller machine (ATM) or telephone, but nowadays bank customers are able to benefit from m-banking adoption and usage because they now have the option to transact banking activities, and other related banking operations ubiquitously



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and use of m-banking

Acceptance

(AbuShanab and Pearson, 2007; Yousafzai, 2012). Many banking customers, in recent times, are unwilling to perform their banking needs at the banks but rather request for service providers that offer convenient services (Zhang and Shim, 2010). The ability of a bank to provide competitive and innovative services and products that aim at addressing customer satisfaction will inure to its success. There should be ways to maintain such competitive advantage to leverage on competition (Coetzee *et al.*, 2013).

Banks have managed to bring convergence among the internet, wireless technology and mobile devices in providing innovative offerings to their clients through e-banking (Luo *et al.*, 2010; Maduku and Mpinganjira, 2012). M-banking services offer convenience and speed for customers together with their cost savings. This has been a strategy for banks to expand their markets through the introduction of mobile services and reduce cost of running banking operations. Customers can also perform additional transactional services such as payment of bills, account information checks, funds transfer and investment-related transactions via bank operational websites (Hanafizadeh *et al.*, 2014). There are also numerous benefits for banks in adopting and using m-banking such as cost savings, increase customer service quality and increase their revenue (Yousafzai, 2012). As such, m-banking services grew from the necessity to satisfy consumers' needs and commercial entities striving to meet consumer needs (Al-Ajam and Nor, 2013; Alalwan *et al.*, 2014). Mobile technology has come to stay and it is regarded as a disruptive technology displacing traditional business lifestyles of both the rural and urban societies.

The focus on developing e-banking capabilities in Ghanaian banks has been researched by Boateng and Molla (2006), nonetheless the research did not generate considerable insights on consumer perspectives regarding e-banking services and products but rather on the strategies adopted by banks to develop e-banking capabilities. ATMs, e-banking and m-banking are some examples of technological advancements that have generated new service routes for banks' products and services in Ghana. Seeking more cost-effective technologies which add value to customers is the main concern of most banks to serve their customers in more convenient ways, while growing their profits and enhancing their competitiveness in the banking industry. At the moment, almost all commercial banks in Ghana offer ATM services to their clients by networking their ATMs to enhance their utility to these customers. The synergy gained with human and automated tellers have made banking more efficient and effective resulting in shorter waiting periods for bank customers (Rose *et al.*, 1999).

A release by the National Communications Authority, the regulator of Ghana's telecommunications, suggests that the total number of mobile data subscription in the country is 22,865,821 as at September 2017 which represents a penetration rate of 79.94 percent. It further indicated that mobile voice subscription stood at 35,984,280 as at April 2017. During the same period internet users in the country stood at 7,958,675 representing 27.8 percent of the total population. This phenomenon has motivated retail banks in Ghana to introduce m-banking systems into their business operations to enhance and expand their operations to reduce costs. Advancements in information technology have improved financial intermediation in the Ghanaian banking industry to help decrease cost and inefficiencies in their business operations (Frimpong, 2010; Acquah, 2006). Convenience and flexibility of m-banking have enabled Ghanaian banks to have absolute control over their business operations. This is an important mobile app platform through which banks provide financial services to customers to perform a variety of banking operations on their mobile devices. In spite of the benefits m-banking has not caught on yet in the country. A day will not pass by without banks advertising to current and would be customers about m-banking in Ghana. Thus, it suggest that m-banking services in Ghana is still in its infancy stage, hence, there is a possibility that the service is seriously underutilized by bank customers thereby creating the need to address the issue.

Many researchers, in recent past, have undertaken studies on the influential factors that inform why people adopt and use a new technology. This has resulted in a number of technology acceptance models (TAM) and theories that predict and explain users' behavioral intentions (BIs) of accepting and subsequent use of new technology (Chau *et al.*, 2001; Taylor and Todd, 1995; Tétard and Collan, 2009; Venkatesh *et al.*, 2003; Lin and Chang, 2011). The importance of the unified theory of acceptance and use of technology 2 (UTAUT2) model in different research context is highlighted by Venkatesh *et al.* (2012). They argue that contextual theories are able to better explain a phenomenon and offer a meaningful extension of theories. Thus, it is necessary to test the applicability of UTAUT2 in different research context, alongside UTAUT2 to build models. In diverse situations this new constructs could lead to essential modifications in theories. Other researchers argue that applicability of a model depends largely on the characteristics of the technology (Hu *et al.*, 1999).

On the other hand, a clear understanding of factors that influence customers' adoption and actual use of m-banking in Ghana have not been extensively examined empirically. Moreover, no prior research had been undertaken in respect of applying the UTAUT2 model to study customers' adoption and use of m-banking in Ghana. Also in this study, trust and level of education were introduced as additional construct and moderator, respectively, into the UTAUT2 model to deepen the scope of its application to customer's technology adoption predictors as suggested by Venkatesh *et al.* (2012). They argue that future studies should be built on previous studies to test the model in different countries, individual demographic differences, cultures, etc., to identify additional significant influential factors that could motivate users' technology acceptance and actual use. It is on this premise that this study takes a critical look at the applicability of UTAUT2 model to examine the factors that influence customers of banks to adopt and subsequently use m-banking services in Ghana.

#### Theoretical framework

An understanding of what influences users to adopt and use IT is a key branch in IS research. Many theoretical models developed from psychology and sociology-related theories are being used in explaining technology acceptance and use. A comprehensive body of academic research (Davis, 1989; Davis et al., 1989; Moore and Benbasat, 1991; Taylor and Todd, 1995) has particularly focused on determining the factors that affect technology acceptance and use. The model that has been the most widely used for this purpose happens to be the TAM formulated by Davis (1989) and Davis et al. (1989); the model was adapted from the theory of reasoned action (TRA) and promulgated by Ajzen and Fishbein (1980) and Fishbein and Ajzen (1975). On the basis of review of earlier technology acceptance research works, the UTAUT model was developed (Venkatesh et al., 2003) by empirically evaluating eight competing models – namely, the TRA, TAM and TAM2, theory of planned behavior (TPB) and decomposed theory of planned behavior, combined TAM and TPB (C-TAM-TPB), innovation diffusion theory, motivational model, model of PC utilization and social cognitive theory by surveying 215 respondents from four organizations. Based on their detailed studies, the authors further integrated and eventually refined the new model of UTAUT. The latent variables included in UTAUT (facilitating conditions performance expectancy, social influence and effort expectancy) which used to make predictions on users' BI to adopt and use a technology in an organization is moderated by their experience, gender, voluntariness of use and age (Venkatesh et al., 2012).

