

# Relationship between Information Communication Technology Adoption in Microfinance Institutions and Access to Financial Services

Mr. Herbet Tenson Mwashuuya & Dr. Ulingeta O. L Mbamba

PhD Student, President's Office, Public Service Management and Good Governance, P. O Box 670, Dodoma, Tanzania.

Senior Lecturer, University of Dar es Salaam School of Business, University of Dar Es salaam, P. O Box 35091, Dar es Salaam, Tanzania.

## Abstract

*Access to financial services is limited to the large population worldwide. This study mainly intended to examine a relationship between ICT adoption in microfinance institutions and access to financial services, particularly availability, convenience and affordability in Tanzania. A cross-section study design was conducted in two regions on 11 selected microfinance institutions. An exploratory factor analysis was employed to reduce variables to a manageable size, while retaining original information. The study used structural equation modelling with the help of Analysis of Moment Structures version 21. SEM was used to determine multiple relationships between ICT adoption and access to financial service variables simultaneously. The analysis included 303 customers from 77 microfinance institutions from Kilimanjaro and Dar es Salaam regions. Five factors were grouped from 29 variables. Only one path leading from ICT adoption to availability of financial services was found statistically significant. This implies ICT plays a key role in financial service delivery to clients via electronic delivery channels. Hence, services become available to everybody regardless of location and time.*

**Keywords:** ICT Adoption, Access to financial services, Microfinance Institutions, Availability of Financial Services, Convenience financial services, Affordability of financial services.

## 1. Introduction

Access to financial services is central to human development and a catalyst for state growth (Cracknell, 2012; Jeanty, 2016; Honohan., 2006; Fischer, 2014). Adequate access to financial services is one of the solutions, which minimises income inequalities and poverty among citizens in any country (Rabobank, 2005; Rojas-Suarez, 2010). Microfinance institution (MFI) is one of the well-known sources of money supply that provides access to financial services for low income earners (Ellis,

Lemma, & Rud, 2010). Financial services include savings, loans, remittance and insurance (Odhiambo, 2009; Burgess & Pande, 2003). MFIs target constrained people, who are unable to offer sufficient collateral and excluded by well-established financial institutions, including commercial banks (Kessy., 2009; Robinson., 2003).

Although MFIs are mushrooming across the globe, evidence shows large populations remain unbanked. According to World Bank (WB) reports, about two billion people do not have access to formal financial services. This comprises countries in Asia, Latin America and Africa (Hossain & Sarker, 2015). Further results indicate that less than a quarter of adult populations have access to financial services in sub-Saharan Africa (SSA) (Koblanck, 2013). In Tanzania, data shows 40 per cent of adults have accounts at financial institutions (WB, 2014). Limited access to financial services implies that financial products are inaccessible, unaffordable, unavailable of banking services, inflexible and unacceptable by some citizens (WB, 2017).

To access financial services adequately, some studies suggest adoption of different advanced operational methodologies such as information communication technology (ICT) in MFIs (Kipasha, 2013; Bada, 2012; Claessens, 2006). ICT facilitates communication, data capturing, processing and transmission of information (Beckinsale & Ram, 2006; Boar, 1997) through the use of computers, mobile phones, the internet, applications, hardware and networks (Ashrafi & Murtaza, 2008). Furthermore, ICT can form new delivery channels, which reach low income earners through branchless banking. Effects of ICT have been appreciated in broadening services, easy processing and in innovative products (Emmanuel & Sife, 2008; Khanna & Gupta, 2015). ICT adoption in MFIs also increases efficiency and effectiveness (Ssewanyana, 2009; Kumar & Rao, 2012), expands services to the unbanked population (Jawadi, Jawadi, & Dechamps,

2010; Shamim, 2007; Osabuohien, 2008), reduces operational costs (Eid, Trueman, & Ahmed, 2006; Akanbi & Oladejo, 2012) and increases staff productivity (Apulu & Latham, 2011; Harindranath, Dyerson, & Barnes, 2008; Brynjolfsson & Hitt, 2003).

Despite positive effects of ICT on MFIs' performance, still large populations in developing countries do not have access to financial services in their operations (Kipasha, 2013). As a result, negative effects on availability, convenience and final retail prices on financial services.

Although, previous studies pointed out the effects of ICT on MFIs' operational performance, especially an increase in efficiency, improved staff productivity, increased service delivery and a reduction in costs (Kairu & Rugami, 2017; Musa & Khan, 2010). This study observed a knowledge gap of the contribution of ICT adoption to access to financial services. Therefore, there is a need to understand how ICT adoption in MFIs contributes directly to access to financial services, particularly in making financial services available, convenience and affordable to large populations. Objectively, this study determines the relationship between ICT adoption in MFIs and access to financial services in Tanzania.

## 2. Literature Review

### 1.1. Theoretical Framework

Two theories guided this study in explaining the relationship between ICT adoption in MFIs and access to financial services through actual usage of electronic delivery channels. The theories are Davis' (1989) Technology Acceptance Model (TAM) and Roger's (1995) Diffusion of Innovation Theory (DOI). TAM was employed to bring out the relevance of accepting new technology in MFIs and its usefulness in operational performance. The theory focused on understanding the causal relationship between the use of external variables and perceived ease of use and perceived usefulness in the actual use of the system. 'Perceived usefulness' refers to the degree to which an individual believes that using a particular application system will enhance his or her job performance and 'perceived ease-of-use' is expressed as the degree to which an individual person believes that using a particular system will be free from effort (Davis., 1989). TAM has proved to be useful and is employed in different disciplines such as health care, including telemedicine (Holden & Karsh, 2010; Hu, Chau, Sheng, & Tam, 1999), ICT such as mobile phones, the internet, websites, e-learning (Bacha, Čeljob, & Zoroja, 2016; Kwon & Chidambaram, 2000; Venkateswara & Hanumantha, 2012), e-government (Chan, Thong, Venkatesh,

(Hossain & Sarker, 2015; Koblanck, 2013). This limited access to financial services was observed in the MFIs, which have low management support in adopting ICT, high ICT investment costs, weak technological connectivity and low control of risks and fraud on electronic transactions (Triodos-Facet, 2011; Ashta, 2010; Sjauw-Koen-Fa & Vereijken, 2005). Consequences of these obstacles delay MFIs to adopt seriously sophisticated and advanced ICT

Brown, Hu, & Tam, 2010) and agriculture (Amin & Li, 2014).

