

Micro-determinants of Customer Level Interoperability: A Feasibility Study between Traditional Banks and Mobile Network Operators in Zimbabwe

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Abstract

MNOs have grabbed the unbanked market including the rural areas that traditional banks have failed to access, traditional banks have been experiencing a decrease in the level of activity, including liquidity shortages, low deposits and limited credit availability. The MNOs have lower charges for transacting, and offer more convenience and accessibility as opposed to traditional banks. Interoperability between traditional banks and MNOs has been riddled with challenges from the main stream banking sector. The paper seeks to find out if the traditional banking sector is indeed under threat from the use of the mobile money transfer system (MMTS) and if the two can harmonise their role in the market and operate together to the benefit of the Zimbabwean citizens. A quantitative study was adopted for the study with a view to gather information from mobile network operators. The population of agents for the three MNOs was 750, The 254 questionnaires were distributed to systematically-randomly selected clients from MNOs. Complementary data was collected from in-depth interviews from five randomly selected commercial bank managers and three MNOs managers to complement data collected from the questionnaires. A statistical analysis was also conducted to validate the results. Findings of this research indicate that in Zimbabwe males prefer mobile money transfer systems more than females, and the banking sector is dwindling because of the inability of traditional banks to adapt to the changes in the economy, technology and customer needs. It was also established that it is relatively easier and cheaper to open an account with MNOs in comparison to traditional banks hence higher numbers of clientele of MNOs. However traditional banks are more secure in transacting because of some of the locations of MNO agents are not secure and are risky to transact. Amalgamation between bank activities and MNOs activities are critical to serve satisfaction of customers.

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1 Introduction

Not-for- finance institutions also known as mobile network operators (MNO) have overtaken the traditional banking system by offering financial services through their respective networks. There has been an outcry in the developing economies, since these MNOs have grabbed the unbanked market including the rural areas that traditional banks have failed to access with their physical structures (Lyman, Pickens & Porteous, 2008). The MNOs and their agents have mushroomed the country with only a desk and a cell phone to convert mobile money into hard cash or vice versa. Morawczynski & Miscione (2008) explain that the MNOs provide an interface through cash-out and cash-in functions which provide convertibility between mobile money and cash.

Zimbabwean MNOs have recently started offering mobile money transfer services (MMTS), with Econet Wireless being the first to launch a Mobile Money Transfer System (MMTS) in 2011. UNCTAD (2012) describes Mobile money as simply the ability for cell phone users to transfer money from one subscriber to another as well as withdrawing cash from appointed mobile money agents. This development literally transformed the telecoms and banking sectors. More than two years later Econet's rivalries Telecel and Net One launched their own mobile payments systems. Econet has a subscriber base of 8.5 million which is the largest and more than the two operators combined (Econet, 2013). Of note is the rate at which MMTS has grown, the subscriber base of 8.5 million was acquired in 3 years, when most financial institutions have been in existence for more than ten years and have failed to accumulate half of such a clientele base (Econet, 2013).

Ecocash witnessed an exponential growth increase in both number and value of transactions. Just eighteen months after launch, 2.3 million Zimbabweans had registered for Ecocash accounts, outnumbering all of Zimbabwe's traditional bank accounts combined (Levin, 2013). World Fact-book (2012) reported that these accounts push about US\$200 million of volume over the platform every month and when annualised it represents an amount equivalent to 22% of Zimbabwe's GDP. In 2013, RBZ reported that mobile banking had grown tremendously with a 104% growth in mobile penetration and the registration of over 7 000 mobile agents across the nation and 119 million transactions having been effected through mobile banking (Nyakudzambara, 2014).

The banks on the other hand have been experiencing a decrease in the level of activity. RBZ (2014) through its Monetary policy reported that the country's banking sector had been experiencing vulnerabilities including liquidity shortages, low deposits and limited credit availability. As mobile money gained market share, traditional banks have been experiencing a downfall.

An MMTS tariff, which is split between the sender and the receiver, is only charged when transactions take place and yet with banks charges ranging from \$5-\$10 accumulate on a monthly basis even when the account is idle and interest only accrues annually at a very small margin of 3-5 percent. MMTS facilities such as Ecocash-save account do not charge monthly fees or withdrawal fees and an amount as little as \$5 accumulates interest on a fortnightly basis. This results in the cost of MMTS being very favourable and lower than those of banks. In addition, with MMTS, customers have access to a wide number of

agents even in the remote areas, peri-urban, high-density suburbs (locations) and rural areas or other suburbs in which banks were never stationed. This is contrary to banks which are not available in these remote areas, hence MMTS become more convenient. However, these MMTS have been accepted with skepticism by the traditional banking sector. Pickens (2009) believes that significant growth in mobile commerce has disadvantaged commercial banks in that their liquidity has been indirectly stolen. Bankers Association of Zimbabwe (BAZ) took its battle with Econet to the state legislature, demanding legislative redress to deal with the monopolistic tendencies of some MNOs arguing that interoperability would make it easier for people to get access to banking services (Gambanga, 2014). The operators argued that they were not in competition with the banks but were simply complementing them, as MNOs are just but a channel that offers banking services through a cell phone and eventually all the money goes to the bank (Telecash, 2013). Kufandirimbwa et al. (2013) added that the intervention of mobile money has significantly helped Zimbabweans who are facing liquidity challenges by offering financial services without the need for bank accounts and queues. Owning a cell phone is all that is needed to connect to this new financial network, without necessarily going to a banking hall.

Since this tag of war between the banks and MNOs, academic research to establish the level of association between mobile money services and bank liquidity in developing countries is still limited (Maurer, 2008). Given the above, it is imperative to find out if the traditional banking sector is indeed under threat from the use of the mobile money transfer system (MMTS) and if the two can harmonise their role in the market and operate together to the benefit of the Zimbabwean citizens. Next the paper presents literature review, followed by methodology, discussion of findings and finally the conclusion and recommendations.