UTAUT is used as a base model to study a range of technologies within and outside organizational contexts. Nonetheless, considering the number of technological applications, devices and services that are targeted at consumers in recent times, it became necessary to

Acceptance and use of m-banking study the influential variables that motivate consumers into accepting and using new technologies (Stofega and Llamas, 2009). This led to the introduction of the UTAUT2 model by Venkatesh et al. (2012). They adopted the four key constructs (facilitating conditions, performance expectancy, social influence and effort expectancy) that influence customers' BI to use a technology from the UTAUT model with a customer perspective. Thus, performance expectancy is referred to as the extent to which individuals in performing certain activities will experience some benefits as a result of using a technology; effort expectancy is defined as being free from effort as one gets from using of technology; social influence refers to the importance users attach to the perception of close relations that they should make use of a particular technology, whereas facilitating conditions is defined as having available resources and support system to perform a behavior (Venkatesh et al., 2012). Past studies claimed that the constructs of performance expectancy, social influence and effort expectancy determine the BI toward technology use, whilst BI and facilitating conditions influence the actual use of a technology (Venkatesh et al., 2003). In addition, Venkatesh et al. (2012) added three additional factors the UTAUT2 model which includes price value, habit and hedonic motivation and included only three moderating variables (age, experience and gender) to make the model applicable to the consumer use context. They further suggested that these new factors can increase the frontiers of theoretical knowledge of UTAUT2. In respect of this, this research has adapted the UTAUT2 model as its conceptual model for the study.

#### M-banking in Ghana

Mobile money services emerged from electronic payment systems and banking industry. It is a broad term that covers mobile money transfer (MMT) services. Jenkins (2008) defines mobile money as the use of a mobile phone to access money. Researchers have argued that MMT falls between two main mobile technologies, namely, mobile payment and m-banking (Tobbin and Kuwornu, 2011; Habane, 2012). Currently, people use the mobile phone to conduct business transactions (including cross-country transactions) daily. Leung and Wei (2000) argue that the use of mobile phone has soar because of its mobility and accessibility attributes. Increase urbanization in Ghana has necessitated the need for money transfer services. Most households depend largely on remittance from relatives in the cities and abroad. Ghanaians rely mostly m-banking because of its easy accessibility. This phenomenon has changed the interaction between financial institutions and their customers. Ghana, with mobile phone penetration rate of approximately 128 percent, is regarded as the fastest growing telecommunication country in Africa. This translates to increase in the number of mobile phone users in the country. As a result most of the 39 commercial banks in Ghana (including Ecobank, Stanbic, Barclays, Access, Stanchart, Ghana Commercial bank, Unibank, HFC, GT Bank, UBA, etc.) have taken the advantage to serve their customers using the m-banking platform. The banks have tailored their services and products by creating user-friendly mobile apps. This allows the customers to enjoy stress free and "everywhere" banking. The service also provides a conduit for the banks to reach the unbanked population in the country thereby improving financial inclusion Ghana. The m-banking application on customers smartphones allow them to transfer funds, check account balance, open account, pay utility bills, mobile recharging, make interbank transfers and alerts on account activity without visiting the bank premises.

#### **Research model and hypothesis**

The research considers eight latent variables (Figure 2) as significant to directly influence users' intention to adopt and use m-banking service in the country making the basis to formulate a conceptual framework of this study. These latent variables are: hedonic motivation, performance expectancy, social influence, effort expectancy, facilitating conditions, Habit, Price Value and Trust, as the newly added construct. The reliability, truth,

**JEIM** 

strength and ability of users' opinion about an entity can be referred to as Trust (Eisenstadt, 1995; Castelfranchi and Falcone, 2000). Individual differences that moderated these constructs were educational level, gender, age and experience (Figure 2).

#### Trust

For the purpose of this study Trust has been added to the UTAUT 2 model. The reliability, truth, strength and ability of an individual's opinion of a person or an organization can be referred to as Trust (Eisenstadt, 1995; Castelfranchi and Falcone, 2000). Trust can also be referred to as the belief that a person or organization's integrity, ability and benevolence can be trusted (Gefen, 2004). It is the fundamental factor that sustains the lasting relationships between businesses and individuals (Humphries and Wilding, 2004). A key barrier to customer adoption of electronic banking services is the lack of trust as it relates to the security of the system (Kivijärvi *et al.*, 2007; Al-Sajjan and Dennis, 2010) since it is a fundamental determinant that influences users' attitudes and BI to adopt e-services (Cai *et al.*, 2008; Mukherjee and Nath, 2003; Nor and Pearson, 2007). Trust is three levels which are Trust in the bank, Trust in the internet and Trust in m-banking information (Yousafzai *et al.*, 2009).

#### Trust in the bank

This kind of trust, called self-interested motivation, is attained from a customer's judgment concerning the integrity of the bank (Sohail and Shanmugham, 2003; Saparito *et al.*, 2004). This type of Trust helps customers to accept and eventually use m-banking services. Trust in the traditional way of banking services has the tendency to persuade banking customers to shift from off-line to on-line banking (Lee *et al.*, 2007). When traditional banking channels are trusted, customers can be persuaded in the electronic banking channels as well (Arnott, 2007; Hongyoun Hahn and Kim, 2009).

#### Trust in the internet

A customer's trust in m-banking service is at the heart of trust in the internet. Internet privacy and security are considered as two key factors bank customers relate to trust (Yousafzai *et al.*, 2003; Kim and Prabhakar, 2004). These factors affect trust not only in the internet but in all internet business services, so, an assurance that no other entity can have access to customers' bank financial information without authorization is critical in implementing privacy and security systems in m-banking services (Sohail and Shanmugham, 2003).

#### Trust in internet banking information

Information accuracy and completeness are very relevant to banks' customers' trust in the bank's internet information (McCole, 2002; Wang and Emurian, 2005). Customers want to ensure that their private accounts' details are accurate and updated. Information completeness and significant information about the bank's offerings are updated, complete, available and accurate (Yousafzai *et al.*, 2009). It is argued that adoption failures can be attributed to a disregard for trust. This research considers m-banking as a new marketing tool as well as a new IS benefit offered to customers by their banks.

#### Educational level

A high number of research works have shown that people with higher education have a higher propensity to adopt new technology than those with less educational background (Krueger, 1993; Wozniak, 1984, 1987; Welch, 1970; Lleras-Muney and Lichtenberg, 2002). By and large, new technologies are associated with high initial risk uncertainties but equally high returns in the long run. The level of investment into the human capital of a society as well as

Acceptance and use of m-banking their knowledge of technology impacts directly on how quickly they accept new technologies. Again, different levels of education and knowledge of IT systems influence the probability of early adoption. Krueger (1993) explains that people with higher education were more probable to use computers in their jobs. Hence, it is hypothesized that level of education moderates the effects of customer adoption and use of m-banking.

#### Performance expectancy

Performance expectancy refers to the extent to which individuals in performing certain activities will experience some benefits as a result of using a technology (Venkatesh and Davis, 2000; Venkatesh *et al.*, 2003). There is a relationship between performance expectation and BI, that is, moderated by age and gender that find younger people and males to be normally more aware of the usefulness of new technology (Venkatesh *et al.*, 2003; Yousafzai and Yani-de-Soriano, 2012). A high number of research works have shown that people with higher education have a higher propensity to adopt new technology than those with less educational background (Krueger, 1993; Wozniak, 1984, 1987; Welch, 1970; Lleras-Muney and Lichtenberg, 2002). Following these assumptions, it can be hypothesized that:

- H1. Performance expectancy impacts BI to adopt m-banking.
- H1a. Age moderates on performance expectancy toward BI.
- H1b. Gender moderates on performance expectancy on BI.
- H1c. Educational level will moderate the effect of performance expectancy on BI.