Another theory that has been used in this study is Diffusion of Innovation (DOI), which tries to explain that technology permeates organisations and individuals' lifestyles and its effects on the overall performance and access to services. Individuals or organisations perceive technology is new in which they may refer innovation regardless of the time of invention within or outside their communities. Thus, innovation is defined as an idea, practice or object, while diffusion is the process by which innovation or perceived new technology is communicated through certain channels over time among members of a social system (Rogers., 2003). DOI has been employed extensively in different studies, including ICT (Echchabi & Aziz, 2012), banking (Al-Jabri & Sohail, 2012; Yahaya, Yusoff, Idris, & Haji-Othman, 2014) and health (Cain & Mittman, 2002).

DOI has five distinct features, which determine innovation adoption, including relative advantage, compatibility, complexity, trialability and observability. Relative advantage refers to the degree to which innovation is considered to have more benefits than DOI. This means that clients perceive usefulness of the latest technology over a traditional one (Roberts & Amit, 2003). Compatibility refers to the degree to which a service is perceived as consistent with users' existing values, beliefs, habits and present and previous experiences (Chen, Gillenson, & Sherrell, 2004). Observability of innovation describes the extent to which innovation is visible to members of a social system and benefits can be easily observed and communicated (Rogers., 2003). Trialability is defined as the capacity to experiment new technology before adoption (Al-Jabri & Sohail, 2012). Observability is defined as the degree to which results of innovation are visible to others (Rogers., 2003).

Presented theories (TAM and DOI) provide in-depth understanding of the subject matter. The review indicates that ICT adoption is beneficial to MFIs' operations and individuals' access to financial services. The theories indicate that technology is more likely to be adopted if it has positive effects on individuals or MFIs. In addition, intensity of adopting

ICT differs among MFIs and individuals based on budget requirements.

## 1.2. Empirical Framework

### 1.2.1. Effects of ICT on Operational Performance

Over the last decades ICT adoption proved to have strong and positive correlation with operational performance in the banking industry (Kairu & Rugami, 2017; Omanyo, 2014; Agbolade, 2011). Studies by Jawadi et al. (2010), Kombe and Wafula (2015), and Wasilwa and Omwenga (2016) revealed that ICT adoption contributed to expansion of financial services and enhanced performance through cost reduction. Sonja (2010) urged that IT adoption significantly increased efficiency on determining loan overdue and calculation of charges and penalties automatically. A study by Musa and Khan (2010) found that adoption of Point of Sale (POS) technology in MFIs operation enhanced implementation strategy and increased outreach through increased staff productivity. ICT adoption is considered as a catalyst and enabler for the MFIs to compete at a global scale due to improved efficiency, effectiveness, service delivery and enhanced customer and supplier relationship (Alam & Noor, 2009; Dangolan, 2011). Well-established technological infrastructure and devices in MFIs facilitates automation of loan application, approval, funds disbursement and tracking loan repayment (Singh & Padhi, 2015).

However, there is no evidence, which shows whether operational performance contributes to access to financial services in the unbanked population. Some studies show that access to financial services is affected by high costs of hardware, software and the internet, unstable network, financial literacy and security of information and fraud (Busler & Ssewanyana, 2007; Kevin, Bernard, & Ronald, 2013; Attom, 2013). For instance, clients spend much on services consumed because MFIs lease technology from mobile service providers to facilitate deposit accumulation, loan disbursement and loan repayment, as clients pay for services (Riggins & Weber, 2013). Further findings by Ray and MacMillan (2005) found that there were no direct effects of different ICT resources employed on the performance of customer service delivery.

### 1.2.2. ICT Adoption and Access to Financial Services

ICT adoption can benefit clients in the context convenient services, saving time and overcome distance barriers (Honohan., 2006). Another benefit of ICT adoption is smooth facilitation and transformation of regular banking services (Bada, 2012; Irechukwu, 2000). For example, mobile and internet banking contribute significantly to account

opening, deposits, bill payment, balance enquiry and printing statements (Wasilwa & Omwenga, 2016; Thulani, Tofara, & Langton, 2009). Furthermore, mobile phones can serve not only as voice call conversations, but also monitor to customer account at anytime and anywhere through a short message services (SMS), whereby it is easy to view an account balance and track transactions (Enu & Gberbi, 2015; Nganga & Mwachofi, 2013; Vota, 2016).

Another study by Hossain and Ahmed (2014) explored the benefits and challenges of mobile banking service deployment for MFIs in South Africa. The study revealed that most of the MFIs deployed mobile banking for loan repayment and cash in and cash out services. Bada (2012) also investigated the extent to which MFIs used ICT to deliver business services in Uganda and results showed that ICT was crucial to service delivery to clients. Asare and Sakoe (2015) examined the effects of electronic banking products on financial service delivery in Ghana and found that electronic banking enabled customers to select products conveniently regardless of time and place. Dangolan (2011) found that ICT in the banking system of Iran contributed to saving time and cutting down expenses. According to a study by Wu, Li and Lin (2010), customer perception on online banking is high compared to other banking delivery channels in Taiwan.

