

Investigating Users' Acceptance of Mobile Money Services Interoperability: A Case Study of Tanzania

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Abstract— Using mobile phones for financial transactions has been on a sharp increase globally and in Tanzania in particular. The introduction of mobile money interoperability allows customers to undertake money transfers across different telecom mobile money accounts and bank accounts. This study aimed to find out factors that may influence the acceptance and successful use of mobile money services interoperability that are tailored to banking and unbanked users' intention by integrating three globally accepted theories; DeLone and McLean information system success model (D&M), The Technology Acceptance Model (TAM) and The Task-Technology Fit (TTF) Theory. The study hypotheses were empirically tested using data from 447 mobile money users from both telecom and banks. Data were analysed using the correlation and regression technique. This study found that approximately 81.5% of the dependent variable, which is interoperability of mobile money services was accounted for by the regression analysis and therefore can strongly be explained very well by independent variables which are Perceived Ease of Use; price value; Network Availability; Security and Trust; Service quality; Task Characteristics. This study's findings provide valuable understandings for formulating effective strategies concerning financial inclusion to mobile money service providers, governments, and other stakeholders and expand the existing customer base to mobile money service providers. Moreover, this study's results will provide the basis for further refinement of technology acceptance and success models in the emerging mobile money service domain.

I. INTRODUCTION

Today, mobile phones can be used as a means of communication and the means of financial inclusion in most low-income countries. 65% of adults in the world's poorest economies still lack access to even the most basic transaction account that would allow them to send and receive payments more safely and efficiently (Pazarbasioglu et al., 2020). The mobile phone has made mobile money services possible and now reaches millions of unbanked low-income populations in developing countries, especially in rural areas (GSMA, 2019; Demirguc-Kant et al., 2018). According to UNCTAD (2019), mobile money has improved financial inclusion,

making it easier, real-time insight at a lower cost, cheaper and safer to transfer money, and paying for goods and services. By the end of 2019, 5.2 billion people subscribed to mobile services, accounting for 67% of the global population, and forecasted that in 2023 more than \$1 trillion will be transacted via mobile platforms annually, with over \$2.8 billion a day (GSMA, 2020). Evidence shows that there are over 1.04 billion registered mobile money accounts worldwide, of which 469 million are from Sub-Saharan Africa. There are 229 live mobile money deployments in 95 countries transacting US dollars 40.8 billion processing over US dollars 1.9 billion per day globally (GSMA, 2019). Tanzania has experienced explosive growth in the use of mobile money since the

service was first introduced in 2008 and has now become the primary tool used to access financial services and achieve financial inclusion (Max & Claudia, 2018; UNCTAD, 2020). The statistics show that the number of active registered mobile money accounts in Tanzania was estimated to be 29,659,961 at the end of June 2020 with the value of transactions about US dollars 4.6 billion (TCRA, 2020). The evidence shows that every month there is an increase in the number of subscribers in each telecom company. This implies that more people will register to use mobile money services in the coming future and hence will trigger the growth in transaction volume and values and increase usage of mobile money services.

The utilisation of interoperability capability in mobile financial services contributes to the overall growth of total mobile money transactions in Tanzania (BOT, 2019). Interoperability with banks and account-to-account (A2A) and integration via an Application Programming Interface (APIs) with organisations ranging from government agencies to utility companies, online businesses, and local entrepreneurs are also on the rise (GSMA, 2019). Using API mobile money, service providers can access data from different public and private systems with speed and reduce costs without compromising safety and reliability (UNCTAD, 2020). With interoperability, mobile money customers can undertake money transfers between two accounts at different mobile money service providers or transfer money between accounts at telecom mobile money and bank accounts (Pasti, 2018). Tanzania launched mobile money interoperability in September 2014. Interoperability began with a bilateral agreement between Airtel and Tigo, joined by Zantel in 2014, and Vodacom in 2016 (Gilman, 2016). To date, five major MNO's are interoperable with each other and with various banks. With the interoperability through bilateral arrangements, mobile money customers can transfer mobile money directly and in real-time between accounts from different MNOs and between telecom mobile money accounts and bank accounts in the same market (GSMA, 2015). For example, nowadays, NMB Bank customers with PesaFasta or CRDB Bank with SIM Banking services can transfer money to TigoPesa or M-Pesa interchangeably.

II. STATEMENT OF THE PROBLEM

Evidence suggests that increased interoperability stimulates the circulation of digital values. For instance, in the first three years of introducing mobile money interoperability in Tanzania, transactions grew for 16 per cent (UNCTAD, 2020). Interoperability between Mobile Money Providers (MMPs) increases mobile money

adoption because it improves convenience for users, enhances efficiency by enabling sharing of different transaction channels, and promotes competition amongst providers (UNCTAD, 2020). The understood factors for user adoption of mobile money services interoperability have currently been an issue of concern to researchers, and it is essential to understand whether it would be well accepted by the potential users (GSMA, 2020). Investigating customers' intentions and adoption of mobile money services has attracted the focus of many researchers (Hamdan, 2019; Mustafa & Sifat, 2018). Despite various studies providing a better understanding of the critical factors for predicting consumers' intentions and use of mobile money services, there are further essential aspects left to study.