2 Literature Review

There are marked differences between MMTS and traditional banking systems which seem to have paved the way for MMTS to dominate the market over traditional banking systems such as the mode of operation, the intended service to the customer, infrastructure requirements, initial requirements to open an account and access channels. The main microeconomics theories that explain the choice of mobile banking over the traditional banking channels are utility, principal agency and demand and supply theories, risk and uncertainties. The utility theory postulates that customers' choice of a product or service is derived from ease of access, use and/or interoperability. The higher the accessibility, ease of use and interoperability, the higher the satisfaction the consumer will attach to such a product or service. The utility theory explains the possibility of consumers' choice of MMTS over traditional banking systems. The principal agent conflicts have negatively affected the customer preference over traditional banking systems and shifted their preferences towards MMTS. Loss of confidence over traditional financial systems was as a result of risk aversion posed by past experiences bankers incurred due to hyperinflation episodes, and according to Levin (2013) there is a considerable percentage of the ex-banked which inevitably raises the uptake of MMTS.

2.1 MNOs versus Traditional Banks

According to Mugenyi (2009) mobile money is not an extension of banking, but a new form of banking, just as cell phones are a new form of telecommunication rather than an extension of landlines. The cumbersome requirements of banking systems over the requirements of MMTS give an edge to MMTS. A major difference between mobile money and traditional banking are the requirements needed to open an account, which include proof of residence, proof of employment while Mobile money registration only requires a user to have a mobile phone and a SIM card. The account takes at least ten days to be activated against the few hours for an MMTS. This becomes a hindering factor as most Zimbabweans are unemployed and do not own houses.

MMTS are accessible with much ease than traditional banks this is due to the infrastructural demands for MMTS which are basically a cell phone, a desk and chair. Kufandirimbwa et al. (2013) reported that the infrastructure required to conduct mobile money transactions includes mobile phone, mobile network coverage and electricity, while, the banking system requires one to visit the banking hall to interface with a human teller or the automated teller machine. In addition, mobile money operators have call centres while with banks a physical visit is required.

Gallup reported that mobile growth was very high in Zimbabwe between 2012 and 2013. This significant penetration increase has made basic mobile services available to billions of people across all income levels (Mauree&Kohli, 2013). During the same period the mobile operators in Zimbabwe, Econet, Netone and Telecel's market share stood at 56,8%, 23,7% and 19,5% respectively. After the introduction of mobile money by Econet, Netone and Telecel also followed, and this has positively affected the supply side of the economy through their operations with network services, and formal and informal points of sale throughout the country (Deloitte, 2012). MMTS has helped the ordinary Zimbabweans in a number of ways. Mobile money helps clients to access financial services at a lower cost (Kendall et al, 2011). A fundamental feature of mobiles is convenience, the ability to transact outside the banking system and without long queues. Klein & Mayer (2011) added that bypassing of bank clearing procedures is an important advantage of mobile money.

Unlike conventional banks, MNOs have created networks that reach further and deeper into rural areas, historically marginalised. Jack, William and Suri (2011) and Madanmohan (2011) add that the bulk of these transactions occur between urban and rural areas, as urban-habitants send money to the rural areas to support their extended families. As such, mobile money replaces the traditional informal methods of sending money for instance sending with someone or by bus. UNICTAD (2012) added that domestic money transfers have dominated amongst the mobile money services in Zimbabwe and even across East African Community. Transfer of funds to rural and remote areas has always been problematic and unorthodox methods employed which were very risky in their nature. The introduction of MMTS has closed this gap in the ordinary citizens of Zimbabwe.

Levin (2013: 5) clarifies this point when he says "The formal and informal sectors do not live in complete isolation from one another. Wealthier, banked Zimbabweans support their unbanked extended families and social networks, and unbanked Zimbabweans still need to make payments into the formal sector, such as utility bills and school fees." Mobile money taps into the unemployment sector as it does not demand people with high qualifications. This is in contrast with the traditional banking sector as the banks staff

comprises of a few people who are highly qualified. Mobile money recruits these people in large numbers as the agent network is one of the contributing factors of mobile money success (Pickens, 2009). According to budget figures from 2011 to 2014 the bulk of Zimbabwe is unemployed formally and are trading in the informal sector hence MMTS capture a wide net of users which are somewhat segregated by traditional banks which need proof of employment and residence before opening an account and an initial deposit of between US\$5-10.

Mobile money is appealing to people of little income and wealthier people still use it to transfer money to their marginalised relatives. Radcliffe (2010) highlights that mobile money reduces risks of loss inherent in handling cash and has also proves to increase savings opportunity in developing countries. MMTS offers convenience for everyone they can pay for goods and services without having to keep unnecessary amounts of cash on them. Kendall, Machoka, Maurer & Veniard (2011) bring about that, for retailers, the MNO's themselves suggest that keeping money in electronic form with clear records of every transaction is valuable to reducing the risk of theft and misappropriation by employees. The carrying out of transactions electronically reduces the production and circulation of counterfeit notes in an economy.

2.2 Disadvantages of MNOs

Despite all the benefits, some customers have been reluctant to adopt MMTS because they have grown comfortable with the traditional banking system (Kwiatkowski, 2010 as cited in Riquelme & Rios (2010). The perception of risk also influences a customer's readiness to accept a new technology service (Yang, 2009). Corradi et al. (2001) echoed that there is greater risk in the telecommunication process between mobile phones than between fixed devices. The probability of losing a phone also poses risk to users of mobile money. According to Mauree & Kohli (2013) MMT applications use various communication channels which are not usually secure, including SMS, USSD and IP-based communications. UNCTAD (2012) points out that a transaction is vulnerable to interception if the data sent either via the USSD or SMS platform is not encrypted.

Security issues become critical as there are risks of request/response manipulations, weak encryption and insecure message communications. Weak cryptographic implementation can result in fraudulent transactions and modification or loss of sensitive data in USSD-based mobile payment applications. However, WAP-based implementations can offer better security, as data are encrypted between the customer and the merchant/bank (ITU, 2013).