Conversely, Munsaka (2009) found that retail prices of financial products could be affected by high investment costs and broadband services. A study by Luka and Frank (2012) revealed that customers were not comfortable with bank charges injected by MFIs. Maiyaki and Mokhtar (2010) also found that availability of electronic facilities such as ATM, online banking and mobile banking had no significant influence on customer's choice of financial institutions. Regardless multiple electronic modes of payment that exist and available in India, still many citizens prefer cash mode of payment (Khanna & Gupta, 2015).

Based on literature reviewed in this study, the following hypotheses were tested:

*Hypothesis 1:* There is a relationship between ICT adoption in MFIs and availability of financial services.

*Hypothesis 2:* There is a relationship between ICT adoption in MFIs and convenience of financial services.

*Hypothesis 3:* There is a relationship between ICT adoption in MFIs and affordability of financial services.

These three hypotheses and their relationship between ICT adoption in MFIs and access to financial services through actual usage of ICT can be seen in Figure 1.

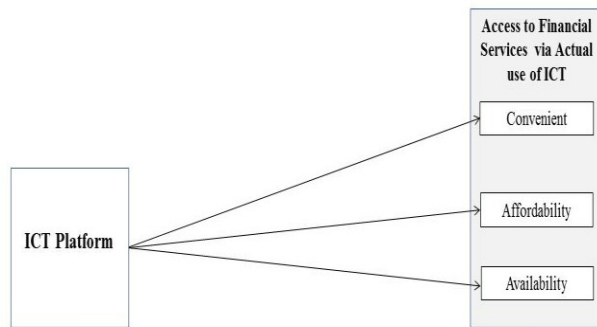


Figure 1: Model of ICT adoption on access to financial services

### 3. Methodology and Technique Used

#### 3.1. Study Area

The study was carried out in Kilimanjaro and Dar es Salaam regions, which were selected because they had many MFIs (FDST, 2013). Located in northern Tanzania, Kilimanjaro Region has more than 1.6 million people and six districts with 116 MFIs. Dar es Salaam is situated in eastern part of Tanzania with more than 5 million people. Dar es Salaam is the commercial capital city of Tanzania and has five districts with 188 MFIs distributed across the region.

#### 3.2. Sample Size Calculation

Sample size was calculated based on the standard formula detailed by Naing et al, 2006 with 95 per cent confidence interval, which gives the confidence level value of 1.96 from the normal distribution table. Marginal error of 5 per cent with 0.3 estimated value for the proportion of sample, which gives the minimum sample size in absence of known population. The target sample size was 322 clients for MFIs and this sample size was within the range as suggested by Sekaran (2000) that the sample size should range between 30 and 500 depending on the sampling design. Kline (2011) recommend that it was important to determine the minimum sample size that met the desired statistical power as per model requirements before data collection.

A total of 77 MFIs (22 in Kilimanjaro and 55 in Dar es Salaam) from the regions, which provided financial services during the survey, were included. Each selected selected MFIs was visited and information was collected from clients. All clients, who attended MFIs for financial services on the days of the survey, were eligible and interviewed.

#### 3.3. Study Design and Data Collection

A cross sectional study design was deployed to 77 MFIs to examine a relationship between ICT adoption and access to financial services for it suited the purpose. A structured questionnaire was developed as

the main survey instrument to gather data from selected MFIs. The questionnaire consisted of a five-point Likert scale and respondents were asked to indicate the extent to which they agreed/disagreed with various statements. In addition, the questionnaire consisted of closed and open ended questions for gathering respondents' characteristics.

Field enumerators were trained on survey procedures and questions on the questionnaire for face to face was also administered. A random sampling technique was applied to select MFIs from the list given by respective districts. On the day of data collection, the first four clients, who visited the MFIs' office, were requested to be interviewed by researcher assistants with supervision from the researcher. The latter requested and they recorded responses in the questionnaire. This method reduced missing values and also improved the validity and reliability of data.

The questionnaire was designed in a manner that the respondents did not reveal their names and the name of the respective of MFIs for commercial confidentiality and sensitivity of financial information. Operational variables in the questionnaire were collected in a standard procedure to achieve the results and test the hypotheses of the study. A total of 303 questionnaires out of 322 were completed during the survey. Data was collected for 12 weeks.

#### 3.4. Data Management and Analysis

Data were entered in the Statistical Package for Social Sciences (SPSS) version 20, a computer software programme. Data cleaning and analysis was performed using SPSS. The study applied a deductive approach to test hypotheses by either approving or disapproving, then the theory was confirmed, modified or abandoned.

A descriptive analysis was carried out to obtain frequencies, mean and standard deviations of various variables using SPSS. The results were presented in form of tables and graphs for easy interpretation of the findings. Furthermore, descriptive statistics were also used to obtain data patterns and check for outliers and missing values. An exploratory factor analysis (EFA) was employed to reduce variables to a manageable size into five factors, while retaining as much original information as possible. The study used Structural Equation Modelling (SEM) with the help of Analysis of Moment Structures (AMOS) version 21. SEM was employed to determine multiple relationships of independent and dependent variables simultaneously. After sampled data fitted the model well, hypotheses were tested and interpreted for

examining a relationship between ICT adoption and access to financial services. A significance test of individual path parameters was tested by z-statistics=1.96, which is referred to as Critical Ratio (C.R.). The C.R. greater than 1.96 was considered significant.

### 3.5. Ethical Clearance

A protocol of this study was approved by the Vice Chancellor of the University of Dar es Salaam and granted an institutional ethical clearance submitted to regional secretariats. All participants in the study were asked for oral informed consent before collecting data and they had a right to withdraw from the study at any time without they wanted.