In Tanzania, this is even more crucial, especially during the fifth government regime in which the core agenda is an industrial economy, and financial inclusion is the backbone of the agenda (Lotto, 2018). Various factors such as fear of security, fraud in mobile money transfer, users' awareness and lack of education among most mobile money users and agents, poor network connectivity, and unreliable services, are some of the significant concerns of mobile money services interoperability in developing countries such as Tanzania (Mustafa & Sifat, 2018; Devadevan, 2013). Understanding customer acceptance and usage of technology innovation requires an emphasis on the technical aspects and the social aspects (Yeh, 2019). Although numerous studies (Mandari, Koloseni & Macha, 2020; Koloseni & Mandari, 2017; Lema, 2017; Lubua & Semlambo, 2017; Abdinoor & Mbamba, 2017) have been conducted on individuals and institutions in Tanzania regarding the factors that influence customer acceptance of mobile money services. However, very little research attention has been given to the use of mobile money service interoperability.

Interoperability will become a permanent issue of research and experimentation since heterogeneity and constant change will persist for the foreseeable future (Cheni & Doumeings, 2005). Therefore, this study aimed to find out factors that may influence the intention to use for mobile money service interoperability using Technology Acceptance Model (TAM), D&M IS success model and The Task-Technology Fit (TTF) to help develop not only practical useful models but also provide a basis for gaining a deeper understanding of strong correlations among factors that influence the usage of mobile money services and get better exploratory power than the individual theory use (Dahlberg et al., 2015; Rahi et al., 2018a; Anouze & Alamo, 2020). For example, Chale & Mbamba (2014) combined TAM, DoI, and UTAUT theories to provide a basis for a deeper understanding of

SMEs' need to continue using mobile money to enhance their businesses.

III. LITERATURE REVIEW, MODEL AND HYPOTHESES DEVELOPMENT

KEY FACTORS OF MOBILE MONEY SERVICES INTEROPERABILITY AND INTEGRATION OF USER'S ADOPTION

Interoperability means that two co-operating software systems can efficiently work together without a particular interfacing effort. It also means establishing communication and sharing information and services between software applications, regardless of the hardware platform(s) (Chen & Doumeingts, 2005). In terms of mobile money services, interoperability is defined as the possibility to transfer money between customer accounts at different mobile money schemes and between accounts at mobile money schemes and accounts at banks (GSMA, 2014). Interoperable payment systems can make it easier for people to send payments to anyone and receive payments from anyone quickly and cheaply (Arabehty et al., 2016). While integration is the connecting application so that data from one system can be accessed by the other one with a middleware aid that translates the data and makes it "work" for the receiving system. The following summarises the common critical factors for mobile money services interoperability and integration.

Empirical Literature Review and Hypothesis Development

When determining the selection of hypotheses to formulate variables/constructs that can affect the adoption of mobile money services interoperability, this study considered theories and models for technology acceptance and knowledge gaps that were not addressed by previous studies. In this context, the followings are the hypothesis formulated from previous theories and empirical studies:

Theoretical Model

Many theories have been developed and applied to study the users' acceptance, actual adoption, and success of new technology products or services. Each of these theories tries to examine different aspects and adopts a different perspective. These theories have been validated, widely recognised, and most cited in various studies in e-commerce systems, knowledge management systems, e-banking systems, mobile money payment, e-government systems, health information systems, and much more. These theories among others, are the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), the Technology Acceptance Model (TAM) (Davis, 1989), the Diffusion of Innovation Theory (Rogers, 1995), the Extended

Technology Acceptance Model (TAM2) (Venkatesh and Davis, 2000), the Theory of Planned Behaviour (TPB) (Ajzen, 1991), The Task-Technology Fit (TTF) (Goodhue & Thompson, 1995), the Unified Technology Acceptance User Technology (UTAUT) (Venkatesh et al., 2003) and D&M IS success model (DeLone & McLean, 1992) to mention a few

All these models and theories are seen to be related to some ideas and complement one another. For example, Lin, Wang, & Chen (2019) incorporated the UTAUT2 and Innovation Diffusion theory and included other variables that might affect consumers' use of mobile payments. Elias & Mtebe (2019) on examining the factors impacting Tanzanian drug dispensaries' perceptions of the potential benefits of using a mobile health (mHealth) reporting system, combines two models: the updated D&M IS success model and the extended unified theory of acceptance and use of technology. However, there is still a need for systematic investigation and theorising of the salient factors applicable to context-based consumer technology use (Anouze & Alamro, 2020).

