USER ACCEPTANCE OF MOBILE PAYMENT: THE EFFECTS OF USER-CENTRIC SECURITY, SYSTEM CHARACTERISTICS AND GENDER

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ABSTRACT
This paper investigates the effects of user-centric, security, and system characteristics and the moderating effects of gender on behavioural intention to use mobile payments (m-payment) services in Tanzania. The study extended the Technology Acceptance Model (TAM) to better explain and predict the users' intentions to use m-payment services. A questionnaire survey was conducted with 292 m-payment users in Morogoro and Dar es Salaam, Tanzania. The study used structural equation modeling and multi-group analysis for data analysis. The study found that compatibility, social influence, and m-payment knowledge determined perceived usefulness, while m-payment knowledge, trust and compatibility predicted perceived ease of use of m-payment services. Moreover, perceived ease of use determined perceived usefulness, and perceived usefulness and personal innovativeness in turn, had positive effects on the behavioural intention to use m-payment. There were gender differences on the behavioural intention to use m-payment. The effect of compatibility and personal innovativeness on perceived ease of use, and the influence of ease of use on behavioural intention were moderated by gender such that it is more significant for men more than women. The effects of social influence on perceived usefulness were stronger for female more than their male counterparts. The paper provides empirical findings for mobile service providers to improve their marketing plans, and development of new applications in the Tanzanian culture or other countries with similar conditions.

KEYWORDS
Mobile payment, Mobile phones, Technology Acceptance Model, Gender, Structural equation modelling, Developing country, Tanzania

1. INTRODUCTION

More recently, most countries have experienced significant advancements in financial inclusion by using mobile payment (m-payment) services (Raj, 2015). Mobile payment is an important application of mobile commerce. Mobile commerce is a broader term encompassing the application of mobile devices and wireless networks to conduct commercial transactions over the web-based system (Nilashi et al., 2015). M-payment refers to the "movement of value that is made from a mobile wallet, accrues to a mobile wallet, and/or is initiated using a mobile phone" (GSMA, 2010). The m-payment service has the potential to improve socio-economic activities, even in the rural areas where financial institutions have failed to reach (Venkatakrishnan & Eston, 2013). As established by Deloitte (2012), the additions of 10 mobile phones for 100 people in a developing country increases Gross Domestic Product (GDP) by as 1.2%. M-payment services are important means of decreasing transaction costs, promoting financial inclusion, and reducing personal and financial risk (Nickerson, 2013).

The increased penetration and use of mobile phones (Chogo & Sedoyeka, 2014), low cost of mobile phones, and unreliable and dilapidated fixed line communication have

enhanced use of m-payment services in developing countries. Consequently, the poor network of financial institutions such as banks together with the lack of reliable infrastructure for transferring money have contributed to the implementation of m-payment services across many countries in Africa (Venkatakrishnan & Eston, 2013). M-payment services have allowed consumers without bank accounts to transfer money, save time and financial costs and reduce personal risk (Nickerson, 2013). There are more people with mobile money accounts as compared to the bank accounts in nine countries of Sub-Saharan Africa (Raj, 2015). The countries are Republic of Congo, Gabon, Kenya, Madagascar, Tanzania, Uganda, Zambia and Zimbabwe (Raj, 2015). In Tanzania, statistics show that the proportion of adults, who were completely excluded from the financial system dropped from 55% to 44% between 2009 and 2013 due to the emergence of m-payment services (Raj, 2015).

In Tanzania, there are seven operational mobile networks, of which the four dominating companies include Vodacom Tanzania, Airtel, Tigo and Zantel. In 2007, the largest mobile network operator, Vodacom, launched a mobile-phone based money transfer and micro-financing service, which is called m-pesa service. Later on, two mobile network operators (Tigo and Zantel) launched the same SMS-based money transfer system in 2010, and Airtel mobile network launched its m-payment service in 2011 (Tanzania Communication Regulatory Authority, 2016a). All these companies require a customer to register for a mobile wallet, or stored value account, and they use the SMS-based money transfer system to deposit, send, and withdraw funds using their mobile phones. In addition, they offer at least one of the following mobile money services: airtime top-up, bulk payments, bill payment, mobile banking, and local and international money transfers.

M-payment has however been adopted at a low rate despite the high levels of m-payment awareness and mobile subscription in Tanzania. Statistics indicate that the general awareness of m-payment services in Tanzania is almost universal, with 93 percent of Tanzanians being aware of at least one brand of m-payment services (Intermedia, 2011). Moreover, there were more than 39 million mobile subscribers in the country, of which 16.5 million were mobile money subscribers as of March 2016 (Tanzania Communication Regulatory Authority, 2016b). Various factors contribute to the low usage of m-payment services, including network problems, poor user support, insufficient service awareness, and fear for money safety (Anthony & Mutalemwa, 2014; Chogo & Sedoyeka, 2014; Intermedia, 2011). Other factors are agents' absenteeism, insufficient e-float or cash to help with a transaction (Intermedia, 2013), high transaction cost, unfriendly interface design and lack of procedure training (Chogo & Sedoyeka, 2014). Most users remain at the initial adoption phase of using the m-payment service (i.e. sending and receiving money), while other m-payment services are used at a low rate, especially those services related to business transactions, saving money, insurance (Intermedia, 2013; Mpogole et al., 2016; Senso & Venkatakrishnan, 2013). Certainly, it is important to assess whether these factors still affect behavioural intentions of the general public to use m-payment services in Tanzania.

The Tanzanian studies either looked at the awareness, value and usability factors of m-payment adoption (Chogo & Sedoyeka, 2014), or usage behavior and barriers of m-payment services (Intermedia, 2011, 2013; Kihoma, 2016; Lewis et al., 2016; Mpogole et al., 2016; Senso & Venkatakrishnan, 2013; Venkatakrishnan & Eston, 2013). Other studies have looked at the adoption of m-payment services in various contexts by using Unified Theory of Acceptance and Use of Technology (UTAUT) (Chachage et al., 2013; Tossy, 2014), or Technology Acceptance Model (TAM) (Anthony & Mutalemwa, 2014; Isaga, 2015; Nickerson, 2013). These studies have focused on acceptance of m-payment services among students (Chachage et al., 2013), or micro-entrepreneurs (Nickerson, 2013), or adoption of a certain type of m-payment service, such as Zantel telecommunication services (Anthony & Mutalemwa, 2014), or Tanzania Revenue Authority (Isaga, 2015), or student examination

fees m-payment system (Tossy, 2014). Although earlier studies used TAM to explain the adoption of m-payment services, to the authors´ best knowledge, few studies have focused on the impact of user-centric, security factors, system characteristics and gender differences on m-payment adoption by the general public in Tanzania. This study therefore extends TAM and reflects on the influence of system characteristics, security factors, user-centric and gender differences on the acceptance of m-payment services in this context. Given the fact that the adoption of m-payment is low, this study will assist m-payment users, telecom companies, and other stakeholders to understand factors that are important for the adoption of these services in Tanzania.