## 4. Results and Discussion

### 4.1. Respondents' Characteristic

Table 1 presents respondents characteristics from two regions (Kilimanjaro and Dar es Salaam). The results show that 67.3 per cent of the respondents were recruited from Dar es Salaam, while 54.1 per cent of the respondents were male. This implies that more males were recruited and attended for financial services in the MFIs during the survey than females. Furthermore, results shows that 47.2 per cent of the respondents were aged 20-30 years. The respondents were relatively young people. Demand for financial services increases as age increases and also this group has a high rate of ICT usage on different services. Respondents' income was generally low. Less than 10 per cent of the respondents would receive Sh1,000,000 and above per month. The output coincides with the study design as MFIs intend to offer financial services to low income earners.

**Table 1: Respondents' Characteristics**

Item		Frequency	Percentage
Region	Dar es Salaam	204	67.3
	Kilimanjaro	99	32.7
Sex	Male	164	54.1
	Female	139	45.9
Age (Years)	20-30	143	47.2
	31-40	119	39.3
	41-50	29	9.6
	≥ 60	12	4.0
Income	< 500,000	155	51.2
	500,000-	128	42.2

1,000,000		
>	20	6.6
1,000,000		

### 4.2. Factor Analysis

The factor analysis was conducted via principal component analysis with orthogonal varimax rotation. The Bartlett Test of Sphericity and Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy were used to validate the use of factor analysis. In Table 2 shows that the value of KMO is meritorious, fall between 0.80 and 0.89 and Bartlett's Test of Sphericity is significant (P<0.05) suggesting that factor analysis can be conducted (Kaiser, 1970).

**Table 2: KMO and Bartlett Test Sphericity**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.86
Bartlett's Test of Sphericity	Approx. Chi-Square	6555.578
	df	595
	Sig.	0

Several studies have given different cut off values for the retention of items based on the value of factor loadings, varying from 0.35 to 0.50 (Hair Jr, Black, Babbins, & Anderson, 2010). In this study, loadings of 0.50 or more are considered practically significant. Table 3 presents results of the exploratory factor analysis. The remaining items were grouped into four factors. First, factor is availability with six items. Second, it is affordability with six items. Third, it is ICT adoption with six items and fourth, it is convenience with four items as shown in Table 3.

**Table 3: Exploratory Factor Analysis**

Items	Values	Factor Loading
Receive alert on financial transaction update	0.801	1
Check balance of loan repayment	0.773	
Check balance of savings	0.759	
Repayment of loans	0.739	
Deposit money	0.648	

Enquire about financial services offered	0.568	2
Low service charges	0.9	
Saving more money	0.826	
Increase in dividends	0.805	
Obtain more than one loan	0.774	
Get micro insurance claim on time	0.665	
Low maintenance charges	0.564	3
Mobile technology	0.894	
Internet or website	0.829	
Voice call	0.796	
Local area network	0.773	
SMS	0.768	
Email or electronic data	0.675	4
Borrow money through download or online	0.919	
Easy process of borrowing money	0.89	
Open account through download or online	0.841	
Easy process in acquiring micro-insurance	0.741	

#### 4.3. Cronbach's Coefficient of Reliability, Mean and Standard Deviation of Constructs

Items in study constructs were tested for reliability. Table 4 shows that computed Cronbach's alpha coefficients of the constructs or factors are above 0.6. The Cronbach's alpha coefficients of 0.6 and above are considered more acceptable (Kline, 2011; Hair et al., 2010). This indicates that all items in factorial groups in this study are sufficient reliable measures.

Table 4 shows the computed mean and standard deviation value of the items in each construct-based on the five Likert scale. Results in Table 4 indicate that the overall mean value score of ICT adoption,

availability and convenience are below 3. This implies that respondents were satisfied on the contribution of ICT to MFIs business. While the mean value of affordability construct was above 3, it implies that the respondents were not satisfied that ICT contributed to affordable services. However, the computed standard deviation values of all constructs were less than 3. This implies that the variability of the responses is small from the respondents.

**Table 4: Mean, Standard Deviation and Cronbach's alpha**

Construct	No. of Items	Mean	Standard Deviation	Cronbach's alpha
ICT Adoption (ADO)	6	2.66	1.048	0.887
Availability (AVA)	6	2.32	0.713	0.783
Convenience (CON)	4	2.4	0.823	0.879
Affordability (AFO)	7	3.16	1.006	0.875

Notes: Mean scores based on a five-point scale, where 1= Strongly Agree and 5= Strongly Disagree.

#### 4.4. Model Fit Measurement

The model fit comprises a measurement model and a structure model. The measurement model uses a confirmatory factor analysis (CFA) to validate sampled data if fits a hypothesised model of related constructs. The constructs of the hypothesised model were correlated by using two headed arrows in AMOS version 21 with a degree of freedom (df) of 550. The AMOS version 21 generated fit statistics as follows: Chi-square = 1994.727; RMSEA= 0.093; GFI=0.739; CFI=0.769; TLI=0.750; NFI=0.708; Chi-square/df = 3.627. All generated fit indices do not fall within acceptable criteria. Hence, the model is rejected and subjected to modification.

In this study, the hypothesised model was rejected based on goodness-of-fit statistics, consideration for an alternative model that fits data is necessary (Lei & Wu, 2007). Modification of the model went through deleting weak factor loadings one after another. Thereafter, redundant items were paired or deleted one of the items preferable with a lower factor loading. Remaining factor loadings reported in the CFA output were above 0.69. New fit statistics generated from AMOS version 21 with degree of freedom (df) of 94 are: Chi-square=185.226; RMSEA

= 0.065; GFI = 0.940; CFI = 0.969; TLI = 0.960; NFI = 0.940; Chi-square/df = 1.970. The results fall within acceptable limits as suggested in previous research using AMOS (Kline, 2011; Hair et al., 2010). Hence, the model fit the data well.