The Technology Acceptance Model (TAM): TAM is the extended theory from the Theory of Reasoned Action (TRA) developed by Fishbein & Ajzen in 1975 for user acceptance of an information system. The TAM has already been used and validated by many other researchers in various academic disciplines of information systems (Anouze & Alamro, 2020; Lu et al., 2005; Yang, 2005). TAM has become one of the most widely used models due to its simplicity and robustness (Mital et al., 2018). TAM hypothesises two critical beliefs determining a user's adoption intention and actual usage of information technology. Davis (1989) argues that user's perceived usefulness (PU) and perceived-ease-of-use (PEOU) are crucial determinants for overall attitude towards using specific information technology and applications. Several researchers have proposed the extended and modified TAM versions due to its simplicity and ease in describing behavioural intention (Ali & Maideen, 2019). In the context of mobile money services adoption, TAM's significance can be found in the study of Lema (2017), which investigated the factors influencing the adoption of mobile financial services in the unbanked population in Tanzania.

The updated D&M IS success model: The updated D&M IS success model was extended from the original D&M model IS success (DeLone & McLean, 1992). The Updated D&M model identified six dimensions of IS success. These are system quality, information quality, service quality, (intention to) use, user satisfaction, and net benefits. The updated D&M model replaced individual impact and organisational impact with the net benefits,

while service quality was added as a new factor (DeLone & McLean, 2003).

The Task-Technology Fit (TTF) Theory: Goodhue and Thompson (1995) proposed the TTF model, which extends the TAM by considering how task affects the use of technology (Tam & Oliveira, 2016). The Task-Technology Fit (TTF) theory is well-accepted and has been applied in various ways for assessing information technology, with an increasing number of studies focusing on mobile technology (Grobbelaar, Botha, & Spies, 2020). Goodhue and Thompson (1995) claim that customers will adopt new technology if it is smart enough to perform a daily task. Empirical results suggested that TTF can better predict IT impacts on individual task performance if not used alone. TTF can be used in any condition or circumstance where people use technology to perform specific tasks (Gikas & Grant, 2013). Tam & Oliveira (2016) and Alanazi et al. (2020) recognise the importance and practical application of constructs of TTF as a significant contributor in their frameworks. In general, TTF corresponds to the relationship of matching amongst task characteristics, user abilities, and functionality of technology.

Based on TAM, TTF, the updated D&M IS success model, and previous works of literature, six (6) variables were selected. These variables have been indicated in the literature that they influence the intention to use and later the success of mobile money service interoperability. These variables are perceived ease of use, service quality, security and trust associated with mobile services, perceived price value, task characteristics, and perceived network availability. All of these selected variables have been theorised, validated, and examined in various technology usage contexts and seem to be a stronger predictor of intention to use information technology products or services (Davis, 1989; DeLone & McLean, 2016; Abdinoor & Mbamba, 2017; Lin et al., 2019).

Hypotheses and Theoretical Framework

Perceived Ease of Use

Davis (1989) argues that users will use new technology when that technology is perceived to be easy to use and useful to them. Ease of use is a degree to which a person believes that using a particular system will be free of effort (Davis, 1989). The individuals' perceptions of the ease of use greatly influence mobile ICT diffusion and acceptance of mobile money services (Meso et al., 2005; Bångens & Söderberg, 2009; Richard & Mandari, 2017; Lin et al., 2019). Based on these findings, this study hypothesises two relationships as follows:

H1: Perceived Ease of use positively affects Tanzanian users' attitude to use mobile money service interoperability.

Services quality

This construct has been derived from the updated D&M IS success model. Users are highly comfortable using the mobile money service if there is a quality of support from service providers. The service quality is the service provided by the developers of the information system (DeLone and McLean, 2003). This includes the quality of support that mobile money users receive from mobile money provider personnel. Users with good system support are likely to continue using the system (DeLone & McLean, 2016). The better system support, the more likely it is to have a positive perception of the service quality (Tam & Oliveira, 2016). Service quality has been found as one of the indicators of success and growth of the money transfer technology. An increase in customer support's perceived quality influences the intention to continue using mobile money services (Lubua & Semlambo, 2017; Wilson & Mbamba, 2017). To ensure the adoption of mobile money service interoperability, MMP should provide support to users. Hence, this study hypothesises this relationship as follows:

H2a: Service quality positively affects Tanzanian users' intention to use mobile money service interoperability.

H2b: Service quality positively affects Tanzanian users' actual use of mobile money service interoperability.