2. RESEARCH MODEL AND HYPOTHESES

Several models and theories have been developed to explain information technology (IT) acceptance behaviour. These include: Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1977), Theory of Planned Behaviour (TPB) (Ajzen, 1991), Technology Acceptance Model (TAM) (Davis, 1986), TAM2 (Venkatesh & Davis, 2000), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) and the extended Unified Theory of Acceptance and Use of Technology (UTAUT2) (Venkatesh et al., 2012). As established by a review of 196 papers (Diniz et al., 2011), most studies have used TAM to examine technology acceptance behaviour in a variety of IT contexts including m-payment studies. TAM is a robust and powerful model in explaining and predicting intentions and usage behavior of technology (Davis, 1989; Marangunić & Granić, 2015; Venkatesh & Davis, 2000; Zhang et al., 2012). A recent meta-analysis of TAM studies revealed that there are still many uninvestigated parts of TAM that could improve its predictive validity (Marangunić & Granić, 2015). M-payment is a new technology that provides new ways of conducting business transactions. Consequently, TAM can effectively predict consumer's intention to use new services and applications. The present study used TAM and extended it with other constructs to explain the acceptance of m-payment services in selected regions of Tanzania.

The main constructs of TAM include actual use (U), behavioural intention (BI), attitude toward using (AT), perceived use (PU), and perceived ease of use (PEOU). BI is the most important factor that predicts one's actual behaviour (Davis, 1986; Zhang et al., 2012). BI is determined by attitude. PU and PEOU are the two most important factors that measure users' internal perception of accepting a particular behaviour in the technology acceptance model, and both influence attitude (Davis, 1986). Most studies used TAM with additional constructs adapted for the study of m-payment such as, system characteristics (compatibility), individual differences (personal innovativeness and subject norms), security (perceived risk and trust) and other factors: perceived behavioural control, and perceived enjoyment (Zhang et al., 2012). Other studies have used the following constructs: system characteristics (mobility, reachability, and convenience), and individual differences (m-payment knowledge) (Kim et al., 2010).

This study adopts the technology acceptance model, and extends it with other factors which were tested in previous studies, which include: user-centric factors (personal innovativeness, m-payment knowledge, and social influence), security factors (trust and perceived security risk), system characteristics (compatibility and mobility), and gender. These user-centric, security factors and system characteristics are antecedents of PU and PEOU, and both PU and PEOU in turn, influence intention to use of m-payment services. The study further tested the moderation effects of gender in the adoption of m-payment services.

2.1 User-Centric Characteristics

These characteristics include the consumer-specific factors, which are personal innovativeness, m-payment knowledge, and social influence.

2.2 Social Influence

Social influence refers to the extent to which a consumer's decision to adopt and use m-payment system is influenced by other individuals in the family, communities, working place etc. (Venkatesh et al., 2003). Previous studies have studied social influence using subjective norm which is defined as, ''one's assessment of whether or not people important to him or her feel the behaviour should be performed'' (Ajzen, 1991). The positive effects of subjective norms have been tested on perceived usefulness (Venkatesh & Davis, 2000), and behavioural intention to use m-payment service in various countries, including China (Yang et al., 2012), Nigeria (Hamza, 2014), and Tanzania (Chachage et al., 2013; Tossy, 2014). Studies found that consumers with more people who have adopted m-payment services in their social networks are more likely to access financial information and adopt m-payment (Murendo et al., 2015). Social influence is crucial in influencing people's decision to use a new technology especially when introduced for the first time (Hamza, 2014). Since m-payment service is still new in Tanzania, it is important to assess if this factor can influence consumers' behavioural intention to use the services. It is expected that the m-payment adoption rate will increase if users perceive that their family/friends believe that they should use it. Based on the literature, the following hypotheses were proposed.

H1: Social influence has positive significant effects on the behavioural intention to use m-payment service.
H2: Social influence has a positive effect on the perceived usefulness of m-payment.

2.3 Personal Innovativeness

Personal innovativeness measures "the willingness of an individual to try out any new information technology" (Agarwal & Prasad, 1998, p. 206). Innovative individuals are communicative, curious, dynamic, venturesome, and information seekers, and therefore innovativeness can play a critical role in the intention to adopt the new mobile technologies (Kim et al., 2010; Sadi, 2011). Kim et al. (2010) found that personal innovativeness was positively associated with perceived ease of use of m-payment services in Korea. Furthermore, personal innovativeness had significant positive effects on perceived ease of use, perceived usefulness and behavioral intention of using m-payment (Zarmpou et al., 2012). In the context of this study, it is expected that personal innovativeness will have positive effects on perceived ease of use, and perceived usefulness of m-payment service. This study hypothesizes the following:

H3: Personal innovativeness has a positive effect on the behavioural intention to use m-payment.
H4: Personal innovativeness has a positive effect on the perceived ease of use of m-payment.
H5: Personal innovativeness has a positive effect on the perceived usefulness of m-payment.

2.4 M-Payment Knowledge

Mobile phones are becoming popular in Tanzania, and the numbers of mobile phones subscribers is higher than those who use fixed phone lines. It is important to know if those who already use mobile services have adequate expertise to use m-payment service. Kim et al. (2010) found that m-payment knowledge had positive impacts on perceived ease of use of m-payment services. Consumers with adequate knowledge of m-payment services are more likely to find that the m-payment systems are easier to use and useful than those users lacking such knowledge. This study attempts to assess whether personal m-payment knowledge has

positive effects on perceived ease of use and perceived usefulness of m-payment services. Accordingly, this study hypothesizes the following:

H6: M-payment knowledge has a positive effect on the perceived ease of use of m-payment.
H7: M-payment knowledge has a positive effect on the perceived usefulness of m-payment.

2.5 Security-Related Conditions

The study assesses the potential of two security factors (perceived security risk and trust) on perceived ease of use and perceived usefulness of m-payment services.

2.6 Trust

In the literature, trust is defined as the "extent to which an individual believes that using m-commerce is secure and has no privacy threats'' (Zhang et al., 2012, p. 1904). Trust is "highly conducive to such psychological forces as expectations, attitudes, willingness and perceived probability" (Kim et al., 2009, p. 287). Prior studies found that customers' trust had positive impacts on the perceived usefulness and perceived ease of use (Zarmpou et al., 2012). Another study in Tanzania however revealed that trust had negative effects on intention to use m-payment services (Anthony & Mutalemwa, 2014). The general levels of trust in Tanzania are low due to fear and jealousy (Intermedia, 2011; Kabanda & Brown, 2015). Once trust is established with service provider, users are more likely to have greater trust in the perceived usefulness and ease of use of the m-payment service and adopt the services. Hence, this paper hypothesizes that:

H8: A customer's trust in m-payment services positively affects the perceived ease of use of m-payment
H9: A customer's trust in m-payment services positively affects the perceived usefulness of m-payment

2.7 Perceived Security Risk

The key feature and major benefit of mobile payment services is their perceived security risk (PSR). The term 'perceived security risk' can broadly be defined as the "potential loss of control over personal information" due to fraud or a hacker compromising the security of the online m-payment user (Lee, 2009, p. 131). Previous studies observed that perceived security risk influenced positively intention to use mobile payment system in Tanzania (Tossy, 2014). In like manner, Kihoma (2016) found that m-payment services are safer, easy to handle and available at any time among women involved with agribusiness in Tanzania. In contrast, other studies in developing countries reported negative effects of perceived risk on m-payment adoption (Lee, 2009; Yang et al., 2012; Zhang et al., 2012). In Tanzania, most mobile consumers are concerned with security issues due to many factors including lack of knowledge about m-payment services, lack of legal infrastructure, inappropriate security features and poor information delivery channels (Mathias, 2015). For instance, Senso and Venkatakrishnan (2013) found that Tanzanian m-payment consumers faced a risk of fraud due to many issues including swapping of SIM cards, unfaithful employees, password leakage during money transfer, fake money and forged mobile money withdrawal text messages. The current study conceptualized perceived security risk to have indirect negative effects on behavioural intention of m-payment services through perceived ease of use and perceived usefulness. Accordingly, the study can deduce that:

H10: Perceived risk of m-payment services negatively affects perceived ease of use of m-payment services.