The overall hypothesised model was tested with the sample data and converted and executed into AMOS version 21. The results of fit statistics output met minimum requirements with degree of freedom of 97 as follows: Chi-square=193.004; RMSEA=0.057, GFI=0.927, CFI=0.967, TLI=0.960, NFI=0.937, Chi-square/df = 1.990. Thus, the model fits the data well and was subjected for hypotheses testing.

#### 4.5. Hypotheses Testing

Subsequent to the model fits the data well, interpretation and examination for statistical significance of the parameter estimate (path coefficients and standard error) is proper. The significance test of individual parameters is tested by z-statistics, which is referred to as Critical Ratio (C.R.) obtained, when estimate divided by Standard Error (S.E) (Ullman, 2006). As a rough reference, the absolute value of this ratio greater than 1.96 may be considered statistically significant at the 0.05 level, otherwise the hypothesis can be rejected (Kline, 2011).

Results in Table 5 show a positive standardised regression coefficient or weights of the path leading from ICT adoption to availability. The standardised regression coefficient of the path from ICT adoption to availability of financial services was 0.313 with the critical ratio (C.R) value of 4.886 above z-test value of 1.96. This implies a significant and positive contribution to the relationship between ICT adoption and availability of financial services. Another positive standardised regression coefficient of the path leading from ICT adoption to convenience was 0.060 associated with the critical ratio (C.R) value, which is less than z-statistics value of 1.96. The path indicates an insignificant relationship between ICT adoption and convenience of financial services. However, the positive standardised regression weight indicates that ICT use contributes to accessibility of financial services. The standardised regression coefficient of the path leading from ICT adoption to affordability is 0.078, which is a positive association with the critical (C.R) value given, which is below z-statistics value of 1.96. The path indicates that there is no statistically significant relationship between ICT adoption and affordability of financial services. However, the positive standardised regression weight indicates that ICT use has little contribution to make financial services affordable.

**Table 5: Unstandardised and Standardised Regression Weights of the Relationship between ICT Adoption and Access to Financial Services**

	CON<-ADO	AFO<-ADO	AVA<-ADO
<b>Unstandardised Estimate</b>	0.079	0.102	0.283
<b>S.E</b>	0.079	0.078	0.058
<b>C.R</b>	1.003	1.304	4.886
<b>P</b>	0.316	0.192	***
<b>Standardised Estimate</b>	0.06	0.078	0.313

#### 4.6. Discussion

This study aims at assessing the relationship between ICT adoption in MFIs and access to financial services (availability, convenience and affordability). The findings provide some explanation to help understand how ICT adoption and access to financial services relate to each other. Availability of financial services is significant and is associated with ICT adoption. This implies that ICT platforms (mobile technology, the internet, websites and telephones) facilitate financial services to be available in unbanked communities. Results of this study coincide with previous studies of Karjaluoto, Mattila, & Pento (2002), Bada (2012), Hosain and Ahmed (2014), Monyoncho (2015), Chale and Mbamba (2014) and Thulani et al. (2009), found that ICT adoption was related significantly to financial service delivery such as money deposits, withdrawals, money transfers and bill payments. Mohammed, Siba and Sreekumar (2009) also concluded that internet banking transformed traditional banking to a growing banks with a significant number of clients with high deposits. Another study conducted in Bangladesh concluded that mobile phone banking contributed to expansion of services via virtual bank accounts to many unbanked individuals (Rayhan, Sohel, Islam, & Mahjabin, 2012).

ICT adoption and convenience of financial services is insignificant. This is contrary to the output of Enu and Gberbi (2015), Asare and Sakoe (2015), Akanbi and Oladejo (2012) and Basweti, Masese and Martin (2013), who found that ICT use in the banking sector was related to accessibility in managing accounts, withdrawals, deposits and money transfers regardless of time and location. Finally, the insignificant output of the relationship between ICT adoption and affordability of financial services is inline with the findings of Luka and Frank (2012), who found that clients were not comfortable with bank charges although ICT was used in banking services. Similar to Munsaka (2009), who studied the impact of ICTs on

development, found that constraints of ICT affected consumer prices of final products.

## 5. Conclusions and Recommendations

Most of the MFIs employ ICT platforms such as computers, the internet, websites, LAN, mobile and fixed phones to perform daily operations and enhance access to financial services to clients. A part from carrying out a business process, ICT plays a key role in financial service delivery to clients via electronic delivery channels. Hence, services are normally available to clients regardless of location and time.

The use of mobile phones and the internet is essential for communication between MFIs and clients. It is possible for clients to enquire about the availability of financial services offered by MFIs through sending SMS or making telephone calls to the MFIs personnel. In addition, clients can browse on the website to understand available financial services and information and download forms for membership account and borrowing money.

## 6. Acknowledgement

We are thankful to the members of staff to the surveyed MFIs and to all field enumerators who collect data. We are grateful to the President's Office, Public Service Management and Good Governance for assistant during this survey.