Security and Trust Associated with Mobile Services

Mobile communication is an open environment; hence much care must be taken when transferring sensitive information, primarily when related to financial data (Abdullah & Abdul-Hadi, 2009). Identity theft and sending money to the wrong account acted as factors for accepting mobile money services (Omol, Abeka, & Wauyo, 2017). Maintaining consumer trust is critical to the growth of mobile money services. Consumer concerns around data privacy and security impact trust are critical concerns when considering whether to use mobile money (GSMA, 2018). In the study conducted in Uganda, mobile money's acceptance has mostly been low due to security issues and challenges associated with the system. The findings revealed that the critical security issues are identity theft, authentication attacks, phishing attack, personal identification number (PIN) sharing, and agent-driven fraud (Guma, Mussa, & Anael, 2020).

H3: Security and Trust Associated with Mobile Services positively affects Tanzanian users' attitudes to using mobile money service interoperability.

Price Value

The price value is a factor drawn from the updated D&M IS success model. It is the degree to which the costs of adopting mobile payments are in proportion to the

benefits received. The cost of mobile money services can be in form of service charges based on the transaction for sending, withdraw and balance requests to customers. Lema (2017) argues that high costs of mobile financial services are a barrier to mobile financial service adoption among the unbanked population. Koloseni & Mandari (2017) and Abdinoor & Mbamba (2017) also found that the transaction cost is one of the barriers to the usage of mobile financial services in Tanzania. When the price value of a service is high, the adoption of mobile money services will be low, but if it is affordable, it can be a motivation for faster adoption (Oliveira, Thomas, Baptista, & Campos, 2016). Based on the literature review and theory, the following hypothesis is proposed: Hence, this study derives the following hypothesis:

H4a: Price value positively affects Tanzanian users' intention to use mobile money service interoperability

H4b: Price value positively affects Tanzanian users' actual use of mobile money service interoperability.

Network Availability

Senso & Venkatakrishnan (2013) found that network or service failures were the major factors that hindered many customers from using mobile money service. This poses the risk of losing cash, wasting time, and other problems like loss of customer goodwill. Anthony and Mutalemwa (2014) investigated factors influencing the use of mobile payments in Tanzania. Their analysis of the findings revealed that system failures or network problems are among the factors influencing the use of mobile payments in Tanzania. Therefore, the following hypothesis can be articulated based on the above discussion

H5: Network Availability positively affects Tanzanian users' attitude to use mobile money service interoperability

Task Characteristics

When mobile users feel that technology can support the task at hand, they show good performance (Tam & Oliveira, 2016). Therefore, mobile money interoperability enables users to smooth transfer money, reduce the time of performing transactions, do more transactions, have more access to more services providers, and make the task easily accomplished without limitations to service providers. A study conducted by Changchun, Haider & Akram (2017) found that task technology fit significantly affects m-banking adoption. Customers are willing to adopt new technology-related products or services when that technology solves their real problems and become useful in their day to day lives. (Bångens & Söderberg, 2009; Lin et al., 2019). Therefore, based on the findings cited above, it is essential to examine the task characteristics of

information technology services. Hence, this study hypothesises this relationship as follows:

H6a: Task characteristics positively affect Tanzanian users' intention to use mobile money service interoperability

H6b: Task characteristics positively affect Tanzanian users' actual use of mobile money service interoperability.

IV. METHODOLOGY

Research Design

This paper adopted a descriptive research design with a case study approach. The case study approach was considered a robust research method particularly when a holistic, in-depth investigation is required (Mohamed & Ismail 2009) and useful for testing whether a specific theory and model applies to phenomena in the real world (Sacred Heart University Library, 2019). Based on this approach, a quantitative approach was adopted to quantify factors that influenced the use of mobile money services. Besides, a quantitative method was deemed useful in summarising the study results in numerical terms with a specified degree of confidence (Abeyasekera, 2005).

Sampling Techniques.

Three cities from Tanzania (Tanga, Arusha, and Dar es Salaam) were conveniently selected due to the unavailability of actual statistical data about the number of users of mobile money services, and it is possible to collect the data more efficiently (Ahmed & Ali, 2017; Rahi, 2017). Conveniently, the researcher selected customers from three (3) MNOs (Tigo, Airtel, and Vodacom) and two (2) banks (National Microfinance Bank (NMB) and CRDB Bank Plc). These banks and MNOs were purposively selected because they are pioneers to introduce mobile money services and have a large market share in users of mobile money services (UNCTAD, 2012; TCRA, 2020). This study limited the study to only experienced mobile money service users because of their mobile money usage experience. The study was also limited to only domestic mobile money transfers. The convenience sampling technique was used to select respondents from three groups of registered mobile money customers, including (a) customers with bank accounts, (b) unbanked customers, and (c) mobile money agents.

Sample Size

In order to determine the minimum acceptable sample size for this study, the formula proposed by Green (1991) was adopted and suggested. The minimum sample size can be calculated as $N_{\min} \geq 50 + 8m$, where N_{\min} is the minimum sample size and m is the number of predictor variables.