#### Effort expectancy

Effort expectancy is defined as the extent of ease from efforts as a result of using a new technology (Plouffe *et al.*, 2001; Venkatesh *et al.*, 2003). Gender, age and educational level influence the relationship between effort expectancy and BIs, as better educated users are more willing to accept and use new technology than less educated users (Venkatesh *et al.*, 2003; Pijpers and van Montfort, 2005; Al-Gahtani *et al.*, 2007). Thus, it can be hypothesized that:

- H2. Effort expectancy influences the BI to adopt m-banking.
- H2a. Age moderates on effort expectancy toward BI.
- H2b. Gender moderates on effort expectancy toward BI.
- H2c. Educational level moderates on effort expectancy toward BI.

#### Social influence

Social influence is the importance users attach to the perception of close relations to use a particular innovation (Venkatesh *et al.*, 2003). Gender, age, experience and educational level moderate the effects of the relationship between social influence and BIs (Venkatesh *et al.*, 2003). Thus, it can be hypothesized that:

- H3. Social influence influences the BI to adopt m-banking.
- H3a. Age moderates on social influence on BI.
- H3b. Gender moderates on social influence toward BI.
- H3c. Experience moderates on social influence toward BI.
- H3d. Educational level moderates on social influence toward BI.

#### **Facilitating conditions**

Facilitating conditions refer to consumers' assurance of the availability of facilities and support systems to use an innovation (Venkatesh *et al.*, 2003). It has been observed that older customers have a propensity to face more challenges in processing new or complex information, as a result affecting their learning of new technologies (Morris *et al.*, 2005; Plude and Hoyer, 1985). Men are willing to spend more effort to overcome different challenges and complexities to pursue their goals than women (Henning and Jardim, 1977; Rotter and Portugal, 1969; Venkatesh and Morris, 2000). Greater experience can lead to greater familiarity with the technology and better knowledge structures to facilitate user learning (Alba and Hutchinson, 1987). Hence, it can be hypothesized that:

- H4. Facilitating conditions influence the BI to adopt m-banking.
- H4a. Age moderates on facilitating conditions toward BI.
- H4b. Experience moderates on facilitating conditions toward BI.
- H4c. Educational level moderates on facilitating conditions toward BI.

#### Hedonic motivation

Hedonic motivation refers to the pleasure that one gets from using a technology (Brown and Venkatesh, 2005). This perceived enjoyment concept is seen to influence consumer's acceptance and use an innovation in IS research (Van der Heijden, 2004; Thong *et al.*, 2006). In the customer context, hedonic motivation has been a determining factor of technology acceptance and use (e.g. Brown and Venkatesh, 2005; Childers *et al.*, 2001). The effect of hedonic motivation on BI is moderated by age, gender and experience due to differences in consumers' innovativeness, novelty seeking and perceptions of novelty of a target technology. When consumers begin to use a particular technology, they pay more attention to its novelty (Holbrook and Hirschman, 1982). As experience increases, consumers use the technology for purposes that are more pragmatic. Age and gender are associated with consumer technology innovativeness. Following these assumptions, it can be hypothesized that:

- H5. Hedonic motivation influences the BI to adopt m-banking.
- H5a. Age moderates on hedonic motivation toward BI.
- H5b. Gender moderates on hedonic motivation toward BI.
- H5c. Experience moderates on hedonic motivation toward BI.

#### Price Value

Price Value is termed as an individual's cognitive tradeoff analysis to compare the perceived benefit to the monetary cost for using a particular innovative service (Brown and Venkatesh, 2005; Dodds *et al.*, 1991). How price and cost are structured impacts significantly on consumers' technology use. For instance in marketing research, to examine the perceived value of products or services, the cost/price analysis is generally considered in relation to the products or services quality (Zeithaml, 1988). In situations where the price value supersedes the monetary cost there is higher propensity for users to adopt a new technology. Theories about social roles consider the differential importance of Price Value among men vs women and among younger vs older individuals (Bakan, 1966; Deaux and Lewis, 1984). Therefore, the hypothesis:

H6. Price value influences the BI to adopt m-banking.

- H6a. Age moderates on price value toward BI.
- H6b. Gender moderates on price value toward BI.

Acceptance and use of m-banking

#### JEIM Habit

Habit refers to the automating behavior from initial learning to regular use of a technology (Limayem *et al.*, 2007). Habit influences technology use regarding its prior use (Kim and Malhotra, 2005) toward BI and moderates the effect of intention on technology actual use (Limayem *et al.*, 2007). As a prior use, habit is a strong predictor of future technology use (Kim and Malhotra, 2005). As age increases, gender differences in learning about technologies from experience become more pronounced. Aging leads to a decreasing capability of information processing. As women tend to process information in a more detailed and subtle manner than men do (Darley and Smith, 1995). Following these, it can be hypothesized that:

- H7. Habit influences the BI to adopt m-banking.
- H7a. Habit will influence use behavior to adopt m-banking.
- H7b. Age moderates on habit on BI.
- H7c. Gender moderates on habit on BI.
- H7d. Experience moderates on habit toward BI.

#### Trust

Trust is the reliability, truth, strength and ability of an individual's opinion of a person or an organization (Eisenstadt, 1995; Castelfranchi and Falcone, 2000). When traditional banking channels are trusted, customers are persuaded in the electronic banking channels as well (Arnott, 2007; Hongyoun Hahn and Kim, 2009). An individual's experience on information technology will have moderating effect on perceived Trust. Following these assumptions, it can be hypothesized that:

- H8a. Trust influences the BI to adopt m-banking.
- H8b. Trust influences use behavior to adopt m-banking.
- H8c. Experience moderates on trust toward BI.
- H8d. Age moderates on habit on BI.
- H8e. Gender moderates on habit on BI.

#### **Behavioral intention**

BI is defined as users' perceived likelihood to make use of something in a given situation (IOM, 2002). Knowledge about the new system, its operations, benefits features and other peoples' perceptions about this new system are important issues that affect users' intention to adopt or not to adopt the new system and use (Wang *et al.*, 2006):

H9a. BI will affect m-banking use behavior.

H9b. Experience moderates on BI toward BI (Figure 1).

#### Data and methodology

The population of the study was users of m-banking services in Ghana. The population comprises of people from various socio-cultural and economic backgrounds. The people engage in all kinds of businesses, both in the formal and informal sectors, with a growing mobile market and internet usage. The study used non-probability sampling approach to select users of m-banking in Ghana. The purposive sampling approach was considered the



most appropriate sampling method for this study given that it increases the possibility of obtaining accurate and reliable information about the subject matter under study. It also allows the researchers to choose respondents who have both the ability and experience to share their perspective on m-banking (Denzin and Lincoln, 2005). This study used primary data gathered from respondents using questionnaire survey. The items and scales for the questionnaire were adapted from Venkatesh et al. (2003, 2012) and Martins et al. (2014). The items included UTAUT2 and use behavior constructs. The items were measured with a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Opinion variables, behavior variables and attribute variable are the three data variable types which were used in the wordings of the research questionnaires (Dillman, 2007). Opinion variables recorded data on respondents' feelings, thoughts, judgment and beliefs about the phenomenon (Tabsh, 2012). The behavioral variables include people's past records, both current and future endeavors. Attribute variables recorded data on respondents' demographic information such as, education, age, marital status and gender. A total of 320 guestionnaires were distributed but 310 guestionnaires were filled and returned. This represents a response rate of 96.855 percent. However, 300 questionnaires were valid for the statistical analysis (Table I).