The other disadvantages of MMTS are that MMTS is only available to mobile phone users and other variables such as network coverage have to be present. It then indirectly discriminates those without mobile phones unlike banks which encompass all who would have opened bank accounts with them. But those marginalised by this are less than those discriminated against by the traditional banking system. Lonie (2012) notes that most mobile money services currently work unconnected to other payment services.

2.3 Importance of Customer Interoperability

Zimbabwe has not yet harmonised the operations of MMTS and traditional banks. However, Jenkins (2008) recommends industry players to develop mobile money ecosystems, which is basically an economic community supported by interacting organisations and individuals which include suppliers and competitors who co-advance

their capabilities. Jenkins stresses that non-interoperability is only reasonable in the inception stages, but in the long run, interoperability becomes favourable for consumers, giving the example of South Africa's Wizzit which allows customers to use their Wizzit master cards at any ATM.

Jenkins emphasizes the importance of interoperability to consumers by widening their choice for instance in South Africa, MTN offers not only MTN banking application but also access to FNB, Nedbank, ABSA and Standard bank. However, decentralisation requires information sharing between MNOs and platform providers to enable development of applications that can run on fellow systems. He added that interoperability can be achieved by three approaches which are standards, bilateral agreements and multilateral hubs. Rowlands (2009) identifies three types of interoperability namely: platform level, agent level and customer level, and this study will focus on customer level which is basically a customer's ability to access her account using any phone with the same network or access multiple accounts with one sim (Kabir & Michael, 2012; Kabukum, 2010).

Mobile money has been commended for increasing efficiency and lowering costs especially in developing countries where majority of transactions involve small amounts (Kshetri & Acharya, 2012). They added that this was supported by another study which found that for transactions involving to \$23, branchless banks cost 38% less than commercial banks and 54% less than informal money transfer channels. Mobile money is also known for convenience especially in the developing world where banking services are not easily accessible.

MNOs provide sales agents and retail outlets which reach out across customers in all income categories, for example in Pakistan 1 million people have bank accounts against 70 million with mobile phones (Jenkins, 2008). MNOs are being preferred by consumers because they enable payment of utility bills than with banks. In addition, they permit sending of money easily, cheaply and securely. They are time saving (time taken to process a transaction is shorter than with a traditional bank). Their versatility, that is their ability to access multiple services using one device as compared to plastic cards gives them competitive advantage. Consumers also gain security advantages with the ability to view their transactions any time on their mobile phones (Jenkins, 2008).

Customers favour mobile money because it is easy to access (Morawczynski & Pickens, 2009). A study conducted in Singapore by Riquelme & Rios (2010) has found ease of use as a stronger influence of females than males. Wan et al (2005) found that males are more inclined to adopt bank technology than females. Amin et al (2006) says that females are more concerned with security issues than males while males pay more attention to effectiveness.

Mbiti and Weil (2011) found users of M-Pesa to be more likely younger, wealthier, better educated, banked, employed in non-rural sectors, to own cell-phones and to reside in urban areas. Mbiti & Weil found 35% of banked individuals saving with M-Pesa and only 19% of the unbanked saving with the same. Individuals with bank accounts use M-Pesa more almost three times those without. And those with mobile phones use M-Pesa three times more than those without phones with men using M-Pesa 35% more than women. Overall, the study found that higher socio-economic status people use M-Pesa more. Despite that Morawczynski & Pickens (2009) add that mobile money has increased rural livelihoods.

2.4 Constraints of Interoperability

Despite the benefits of interoperability which include increasing competition and breaking dominance, reducing costs and increasing customer choice (Cagri, 2013), interoperability is still limited. The quest to balance competition and collaboration have hampered interoperability as MNOs seeking to gain competitive advantage in new markets are reluctant to give up control (Dolan, 2009). On the other hand, majority of people in developing countries lack alternatives to cash such as credit cards. Kshetri & Acharya (2012) reported that in Africa only 20% of families have bank accounts, 10% in Kenya, 5% in Tanzania and in Zimbabwe people prefer to use mobile banking to reduce the risk of being robbed of their money.

One major setback in interoperability is lack of collaboration between banks and platform providers. Kshetri & Acharya (2012) gave the example of Kenya, where deposits initiated by M-Pesa users take long to be credited to customers' bank accounts, and customers also struggling to withdraw money from banks using M-Pesa account. They added that the traditional banks lacked proper tools to address mobile payments.

Another challenge is that payment models that rely on advanced technology are not suitable for the developing countries. Security issues are also a challenge as cyber criminals target mobile payment users particularly in emerging markets. They expect more incidences of mobile malware in future since the antivirus are either less developed or unaffordable.

3 Data and Methodology

A quantitative study was adopted for the study with a view to gather information from mobile network operators (Econet, Netone and Telecel). The population of agents for the three MNOs was 750 according to (Potraz, 2014) and according to Krejcie & Morgan (1970) the sample size should be 254. The 254 questionnaires were distributed to systematically-randomly selected clients from the Ecocash, One-wallet and Telecash client base respectively, based on Potraz's (2014) findings that the market share for Econet, Netone and Telecel stood at 56.8%, 23.7 and 19.5% respectively as at December 2014. To these a questionnaire with a 5- point scale was administered which focused on convenience of MMTs services mainly on three issue to do with accessibility, ease of use and cost and time effectiveness. Customers were also probed to choose their mostly preferable service provider namely i) a bank; ii) Ecocash; iii) One-wallet and iv) Telecash. Of the 254 questionnaires distributed 200 questionnaires were properly filled out in the ratio of 114, 47 and 39 for ecocash, one-wallet and Telecash respectively. The Secondary data was also utilised from the various MNO on their demographics and clientele distribution and volume of transactions. Other data was collected from interviews from ten agents of each provider in the top-five cities in the country (Harare, Bulawayo, Gweru, Mutare and Kwekwe) regarding their attitudes towards the interoperability of MNO and traditional banking institutions. In-depth interviews were utilised from five randomly selected commercial bank managers and three MNOs managers to complement data collected from the questionnaires. A statistical analysis was also conducted to validate the results.