H11: Perceived risk of m-payment services negatively affects perceived usefulness of m-payment services.

2.8 M-payment Services Characteristics

The study assesses the potential of two system characteristics (compatibility and mobility) on perceived ease of use and perceived usefulness of m-payment service.

2.9 Compatibility

In broad terms, compatibility encompasses ‘‘the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters’’ (Rogers, 1983, p. 15). A positive relationship between the two constructs - compatibility and intention to use - has been found in a number of previous m-payment studies (Dass & Pal, 2011; Kapoor et al., 2015; Schierz et al., 2010; Yang et al., 2012; Zhang et al., 2012). The perceived ease of use and usefulness constructs are always parallel with each other, and they are the most significant indicators of technology adoption (Kim, Mirusmonov, & Lee, 2010). This study conceptualized compatibility to have an indirect impact on behavioural intention of m-payment through perceived ease of use and perceived usefulness. Therefore, the researchers proposed the following:

H12: Perceived compatibility has positive significant effects on perceived ease of use of m-payment services.
H13: Perceived compatibility has positive significant effects on perceived usefulness of m-payment services.

2.10 Mobility

The term ‘mobility’ is generally understood to mean the ability to access mobile phone services and conduct transactions from anywhere within a mobile network area from a variety of mobile devices, including personal digital assistant (PDA) and mobile phones (Kim et al., 2010). Mobility refers to the advantages of time and place independent to access and use of m-payment service (Mallat et al., 2008). A Korean studies found positive relationship between mobility and perceived usefulness of m-payment services (Kim et al., 2010). In contrast, studies in Tanzania reported negative effects between mobility and behavioural intentions to use m-payment services (Anthony & Mutalemwa, 2014). Poor mobile network coverage and infrastructure contribute to the negative effects of mobility on the adoption of m-payment services in Tanzania (Anthony & Mutalemwa, 2014). This study contends that mobility can have negative indirect impact on behavioural usage intention of m-payment service through perceived ease of use and perceived usefulness. These observations led to the following hypotheses:

H14: Mobility has a negative effect on the perceived ease of use of m-payment.
H15: Mobility has a negative effect on the perceived usefulness of m-payment.

2.11 Perceived Ease of Use

Given the technical barriers of using mobile phones, perceived ease of use becomes an important driver of adopting m-payment services (Kim et al., 2010). The perceived ease of use encompasses to the degree to which consumers find it easy or difficult to use m-payment service (Davis, 1989). The perceived ease of use construct is significant only during the initial period of adopting and using the system, and it becomes non-significant over periods of extended and sustained usage (Venkatesh et al., 2003). Earlier studies reported that perceived ease of use is positively associated with perceived usefulness (Davis, 1989; Kim et

al., 2010). Moreover, a number of studies have revealed a positive relationship between perceived ease of use and behavioural intention to use m-payment services (Hamza, 2014; Kim et al., 2010; Tobbin & Kuwornu, 2011; Zhang et al., 2012). Even in Tanzania, Chachage et al. (2013) found that effort expectance, which is similar to perceived ease of use positively influenced the behavioural intention to use m-payment services among University students. Consumers who believe that m-payment service is easy to use and useful will have positive intentions towards using the system. Hence, the study hypothesizes that the perceived ease of use of m-payment has positive influences on the consumer's perceived usefulness and behavioural intention of m-payment service.

H16: Perceived ease of use will have a positive effect on the perceived usefulness of m-payment services.
H17: Perceived ease of use has a positive effect on the behavioural intention to use m-payment service

2.12 Perceived Usefulness

In broad terms, perceived usefulness relates to the degree to which consumers believe that using m-payment service will enhance their job performance (Seddon, 1997). Previous research demonstrate that perceived usefulness is positively linked with the behavioural intention to use m-payment (Hamza, 2014; Kim et al., 2010; Tobbin & Kuwornu, 2011; Zarmpou et al., 2012). Consumers can use m-payment service once they believe that using such a system can enhance their saving or increase efficiency in the way they conduct various transactions. Hence, the study theorizes that the perceived usefulness has positive impacts on the behavioural intention to use m-payment service.

H18: Perceived usefulness will have a positive effect on the behavioural intention to use m-payment services.

2.13 Gender and Adoption of M-payment

Gender is hypothesized to moderate the effects of user centric and MPS constructs on consumers' behavioural intention to use new technology as conceptualized by UTAUT and UTAUT2 (Venkatesh et al., 2003; Venkatesh et al., 2012). Various studies reported that gender moderated adoption of mobile commerce (Okazaki & Mendez, 2013), mobile banking (Riquelme & Rios, 2010), and m-payment services (Hamza, 2014). For instance, Hamza (2014) found that males are more influenced by perceived ease of use and usefulness than females in the intention to use m-payment. Besides, women were found to be influenced by social influence factor as compared to men in the adoption of new technology (Hamza, 2014; Riquelme & Rios, 2010; Venkatesh et al., 2003). This study contends that gender can moderate the effects of user-centric, security and m-payment service characteristics on the perceived usefulness and ease of use, which eventually will predict intention to use m-payment.

3. METHODOLOGY

We started by conducting a questionnaire survey in two regions of Tanzania, whereby one district was selected from each region (Ilala district in Dar es Salaam and Morogoro town district in Morogoro). These districts were selected based on the accessibility by roads; presence of mobile phone networks; a diverse combination of urban areas which were likely to be the first participant segment in using m-payment; and economic activities taking place in these regions. The questionnaire survey was conducted over the course of 10 weeks, from November 2013 to January 2014.

3.1 Sampling

According to the National population census of 2012, Morogoro Town district had a total of 307,904, while Ilala district had a total of 1,195,936, making a total of 1,503,840 (National Bureau of Statistics (NBS), 2012). The sample size was determined using Kish's formula for cross-sectional studies (Kish, 1965). This sample was calculated at 95% confidence interval of estimate and margin of error in the estimate equal to 5. The study used stratified random sampling procedure to select a sample of individuals who use m-payment services (n = 384) from a total population of 1,503,840. The response rate was 76% (n=292). Moreover, the sample size achieved the minimum requirement of 1 independent variable to 10 sample (1:10) recommendation by Hair et al. (2010).