First-generation techniques are statistical methods widely used by social scientists for the past 20 years (Fornell and Bookstein, 1982). In recent times, researchers have overcome the weaknesses of first-generation techniques with the application of second-generation techniques. The latter, referred to as structural equation modeling (SEM) allow researchers to include constructs and account for measurement error in indicator variables (Chin, 1998). Partial least square (PLS–SEM) was the statistical tool used for the study. PLS–SEM was developed to explain theories in exploratory research. It helps to explain the cause-effect relationships among dependent and independent constructs (Hair *et al.*, 2014). The technique also predicts a series of relationships hypothesized to deepen the understanding of the inconsistencies in dependent variables, making this method significantly useful for this study (Hair *et al.*, 2014).

A distinction is made between reflectively and formatively measured constructs when evaluating measurement models because both approaches are best suited for different concepts

JEIM	Variable	Category	Frequency	%
	Gender	Male	159	53.0
		Female	141	47.0
	Age (Years)	Below 20	27	9.0
		20-30	177	59.0
		31-40	82	27.3
		41-50	9	4.0
		Above 50	5	1.7
	Educational level	School certificate	28	9.3
		Diploma	74	24.7
		Bachelor's degree	147	49.0
		Masters' degree	43	14.3
		PhD	8	2.7
	M-banking use experience (Years)	1-2	135	45.0
Table I.		2–3	97	32.3
Descriptive statistics		3-4	54	18.0
of respondents		5-6	10	3.3
characteristics		Above 8	4	1.4

and as such require consideration before a choice is made. A reflective measurement model best suited the study because causality is from the constructs to their measures/indicators. Evaluation of reflective measurement models included determining the composite reliability to evaluate internal consistency, individual indicator reliability. The average variance extracted (AVE) was applied to assess convergent validity. Additionally, the discriminant validity was assessed using the Fornell–Larcker criterion and cross-loadings.

Internal consistency reliability is a measure of composite reliability (Pc) that considers the outer loadings of indicator variables. Values of composite reliability vary between 0 and 1, where larger values indicate high levels of reliability. Measured values of 0.60–0.70 as composite reliability are acceptable values in exploratory research. Pc values between 0.70 and 0.90 is considered satisfactory in complex research works (Nunnally and Bernstein, 1994).

Discriminant validity is the extent to which an unobservable variable is largely different from other latent variable by empirical standards. This means a latent variable uniqueness displays different features from other constructs in the model. An examination of the cross-loadings of the indicators is a method for assessing discriminant validity. Particularly, an observed variable's outer loadings on related latent variables are expected to be higher when compared to other unobserved variables' outer loadings (Hair *et al.*, 2014). A second and much conservative approach to assessing discriminant validity is the Fornell–Larcker criterion. It compares AVE values square root with construct correlations. Particularly, the square root of each construct's AVE is expected to be higher when compared to the highest correlation of any construct.

Assessing results of structural model involves an examination of the model's predictive capabilities, in addition to the relationships among the latent variables. Coefficients of determination ( $R^2$ ) values and the *t*-values of the path coefficients are the primary evaluation criteria to assess for PLS–SEM result. The other measures to assess are effect size ( $f^2$ ), predictive relevance ( $Q^2$ ) and effect size ( $q^2$ ).

In structural models, path coefficients represent the hypothesized relationships among latent variables. For a two-tailed test, the critical values are 1.65 (at a significance level of 10 percent), 1.96 (at a significance level of 5 percent) and 2.57 (at a significance level of 1 percent) are considered as satisfactory and significant. For the study, path coefficients with a 10 percent probability of error were considered as statistically significant in determining which constructs were significant in influencing customers' BI to adopt and use m-banking.

 $R^2$  measures the model's predictive accuracy. It is determined by calculating the squared correlation between specific endogenous variables' real and predicted values. These  $R^2$  values range from 0 to 1 corresponding to the combined effects of exogenous constructs on the endogenous constructs where values close to 0 signify low predictive accuracy levels and  $R^2$  close to 1 signify high levels of predictive accuracy. The  $f^2$  effect size represents the change in the value  $R^2$  under conditions where certain exogenous construct is left out from the model to evaluate whether it has a significant influence on the endogenous latent variable (Hair *et al.*, 2014).  $Q^2$  value is also assessed to determine the predictive relevance of the model (Geisser, 1974). In the structural model, high  $Q^2$  values (bigger than zero) signify the model's high predictive relevance. In assessing the relative predictive relevance ( $q^2$ ), values of 0.35, 0.15 and 0.02 in that order signify an exogenous latent variable's large, medium or small relative predictive relevance on endogenous constructs.

#### **Results and discussion**

#### Measurement model analysis

To be able to establish that the theory fits the sampled data, the validity and reliability of the measured constructs were confirmed. Reflective model was used to measure constructs associated parameters. Following the Rule of Thumb for evaluating measurement model, PLS algorithm was calculated to test measures including the composite reliability (to assess the internal consistency reliability), indicator reliability, convergent validity, AVE and discriminant validity (Hair *et al.*, 2014) (Figure 2).

With regards to internal consistency reliability, values of composite reliability must be bigger than 0.708 to be considered acceptable. Convergent validity is defined as the degree



Acceptance and use of m-banking

Figure 2. Research model path loading of positive correlation among alternative measures of a construct. Indicators of the reflective construct indicate that the AVE should be larger than 0.50 or higher to indicate the construct's ability to explain over half of the variations of its indicators.

Table II also presents high levels of internal consistency reliability (meaning the composite reliability values are higher than 0.7) on all measured latent variables. AVE value as the evaluation criterion is used to assess convergent validity. AVE registered values of constructs were above 0.50. In view of this, it can be confirmed that there is a positive correlation among alternative measures of the same latent variables. Table III shows the diagonal values of each latent variable having higher values than its highest correlation of the construct (Fornell–Larcker criterion).

Employing the Rule of Thumb in evaluating the reflective measurement model chosen, it was arrived that internal consistency reliability was achieved as a result of having composite reliability bigger than 0.708. The outer loadings (Table IV) of an indicator were also bigger than 0.708. Indicators of the reflective construct showed that the AVE were higher than 0.50 suggested threshold or bigger indicating the construct's ability to explain over half of the variations of its indicators. The indicator's outer loadings on the latent variables were also bigger than all its cross-loadings (Table V) with other constructs. The AVE's square root of each latent variable was bigger than its highest correlation with other construct. This in summary suggests that the theory well fits the sampled data, confirming the validity and reliability of the measured constructs.