3.1 Logistical Estimation Methodology

The possible impact of micro-determinants of customer-level interoperability using the following logistical regression model:

$$F(x) = \frac{\exp(z_i)}{[1 + \exp(z_i)]} \text{ and } -\infty \leq z \leq \infty ; \quad \text{Clearly; } 0 \leq F(x) \leq 1$$

Where:

$F(x)$ is a function which follows a logistic (cumulative) distribution

$F(x)$ is a function such that $F : x \rightarrow [0; 1]$ and x equals to one if the customer under consideration prefers MMTs service over a bank service and zero otherwise.

The variable z_i represents the MMTs service preference determining factors by individual i while $F(x)$ represents the probability of such an event occurring. The variable is a measure of the total contribution of all the MMTs determining factors by customers used in the z_i model and is known as the logit. The above function can be transformed into the following model:

$$z_i = \alpha_0 + \beta_i X_i + \varepsilon_i$$

Where α_0 = constant

β_i = a vector of parameters of explanatory variables

X_i = a vector of socio-economic, technological and demographic explanatory variables determining customer's choice of MMTs services over banks services

ε_i = white noise error term

4 Main Results

4.1 Questionnaire Results

In line with Wan et al. (2005) as cited in Riquelme & Rios (2010) found males more inclined to using mobile banking technology than females, and Amin et al (2006) noted that females are more concerned with security issues as compared to males who are concerned with effectiveness, findings of this research indicate that in Zimbabwe males prefer mobile money transfer systems more than females.

When asked if mobile money is a threat to the Zimbabwean banking system out of the total number of respondents questioned, 40% of the respondents, strongly agreed that the mobile money system was a threat to the banking sector, whilst 30% of the respondents agreed, 20% of the respondents were not sure and 10% of the respondents disagreed. These findings bring out that according to mobile money customers; mobile money is a threat to the banking system as a majority of 70% agreed that mobile money is indeed a threat to the banking system in Zimbabwe. This response corresponded with Pickens, (2009) who believes that the significant growth in mobile commerce disadvantages commercial banks. This was further compounded by all the managers of banks, who acknowledge that the banking sector is dwindling because of the inability of traditional banks to adapt to the changes in the economy, technology and customer needs.

When respondents were asked if mobile money services are very different from services offered by banks 50% of the respondents strongly agreed, 20% of the respondents only agreed and 10% of the respondents were uncertain whilst 20% of the respondents disagreed. The research findings are indicative of the fact that the clients view mobile money services as very distinct from traditional banks. This is supported by Mugenyi (2009) mobile money is not an extension of banking, but a new form of banking. From the interviews conducted the services that are offered by MMTSs are similar to that banks now offer with their e-banking services. When the respondents were asked on the major differences between MMTSs and traditional banks the respondents' cited reasons include requirements for opening of an account, access to the account and the mode operation. Findings showed that 40% of the respondents of the customers strongly agreed that opening an account and accessing the account is easier with MNOs, 30% of the respondents also agreed and 20% of the respondents were not sure on the question as they did not have accounts with traditional banks hence it was difficult for them to draw a comparison. Ten percent of the respondents disagreed and were of the opinion that traditional banks were better in comparison to MMTSs. Bank manager confirm that it is relatively easier and cheaper to open an account with MNOs in comparison to traditional banks hence higher numbers of clientele of MNOs.

When asked if a stronger system could be formed by integrating the two systems i.e. interoperability. The results indicate that a majority of the customers 70% of the respondents are of the opinion that a stronger system would result if the banking system is integrated with the mobile money system. The customers' responses confirm an assertion offered by Swift (2012) who acknowledges that interoperability, for end-customers simply means that it works and is easy, fast, safe and cheap. Five percent of the respondents were unsure as to how that would be feasible practically on the ground. Twenty-five percent of the respondents disagreed that the interoperability of MMTSs and traditional banks was possible. The bank managers who were interviewed agreed that the interoperability of banks and MMTSs would benefit the traditional banks more than the MMTSs. Banks are currently riddled with liquidity challenges that would be alleviated by the merger with MMTSs which operate in a very liquid state. Though they added that MMTSs do not have minimum capital requirements which would help their partnering with the traditional banks by the inflows to the traditional banking sector.

When respondents were also asked whether they still maintained any bank accounts, the results showed that 56% of the respondents confirmed that they had bank accounts but still went on to use mobile money transfer services whenever they wanted to receive or send money, 44% of the respondents did not have bank accounts with traditional banks. The major reason for not having traditional bank account was due to the inability to meet the requirements for opening bank accounts due to mainly unemployment. All the respondents had accounts with the MMTSs even if they maintained traditional bank accounts. The major reason brought forward was that MMTS are efficient and convenient due to their nature of being accessible all round the clock. This response confirms an assertion by World Bank (2009) which said that consumers take advantage of the efficiencies, and technology development brings along.

Sixty percent of the respondents of the respondents strongly agreed that mobile money is more convenient than the traditional banking system. Twenty-four percent of the respondents agreed and the remaining 16% were uncertain as they highlighted that the MMTS also has some downtime when the network is down although this is less frequent and normally lasts for only a few hours. Overallly, these results translate to 74% of the

respondents agreeing that mobile money systems are much more convenient than the traditional banking system. Some of the factors listed include that MMTS can reach remote areas where there are no bank branches and the system can also operate outside the normal working hours within which the banking system operates. As noted by Lyman, Pickens & Porteous, (2008) MNOs have invested in the necessary infrastructure in rural areas that traditional banking services have failed to access with brick and mortar branches.

The question on whether the mobile money system's security is weaker than the traditional banking system got mixed responses. Ten percent of the respondents strongly agreed that the banking system is more secure, 26% agreed and 64% were uncertain. It was also revealed that mobile money is a success because of simple infrastructure more than low transaction costs and loss of trust in the traditional banking system. The two have been found to have few similarities as 55% of the respondents only identified that the two are both modes of financial services and that they both use Personal Identification Numbers (PIN) while 45% who disagreed hammered on factors such as cyber-crime. Bank managers also shared the same sentiments by Kufandirimba et al. (2013) traditional banks are more secure in transacting because of some of the locations of MNO agents are not secure and are risky to transact.