The study had five factors. Therefore, the minimum sample size required for this study was $50 + (8 \times 6) = 98$. Table 3.1 summarises the sample size that participated in the study. The ratio of the distribution was based according to the Tanzania National Bureau of Statistics (2013). A

total of 500 questionnaires were issued to the respondents of which 130 were from Tanga, 100 from Arusha, and 270 from Dar es Salaam. However, 450 out of the 500 questionnaires issued were successfully returned. Therefore, the required minimum sample size was met.

Table 3. 1: Overview of respondents who were given a questionnaire

Register Money Users	Mobile Services	TANGA		ARUSHA		DAR ES SALAAM		TOTAL	
		Issued	Returned	Issued	Returned	Issued	Returned	Issued	Returned
With Bank Accounts		50	48	40	37	150	145	240	230
Unbanked Customers		50	37	40	36	70	47	160	120
Mobile Money Agents		30	27	20	25	50	48	100	100
Total		130	112	100	98	270	240	500	450

Source: This research 2020

Data Collection Methods

In this study, data collection was done in the morning, afternoon, and evening to avoid potential bias. Data was conveniently collected from a population that was close at hand and easily accessible to the researcher. This allows a researcher to complete interviews or get responses cost-effectively (Rahi, 2017; Hair *et al.*, 2013). Both primary and secondary data sources were used to identify factors that influence customers' use of mobile money services interoperability. The data collection started in September 2019 and ended in February 2020.

Collection of Primary Sources of Data

Questionnaire

The questionnaire was developed using constructs and items from literature reviews of both previous empirical studies and theories. A 5-point Likert-type scale was used to measure customers' satisfaction level on the use of mobile money and mobile banking services. The questionnaires were physically circulated to all respondents to get opinions for the research questions. Moreover, the questionnaire was translated into the Swahili language during the interview. This is because most respondents use the Swahili language to communicate in both rural and urban areas.

Data Quality Control

Pilot study

To ensure the reliability and validity of the questionnaire, the researcher conducted a pilot study. The pilot test was done at the Njiro ward in Arusha in August 2019. Twenty-five (25) sample questionnaires were piloted through face-to-face interviews with the respondents. Hertzog (2008) suggests that a sample size of 10 to 40 per group is enough to validate the questionnaire intended to meet various aims. The pilot study aimed to reveal

deficiencies in the questionnaire in terms of wording, clarity, relevance, and time spent on completion, gaining additional comments on the content and structure to ensure that all relevant investigations to the study were made and data were recorded without problems. A pilot test was used to avoid problems for the respondents in answering the questions. The revealed shortcomings through the pilot study were addressed and adjusted accordingly. In the study's validity, the researcher adopted face validity whereby the questionnaire was subjected to three subject matter experts to ensure whether it measured what it was intended to measure for content validity.

Triangulation of data collection methods

As presented above, to ensure the quality of the data, the study triangulated its data collection methods. Specifically, the study employed secondary sources of data, questionnaires, key informant interviews, and on-site participant observation.

Data Treatment

Before the data from the questionnaires were analysed, raw data from returned questionnaires were cleaned, organised, validated, and coded. All questionnaires that were insufficiently completed, or where there is evidence that the respondent did not take the completion seriously were discarded (Rowley, 2014). Epidata program was used to compare quantitative data to check for consistency while a logic check was used for qualitative data. In this case, two database files were created. The two files were then compared using the Epidata program. All mismatched records, miss-codes, or missing data due to omissions or mistakes in the data entry were validated, cleaned, and then corrected using the original hard copy questionnaire. Upon reviewing, cleaning, and eliminating incomplete questionnaires, a total of 447 out of 450 returned questionnaires were complete and appropriate for analysis.

Reliability and Validity of the Items/Measurements

The validity and reliability of the scales used in research are essential factors that enable the research to yield beneficial results (Sürücü & Maslakçi, 2020). Before testing the research hypothesis for meaningful interpretation, it is always good practice to examine each construct item for reliability and validity (Anderson & Gerbing, 1988; Hair Jr et al., 2014) to assure the integrity and quality of a measurement instrument (Kimberlin & Winterstein, 2008). Validity is the extent to which any measuring instrument measures what it is intended to measure (Thatcher, 2010; Ginty, 2013), while reliability measures consistency, precision, repeatability, and research trustworthiness (Chakrabarty, 2013). The validity and reliability of the constructs and items of constructs in this study were measured using SPSS (Anderson & Gerbing, 1988; Hair et al., 2013). SPSS is widely accepted

and used by researchers in different disciplines (Edwin, Silvan, & Fred, 2017).