The population of the study comprises all persons in the selected districts who are able to use m-payment applications. The study used the purposive sampling technique to select m-payment users by visiting m-payment dealers or stores, mobile phone voucher recharge shops, schools and Internet cafes in the sampled districts. The researchers physically administered the questionnaire which enabled the study to have a high response rate.

3.2 Research Instrument

The measurement items were formulated as Likert-type statements anchored by a five-point scale, ranging from 1 (''strongly disagree") to 5 (''strongly agree"). Perceived usefulness was measured by six items, while ease of use was assessed with two items, which were selected from Davis (1989). Social influence was measured with three items, which came from Moore and Benbasat (1991) and Chong et al., (2010). Three items were used to measure perceived security risks (PSR), and they were derived from Lee (2009). Compatibility was measured with four items, which were adapted from Moore and Benbasat (1991). Mobility (MOB) construct was measured using three items, and they were adapted from Kim et al. (2010). Trust was measured with four items, which came from Kim et al. (2009). Personal innovativeness was assessed with two items, which were taken from Agarwal and Prasad (1998). M-payment knowledge was measured with four items, which were adapted from Kim et al. (2010). Behavioural intention was measured with five items, which were adapted from the literature (Kim et al., 2010; Venkatesh et al., 2003).

3.3 Data Analysis

The study analyzed data using structural modelling, and the unit of analysis was the prospective individual intention to use m-payment in Tanzania. The study performed exploratory factor analysis (EFA) and confirmatory factor analysis to assess the validity and reliability of the measurement model. The study used structural equation modeling to examine the hypothesized relationships in the research model (see Figure 1), while we performed multi-group analysis to test the moderation effect of gender on the research model.

3.4 Measurement Model

We screened the data before conducting the multivariate analyses. There were no measurement items which violated the skewness and kurtosis thresholds (see Appendix I). We performed Exploratory Factor Analysis (EFA) with a varimax rotation method to ensure validity of the data. Table 1 presents the factor loading of the measurement items on the ten factors after Varimax rotation. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.913 which is above the threshold of 0.6 (Hair et al., 2014). Furthermore, Table 2 depicts that Cronbach's Alpha (α) values of all factors were approximately 0.7 and above, that is, all constructs were reliable (Hair et al., 2014).

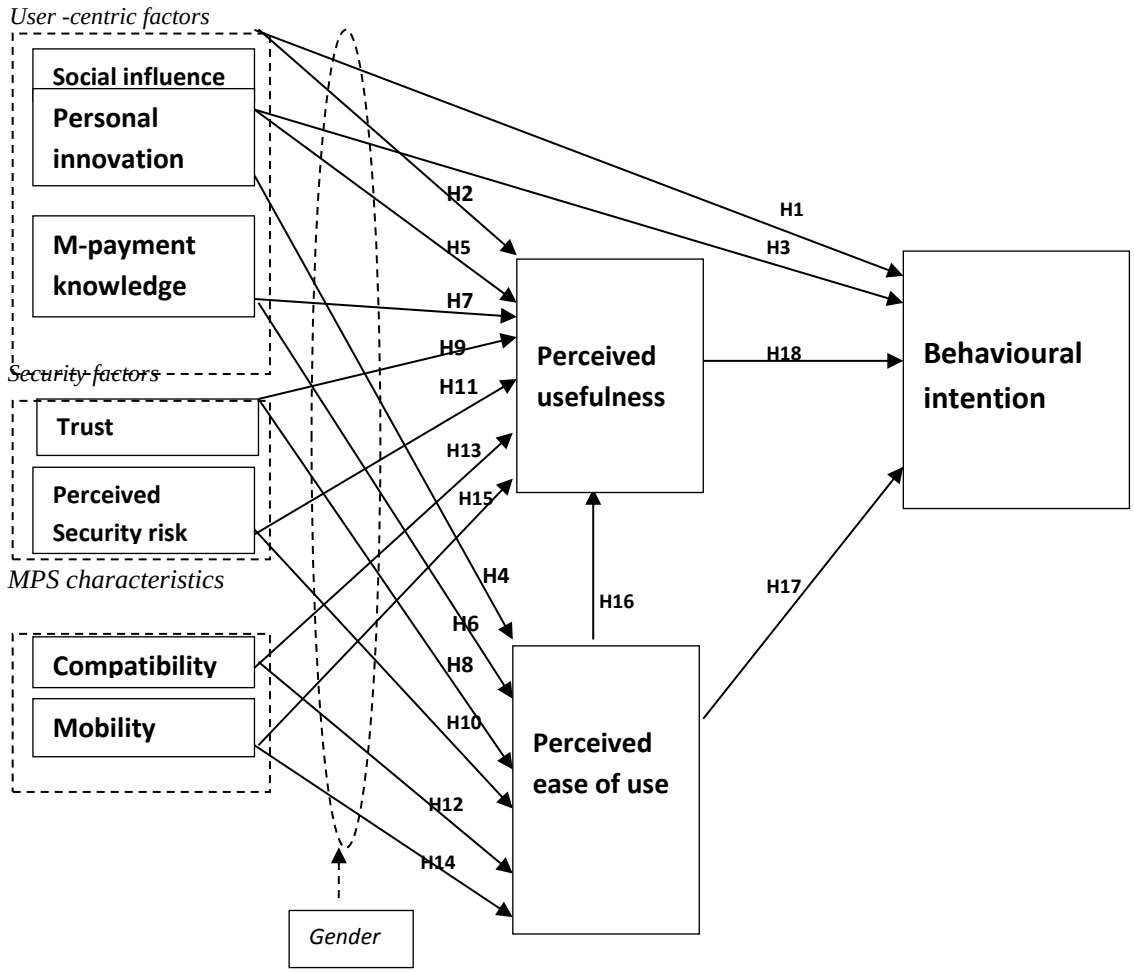


Figure 1: Research Model

Table 1: Rotated Factor Matrix Results

Factors		Factor loadings
PU1	Using m-payment increases my productivity	.759
PU2	Using m-payment enhances my effectiveness on the job	.814
PU3	Using m-payment would enables me to accomplish tasks e.g. payments more quickly	.787
PU4	Using m-payment makes it easier to do my job such as conduct transactions	.784
PU5	I would find m-payment services a useful possibility for paying	.734
PU6	Overall, I find m-payment useful in my job	.607
INT1	Now I pay for purchases with a mobile phone	.661
INT2	I intend to use the mobile payment services in the next three months	.775
INT3	I predict I would use the mobile payment services in the next six months.	.779
INT4	My intentions are to use the mobile payment services in the next one year	.705
INT5	I intend to continue using mobile payment system more frequently in the future	.643
TRUST1	I could use the system if the system protects the privacy of its users	.797
TRUST2	M-payment always provides accurate financial services	.802
TRUST3	M-payment always provides reliable financial services	.788
TRUST4	M-payment always provides safe financial services.	.754