With the growth in mobile phone penetration outstripping growth in access to conventional banking systems, mobile transfer and financial systems are increasingly being viewed by central banks in the developing world, as a great way to enhance financial inclusion and in bringing banking to the unbanked. A partially integrated product clearly delineates the role of the bank, which provides and owns banking services, and the mobile service provider, which provides the mobile telephony infrastructure and controls the agent network. The bank compensates the mobile service provider for access to the network and enjoys the remaining profits.

4.2 Statistical Results

Table 1: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Education level	200	12.84538	2.787995	4	17
Age	200	46.81152	5.129098	5	72
Dependents	200	6.676346	0.4615122	4.60517	8.537
Income	200	419.85378	60.96637	45	3545

The descriptive statistics in table 1 shows that the average educational level is 13 years, that is, on average the MMTs customers have achieved ordinary level of education with a deviation from this mean of around 2.78. In other words, mean educational level is advanced level (i.e., 13years of education), which ranges from ordinary level (10years) to diploma level (16years) the average age of MMTs customers in the five cities is around 47 years with the second highest standard deviation of 5.13, which a ranges from 41.68 to 51.94 years. Using the same analysis, the average number of dependents of each customer who uses MMTs is approximately seven people, with a smallest standard deviation of 0.4615 and lastly the average income is approximately \$420, with the largest variation

around the mean of about \$60.97 which justifies the use of logarithm of income instead of actual income level, to reduce problem posed by outliers (Gujarati, 2013, Maddala & Lahiri, 2009; Cameron & Trivedi, 2005; Greene, 2005, 2008).

4.2.1 Diagnostic Test Results

It's critical and of paramount importance to diagnose the data to ascertain whether it satisfy crucial econometric assumptions in order to guarantee the efficiency, constituency and reliability of results (Greene, 2008; Gujarati, 2013; Cameron & Trivedi, 2005). The diagnostic tests to be carried out includes; multicollinearity and heteroskedasticity.

4.2.2 Multicollinearity Test

According to Gujarati (2013) multicollinearity is the existence of ideal or perfect linear correlation among some or all exogenous variables of a regression model and results in large variance and covariances, making precise estimation difficult. It also results in much wide confidence interval leading higher chances of committing type II error that is, not rejecting the null hypothesis that the true population coefficient is zero, when it is supposed to be rejected. Furthermore, t-ratios of most parameters in the model will be statistically insignificant. Presence of multicollinearity invalidates the application of the *ceteris paribus* assumption when interpreting the coefficients of explanatory variables. This will render the essence of variable interpretations contemporaneous. Correlations and variance inflation factors are mostly used as indicators of severe multicollinearity. Correlations between explanatory variables in excess of 0.8 in absolute terms are considered an indication of severe multicollinearity (Gujarati, 2013). The correlation matrix table 2 below indicate no correlations in excess of 0.8 an indication of no severe multicollinearity in our empirical model.

Table 2: Correlation Matrix

Variable	Education level	Cost Effectiveness	Income	Marital Status	Gender	Region	Bank a/c ownership	Interoperability
Education level	1.0000							
Cost effectiveness	-0.1196	1.0000						
Income	0.3939	-0.1895	1.0000					
Marital status	-0.0012	0.2086	-	1.0000				
Gender	-0.0083	-0.2150	0.3250 0.2875	-	1.0000			
Bank a/c ownership	0.1843	0.1154	0.2240	0.1044	-	1.0000		
Region	-0.1216	0.1218	-	0.0516	-	-0.135	1.0000	
Interoperability	0.7218	0.6904	0.7793	-0.092	0.1606	0.0526	0.7877	1.0000

Variable	Religion	Security	Age	Age squared	Accessibility	Ease of use	Dependents	Employment Status
Religion	1.0000							
Security	-0.6194	1.0000						
Age	-0.4561	0.5356	1.0000					
Age-squared	0.0404	-0.0038	0.9834	1.0000				
Accessibility	-0.0023	0.0822	0.5153	-0.7428	1.0000			
Ease of use	-0.0016	0.5218	0.6521	-0.7516	-0.7403	1.0000		
Dependents	0.1269	0.2568	0.0418	-0.306	-0.0628	0.089	1.000	
Employment Status	-0.619	0.0837	0.6211	-0.084	0.0706	0.2018	0.0413	1.0000

In multiple regression, computationally, the variance inflation factor (VIF) is defined as the reciprocal of tolerance: $1 / (1 - R^2)$. Ceteris paribus, researchers desire lower levels of VIF, as higher levels of VIF are known to affect adversely the results associated with a multiple regression analysis. In fact, the utility of VIF, as distinct from tolerance, is that VIF specifically indicates the magnitude of the inflation in the standard errors associated with a particular beta weight that is due to multicollinearity. Various recommendations for acceptable levels of VIF have been published in the literature. Kennedy (1992), Marquardt (1970), Neter et al. (1989), Hair et al. (1995) argued that the most common value of 10 has been recommended as the maximum level of VIF. The VIF recommendation of 10 corresponds to the tolerance recommendation of 0.10 (that is, $1/0.10 = 10$). However, Rogerson (2001) recommended that the maximum VIF value of 5 and even 4 (Pan and Jackson, 2008) can be found in the literature. The average VIF value for this research in table 3 below are less than the ones stated in literature above, which is an indication of less severe multicollinearity, complementing the results shown on the correlation matrix in table 2 above.