## 7. References

- [1]. Agbolade, O. K. (2011). Information and Communication Technology and Banks Profitability in Nigeria. *Australian Journal of Business and Management Research*, 1(4), 102-107.
- [2]. Akanbi, T., & Oladejo, M. (2012). Bankers Perceptions of Electronic banking in Nigeria: A Review of Post Consolidation Experience. *Research Journal of Finance and Accounting*, 3(2).
- [3]. Alam, S. S., & Noor, M. K. (2009). ICT Adoption in Small and Medium Enterprises: an Empirical Evidence of Service Sectors in Malaysia. *International Journal of Business and Management*, 4(2), 112-125.
- [4]. Al-Jabri, I. M., & Sohail, S. M. (2012). . Mobile banking adoption: Application of Diffusion of Innovation Theory. *Journal of Electronic Commerce Research*, 13(4), 379-391.
- [5]. Amin, K., & Li, J. (2014). . Applying Farmer Technology Acceptance Model to Understand Farmer ICT Based Microfinance Platform: A Comparative analysis between Bangladesh and China. . *The Thirteenth Wuhan International Conference*.
- [6]. Apulu, I., & Latham, A. (2011). Drivers for Information and Communication Technology Adoption: A Case study of Nigerian Small and Medium Sized Enterprises. *International Journal of Business and Management*, 6(5), 51-60.
- [7]. Asare, M., & Sakoe, J. (2015). The Effects of Electronic Banking on Financial Services in Ghana. *Research Journal of Finance and Accounting*, 6(16), 147-154.
- [8]. Ashrafi, R., & Murtaza, M. (2008). Use and Impact of ICT on SMEs in Oman. *The Electronic Journal Information Systems Evaluation*, 11(3), 125-138.
- [9]. Ashta, A. (2010). *MIS Software for Microfinance Market: Analysis*. CEREN, CERMi: Burgundy School of Business .
- [10]. Attom, B. E. (2013). The impact of Information Communication Technology (ICT) on business Growth strategies of Small and Medium-scale Enterprises (SMEs) in the Awutu-Senya East Municipality of Central Region of Ghana. *Asian Journal of Business and Management Asian Journal of Business and Management Sciences*, 13-28.
- [11]. Bacha, M. P., Čeljob, A., & Zoroja, J. (2016). Technology Acceptance Model for Business Intelligence Systems: Preliminary Research. *Procedia Computer Science* 100, 995 – 1001.
- [12]. Bada, J. (2012). ICT for Business Services: The Case of Ugandan Microfinance Institutions. *International Journal of Research and Reviews in Applied Sciences*, 11(1).
- [13]. Basweti, K. O., Masese, B. C., & Martin, R. O. (2013). Impact and Challenges of Information Communication Technology Adoption in the Tanzanian Banking Sector. *International Journal of Academic Research in Business and Social Sciences*, 3(2), 323–334.
- [14]. Beckinsale, M., & Ram, M. (2006). Delivering ICT to ethnic minority businesses: an action- research. *Environment and Planning C: Government and Policy*, 847-867.
- [15]. Boar. (1997). *Strategic thinking for information technology: How to build the IT organization for the information age*. New York,, NY, USA: John Willey & Sons, Inc.
- [16]. Brynjolfsson, E., & Hitt, L. (2003). Computing Productivity: Firm-Level Evidence. *Review of Economics and Statistics*, 85, 793-808.
- [17]. Burgess, R., & Pande, R. (2003). *Do Rural Banks Matters? Evidence from Indian Social Banking Experiment*. India.
- [18]. Busler, M., & Ssewanyana, J. K. (2007). Adoption and usage of ICT in developing countries: A case of Ugandan firms. *International Journal of Education and Development using ICT (IJEDICT)*, 3(3).
- [19]. Cain, M., & Mittman, R. (2002). *Diffusion of Innovation in Health Care*. California: California HealthCare Foundation.
- [20]. Chale, P. R., & Mbamba, U. (2014). The role of mobile money services on growth of small and medium enterprises in Tanzania: evidence from Kinondoni district in Dar es Salaam region. *usiness Management Review*, 81-96.