#### Structural model analysis and hypothesis testing

The confirmation of the validity and reliability of measured latent variables are a pre-requisite to perform an evaluation of the structural model involving the measuring of

		Cronba	ch's α	$\rho\_A$	Composit	e reliabi	lity A	verage va	ariance e	xtracted	(AVE)
	Effort expectancy	0.75	50	0.754	0	.889			0.799	)	
	Facilitating conditions	0.72	27	0.792	0	.846			0.649	)	
	Habit	0.83	38	0.841	0	.903			0.756	5	
	Hedonic motivation	0.84	43	0.846	0	.927			0.865	5	
	Performance expectancy	0.79	97	0.880	0	.875			0.701	L	
	Price value	0.80	)7	1.109	0	.903			0.823	3	
	Social influence	0.90	)8	0.976	0	.940			0.840	)	
Table II.	Trust	0.84	16	0.849	0	.907			0.765	5	
Construct reliability	Use behavior	0.89	90	0.898	0	.931			0.819	9	
and validity	Behavior intention	0.81	11	0.827	0	.887			0.725	5	
		EE	FC	HB	HM	PE	PV	SI	TT	UB	BI
	Effort expectancy	0.894									
	Facilitating conditions	0.409	0.806								
	Habit	0.314	0.408	0.869	)						
	Hedonic motivation	0.467	0.585	0.568	0.930						
	Performance expectancy	0.611	0.468	0.575	0.545	0.837					
	Price value	0.285	0.397	0.606	0.549	0.548	0.907				
	Social influence	0.431	0.309	0.423	0.317	0.435	0.487	0.917			
Table III.	Trust	0.339	0.512	0.767	0.621	0.586	0.637	0.432	0.874		
Fornell–Larcker	Use behavior	0.291	0.280	0.620	0.369	0.494	0.429	0.375	0.528	0.905	
criterion	Behavior intention	0.298	0.361	0.553	0.442	0.442	0.339	0.276	0.539	0.708	0.851

JEIM

	EE	FC	HB	HM	PE	PV	SI	TT	UB	BI	and use of
BI1 BI2 BI3 EE1	0.884									0.845 0.899 0.807	m-banking
EE2	0.904										
FC1		0.738									
FC2		0.747									
FC3		0.920									
HABIT1			0.833								
HABIT2			0.875								
HABI13			0.898	0.025							
HM2				0.925							
PE1				0.555	0.888						
PE2					0.846						
PE3					0.774						
PV1						0.965					
PV2						0.846					
SI1							0.934				
SI2							0.895				
SI3 TDUCT1							0.920	0.072			
TRUSII								0.873			
TRUST2								0.802			
UB1								0.007	0.901		
UB2									0.934		
UB3									0.880		
Notes: Ind	licator rel	liability: a	ull values	of the ou	ter loadir	ngs of an	indicator	are bigge	er than th	ne 0.708	
suggested t	hreshold	figure; dis	scriminant	validity:	the outer	loadings of	of an indi	cator of la	tent varia	bles are	
bigger than	all their o	ross loadi	nge comp	ared to oth	or constri	icte enigra	eting that	the const	ructo aro f	actually	Table IV

bigger than all their cross-loadings compared to other constructs, suggesting that the different from each other constructs by empirical standards

Table IV.Outer path loading

the model's capability in predicting and the relationships between latent variables. Bootstrapping process was employed to assess the significance of path coefficients in PLS–SEM. The key criteria for the assessment included  $R^2$  values, effect size  $(f^2)$ , predictive relevance  $(Q^2)$  and effect size  $(q^2)$  (Hair *et al.*, 2014). Associated Rules of Thumb for structural model assessment were employed to perform the structural model analysis.

#### Collinearity assessment

To assess for collinearity, tolerance values of each predictor construct (VIF) should range between 0.20 and 5. As shown in Table VI, recorded VIF values are bigger than 0.2 and smaller than the threshold of 5. For that reason, there is no collinearity among the predictor constructs in the structural model.

#### Assessment of the significance and relevance of structural model relationships

The results on the assessment of structural model relationships indicated that a number of path coefficients recorded relatively small values. Complete bootstrapping procedure was run to confirm the significance of the constructs following the Rule of the Thumb procedure. The minimum number of recommended bootstrap samples adopted was 5,000. For a two-tailed test, significant values of 1.65, 1.96 and 2.57 are considered as satisfactory at probability error levels of 10, 5 and 1 percent, respectively. For this study, path coefficients values with

JEIM		EE	FC	HB	HM	PE	PV	SI	TT	UB	BI
	BI1	0.185	0.302	0.615	0.370	0.399	0.380	0.357	0.512	0.667	0.845
	BI2	0.285	0.285	0.450	0.445	0.381	0.250	0.179	0.454	0.615	0.899
	BI3	0.312	0.345	0.302	0.303	0.343	0.214	0.138	0.397	0.505	0.807
	EE1	0.884	0.337	0.280	0.434	0.543	0.251	0.440	0.305	0.251	0.254
	EE2	0.904	0.392	0.282	0.403	0.550	0.258	0.335	0.302	0.269	0.279
	FCI	0.375	0.738	0.279	0.396	0.345	0.285	0.244	0.364	0.235	0.234
	FC2	0.214	0.747	0.244	0.455	0.235	0.193	0.081	0.298	0.122	0.253
	FU3 UARITI	0.392	0.920	0.432	0.548	0.510	0.442	0.377	0.557	0.299	0.305
	HABIT2	0.345	0.317	0.000	0.521	0.405	0.516	0.401	0.047	0.507	0.470
	HABIT3	0.205	0.435	0.898	0.434 0.470	0.555	0.505	0.200	0.702	0.525	0.486
	HM1	0.205	0.310 0.472	0.513	0.925	0.546	0.300	0.268	0.561	0.334	0.397
	HM2	0.386	0.611	0.543	0.935	0.471	0.525	0.319	0.593	0.353	0.424
	PE1	0.489	0.383	0.464	0.469	0.888	0.464	0.324	0.472	0.462	0.475
	PE2	0.514	0.426	0.538	0.498	0.846	0.539	0.423	0.580	0.432	0.330
	PE3	0.582	0.385	0.467	0.402	0.774	0.364	0.383	0.433	0.317	0.240
	PV1	0.282	0.383	0.567	0.563	0.533	0.965	0.461	0.605	0.392	0.377
	PV2	0.226	0.334	0.548	0.395	0.454	0.846	0.431	0.558	0.408	0.186
	SI1	0.419	0.309	0.425	0.296	0.449	0.464	0.934	0.427	0.414	0.315
	SI2	0.288	0.222	0.338	0.266	0.308	0.397	0.895	0.340	0.269	0.198
	SI3	0.463	0.304	0.382	0.307	0.412	0.471	0.920	0.407	0.313	0.213
	TRUSTI	0.238	0.523	0.675	0.567	0.484	0.575	0.352	0.873	0.429	0.440
	TRUS12	0.340	0.353	0.649	0.597	0.556	0.567	0.391	0.862	0.450	0.498
	IRUSI3	0.307	0.472	0.089	0.470	0.495	0.002	0.389	0.887	0.001	0.475
Table V		0.255	0.329	0.502	0.395	0.454	0.303	0.290	0.529	0.901	0.071
Cross-loadings	UB3	0.315	0.223	0.537	0.355	0.396	0.434	0.355	0.481	0.880	0.542
			E	E FC	HB	HM	PE	PV SI	TT	UB	BI
	Effort expe Facilitating Habit Hedonic m Performand Price value	ectancy g condition otivation ce expecta	ns ncy							2.606	1.919 1.679 2.741 2.271 2.421 2.143
<b>Table VI.</b> Collinearity	Social influ Trust Use behavi	ience ior								2.551	$1.556 \\ 3.150$
statistics (VIF)	Behavior in	ntention								1.511	

10 percent probability error were considered as significant statistically. As already indicated in the structural models, path coefficients represent the hypothesized relationships among latent variables. The results of analysis for the structural model path coefficients significance levels as presented in Table VII indicate that Price Value, Habit and Trust were significant in influencing the respondents' BI to adopt MB, while Habit and BI influenced their actual use of the technology. It could be observed that *p*-values of the constructs that were significant in influencing customers' BI to adopt and use m-banking were either 0.10 or lower. The findings on Price Value, therefore, is consistent with the claim that the cost of using the technology and pricing structure have significant impact on consumers' technology