KNOW2	I can use the m-payments services without detailed instruction on its use	.693
KNOW3	I have the skills/knowledge necessary for purchasing products via mobile devices	.809
KNOW4	I am confident of purchasing products via mobile devices	.807
KNOW5	In general, I am competent in using the m-payments services	.807
COMP1	Using mobile payment services is compatible with all aspects of my work.	.691
COMP2	Using m-payment services fits into my work style	.733
COMP3	Using m-payment services fits well with the way I like to purchase products and services	.703
COMP4	Using m-payment is completely compatible with my current situation	.640
MOB1	I believe m-payment is independent of time	.803
MOB2	I believe m-payment is independent of place	.860
MOB3	I can use m-payment anytime while travelling	.833
SI1	People who influence my behavior think that I should use the system.	.804
SI2	People who are important to me think that I should use the system.	.801
SI3	In general, the community around me has supported the use of the system.	.703
PSR1	I would not feel secure sending sensitive information across the mobile payment system.	.796
PSR2	I would not feel totally safe providing personal private information over the m-payment services.	.819
PSR3	I'm worried about using m-payment services because other people may be able to access my account.	.758
PEOU1	Learning mobile phone payments services would be easy for me.	.758
PEOU2	I find it easy to use m-payments services to do what I wanted to do.	.809
INNO1	If I heard about a new information technology, I would look for ways to experiment with it	.773
INNO2	Among my peers, I am usually among the first to try new information technologies	.725

KEY: PU= Perceived Usefulness; INT= Behavioural Intention; TRUST= Trust; KNOW = M-payment Knowledge; COMP= Compatibility; MOB = Mobility; SI= Social Influence; PSR = Perceived Security Risk; PEOU = Perceived Ease of Use; INNO = Personal Innovativeness.

Table 2: Correlations and measurement model results

	Item	PU	INT	TRUST	KNOW	COMP	MOB	SI	PSR	PEOU	INNO	α
PU	6	1	0.546**	0.479**	0.437**	0.572**	0.205**	0.505**	0.032	0.582**	0.290**	0.916
INT	4	0.546** [a]	1	0.538**	0.556**	0.600**	0.345**	0.355**	0.002	0.380**	0.496**	0.896
TRUST	4	0.479**	0.538**	1	0.461**	0.484**	0.319**	0.303**	0.068	0.434**	0.400**	0.890
KNOW	4	0.437**	0.556**	0.461**	1	0.504**	0.312**	0.350**	-0.026	0.302**	0.523**	0.890
COMP	4	0.572**	0.600**	0.484**	0.504**	1	0.409**	0.395**	0.039	0.355**	0.483**	0.848
MOB	3	0.205**	0.345**	0.319**	0.312**	0.409**	1	0.174**	0.140*	0.221**	0.298**	0.846
SI	3	0.505**	0.355	0.303**	0.350**	0.395**	0.174**	1	0.134*	0.391**	0.332**	0.788
PSR	2	0.032	0.002	0.068	-0.026	0.039	0.140*	0.134*	1	-0.057	0.173**	0.652
PEOU	2	0.582**	0.380**	0.434**	0.302**	0.355**	0.221**	0.391**	-0.057	1	0.167**	0.811
INNO	2	0.290**	0.496**	0.400**	0.523**	0.483**	0.298**	0.332**	0.173**	0.167**	1	0.758
AVE		0.652	0.684	0.671	0.673	0.585	0.654	0.563	0.508	0.685	0.611	

Fit indices: χ^2 = 848.960 (*df* = 482, *p* < .01), RMSEA = .051, CFI = .938, TLI = .928

[a] Correlations, [b] Squared correlations, AVE = Average Variance Extracted

A Confirmatory Factor Analysis (CFA) was conducted with the measurement items that passed the EFA process. Item INT1 was found to be associated with high values of modification indices, and was therefore omitted from further analysis. The measurement model reasonably fit the data (χ^2 = 848.960, *df* = 482, $p < .01$, RMSEA = .051, CFI = .938), and standardized loadings were all equal or above 0.6 and significant (See Table 2 and Appendix 1). As illustrated in Table 2, the Average Variance Extracted (AVE) values surpassed the cutoff of .50 (Hair et al., 2014). The squared correlation between a pair of variables was less that the AVE values. Thus, convergent and discriminant validity were established.

4. FINDINGS

As outlined in Table 3, 56.2% (n=164) were male and 43.8% (n=128) were female. The average age was 31 years, with most respondents aged between 26 and 35 years (39%, n=114). A substantial number of respondents had ordinary level of secondary education (34.6%, n=98), with an income below 45 USD or 100,000 Tanzanian shillings (41.4%, n=118). Over half (55.3%, n=151) of study participants had experience of using m-payment service for five years and above (see Table 3).

Table 3: Demographic Characteristics

		Number	Percentage
Gender	Female	128	43.8%
	Male	164	56.2%
Age	25 years and below	87	29.8%
	26-35	114	39.0%
	36-45	52	17.8%
	46-55	23	7.9%
	56 years and above	16	5.5%
Level of education	Not educated	10	3.5%
	Adult education	16	5.7%
	Primary education	70	24.7%
	Ordinary secondary education	98	34.6%
	Advanced secondary education	31	11.0%
	Diploma	24	8.5%
	Bachelor degree	30	10.6%
	Master's degree	4	1.4%
Level of income	100,000 TShs and below (45 USD and below)	118	41.4%
	100,001– 300,000 TShs (45.1 – 136 USD)	73	25.6%
	300,001– 600,000 TShs (136.1 – 273 USD)	47	16.5%
	600,001 – 1,000,000 TShs (273.1 – 455 USD)	28	9.8%
	1,000,001 – 2,000,000 TShs (455.1 – 909 USD)	14	4.9%
	2,000,001 -3,000,000 TShs (909.1 – 1364 USD)	3	1.1%
	3,000,001 TShs and above (1364.1 USD and above)	3	0.7%
M-payment prior Experience	One year	20	7.3%
	Two years	28	10.3%
	Three years	31	11.4%
	Four years	43	15.8%
	5 years and above	151	55.3%

4.1 M-Payment Services Usage Activities

By using a five point Likert scale, the results illustrate that m-payment service was mainly used for loading airtime and for frequent confirmation of account balances, with a mean score of 3.25 and 3.15 (see Table 4).

Table 4: Frequency of Using Mobile Phone Payment System

	Never		Seldom		Sometimes		Often		Always		Mean scores
	No	%	No	%	No	%	No	%	No	%	
Loading of airtime through m-payment	34	11.9%	62	21.7%	61	21.3%	56	19.6%	73	25.5%	3.25
Confirmation of account balances	48	16.8%	49	17.1%	66	23.1%	59	20.6%	64	22.4%	3.15
Deposits and withdrawals	52	17.9%	64	22.1%	76	26.2%	59	20.3%	39	13.4%	2.89
Sending of money to other parties	54	18.6%	86	29.6%	82	28.2%	42	14.4%	27	9.3%	2.66
Payment of bills	122	42.5%	52	18.1%	54	18.8%	42	14.6%	17	5.9%	2.23
Purchases using m-payment	132	46.0%	50	17.4%	49	17.1%	41	14.3%	15	5.2%	2.15

4.2 Prediction of M-Payment Behavioural Use Intention

We tested the hypotheses in the conceptual framework by using a Structural Equation Modelling (SEM) with a maximum likelihood estimation method, which accounted for measurement errors, as well as the interrelationships between constructs. Results verified the fit of the model to the data (χ^2 = 891.548, *df* = 488, $p < .01$, RMSEA = .072, CFI = .932, TLI = .922) as indicated in Appendix II.