- [21]. Chan, F. K., Thong, J. Y., Venkatesh, V., Brown, S. A., Hu, P. J., & Tam, K. Y. (2010). Modeling citizen satisfaction with mandatory adoption of an e-government technology. *Journal of the Association for Information Systems, 11*(10), 519–549.
- [22]. Chen, L., Gillenson, M., & Sherrell, D. (2004). Consumer acceptance of virtual stores: A Theoretical Model and Critical Success Factors for Virtual Stores. *ACM SIGMIS Database, 35*(2), 8-31.
- [23]. Chijoriga, M. M. (2000). *The Performance and Sustainability of Micro Finance Institution in Tanzania*. Dar es Salaam.
- [24]. Claessens, S. (2006). Access to Financial Services: A Review of the Issues and Public Policy Objectives. *The World Bank Research Observer, 21*(2), 207-240.
- [25]. Cracknell, D. (2012). *Policy Innovations to Improve Access to Financial Services in Developing Countries: Learning from Case Studies in Kenya*. Nairobi.
- [26]. Dangolan, S. K. (2011). Impact of Information Technology in Banking System: A Case study in a Bank of Keshavarzi, Irani. *Procedia -Social and Behavior science, 30*, 13-16.
- [27]. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319 - 340.
- [28]. Echchabi, A., & Aziz, H. A. (2012). Empirical Investigation of Customers' Perception and Adoption Towards Islamic Banking Services in Morocco. *Middle-East Journal of Scientific Research, 12*(6), 849-858.
- [29]. Eid, R., Trueman, M., & Ahmed, A. M. (2006). B2B international internet marketing: A benchmarking exercise. *13*, 200-213.
- [30]. Ellis, K., Lemma, A., & Rud, J.-P. (2010). *Investigating the impact of access to financial services on household investment*. London, UK: Overseas Development Institute.
- [31]. Emmanuel, G., & Sife, A. (2008). Challenges of Managing Information and communication Technologies for Educations, experiences from Sokoine National Agricultural Library. *International Journal of Education and Development using ICT, 4*(3).
- [32]. Enu, P., & Gberbi, J. T. (2015). Effect of Information and Communication Technology (ICT) on the Delivery of Banking Services in Ghana: A Case Study of Zenith Bank Ghana Limited. *Global Journal of Management Studies and Researches, 2*(2), 60-82.
- [33]. ESRF. (2008). *Enhancing the Livelihoods of the Rural Poor through ICT: Knowledge Gap, Tanzania Country Study*. InfoDev.
- [34]. FDST. (2013, July 29). *Demand for and Access to Financial Services Amongst Adults - FinScope TANZANIA 2013*. Retrieved from National Bureau of Statistics -NBS: <http://www.nbs.go.tz/nbs/takwimu/references/FinScope-Brochure-2013.pdf>
- [35]. Fischer, G. (2014). Access to Finance: A Functional Approach to Supply and Demand. *LSE Asia Research Center: Working Papers No.42*.
- [36]. Hair Jr, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis*. New York: National.
- [37]. Harindranath, G., Dyerson, R., & Barnes, D. (2008). ICT Adoption and Use in UK SMEs: a Failure of Initiatives? *The Electronic Journal Information Systems Evaluation, 11*(2), 91-96.
- [38]. Holden, R. J., & Karsh, B.-T. (2010). The technology acceptance model: Its past and its future in health care. *Journal of Biomedical Informatics, 43*(1), 159–172.
- [39]. Honohan, P. (2006). Household Financial Assets in the Process of Development. *Policy Research Working Paper*.
- [40]. Hossain, M. A., & Ahmed, F. (2014). Evaluating the impact of mobile banking deployment for microfinance. *Journal of Marketing, 15*, 143-157.
- [41]. Hossain, S., & Sarker, D. (2015). Benefits And Constraints Of Using Mobile Banking In Microfinance in Developing Countries. *International journal of management and economics Invention, 1*(1), 1-15.
- [42]. Hu, P. J., Chau, P. Y., Sheng, O. R., & Tam, K. Y. (1999). Examining the technology acceptance model using physician acceptance of telemedicine technology. *Journal of Management Information Systems, 91-112*.
- [43]. Irechukwu, G. (2000). Enhancing the Performance of Banking Operations Through Appropriate Information Technology In: Information Technology in Nigerian Banking Industry. . *Spectrum Books*.
- [44]. Jawadi, F., Jawadi, A., & Dechamps, V. (2010). European Microfinance Institutions and Information and Communication: An Empirical Qualitative Investigation in the French Context. *Journal of Electronic Commerce in Organization, 8*(3), 38-48 .
- [45]. Jeanty, J. (2016). *Role of Microfinance Institutions*. Retrieved 12 23, 2016, from <http://smallbusiness.chron.com/role-microfinance-institutions-13233.html>
- [46]. Kairu, M. M., & Rugami, M. (2017). Effect of ICT deployment on the operational performance of Kenya Revenue Authority. *Journal of Strategic Management, 2*(1), 19-35.
- [47]. Kaiser, H. F. (1970). A second generation Little Jiffy. *Psychometrik, 35*, 401-415.
- [48]. Karjaluo, H., Mattila, M., & Pentto, T. (2002). Factors underlying attitude formation towards online banking in Finland. *International Journal of Bank Marketing, 20*(6), 261-72.