	Original sample (O)	Sample mean (M)	SD	<i>T</i> -statistics ( <i>t</i> -values)	<i>p</i> -values	Significance level	Acceptance and use of
EE > BI	0.027	0.026	0.087	0.304	0.761	Not significant	m-banking
FC > BI	0.054	0.057	0.058	0.925	0.355	Not significant	
HB > UB	0.344	0.347	0.071	4.829	0.000	Significant	
HB > BI	0.316	0.311	0.095	3.329	0.001	Significant	
HM > BI	0.094	0.092	0.074	1.268	0.205	Not significant	
PE > BI	0.110	0.118	0.082	1.345	0.179	Not significant	
PV > BI	-0.138	-0.137	0.071	1.952	0.050	Significant	Table VII
SI > BI	0.008	0.013	0.061	0.125	0.901	Not significant	Significance testing
TRT > UB	-0.022	-0.021	0.082	0.267	0.789	Not significant	results of the
TRT > BI	0.222	0.223	0.091	2.430	0.015	Significant	structural model path
BI > UB	0.530	0.526	0.068	7.748	0.000	Significant	coefficients

use (Venkatesh *et al.*, 2012). In respect of Habit, studies in technology acceptance, in the context of mobile applications, found that Habit is the most important factor which affects the intention to use mobile applications (Hew *et al.*, 2015), it was discovered that habit directly and indirectly affects BI to use technology, indicating that increased experience in usage leads to habitual technology use (Venkatesh *et al.*, 2012). Regarding the findings on Trust, research has proven that Trust increases users' intention to use a technology (Pavlou, 2003; Gefen *et al.* (2003) Gefen, 2003; Pavlou and Gefen, 2004; Nicolaou and McKnight, 2006).

#### Coefficients of determination $(R^2)$ and adjusted $R^2$ $(R^2_{adj})$

The coefficient of determinant  $(R^2)$  signifies the accuracy of prediction of constructs in structural models. The PLS–SEM technique aims at maximizing the  $R^2$  values of endogenous latent variables in the path model.  $R^2$  values are substantial, moderate and weak if their values are 0.75, 0.50 or 0.25, respectively. The  $R_{adj}^2$ , value reduces the  $R^2$  value to compensate for adding non-significant exogenous latent variables in order to increase the explained variance  $R^2$ . The model shows moderate predictive accuracy ( $R^2$  adjusted) value of 0.572 toward use behavior and fairly weak predictive accuracy ( $R^2$  adjusted) value of 0.350 toward behavior intention as shown in Table VIII.

#### Effect size ( $F^2$ ) and predictive relevance ( $Q^2$ )

Predictive relevance  $(Q^2)$  value was also analyzed by running the blindfolding procedure to calculate cross-validated redundancy for endogenous latent variables to indicate the model's predictive relevance of an indicator. The resulting  $Q^2$  values are larger than 0 and lower than 5 (Table IX), implying that there is a significant predictive relevance for the endogenous constructs under study. The cross-validated redundancy approach produced the result below.

Table X shows the exogenous constructs  $f^2$  results as having generally large effects (larger than 0.35) on endogenous constructs and  $q^2$  having relatively medium predictive relevance for certain endogenous constructs.

	$R^2$	$R^2$ adjusted	Table VIII.
Use behavior	0.577	0.572	determination $(R^2)$ and $R^2$ adjusted
Behavior intention	0.367	0.350	

#### Moderation effect analysis

PLS-MGA, a multi-group analysis, determines the moderating effects on the latent variables. The study hypothesized that age, educational level, gender and experience have moderating effects on PE, EE, SI, FC, HM, PV, TRT and HB on users' motivation to adopt and use m-banking service in Ghana. Mediating variables reflect stronger contingent effect on the relationship among exogenous and an endogenous construct in the PLS path model.

#### Moderation by gender

Both male- and female-specific path coefficients reveal a number of differences in the effects. In respect of females Trust, Price Value, effort expectancy and facilitating conditions showed higher path loading toward behavior intention whereas higher path loading of habit geared toward use behavior as shown in Figure A2 and confirmed by their t-values as significant. Males only showed higher path loading for habit and performance expectancy toward behavior intention and higher path loading toward use behavior which are significant as shown in Table XI and confirmed by their *t*-values in Figure A3. Men, more than women, are willing to spend more effort to overcome different constraints and challenges to pursue their goals, with women tending to focus more on the magnitude of effort involved and the process to achieve their objectives (Henning and Jardim, 1977; Rotter and Portugal, 1969; Venkatesh and Morris, 2000). Thus, men tend to rely less on facilitating conditions when considering use of a new technology whereas women tend to place greater emphasis on external supporting factors. In a consumer context, women are likely to pay more attention to the prices of products and services, and will be more cost conscious than men. Furthermore, women are typically more involved in purchasing thus, more responsible and careful with money than men are (Slama and Tashchian, 1985).

#### Moderation by user experience

Regarding m-banking user experience among respondents, 45 percent have less than a two-year experience in using the service followed by a 32.3 percent respondent user rate between two and three years of experience. In total, 18 percent of respondents have a three to four years user experience, while 3.3 and 1.4 percent of respondents have four to five and those above five years

Table IV		Q <sup>2</sup>
Predictive relevance $(Q^2)$	Use behavior Behavior intention	0.442 0.239

		$f^2$	$q^2$
	EE > BI	0.05	0.26
	FC > BI	0.28	0.14
	HB > UB	2.38	1.22
	HB > BI	1.54	0.79
	HM > BI	0.51	0.26
	PE > BI	0.57	0.29
Table X.	PV > BI	0.96	0.49
Effect size $f^2$ and	SI > BI	0.01	0.00
relative impact of	TRT > UB	0.05	0.02
predictive	TRT > BI	1.08	0.55
relevance $(q^2)$	BI > UB	2.99	1.53