This study used Cronbach's Alpha (CA) and Composite Reliability (CR) to assess the reliability and validity of constructs (Keith, 2018; Henseler, Ringle, & Sinkovics, 2009) as shown in table 3.2. Cronbach's alpha coefficient was used to calculate the internal consistency reliability, that is, how closely related a set of items are intended to measure the same variable, while CR was used to measure the overall reliability of a collection of heterogeneous but similar items (Fornell & Larcker, 1981; Cronbach & Shavelson, 2004) as well as to test for the validity of constructs. This study adopted a cut-off value for CA and CR to be 0.70 or greater as recommended by many scholars (Straub, 1989; Hair et al., 2017; Fornell & Larcker, 1981) and therefore not questionable to be reliable significant, and consistent, and thus qualified for further analysis.

Table 3.2: Constructs Reliability

Construct / Variable	No. of Measurement Items	Cronbach's Alpha(α) (CA)	Composite Reliability(CR)
Ease of Use (EU)	4	0.901	0.921
Service Quality (SQ)	5	0.786	0.870
Security and Trust (ST)	7	0.873	0.884
Price Value (PV)	3	0.824	0.991
Network Availability (NA)	3	0.775	0.871
Task Characteristics (TC)	5	0.801	0.894
Adoption of Mobile Money Service interoperability (AMMSI)	3	0.881	0.925

Source: Research findings, 2020

As shown in Table 3.3, the values of CA ranged from 0.775 (NA) to 0.901(EU), while CR ranged from 0.870 (SQ). Both CA and CR for all constructs were found to be greater than the recommended cut-off value of 0.70.

V. DATA FINDINGS AND ANALYSIS

Descriptive statistics on the use of Mobile Money Services

Using a questionnaire, the frequency with which customers' used mobile money services were found. As shown in table 4.1, it has been revealed that over 60% of respondents had used the service 4-5 times each month.

Therefore, based on these results, it can be confirmed that the reliability and validity of the constructs of the measurement model have satisfactorily fulfilled the requirements and hence achieved.

Table 4.1: Respondents' use of Mobile Money Services (n =447)

Duration of mobile money usage				
Less than 6 months	7-12 months	1-2 years	More than 2 years	Total
25 (6%)	84 (19%)	105(23%)	233(52%)	447
Frequency use of mobile money services per month				
1 time	2-3 times	4-5 times	More than 6 times	Total
30 (7%)	131 (29%)	267(60%)	19 (4%)	447

Customers who have a mobile money account				
Only One	Two	Three	More than three	Total
47 (11%)	267 (60%)	120 (27%)	13 (3%)	447

Source: Research findings, 2020

By asking the respondents, the study further found that frequent use by customers was to transfer money to other people's either to the mobile telecom accounts or to the bank account, checking of account balances, payment of their bills for utilities (electric power, water, TV subscription and others) and purchase of airtime. Further investigations revealed that most respondents that account for over 60% have over one mobile money telecom and bank account. It has been further found that 52% of respondents have been using mobile money services for over two years. Table 4.1 shows the percentage and frequency analysis for the user's mobile money usage duration, mobile money services per month, and customers who have mobile money accounts.

The Regression and The Pearson Product-Moment Correlation (PPMC) analysis

To establish the relationship between the dependent and independent variables, the Multiple Regression and PPMC Analysis were used. In this study, the independent variables were Perceived Ease of Use, Price Value, Network Availability, Security and Trust, Service Quality, and Task Characteristics while the dependent variable was interoperability of Mobile Money Services. Coefficient Correlation (r) for the PPMC was used to determine if relationships between independent variables were positive or negative. The coefficient of correlation may be between

-1 and +1. Nearer correlation to +1 or -1 indicates very high, while it is low when the correlation coefficient is nearer to zero. A positive correlation indicates a direct relationship, while a negative correlation indicates an inverse relationship (Bordens & Abbott, 2011).

Correlation results

The results of the PPMC coefficient for this study are indicated in Table 4.2. The results show that all independent variables were positively and highly correlated. The evidence shows that each independent variable influences the other independent variables and on the dependent variable. The correlation coefficients for all independent variables were between $r = .529^{**}$ (PV against NA) to $r = .958^{**}$ (TC against EU). Furthermore, the result shows that the EU has a strong relationship with ST at $p < 0.01$ with $r = .944^{**}$. EU has again shown a strong association with NA, PV, SQ and AMMSI at $r = .774^{**}$, $r = .737^{**}$, $r = .848^{**}$ and $r = .808^{**}$ respectively. It has also revealed that NA shows a weak relationship with PV with $r = .529^{**}$ and SQ with $r = .659^{**}$ at $p < 0.01$. Additionally, associations were strongly significant between independent constructs (EU, NA, SQ) and dependent construct, which is mobile money service interoperability.