Table 3: Variance Inflation Factor

Variable	VIF	1/VIF
Age	19.29	0.030974
Age-squared	18.77	0.031478
Marital status	2.12	0.446125
Gender	2.1	0.460111
Education level	1.98	0.505074
Security	1.72	0.581359
Income	1.65	0.607886
Employment status	1.68	0.594652
Bank a/c ownership	1.55	0.644288
Dependents	1.50	0.665171
Accessibility	1.22	0.821555
Interoperability	1.20	0.851327
Cost effectiveness	1.16	0.868081
Ease of use	1.15	0.871668
Religion	1.14	0.879181
Region	1.05	0.950256
Mean VIF	3.77	

4.2.3. Heteroskedasticity Test

Is a situation where by error variances appearing in the population regression function (PRF) are not constant, that is, all disturbance terms have different and time variant-variances. Heteroskedastic error terms result in inefficient estimators both in small samples and large samples, that is, it yields parameters which are no-longer Best, though they are Linear and Unbiased (BLUE) (Gujarati, 2013). The test is carried out based on the null hypothesis that there is no heteroskedasticity against the alternative that there is heteroskedasticity. To test for homoskedasticity of the error terms in our model we used the both the Breusch-Pagan / Cook-Weisberg test, the White’s test with unrestricted residuals and the Cameron and Trivedi’s decomposition IM-test and the result are presented in table 4 and 5.

Table 4: Breusch-Pagan / Cook-Weisberg Heteroskedasticity Test Results
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity

Ho: Constant variance
Variables: fitted values of MMTs choice
chi2(1) = 17.18
Prob> chi2 = 0.0000

Table 5: White’s and Cameron & Trivedi's Heteroskedasticity Test Results

White's test for Ho: **Homoskedasticity**
against Ha: Unrestricted Heteroskedasticity
chi2(183) = 94.85
Prob> chi2 = 0.0000

Cameron & Trivedi's Decomposition of IM-test

Source	Chi-square	Degrees of Freedom	p-value
Heteroskedasticity	94.85	183	0.0000
Skewness	89.99	16	0.0000
Kurtosis	0.28	1	0.5968
Total	185.12	200	0.0000

The Breusch-Pagan / Cook-Weisberg test, White’s test and the Cameron and Trivedi’s decomposition IM-test results in table above indicates the probability-values of the chi-square (χ^2) less than 0.1, 0.05 and 0.01, which gives a no rejection decision on the null hypothesis of no heteroskedasticity at all level of significance. These three tests’ results indicate the presence of heteroskedasticity, an indication of larger than necessary standard errors. To correct this problem, the researchers used robust or Hubber-White standard errors as recommended by Green (2008) and Cameron & Trivedi (2005). In addition, the results in table 5 indicate that the null hypothesis of no positive or negative skewness was rejected in favour of a positively skewed data at all level of significance since the

probability value of skewness is greater than the 1%, 5% and 10% critical values. But the null hypothesis of mesokurtic data was not rejected since the probability value of the kurtosis was not significant. This implies that the peakedness of the distribution of the data was not leptokurtic or platkurtic. The kurtosis test results indicate that, though the data is positively skewed, overall, the errors are normally distributed, since the null hypothesis of a kurtosis value of 3 ($H_0 : K = 3$) was not rejected and that the alternative hypothesis of kurtosis value of smaller or greater than 3 ($H_1 : K \neq 3$) was rejected. This validates the use of a z-score test for determining the significance of the parameters, since they are based on the normal distribution or normality assumption (Gujarati, 2013).

4.3. Regression Results

Table 6: Logistical Regression Results

Variable	Coefficient	Std. Err.	z-score	P>z	[95% Confidence	Interval]
Interoperability	-0.6050***	0.0982	-6.16	0.000	-0.7975	-.4125
Education level	-0.1504***	0.0194	-7.73	0.000	-0.1885	-0.1122
Cost effectiveness	0.6363***	0.1496	4.25	0.000	0.3431	0.9296
Income	0.8018***	0.1062	7.55	0.000	0.5936	1.0100
Marital status	-0.2252	0.1953	-1.15	0.249	-0.6079	0.1575
Gender	0.5404***	0.1484	3.64	0.000	0.2495	0.8314
Bank a/c ownership	0.4348***	0.0844	5.15	0.000	0.2693	0.6003
Region	-1.0061***	0.0908	-11.08	0.000	-1.1841	-0.8282
Religion	0.1422*	0.0784	1.81	0.070	-0.0115	0.2958
Security	1.6861***	0.0983	17.15	0.000	1.4934	1.8788
Age	1.501***	0.0979	15.33	0.000	1.3091	1.6929
Age-squared	-0.0913***	0.0081	-11.25	0.000	-0.1072	-0.0754
Accessibility	-0.0169***	0.0038	-4.48	0.000	-0.0243	-0.0095
Ease of use	-0.6154***	0.0254	-24.18	0.000	-0.6652	-0.5655
Dependents	0.0161*	0.0089	1.82	0.069	-0.0013	0.0334
Employment status	0.5035***	0.0957	5.32	0.000	0.3179	0.6892
Constant	-0.9187	0.7581	-1.21	0.226	-2.4045	0.5671

Note: *(**)(***) indicates significance at 10%, 5% and 1%

Number of obs	200
LR chi2(16)	1101.23
Prob> chi2	0.0000
Pseudo R2	0.2016
Log likelihood	-2180.2813

Results in Table 6 indicates that factors that significantly increases the preference of MMTs by customer over traditional banks are cost effectiveness, disposable income, bank account ownership, religion, security age, gender, number of dependents and employment status. On the other hand, factors such as interoperability between banks and MMTs, region, educational level, region, age-squared of the respondent, accessibility and ease of use reduce the preference of MMTs by customers over traditional banks.