The findings demonstrate that three constructs (social influence, m-payment knowledge and compatibility) positively predicted perceived usefulness of m-payment services, and thus, H2, H7, and H13 were supported (b=0.216, b=0.168, and b=0.517) (see Table 5). Mobility had negative significant effects on perceived usefulness, and hence H15 was supported. Meanwhile, personal innovativeness negatively predicted perceived usefulness, and at the same time, trust and perceived security risk had no effects on perceived usefulness, and thus, H5, H9 and H11 were not supported.

Moreover, the study found a significant positive relationship between the three constructs (m-payment knowledge, trust and compatibility) and perceived ease of use, and consequently hypotheses (H6, H8, and H12) were supported (b=0.233, b=0.458, and b=0.339). Perceived ease of use had positive effects on perceived usefulness, and in turn, perceived usefulness positively predicted intention to use m-payment, and henceforth H16 and H18 were supported (b=0.332 and b=0.348). Personal innovativeness was very significant, strongly and positively related to behavioural intention, while it had negative significant effects on perceived ease of use and accordingly, H3 was supported, and yet H4 was not supported. Moreover, the perceived security risk and mobility had no significant relationship with perceived ease of use, while social influence and perceived ease of use had no effects on behavioural intention, and henceforth H10, H114, H1 and H17 were not supported.

Table 5: Regression Weights: (Group Number 1 - Default Model)

			Standardized Estimate	P
PEOU	<---	KNOW	.233	.024
PEOU	<---	COMP	.339	.002
PEOU	<---	PSR	.018	.800
PEOU	<---	MOB	.032	.663
PEOU	<---	TRUST	.458	***
PEOU	<---	INNO	-.457	.002
PU	<---	PSR	.112	.086
PU	<---	MOB	-.134	.019
PU	<---	TRUST	.109	.124
PU	<---	COMP	.517	***
PU	<---	KNOW	.168	.044
PU	<---	INNO	-.292	.017
PU	<---	SI	.216	***
PU	<---	PEOU	.332	***
INT	<---	PU	.348	***
INT	<---	PEOU	.133	.067
INT	<---	SI	-.073	.288
INT	<---	INNO	.565	***

4.3 Gender and Behavioural Intention to Use M-Payment

Before testing the moderation effect of gender, the data was grouped (females, 128 cases and males, 164 cases). Next, a measurement invariance test was done. Non-constrained models exhibited a good fit to the data (χ^2 = 1544.249, *df* = 964, $p < .01$, RMSEA = .046), as depicted in Table 7. The model was compared with constrained model in which all path estimates (factor loadings) were fixed to be equal. As outlined in Table 6, the chi-square difference between the models ($\Delta\ \chi^2$) is 18.019 with seven degree of freedom. The difference is not significant ($p > .05$), indicating that constraining the path estimates to be equal between groups did not cause significant changes in model fit. This result demonstrates that the full-metric invariance was supported ($\Delta\chi^2$ (7) = 18.019, $p > .01$).

Table 6: Results of Measurement Invariance

Models	χ^2	*df*	RMSEA	CFI
Non-constrained model	1544.249	964	.046	.905
Constrained model	1561.143	988	.045	.906

Chi-square difference test: $\Delta\ \chi^2$ (24) = 16.894, $p > .05$ (insignificant) (metric invariance is supported)

A structural invariance test was conducted to test the moderating role of gender. A two-group structural model was set up as previously done on the measurement model. A baseline model was generated by adding paths among variables rooted in full-metric invariance model. The baseline (non-constrained) model demonstrated the adequate fitness to the data (χ^2 = 1601.050, *df* = 976, $p < .01$, RMSEA = .047), as indicated in Table 8. Moreover, the non-constrained model was estimated and it presented acceptable fit indices, and it was compared to the constrained model. As represented in Table 7, the chi-square difference between the models ($\Delta\ \chi^2$) is 42.818 with 42 degree of freedom. The difference is not significant ($p > .05$), indicating that constraining the path estimates to be equal between groups in the structural model produces better fit. Therefore, the unconstrained model in which the paths are freely estimated in both groups is not supported.

Table 7: Results of Structural Invariance

Models	χ^2	*df*	RMSEA	CFI
Non-constrained model	1601.050	976	.047	.898
Constrained model	1643.868	1018	.046	.897

Chi-square difference test: $\Delta \chi^2$ (42) = 42.818, $p > 0.05$ (insignificant) (paths across two groups are not significantly different)

As argued by Gaskin (2012) that the groups can be different at the path level, henceforth, the study conducted the moderation test at the path level to determine whether there were significant different paths between the two groups. At the path level, there are several statistically significant differences between the two groups. As can be seen from Table 8, the influence of compatibility and personal innovativeness on perceived ease of use, and ease of use on behavioural intention were stronger among male than female. The social influence had strong effects on the perceived usefulness among female more than male.

Table 8: Multi-Group Analysis on the Behavioural Intention of M-Payment by Gender

			Male		Female			Difference
			Estimate	P	Estimate	P	z-score	
PEOU	<---	KNOW	.381	0.125	.214	0.287	-0.369	NO
PEOU	**<---**	**COMP**	**.945**	**0.005**	**.192**	**0.203**	**-2.207****	**YES**
PEOU	<---	PSR	.433	0.141	-.048	0.608	-1.559	NO
PEOU	<---	MOB	.089	0.584	.082	0.445	0.083	NO
PEOU	<---	TRUST	.534	0.004	.459	0.000	-0.059	NO
PEOU	**<---**	**INNO**	**-.968**	**0.006**	**-.142**	**0.607**	**2.364****	**YES**
PU	<---	PSR	.742	0.513	.136	0.132	-0.543	NO
PU	<---	MOB	-.032	0.911	-.167	0.056	-0.535	NO
PU	<---	TRUST	.700	0.516	-.008	0.938	-0.654	NO
PU	<---	COMP	.997	0.488	.538	0.000	-0.507	NO
PU	<---	KNOW	.716	0.450	.090	0.586	-0.644	NO
PU	<---	INNO	-.940	0.564	-.237	0.286	0.527	NO
PU	**<---**	**SI**	**-.042**	**0.816**	**.318**	**0.000**	**1.915***	**YES**
PU	<---	PEOU	-.592	0.750	.401	0.000	0.512	NO
INT	<---	PU	.209	0.126	.319	0.011	0.785	NO
INT	**<---**	**PEOU**	**.377**	**0.009**	**.037**	**0.731**	**-1.864***	**YES**
INT	<---	SI	-.261	0.032	-.001	0.993	1.466	NO
INT	<---	INNO	.742	0.000	.596	0.000	-0.756	NO

5. DISCUSSION

This paper is a modest contribution to the ongoing discussions on the usage and intention to use m-payment services in developing countries. On the usage of m-payment services, the results are in good agreement with other Tanzanian studies which demonstrated that m-payment services are still used at a low rate (Intermedia, 2013; Mpogole et al., 2016; Senso & Venkatakrishnan, 2013). In the current study, most consumers used m-payment services for loading airtime and confirming account balances probably because the technology is still new and most of the respondents had low level of education (i.e. secondary education). This finding is in contrast to the findings of Mpogole et al. (2016) who found that undergraduate

students were increasingly using m-payment services for money transfer, making payments and savings deposits in Tanzania. The findings demonstrate that the usage of m-payment can vary according to the target population, whereby socio-demographic factors can affect usage of the services.