- [49].Kessy., S. (2009). Microfinance and Enterprises Performance in Tanzania: Does Gender. *Proceedings of the 10th Annual Conference*.
- [50].Kevin, O. K., Bernard, M. C., & Ronald, D. (2013). Impact and Challenge of Information and Communication Technology Adoption in Tanzania Banking Sector. *International Journal of Academic Research in Business and Social Science*, 3(2), 323-334.
- [51].Khanna, V. T., & Gupta, N. (2015). Customer's Perception about Banks Technology for Innovative Delivery Channels of Public Sector Banks (PSBs) of India. *International Journal of Business and Management*, 10(2), 214-225.
- [52].Kipasha, E. F. (2013). Impact of ICT Utilization on Efficiency and Financial Sustainability of Microfinance Institutions in Tanzania. *International Journal of Interdisciplinary Studies on Information Technology and Business*, 67-82.
- [53].Kline, R. (2011). *Principles and practice of Structural equation modelling* (3rd ed.). New York: Guilford Press.
- [54].Koblanck, A. (2013). *Access to Finance Sub Saharan Africa: Fiscal Year 2013*. Washington DC: International Finance Corporation: World Bank Group.
- [55].Kombe, S. K., & Wafula, M. K. (2015, May). Effects of Internet Banking on the Financial Performance of Commercial Banks in Kenya a Case of Kenya Commercial Bank. *International Journal of Scientific and Research Publications*, 5(5), 1-10.
- [56].Kumar, K. S., & Rao, S. H. (2012). The Paradigm Shift in Microfinance-Role of Information and Communication Technology (ICT). *Asian Journal of Research in Business Economics and Management*, 2(12).
- [57].Kwon, H. S., & Chidambaram, L. (2000). A test of the technology acceptance model: The case of cellular telephone adoption. *33rd Annual Hawaii International Conference on System Sciences*. Maui, Hi.
- [58].Lei, P.-W., & Wu, Q. (2007). Introduction to Structural Equation Modeling: Issues and Practical Considerations.. *Educational Measurement: Issues and Practice*, 33-43.
- [59].Luka, M., & Frank, I. (2012). Impacts of ICTs on Banks: A Case study of the Nigerian Banking Industry. *International Journal of Advanced Computer Science and Applications*, 3(9), 145-149.
- [60].Mohammed, S. K., Siba, S. M., & Sreekumar, S. (2009). Services quality evaluation in internet banking: An empirical study in India. *International Journal of Indian culture and business management*.
- [61].Monyoncho, L. N. (2015, November). Relationship between banking technologies and financial performance of Commercial Banks in Kenya. *International Journal of Economics, Commerce and Management, United Kingdom*, 3(11), 784-815.
- [62].Munsaka, J. (2009). *ICT4D: Challenges & Opportunities in Zambia. Zambia Country Report*. Lusaka: Thetha - Regional ICT Discussion Forum Project.
- [63].Musa, A. M., & Khan, M. S. (2010). Benefit and Limitation of Technology in MFI:Come To Save (CTS) Experience from Rural Bangladesh. *Journal of Electronic Commerce in Organizations*, 8(2), 54-65.
- [64].Naing, L., Winn, T., & Rusli, B. N. (2006). *Practical Issues in Calculating the Sample Size for Prevalence Studies*. Arch Orofac Sci.
- [65].Nganga, S. I., & Mwachofi, M. M. (2013). Technology Adoption and the Banking Agency in Rural Kenya. *Journal of Sociological Research*, 4(1), 249-266.
- [66].Odhiambo, N. (2009). Financial deepening and poverty reduction in Zambia: an empirical investigation. *International Journal of Social Economics*, 37, 41-53.
- [67].Omanyo, V. O. (2014). Relationship between ICT Integration and Operational Performance of Hotels in Kenya. *International Journal of Innovative Research and Development*, 3(13), 17-25.
- [68].Osabuohien, E. S. (2008). ICT and Nigerian banks reforms: analysis of anticipated impacts in selected banks. 2(2), 67-76.
- [69].Rabobank. (2005). *Access to financial services in developing countries*. Economic Research Department of Rabobank Nederland.
- [70].Ram, S., & Sheth, J. N. (1989). Consumer resistance to innovations: the marketing problem and its solutions. *Journal of Consumer Marketing*, 6(2), 5-14.
- [71].Ray, R., & MacMillan, I. C. (2005). Innovation and financial performance: A model and Test. *Management Science*, 42, 389-403.
- [72].Rayhan, J., Sohel, S., Islam, A., & Mahjabin, S. (2012). Problems and Prospects of mobile banking in Bangladesh. *Journal of Arts, Science & Commerce*.
- [73].Riggins, F. J., & Weber, D. M. (2013). The impact of ICT on intermediation in the Microfinance Industry. *46th Hawaii International Conference on System Sciences* (pp. 46-55). IEEE Computer Society.
- [74].Roberts, P., & Amit, R. (2003). The dynamics of innovative activity and competitive advantage: the case of Australian retail banking, 1981 to 1995. *Organization Science*, 14(2), 107-122.
- [75].Robinson., M. (2003). *The Microfinance Revolution: Sustainable Finance for the Poor*. Washington DC: World Bank.
- [76].Rogers., E. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.: Free Press.

- [77]. Rojas-Suarez, L. (2010). *Access to Financial Services in Emerging Power: Facts, Obstacles and Policy Implication*. Washington DC: Center for Global Development.
- [78]. Shamim, F. (2007). The ICT environment, financial sector and economic growth: a cross-country analysis. *Journal of Economic Studies*, 34(4), 352-370.
- [79]. Shih, Y., & Fang, K. (2004). The use of decomposed theory of planned behaviour to study Internet banking in Taiwan. *Internet Research*, 14(3), 213-223.
- [80]. Singh, V., & Padhi, P. (2015). Information and Communication Technology in Microfinance Sector: Case study in Three Indian MFIs. *IIM Kozhikode Society & Management Review*, 4(2), 106-123.
- [81]. Sjauw-Koen-Fa, A., & Vereijken, I. (2005). *Access to financial services in developing*.
- [82]. Sonja, K. R. (2010). *Effects of Computerization on Saving and Credit Cooperatives in Uganda*.
- [83]. Ssewanyana, J. K. (2009). ICT Usage in Microfinance Institutions in Uganda. *The African Journal of Information Systems (AJIS)*, 5-28.
- [84]. Thulani, D., Tofara, C., & Langton, R. (2009). Adoption and Use of Internet Banking in Zimbabwe: An Exploratory Study. *Journal of Internet Banking and Commerce*, 14(1).
- [85]. Triodos-Facet. (2011). *Tanzania Microfinance Country Scan for Hivos/MicroNed*. Final Report, New York.
- [86]. Ullman, J. B. (2006). Structure equation modeling: Reviewing the basic and moving forward. *Journal of personality assessment*, 87(1), 35-50.
- [87]. Venkateswara, K. K., & Hanumantha, R. S. (2012). The paradigm shift in micro finance – Role of information and communication technology (ICT). *Asian Journal of Research in Business Economics and Management*, 2(2), 106-119.
- [88]. Vota, W. (2016). *Farmers Will Benefit Most from Mobile Financial Services*. Retrieved 01 03, 2017, from ICTWorks: <http://www.ictworks.org/2016/12/28/farmers-will-benefit-most-from-mobile-financial-services/>
- [89]. Wasilwa, N. S., & Omwenga, J. (2016). Effects of ICT Strategies on Performance of Commercial Banks in Kenya: A Case of Equity Bank. *International Journal of Scientific and Research Publications*, 6(11), 382-400.
- [90]. WB. (2017a). *Financial Inclusion*. Retrieved 09 13, 2017, from The World Bank: <http://www.worldbank.org/en/topic/financialinclusion/overview>
- [91]. WB. (2014b). *Financial Inclusion Data / Global Findex: Tanzania*. Retrieved 12 27, 2016, from <http://datatopics.worldbank.org/financialinclusion/country/tanzania>
- [92]. Yahaya, S., Yusoff, W. S., Idris, A. F., & Haji-Othman, Y. (2014). Conceptual Framework for Adoption of Islamic Banking in Nigeria: The Role of Customer Involvement. *European Journal of Business and Management*, 6(30), 11-24.