Table 7: Logistical Marginal Effects

Variable	dy/dx	Std. Err.	z-score	P>z	[95%	C.I.]	X
Interoperability	-0.1492***	0.0237	-6.30	0.000	-0.1956	-0.1028	0.6538
Education level	-0.0329***	0.00425	-7.75	0.000	-0.0413	-0.0246	12.8454
Cost effectiveness	0.1498***	0.03678	4.07	0.000	0.0777	0.2219	0.0723
Income	0.1756***	0.02322	7.56	0.000	0.1301	0.2211	6.6764
Marital status	-0.0477	0.0399	-1.20	0.232	-0.1259	0.0305	0.1126
Gender	0.1105***	0.02799	3.95	0.000	0.0556	0.1653	0.8144
Bank a/c ownership	0.0927***	0.01749	5.30	0.000	0.0584	0.1260	0.6538
Region	-0.2008***	0.01606	-12.50	0.000	-0.2323	-0.1693	0.2903
Religion	0.0313*	0.01733	1.80	0.071	-0.0027	0.0652	0.3954
Security	0.3538***	0.01873	18.89	0.000	0.3171	0.3904	0.5112
Age	0.3529***	0.02054	17.18	0.000	0.3127	0.3932	0.3640
Age-squared	0.0200***	0.00178	-11.21	0.000	-0.0235	-0.0165	46.812
Accessibility	-0.0037***	0.00083	-4.48	0.000	-0.0053	-0.0021	19.854
Ease of use	-0.1535***	0.00638	-24.10	0.000	-0.1662	-0.1412	12.845
Dependents	.040*	0.00221	1.82	0.069	-0.0003	0.0084	46.812
Employment status	0.1248***	0.02313	5.40	0.000	0.07946	0.1701	0.3954

Note: *(**)(***) indicates significance at 10%, 5% and 1%

The logistical marginal effect results in table 7 indicate that interoperability which was measured by MMTs customers' views on the importance of vertical integration or amalgamating the services of banks and mobile money network operators using a 5-likert scale which was recoded into a binary dummy variable with two outcomes, those who disagree were given a value of 1 and zero if otherwise. It has been found that the amalgamation of bank and mobile money network operators increases the probability of MMTs preference by financial services users over traditional banks by 14.92%. The interoperability odds-ratio in table 8 indicates that those who agree that vertical integration between bank and mobile money network providers have 0.4539 higher probability of MMTs preference than those who disagree. This indicates the level of importance that the interoperability between banks and MNOs play on achieving customers' satisfaction. On the same vein, surprisingly higher education level was found to reduce the probability of MMTs choice over banks by financial services users. The educational level marginal effects on table 7 shows that an additional year of education reduces the chance of MMTs use by 3.29% and its odds-ratio on table 8 indicates that a customer who is highly educated is 0.8604 time less likely to prefer MMTs services than bank services as compare to an individual who has a lower level of education. In other words, less educated individuals have a 0.1316 higher probability of preferring MMTs service use than banks as compared to highly educated individuals. The reason might be that those who are less educated in most instances have less chance of finding formal employment and also find it difficult to afford to open accounts with financial institutions due to higher account opening and servicing cost. This support the assertion by Demircuc-Kunt & Klapper (2012) that, MMTs services increase financial inclusion,

economic growth and reduce poverty especially in developing countries where more than 70% of the world's population under abject poverty resides.

On another note, the cost effectiveness of MMTs increases their preference by clients over traditional banks by 14.98%. Lower cost of MMTs drives clients to prefer them by 1.8896 times as compared higher cost of banks. This indicates that lower MMTs cost increases the probability of preference of MNOs services by customers by 0.8896, which might be even higher if the services offered by MMTs and banks are fused together. Customers' income level either from relatives, formal or informal sources increases the preference of MNOs services as opposed to bank services by 17.56%. Individuals with more access to money, either from local or Diaspora relatives, formal or informal sources are 2.2295 times more likely to choose MMTs service against banks when compared to those faced with financial constraints to such sources. This confirms the importance of social fabric in African communities. Results have also shown that gender determine the use of MMTs services. Males have shown to have higher chances of using MMTs services more intensively than female. The logistical marginal effects from the research have shown that an additional male increases the MMTs use intensity by approximately 11.1% and odds-ratios indicates that males are 1.7168 times more likely to use MMTs financial services than females. This is an indication that males are early adopters of technology by an extra probability of 0.7168 and women are laggard by the same magnitude as far as technology is concerned. This concurred with research findings by Mbiti & Weil (2011).

Table 8: Logistical Odds-Ratios

Variable	Odds Ratio	Robust Std. Err.	z-score	P>z	[95% Confidence	Interval]
Interoperability	0.5461***	0.0514	-6.43	0.000	0.4541	0.6567
Education level	0.8604***	0.0163	-7.92	0.000	0.8290	0.8930
Cost effectiveness	1.8896***	0.3000	4.01	0.000	1.3843	2.5792
Income	2.2295***	0.2285	7.82	0.000	1.8238	2.7256
Marital status	0.7983	0.1689	-1.06	0.287	0.5274	1.2084
Gender	1.7168***	0.2533	3.66	0.000	1.2857	2.2923
Bank a/c ownership	1.5446***	0.1300	5.17	0.000	1.3098	1.8215
Region	0.3656***	0.0326	-11.29	0.000	0.3070	0.4354
Religion	1.1528*	0.0874	1.87	0.061	0.9935	1.3375
Security	5.3984***	0.5609	16.23	0.000	4.4038	6.6177
Age	4.4862***	0.4378	15.38	0.000	3.7052	5.4318
Age-squared	0.91273***	0.0095	-8.79	0.000	0.8943	0.9315
Accessibility	0.9832***	0.0036	-4.62	0.000	0.9762	0.9903
Ease of use	0.54045***	0.0144	-23.08	0.000	0.5129	0.5694
Dependents	1.0162*	0.0088	1.85	0.064	0.9990	1.0337
Employment status	1.6546***	0.1611	5.17	0.000	1.3671	2.0023

Note: *(**)(***) indicates significance at 10%, 5% and 1%

Bank account ownership of MMTs users increases the use intensity of MMTs services by customers. The results presented in table 7 indicated that an additional account holder increases the probability of MMTs use intensity by 9.27% and the odds ratios in table 8 pointed out that a bank account holder is 1.546 times more likely to use MMTs more intensively than a non-bank account holder. Mbiti & Weil (2011) found those with bank accounts using MMTs three times more than those without. This furtherance and complements the importance of interoperability of banks and MMTs at the expense of antagonistic and isolated operation. Therefore, it has been found that the services of