Table 4.2 The Pearson Product-Moment Correlation (PPMC) as extracted from SPSS

CONSTRUCT		EU	PV	NA	ST	SQ	TC	AMMSI
Ease of Use	Pearson Correlation	1	.737**	.774**	.944**	.848**	.958**	.808**
	Sig.(2-tailed)		.000	.000	.000	.000	.000	.000
Price Value	Pearson Correlation	.737**	1	.529**	.801**	.733**	.825**	.717**
	Sig.(2-tailed)	.000		.000	.000	.000	.000	.000
Network Availability	Pearson Correlation	.774**	.529**	1	.649**	.659**	.779**	.829**
	Sig.(2-tailed)	.000	.000		.000	.000	.000	.000
Security and Trust	Pearson Correlation	.944**	.801**	.649**	1	.770**	.851**	.609**
	Sig.(2-tailed)	.000	.000	.000		.000	.000	.000
Service Quality	Pearson Correlation	.848**	.733**	.659**	.770**	1	.859**	.860**
	Sig.(2-tailed)	.000	.000	.000	.000		.000	.000
Task	Pearson Correlation	.958**	.825**	.779**	.851**	.859**	1	.730**

Characteristics	Sig.(2-tailed)	.000	.000	.000	.000	.000		.000
Adoption of mobile money service interoperability	Pearson Correlation	.808**	.717**	.829**	.609**	.860**	.730**	1
	Sig.(2-tailed)	.000	.000	.000	.000	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed). ; N=447								

Source: Research findings, 2020

Regression Analysis

Multiple regression analysis was done to determine how independent variables could be used to predict the use of mobile money services interoperability. The results of the regression analysis are provided in Table 4.3. The value of R, the multiple correlation coefficients was .903, which indicates an adequate level of prediction of the variables. R Square in the regression analysis provides an index of the amount of variability in the dependent variable accounted for by the predictor variables (Bordens & Abbott, 2011). To know if the R-squared is significant, it has been recommended by looking at the significance of an F test of ANOVA (Mark & Jolley, 2010).

The ANOVA analysis shows that $F(5, 441) = 388.793$, $p < .05$, which suggests the regression is a good fit for the data and statistically significant. Since the value of R-square is high, which generally indicates a better model and therefore, it is a measure that provides a good fit to the data in the model.

As shown in table 4.3, the results show that the value of R square was .815, showing that collectively, approximately 81.5% of the dependent variable, which is interoperability of mobile money services was accounted for by the regression analysis and therefore can strongly be explained very well by independent variables which are Perceived Ease of Use; price value; Network Availability;

Security and Trust; Service quality; Task Characteristics. Moreover, it is 81.5% confident that the regression model provides an adequate fit to the data. All Six variables were statistically significant in predicting mobile money services due to interoperability since their p-values are less than the threshold value, which is .05. The result shows that task characteristics which its p-value being less than 0.05 ($\beta = 0.425$, $p < 0.05$) and ease of use which its p-value being less than 0.05 ($\beta = 0.69$, $p < 0.05$). Both these two constructs are positively predicting the use of mobile money services interoperability. Thus, these findings indicated that task characteristics and ease of use of mobile money service interoperability were not a limiting factor. Users of mobile money services interoperability were willing to adopt the service because it solves their actual problems, useful in their daily lives, and free of effort on usage. Moreover, the results revealed that there is negative relationship of security and trust ($\beta = -0.425$, $p < 0.05$), network availability ($\beta = -0.511$, $p < 0.05$), and price value ($\beta = -0.478$, $p < 0.05$) due to the use of interoperability of mobile money services. Thus, the results suggest that users fear using mobile money services interoperability due to lack of security and trust, high price value, and poor network connectivity.

Table 4.3: Multiple Regression Results as extracted from SPSS

MODEL SUMMARY						
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.903 ^a	0.815	0.813	0.406	
COEFFICIENTS						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	6.459	0.491		13.144	0
	Price Value	-1.05	0.085	-0.478	-12.317	0
	Network Availability	-0.479	0.033	-0.511	14.336	0
	Security & Trust	-0.79	0.155	-0.425	-5.081	0

	Service Quality	-0.555	0.059	-0.417	9.445	0
	Ease of Use	0.492	0.072	0.69	6.82	0
	Task Characteristics	0.3512	0.054	0.425	9.682	0
ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	320.679	5	64.136	388.793	.000 ^a
	Residual	72.748	441	0.165		
	Total	393.427	446			

Source: Research findings, 2020

a. Predictors: (Constant), Ease of Use, Affordability & Transaction Cost, Network Availability, Service quality & Convenience, Security & Trust

b. Dependent Variable: Interoperability & Integration; c. 95% Confidence Interval for B