The authors concentrated not only on usage of m-payment service, but also on adoption of m-payment by extending TAM with user-centric, security and system characteristics and gender differences. Among three user-centric factors, our results indicate that social influence explained perceived usefulness, more than behavioural intention in this study, as emphasized in the Theory of Planned Behavior (Ajzen, 1991). The study findings are contrary to the results of previous studies which demonstrated that social influence had significant positive impacts on intention to adopt m-payment service (Chachage, 2013; Hamza, 2014; Tossy, 2014; Yang et al., 2012). An important implication of these findings is that social pressure can influence people's perception on the usefulness of the m-payment services. Moreover, it was interesting to note that consumers with significant m-payment knowledge find m-payment services are ease to use and usefulness, and therefore they do not have difficulty in adapting to m-payment. These findings were in agreement with previous findings that m-payment knowledge had positive effects on perceived ease of use of m-payment services (Kim et al., 2010). Indications of these are that consumers who are knowledgeable with the use of m-payment services are more likely to use the services as compared to their counterparts.

Subsequently, personal innovativeness was a strong predictor of behavioural intention, and yet it had negative effects on both perceived usefulness and ease of use. The finding suggests that consumers who are competent technically, with highly innovative attributes are more likely to adopt the m-payment service. This finding is similar to previous m-payment adoption studies (Yang et al., 2012; Zarmpou et al., 2012). Contrary to previous studies (Kim et al., 2010), this study found that personal innovativeness had negative significant effects on perceived usefulness and ease of use. The most likely explanation of the negative result is that consumers need to be motivated on the value and complexity of the technology for them to be innovative and regard these technologies as useful and ease to use.

Only one security factor (customer's trust) had a significant positive relationship with the perceived ease of use of m-payment, which is in agreement with previous findings (Zarmpou et al., 2012). A significant implication of these findings is that consumers are generally concerned with the reliability, safety, accuracy and privacy offered by m-payment service providers, and do not trust transactions that lack physical contact. Consequently, service providers need to improve consumer's trust to enhance the behavioural of m-payment services in the country.

With regard to the system characteristics, the study's findings depicted a positive relationship between compatibility and both perceived usefulness and ease of use, while mobility had negative effects on perceived usefulness of m-payment services. The positive impacts of compatibility on perceived usefulness and ease of use suggest that consumers are generally concerned about the manner in which they prefer to purchase products or services through mobile devices. Consumers who perceive m-payment service to be compatible with the way they use mobile phones, are most likely to adopt the service. These findings were not consistent with the results of previous studies which found no significant relationship between compatibility and perceived usefulness and ease of use (Kim et al., 2010). Service providers can improve the m-payment system features to fit with consumer's lifestyle to enhance adoption of their services. Moreover, the negative effects of mobility on perceived usefulness imply that users were not satisfied with the availability and reliability of m-payment services. These findings were in line with the findings of previous studies that mobility had a significant negative impact on intentions to use m-payment service (Anthony

& Mutalemwa, 2014). Another most likely explanation of the negative result is that the mobile network's signals are not reliable to ensure that the m-payment services are accessible all the time. Users will have positive intentions towards using the m-payment services, if the accessibility of m-payment services is independent of physical space or time.

Other important findings were that perceived ease of use explained perceived usefulness. When consumers feel that m-payment is not difficulty to use, the more useful they will believe the m-payment is. The finding that perceived ease of use had significant relationship with the perceived usefulness is similar with other related studies (Davis, 1989; Kim et al., 2010). It is critical to design user friendly m-payment service to enable consumers to conduct their m-payment transactions effectively.

Another significant finding was the positive effects of perceived usefulness on consumer's intention to use m-payment services, which is in agreement with other previous studies (Hamza, 2014; Kim et al., 2010; Tai et al., 2012; Tobbin & Kuwornu, 2011; Zarmpou et al., 2012). The more the consumers believe that the use of m-payment service would be useful for buying airtime, saving, and carrying out various transactions online, the higher their intention to use the system will be. An important suggestion of these findings is that service providers need to advocate the benefits and value of using m-payment without increasing the complexity of the m- payment services to influence consumers' decision to adopt m-payment.

The study results indicated that there were no gender differences on the behavioural intention at the model level. Nonetheless, there were several statistically significant differences at the path level. The findings indicated that the influence of compatibility and personal innovativeness on perceived ease of use, and the effects of ease of use on intention are significantly higher among men than women. The most likely explanation of these results is that male users with innovative characteristics and who believe that the m-payment is compatible to their lifestyle are more likely to perceive that it is easy to use, and eventually use the system. Subsequently, the study found that effect of social influence on perceived usefulness was moderated by gender, such that it is more significant for women than male counterpart. This finding is similar with that of Hamza (2014), Riquelme and Rios (2010) and Venkatesh et al. (2003) who claimed that women are influenced by social norm more than men. Our observation is that, social pressure influences more the perception of usefulness among women than men.

6. PRACTICAL AND THEORETICAL IMPLICATIONS AND LIMITATIONS

The findings are of direct practical, theoretical and methodological relevance. The implications of this study will be useful for service providers, banks, merchants and investors in formulating appropriate marketing strategies, development of new applications, and implementation and evaluation of their services in general, which include the following:

- Mobile service providers need to improve their awareness and training programme to promote the benefits and value of the m-payment system in order to increase usage of m-payment services, and reduce the gender differences in the adoption.
- Mobile service providers should identify the segment of innovative consumers, and create a positive image of their m-payment service together with suitable incentives to consumers.
- Mobile service providers need to conduct frequent user studies and market research on how user-centric, security factors and system characteristics, and demographic variables affect adoption of m-payment services.
- Mobile Service providers should create awareness on safety and privacy issues of m-payment to influence consumers' intentions to use the service. Subsequently, mobile application developers and systems security software providers need to ensure that

security in transactions procedures, data integrity and confidentiality are improved for m-payment service to be useful

- Mobile Service providers should strive to expand their network coverage, and minimize or eliminate system failures or network problems to ensure system stability.
- Mobile service providers should work with banks and other investors to develop a new technology that will allow users of M-payment services to access cash through automated teller machine (ATMs)

From a theoretical perspective, the extended TAM model fits very well in the m-payment circumstance, and it can be used by other studies to determine factors that enhance adoption of m-payment services in non-Western contexts. Our paper extended TAM model, and validated the model in the Tanzanian context. The study adapts and extends TAM model with three user-centric factors, two security factors, two system characteristics and gender to assess the behavioural intention of m-payment services in Tanzania. The study further contributes to theory by revealing factors that do not have effects on perceived ease of use and usefulness of m-payment, which was perceived security risk. The study further revealed that personal innovativeness had negative effects on both perceived usefulness and ease of use. Indications are that further research is required to study the effects of these factors on perceived ease of use and perceived usefulness of m-payment. Consequently, the study findings contribute to existing knowledge by highlighting how gender differences may affect behavioural intention to use m-payment. These findings suggest that future research should examine the effects of these factors (user-centric, security, system characteristics and demographic variables) on the actual usage and behavioural intention to use m-payment services.