MMTs and banks are complements rather than being substitutes, which is supported by 76% of the respondents with bank accounts who said that they can pay their utility bills and credit accounts using their mobile lines linked to their bank accounts in the comfort of their homes. By the same token, region which was a dummy variable divided into two categories, that is, whether one resides an urban district (with a value of 1) or rural district (with a value of 0), was an important variable in explaining customers' satisfaction with the services of MMTs. Those in rural districts use MMTs service more intensively and their preference towards MMTs is higher than traditional banks when compared to those in urban districts. If one moves from a rural district to an urban district the use intensity of MMTs services declines by 20.1% and one in an urban district is 0.37 times less likely to use MMTs services than one in a rural district. This was contrary to Mbiti & Weil (2011) who found those in urban areas inclined to use MMTS more than those in rural areas. Security of funds was a major determinant of MMTs services choice by customers based on the odds-ratios which indicated that customers' belief that funds channelled through MMTs are 5.4 times more likely to be secured than those channelled through traditional banks. This loss aversion feeling is insightful on how risk averse Zimbabweans are towards bank services and might be a justification on why the Reserve Bank of Zimbabwe observed that more than 2 billion US dollars is circulating outside the formal financial system which contributed immensely towards the current liquidity crisis bedevilling the economy.

Age has been found to have a curve-linear impact on the preference of MMTs services. Age has a positive effect on customers' satisfaction with MMTs services implying that as one grows the more one understands technology and the importance MMTs use as a way of sending and receiving money. As one grows up an additional year increases the use of MMTs by 35.3% and as one becomes older an additional year reduces the use of MMTs services 2%. The odds ratios of age and age-squared indicated that old individuals are 4.49 times more likely to use MMTs services more intensively than those who are young and older citizens are 0.91 times less likely to use MMTs services than less old ones. that is, a middle aged individual says in-between 18-65 has a 0.49 higher chance of understanding the ICT technology than one who still in childhood ages and an individual who is more advanced in age say in late 80s has 0.09 lower probability of using MMTs than those in middle ages. Accessibility of MMTs has also been found to influence preference. The results have shown that as the distance from the MMTs increases the preference declines. This might be taken as a justification why rural residence derives higher utility from MMTs services as compared to banks. The reason might be that banks have minimal coverage in rural area and bank customers have to travel long distance to the nearest bank branch when compared to urban areas. an additional meter reduced the chances of using MMTs services by 0.37% and MMTs located a bit far away are 0.98 less likely to be preferred by client than those located closer. Ease of use was also found to be an important determinant of MMTs use. Ease of use reduces the service satisfaction of MMTs users by 15.4% and unfriendly user language and service options from MMTs service provider is 0.54 times less likely to induce customer satisfaction than a more user friendly service. Riquelme & Rios (2010) found ease of use as a major influence to women than men. Number of dependents has also been found to positively influence the chances of MMTs service use. Those with more dependents were found to be 1.02 more likely to use MMTs services more intensively than those with less dependents which is in line with African traditional culture of not forgetting relatives and siblings who are in need. An additional dependent has been found to increase the use intensity of MMTs

services by 4%. Lastly, employment status increases the preference of MMTs by citizens. Those who are unemployed have higher chances of using MMTs more intensively than banks the reason being that they are unable to meet bank account opening requirements. If one changes employment status from being employed to unemployed the chances of using MMTs than bank service rise by 12.5% and one who is unemployed is 1.65 times more likely to use MMTs at the expense of bank services than someone who is employed. Mbiti & Weil (2011) also found those employed in non-rural sectors using MMTS more.

5 Conclusions

Amalgamation between bank activities and MNOs activities are critical to serve satisfaction of customers. Security issues have higher impact on the choice between MMTS and banks. Customers are mostly concerned with security issues, and they perceive MMTS as more secure, probably because of their past experience with banks, while religion has no impact at all. Security issues were followed by age, and the study concluded that customers understand MMTS more when young. Ease of use, followed by security had higher significance, while marital status has no significance on choice between bank and MMTS.

Variables that increase customer's choice of MMTS over banks are cost effectiveness, followed by income, gender, bank account ownership, age, number of dependents and employment status.

Cost effectiveness- MMTS is viewed as less costly and this maybe because of intervention of Potraz, but Zimbabwean rates are more expensive compared to other African countries for example M-Pesa in Kenya.

Income- customers with higher income are more likely to use MMTS than bank services.

Gender- Males use MMTS more than females

Bank account ownership- those who own bank accounts use MMTS services more than those without

Age- the young people between 18 and 60 years use MMTS more than the older, and the oldest people hardly use such services, and this can be explained by the ability to understand technological demands for a transaction to be effected.

Number of dependents- the customers with more dependents use MMTS more. An increase in dependents increases the chances of an MMTS transaction

Employment status- the study found the unemployed using MMTS more, probably because unlike banks, MNOs do not have prohibitive requirements

Interoperability between banks and MMTS increases customer choice of MMTS than bank because he no longer has to visit the bank more often. Surprisingly, and contrary to findings of prior studies, the less educated use MMTS more than banks probably because they don't meet the bank requirements. Those in rural areas prefer MMTS to banks probably because of bank coverage as banks are situated far from residents and the costs involved are higher. These findings are in line with the World Bank report that MMTS are closing the gap. Age squared showed that as a customer becomes older the use of MMTS dwindles. Accessibility- customers prefer MNOs because they are more accessible to banks. In addition, MMTS provide customers with ease of use with just a phone and no deposit or withdrawal slips.

5.1 Recommendations

The study recommends that there must be interoperability as it increases customer satisfaction and benefits to both banks and MMTS since a person with a bank account has higher chance of using MMTS. Banks on the other hand should review their bank account opening requirements and reduce their transaction costs so as to promote financial inclusion.

In line with the government's gender policy, MNOs must do workshops to encourage women to use MMTS. MNOs must open more agents in rural areas to take advantage of low coverage of banks in that area. MNOs must come up with more security measures to boost customer confidence and should introduce investment options to trap excess cash in the informal sector. MNOs must have options for local languages to capture the older. Banks should adopt services tailor made for the unemployed for instance in South Africa banks have zero deposit and zero-charge accounts.

6 Areas for further Study

This research only focused on the feasibility of interoperability of banks and MNOs focusing on customer level interoperability. Research could also be carried out on interoperability at platform level and, agent level.

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