**JEIM** 

<i>p</i> -values (males)	$\begin{array}{c} 0.647\\ 0.723\\ 0.017\\ 0.003\\ 0.003\\ 0.717\\ 0.217\\ 0.384\\ 0.384\\ 0.3841\\ 0.653\\ 0.653\\ 0.000\\ 0.000\\ \end{array}$	Acceptance and use of m-banking
<i>p</i> -values (females)	$\begin{array}{c} 0.065\\ 0.001\\ 0.000\\ 0.094\\ 0.156\\ 0.660\\ 0.060\\ 0.000\\ 0.$	
<i>t</i> -values (males)	$\begin{array}{c} 0.458\\ 0.355\\ 2.388\\ 3.013\\ 0.363\\ 0.363\\ 0.502\\ 0.502\\ 0.201\\ 0.449\\ 8.891\\ 8.891 \end{array}$	
<i>t</i> -values (females)	$\begin{array}{c} 1.844\\ 3.419\\ 4.407\\ 1.675\\ 1.417\\ 0.474\\ 1.883\\ 0.586\\ 0.088\\ 3.718\\ 3.718\\ 3.718\\ 3.585\end{array}$	
SD (males)	$\begin{array}{c} 0.135\\ 0.089\\ 0.088\\ 0.125\\ 0.1127\\ 0.090\\ 0.093\\ 0.093\\ 0.076\\ 0.076\end{array}$	
SD (females)	$\begin{array}{c} 0.091\\ 0.063\\ 0.118\\ 0.129\\ 0.089\\ 0.086\\ 0.086\\ 0.086\\ 0.0080\\ 0.106\\ 0.106\\ 0.093\end{array}$	
Path coefficients mean (males)	-0.065 -0.015 0.219 0.239 0.043 0.043 0.016 0.071 -0.016 0.071 0.0555 0.0663 0.0655 0.05555 0.05555 0.05555 0.05555 0.055555 0.055555 0.055555 0.055555555555555555555555555555555555	
Path coefficients mean (females)	$\begin{array}{c} 0.164\\ 0.219\\ 0.521\\ 0.523\\ 0.203\\ 0.203\\ 0.049\\ -0.012\\ -0.012\\ 0.049\\ 0.0397\\ 0.330\end{array}$	
Path coefficients original (males)	-0.062 -0.031 0.210 0.376 0.045 -0.089 0.045 0.045 0.065 0.673	
Path coefficients original (females)	$\begin{array}{c} 0.168\\ 0.214\\ 0.519\\ 0.216\\ 0.126\\ 0.043\\ -0.047\\ -0.047\\ 0.0395\\ 0.335\\ 0.334\\ 0.334\end{array}$	
	$\begin{array}{l} \mathrm{EE} > \mathrm{BI} \\ \mathrm{FC} > \mathrm{BI} \\ \mathrm{HB} > \mathrm{UB} \\ \mathrm{HB} > \mathrm{UB} \\ \mathrm{HB} > \mathrm{UB} \\ \mathrm{HM} > \mathrm{BI} \\ \mathrm{HM} > \mathrm{BI} \\ \mathrm{PC} > \mathrm{BI} \\ \mathrm{PC} > \mathrm{BI} \\ \mathrm{PC} > \mathrm{BI} \\ \mathrm{PC} > \mathrm{BI} \\ \mathrm{BI} > \mathrm{UB} \\ \mathrm{BI} > \mathrm{UB} \end{array}$	Table XI.     Path coefficients for gender moderation MGA analysis

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user experience, respectively. This showed an increasing rate of the number of customers over the last five years. User experience research strives to explain, how the nature of experiences develops over time (Hassenzahl and Tractinsky, 2006). Results as shown in Table XII indicate that Habit and facilitating conditions influence respondents with one to two years of user experience toward use behavior. A meta-analysis indicated that users with less experience or familiarity will depend more on facilitating conditions (Notani, 1998). In respect of respondents from two to three years of user experience, PV, Habit and TRT were significant toward use behavior. Habit, HM, and SI were significant for respondents who had three to four years of m-banking experience. With increasing experience, consumers have more opportunities to strengthen their habit because they have more time to encounter the cues and perform the associated behavior (Kim and Malhotra, 2005). Greater experience can lead to greater familiarity with the technology and better knowledge structures to facilitate user learning, thus reducing user dependence on external support (Alba and Hutchinson, 1987).

#### Moderation by age

Age differences among respondents were grouped into four categories; below 20, between 20 and 30, between 31 and 40, between 41 and 50 years and respondents aged over 50 years. Age bracket 41–50 and those above 50 years were excluded from the moderation analysis because of their low response rate (4 and 1.7 percent, respectively). On the score of age groups, the highest number of users were between 20 and 30 years, accounting for 58 percent of respondents followed by the respondents aged 31–40 (27.3 percent) of the respondents. From the path coefficients of the various groups, age group 20–30 years showed higher loadings for HB, PV, PE toward BI and higher loading values for HB and BI toward use behavior. In this regard, it is believed that younger customers' are more likely to accept and use m-banking compared to older customers. This finding supports previous research in this area which links user age to technology acceptance and usage (Morris and Venkatesh, 2000; Venkatesh *et al.*, 2003).

Higher *t*-values of EE, HB, SI and FC had appreciable effect on BI for age groups 31–40 years (Table XII). Compared to younger consumers, older consumers tend to place greater importance on the availability of adequate support (Hall and Mansfield, 1975). Older customers tend to rely more on heuristics and schema acquired from usage experiences to determine their BI, paying little attention to environment cues. Therefore, older customers with more usage experience will rely mostly on their habits. Once they have formed a habit by repeated use of a particular technology, it is difficult for them to override their habit to adapt to a changed environment (Darley and Smith, 1995; Lustig and Buckner, 2004).

The category of respondents below 20 years of age showed a higher path loading *t*-values for EE and HM on BI while demonstrating higher loadings of HB toward use behavior (Table XIII). In the early stages of using a new technology, younger men tend to exhibit a greater tendency to seek novelty and innovativeness. This greater tendency will in turn increase the relative importance of hedonic motivation in younger men's early technology use decisions (Chau and Hui, 1998).

#### Moderation by level of education

PHD holders recorded less than 5 percent of total respondents and were excluded from the moderation analysis because of their low response rate. Respondents belonging to diploma holders showed higher loadings for HM, HB and PV toward BI and higher loading values for HB toward use behavior (Table XIV). Higher *t*-values of HB, PE and PV registered appreciable effect on BI for educational group that hold bachelor's degree. The category of respondents holding master's degree showed a higher path loading *t*-values for FC and HB on BI while demonstrating higher loadings of BI toward use behavior. Likewise, the category of respondents holding school certificate showed a higher path loading *t*-values for FC, PV and EE on BI. Users with bachelors, master's and diploma

	Path coefficients original (2–3 years)	Path coefficients original (3-4 years)	Path coefficients original (1–2 years)	Path coefficients mean (2–3 years)	Path coefficients mean (3-4 years)	Path coefficients mean (1-2 years)	SD (2-3 years)	SD (4–5 years)	SD (1–2 years)	<i>t</i> -values (2–3 years)	<i>t</i> -values (3–4 years)	<i>t</i> -values (1–2 years)	<i>p</i> -values (2–3 years)	<i>p</i> -values (3–4 years)	<i>p</i> -values (1–2 years)
EE > BI	0.056	0.153	-0.170	0.058	0.225	-0.141	0.116	0.160	0.150	0.477	0.956	1.133	0.633	0.339	0.257
FC > BI	0.092	0.192	0.025	0.100	0.173	0.047	0.125	0.101	0.114	0.736	1.904	0.217	0.462	0.057	0.828
HB > UB	0.307	0.748	0.326	0.302	0.754	0.333	0.160	0.131	0.123	1.915	5.710	2.645	0.056	0.000	0.008
HB > BI	0.078	0.194	0.455	0.077	0.188	0.459	0.159	0.227	0.157	0.492	0.854	2.900	0.623	0.393	0.004
HM > BI	0.043	0.481	-0.014	0.044	0.443	-0.030	0.151	0.176	0.111	0.285	2.738	0.123	0.775	0.006	0.902
PE > BI	0.499	0.066	0.121	0.483	-0.073	0.108	0.157	0.273	0.106	3.170	0.244	1.139	0.002	0.807	0.255
PV > BI	-0.300	0.221	-0.157	-0.277	0.264	-0.146	0.148	0.167	0.127	2.028	1.320	1.235	0.043	0.187	0.217
SI > BI	-0.012	-0.344	0.139	-0.008	-0.242	0.144	0.122	0.167	0.109	760.0	2.064	1.284	0.923	0.039	0.199
TRT > UB	0.052	0.033	-0.150	0.056	0.034	-0.139	0.133	0.156	0.134	0.388	0.210	1.119	0.698	0.834	0.263
TRT > BI	0.325	-0.200	0.214	0.311	-0.167	0.220	0.183	0.160	0.175	1.780	1.253	1.221	0.075	0.210	0.222
BI > UB	0.487	0.031	0.687	0.476	0.029	0.673	0.131	0.124	0.091	3.725	0.246	7.519	0.000	0.806	0.000