In terms of methodology, the study was conducted in two research sites to explore consumers' intention to adopt m-payment services. The researchers had to explain the relevance of the study to respondents in order to obtain their consent to participate in the study. Further, the questionnaires were translated into Swahili language as most participants were not comfortable with English language. Although the use of questionnaires enabled the study to collect reliable and validated data, future studies should mix questionnaires with other qualitative tools to verify, clarify and validate information lacking detail in the questionnaires.

7. CONCLUSION

Based on the results, it can be concluded that the extended TAM was useful for providing a better understanding of success factors in improving consumers' acceptance of m-payment services in Tanzania. This study adapted TAM to the m-payment context, and extended it with three user-centric, two security factors, two system characteristics and gender differences to assess the behavioural intention to use m-payment service in Tanzania. It has been demonstrated that the strongest determinants for perceived usefulness were compatibility, social influence, and m-payment knowledge, while m-payment knowledge, trust and compatibility predicted perceived ease of use of m-payment services. Moreover, perceived ease of use determined perceived usefulness, and usefulness and personal innovativeness in turn, had positive effects on the behavioural intention to use m-payment. Consequently, gender differences in the behavioural intention to use m-payment were established. Men were influenced by compatibility and personal innovativeness to perceive that the m-payment systems are easy to use, while women's perception of usefulness was influenced by social pressure. Summing up the results, it can be concluded that service providers, banks, merchants and investors need to formulate appropriate marketing strategies and training programmes, as well as develop applications which are secure in order to attract more consumers and increase usage base of their services. This research was concerned with

m-payment adoption in Tanzania; however, the results should be applicable also to other countries with similar conditions.

Several other questions remain to be addressed. Most notable is that, the study participants are not fully representative of the entire population as the sample was drawn from two out of 26 regions of Tanzania. These two regions included the capital city (Dar es Salaam) and a neighbouring region (Morogoro), whereby most of the households living in these two regions are likely to be the first participant segment in using m-payment. Further research is needed with user segments from various locations, including rural and urban areas. Besides, the current study is limited to m-payment services and the extended TAM should be tested with a wide range of different mobile services and applications. Additional adoption factors such as self-efficacy, convenience, reachability, perceived costs, perceived behavioural control for example, have not been included in this model, and they can be included in future research models. More tests are significant to measure factors affecting behavioural intentions and actual usage of m-payment services at two points in time, in order to verify whether behavioural intentions translate into actual behaviour.

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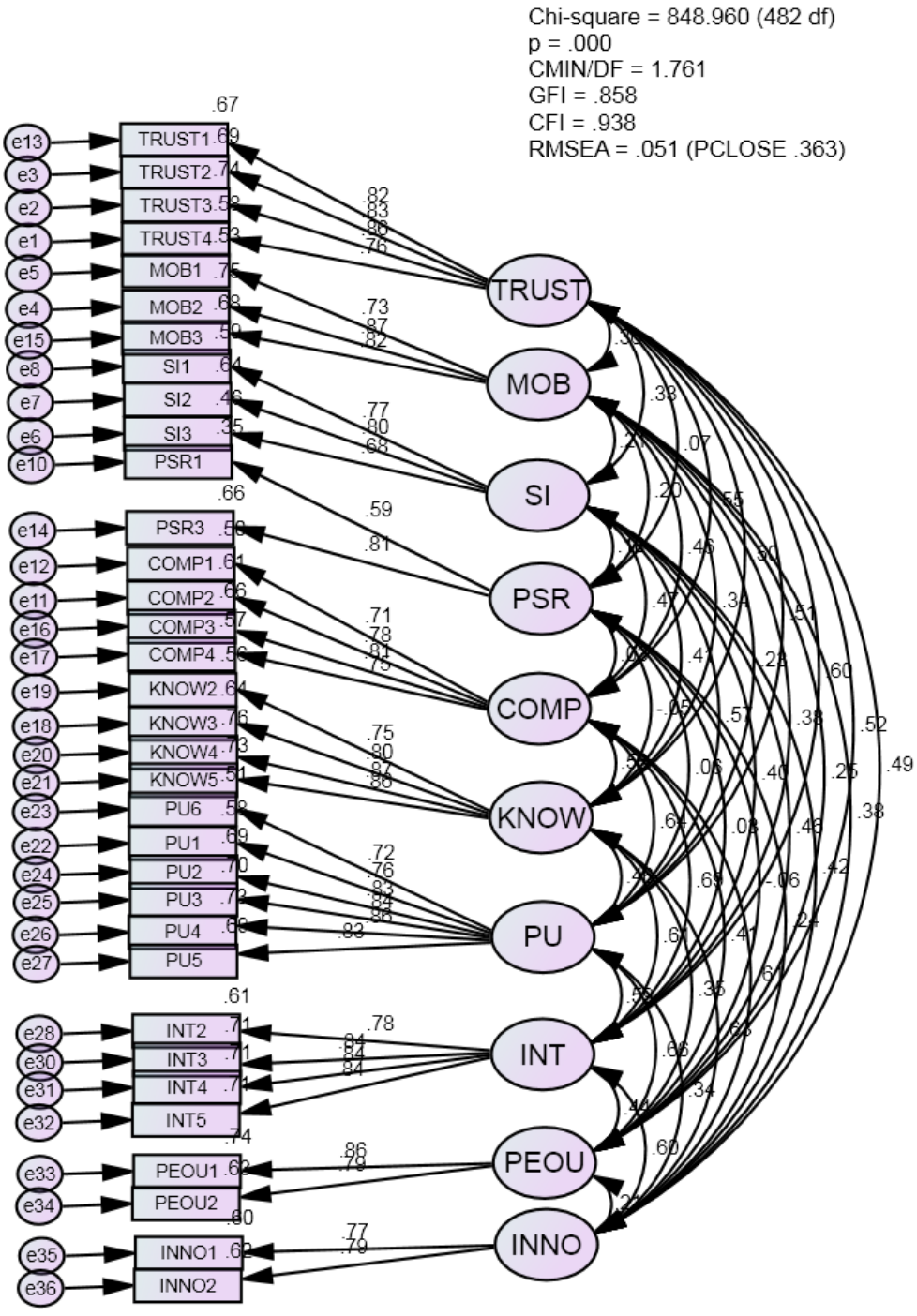
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Appendix 1: Confirmatory Factor Analysis (CFA)



Appendix II: Structural Equation Model