VI. DISCUSSION OF FINDINGS

This study aimed to investigate the factors that influence the acceptance and success of the interoperability of mobile money services in developing countries with the case study of Tanzania. The study reveals that users are willing to use mobile money service interoperability since it is easy to use. This result matches with the study by Bångens & Söderberg (2009) and Richard & Mandari (2017) in which they found that users opt for technology that is easy to use and solves real problems as such, more customers are attracted to use mobile money services (Mbogo, 2010; Isaacs, 2009). It was also found that price value on the use of mobile money service interoperability was a major factor which influences the intention to use and actual usage of mobile money service interoperability. This finding is also the same as for studies conducted by Lema (2017) and Richard & Mandari (2017) on factors influencing mobile financial services' adoption. The above studies suggest that high costs of mobile financial services are a barrier to mobile financial service adoption among the unbanked population in Tanzania. However, if the service is affordable, it can motivate faster adoption (Oliveira, Thomas, Baptista, & Campos, 2016). For proper utilisation of the integration of mobile money services, the reduction of transactional cost of mobile financial services should be considered.

The evidence from the study findings revealed that security and Trust were found to have a significant positive influence on the use of mobile money services due to service interoperability. The result supports the findings of other studies that found identity theft and sending money to the wrong account acted as factors for accepting mobile money services (Omol & Abeka, 2017). Moreover,

the study findings are similar to the one conducted by GSMA (2018), which found that data privacy and security impact trust are the critical concern of users when considering whether to use mobile money. Furthermore, much care must be taken when transferring sensitive information, especially when related to financial data (Abdullah & Abdul-Hadi, 2009). Moreover, the findings revealed that the vital security issues are identity theft, authentication attack, phishing attack, personal identification number (PIN) sharing, and agent-driven fraud (Guma, Mussa, & Anael, 2020). Data should be protected in all stages: data at rest, data in motion, and people (Stallings, 1999).

Service quality was also a factor that was considered for the integration and interoperability of mobile money services. This study again is similar to the one conducted in Tanzania that found Service quality one of the indicators of success and growth of the money transfer technology. Users are highly comfortable with the quality of support from service providers (Lubua & Semlambo, 2017; Wilson & Mbamba, 2017). The increase in the perceived quality of customer support influences the intention to continue using mobile money. Improving service quality will attract and retain more customers.

Furthermore, the study found that convenience was statistically significant for the integration and interoperability of mobile money services. Typically, users who send the money need a fair price, transparency, certainty, convenience, and speed. Users do not need to travel a long distance or give up a day's work to collect money, need minimal documentation, and should not suffer fee deductions. This study is similar to the one conducted in Kenya by Isaacs (2009). The findings show

that network availability is statistically significant in the design consideration of mobile money services.

This study is again similar to Senso, & Venkatakrishana (2013) and Mutalemwa & Anthony (2014) that found network or service failures to be the primary factor that hindered a large population of customers from using mobile money service. Failure of network connectivity or problem may risk losing cash, wasting time, and other problems like loss of customer goodwill. Most of the time, network availability failure may affect the e-float top-up, check bank balances, and even withdraw money from either the service provider or mobile money agent. Additionally, the study found that task characteristics significantly affect the acceptance and successful use of mobile money service interoperability. This result is the same as the one revealed by Tam & Oliveira (2016) and Changchun, Haider, & Akram (2017) which found that mobile users feel to use technology services if they support the task at hand. Therefore, mobile money interoperability enables users to smooth transfer money, reduce the time of performing transactions, do more transactions and have more access to more service providers. Also, it makes the tasks easily accomplished without limitations to service providers.

VII. CONCLUSIONS AND AREAS FOR FURTHER STUDIES

This study investigates factors for acceptance and successful use of mobile money services interoperability in developing countries such as Tanzania. This study concluded that, for the mobile money service interoperability to be useable, the security and trust of mobile payment transactions, network availability, and service quality were found to be the primary concerns for users. Other factors found were easy to use, task characteristics, and price value. The results obtained in this study are not sufficient for generalisation because most of the data were collected in a few cities from Tanzania. Therefore, further studies should be conducted in various cities or even across East Africa countries.

Categorically, studies should be done on factors that influence the mobile money services interoperability with Post offices, Money Gram, Western Union, and Telegraphic Transfer (TT) as the other means of money transfers. This study contributes the understanding and enhances the body of knowledge in the literature on factors that influence the acceptance and successful use of mobile money service interoperability in Tanzania. The study found that the D&M model, TAM, and The Task-Technology Fit (TTF) Theories directly affect the acceptance and successful use of mobile money service

interoperability. Therefore, the results provided theoretical and empirical support for the newly developed integrated model (Rahi *et al.*, 2019). The results will provide the basis for further refinement of technology acceptance and success models in the emerging mobile money service domain. Also, the findings of this study provide valuable understandings for formulating effective strategies concerning financial inclusion to mobile money service providers, government, and other stakeholders and expand the existing customer base to mobile money service providers (Dahlberg, Guo, & Ondrus, 2015).

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