Acceptance and use of m-banking

Table XII.Path coefficients foruser experiencemoderation MGAanalysis

JEIM	s urs)	
	<i>p</i> -values (31–40 yez	0.001 0.014 0.016 0.033 0.014 0.117 0.117 0.132 0.112 0.112 0.112 0.112 0.112
	<i>p</i> -values (20–30 years)	$\begin{array}{c} 0.250\\ 0.419\\ 0.000\\ 0.008\\ 0.076\\ 0.076\\ 0.016\\ 0.151\\ 0.151\\ 0.175\\ 0.000\end{array}$
	<i>t</i> -values (31–40 years)	3.195 2.471 2.770 1.679 1.567 1.567 1.568 1.588 1.588 1.588 3.980
	<i>t</i> -values (20–30 years)	1.150 0.808 0.808 0.405 0.405 1.773 2.404 1.224 1.435 1.356 6.560
	SD (31–40 years)	0.122 0.081 0.081 0.130 0.117 0.116 0.116 0.116 0.116 0.113 0.113 0.133
	SD (20–30 years)	0.136 0.075 0.075 0.134 0.134 0.134 0.140 0.110 0.112 0.112 0.145 0.086
	Path coefficients mean (31–40 years)	0.383 0.211 0.276 0.376 0.376 0.235 0.235 0.376 0.235 0.235 0.235 0.197 0.197 0.116
	Path coefficients mean (20–30 years)	-0.127 0.063 0.414 0.358 0.358 0.251 0.251 0.249 0.113 0.113 0.113 0.180
	Path coefficients original (31–40 years)	$\begin{array}{c} 0.391\\ 0.200\\ 0.260\\ 0.360\\ 0.392\\ -0.184\\ -0.184\\ -0.175\\ -0.175\\ 0.177\\ 0.179\\ 0.179\\ 0.178\end{array}$
	Path coefficients original (20–30 years)	$\begin{array}{c} -0.156\\ 0.061\\ 0.406\\ 0.354\\ 0.365\\ 0.36\\ 0.247\\ -0.265\\ 0.112\\ 0.112\\ 0.196\\ 0.196\\ 0.562\end{array}$
Table XIII.   Path coefficients for age moderation MGA analysis		$\begin{array}{l} \label{eq:eq:expectation} EE > BI\\ FC > BI\\ HB > UB\\ HB > UB\\ HB > BI\\ HM > BI\\ HM > BI\\ PV > BI\\ PV > BI\\ PV > BI\\ SI > UB\\ BI > UB\\ BI > UB \end{array}$

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lues oma)	81	40	00	38	31	71	69	11	85	94	9
<i>p</i> -va (diple	0.7	0.0	0.0	0.4	0.0	0.4	0.3	0.8	0.3	0.7	0.0
<i>p</i> -values (bachelors)	0.525	0.653	0.000	0.002	0.953	0.234	0.024	0.887	0.121	0.504	0.000
<i>t</i> -values (diploma)	0.278	0.467	5.230	0.776	2.157	0.722	0.898	0.239	0.870	0.261	4.037
<i>t</i> -values (bachelors)	0.636	0.450	3.637	3.136	0.058	1.191	2.258	0.142	1.553	0.668	5.108
SD (diploma)	0.163	0.189	0.107	0.228	0.139	0.200	0.200	0.133	0.096	0.223	0.083
SD (bachelors)	0.144	0.087	0.122	0.177	0.142	0.143	0.101	0.094	0.127	0.177	0.110
Path coefficients mean (diploma)	0.087	-0.055	0.557	0.119	0.246	0.185	0.197	-0.017	0.082	0.081	0.332
Path coefficients mean (bachelors)	-0.068	0.062	0.462	0.544	-0.011	0.175	-0.218	-0.011	-0.193	0.125	0.539
Path coefficients original (diploma)	0.045	-0.088	0.559	0.177	0.300	0.144	0.180	-0.032	0.084	0.058	0.335
Path coefficients original (bachelors)	-0.092	0.039	0.445	0.556	0.008	0.170	-0.228	-0.013	-0.197	0.118	0.560
	EE > BI	FC > BI	HB > UB	HB > BI	HM > BI	PE > BI	PV > BI	SI > BI	TRT > UB	TRT > BI	BI > UB

Acceptance and use of m-banking

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Table XIV. Path coefficients for educational-level moderation MGA analysis degrees were the highest on the subject of education levels with response rate. Higher educated users are highly probable to accept m-banking, as compared to those minimal educational levels who believe that m-banking system is complicate to work with. This can be attested by a high number of research works that have shown that people with higher education have a higher propensity to adopt new technology than those with less educational background (Krueger, 1993; Wozniak, 1984, 1987; Welch, 1970; Lleras-Muney and Lichtenberg, 2002). It also explained that there are positive relationships between users' educational level and technology usage (Nambisan-Wang, 2000; Kang-Yoon, 2008).

#### Conclusions

The study concludes that the main motivations for m-banking services adoption and use in Ghana are Habit, Price Value and Trust. The applicability of UTAUT 2 model was confirmed in the context of the research. Individual differences of gender, age, educational level and user experience responded differently as they moderate on the UTAUT 2 model constructs. The study gives an insight into the barriers to adoption and the frequency of usage rate of m-banking services in Ghana. The reasons as to why the other UTAUT 2 model constructs, performance expectancy, effort expectancy, social influence and hedonic motivation were not significant in affecting consumer's BI to adopt and use technology need to be addressed by engaging more in m-banking sensitization programs with bank customers. To enhance customer trust, banks should focus on initial trust building to facilitate and accelerate the usage of the service by adopting technological structures such as third-party security certificates during and after m-banking transactions. Analysis of sound managerial and technical procedures should be performed by banks periodically to protect data transmission and user information. To attract new customers, bank managers should offer technical support to m-banking services, as well as user-friendly platforms. To increase customer confidence, banks should demonstrate how to use m-banking services on their website or provide the instructions to use in other mass media platforms. The study findings revealed users within the 20–30 years brackets and higher educated users with bachelors and diploma degrees as highly probable to accept m-banking. On these findings, banks can target these categories of users to increase the service usage rate. Users are encouraged to leverage the advantages m-banking offers as applicable with their needs since these services are designed to fulfill individual's needs. Government, in partnership with the private sector, is entreated to ensure that internet connectivity is available in all parts of the country to help promote the use of m-banking service.

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Appendix







### Figure A4.

One to two years user experience structural model path coefficients with  $R^2$ values



**Figure A5.** Two to three years user experience structural model path coefficients with  $R^2$  values





Figure A7. Age (less than 20 years) structural model path coefficients





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Figure A12. Master's degree structural model path coefficients





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