

# The Assessment of Technologies and Security Platforms Employed in Mobile Money Transfer System in Ghana.

## (A Case Study in Ashanti Region, Kumasi)

Richard Tuffour<sup>1</sup>, Joseph Kobina Panford<sup>2</sup>, James Ben Hayfron-Acquah<sup>3</sup>

richie\_az@yahoo.co.uk, jpanford@yahoo.com, jbha@yahoo.com

<sup>1</sup>Kwame Nkrumah University of Science and Technology, Dept. of Computer Science, Kumasi, Ghana

<sup>2</sup>Kwame Nkrumah University of Science and Technology, Dept. of Computer Science, Kumasi, Ghana

<sup>3</sup>Kwame Nkrumah University of Science and Technology, Dept. of Computer Science, Kumasi, Ghana

\*\*\*

**Abstract** - Mobile money payments are gradually growing within the African continent with the idea to elevate the cash system of this global system to be cashless. By acceptance of mobile money services and number of business used cases designed each day, it has become important to assess the technologies and the security aspects used in mobile money transfer that will highlight the need to improve the services it gives to prevent the system from theft attacks. This research, therefore examines the technologies and the security platforms used in the mobile money transfer and how it is being used in the service.

The research is a case study about the assessment of technologies and security platforms employed in mobile money transfer in Ghana specifically in Ashanti Region, and used qualitative and quantitative data collected through questionnaires and structured interviews of key staff of the mobile network operators (MNOs). Some of the main findings of this research include the problems faced by the vendors of the various mobile money transfers. It was also identified that one of the major causes of vendor problems includes data traffic jams and network hacking. In addressing mobile money fraud, it is suggested that the service provider should give mobile money security tips to the users at least twice in a year through short message service to alert them of ways to enhance the security of their mobile phones.

**Key Words:** Authentication, Authorization, Confidentiality, Integrity, Mobile Network Operators, Non-repudiation, Payment Systems, Short Message Service,

## 1. INTRODUCTION

### 1.1 Background

Mobile phones usage has transformed the social lives of people through communication and has opened up a wide varieties and unprecedented platforms for business activities.

A mobile money transfer is the transfer of cash from one mobile phone to another, through a mobile device system. Mobile money transfer is again the sending and receiving of money using technological platforms such as Short Message Services, SIM toolkit and others.

The major advantages of mobile money transfers are reduced costs, faster speeds of transactions and ease of access to people.

The challenges include- increasing the consumer adoption rate, handset capabilities, customer education, minimizing costs (both for the company and the end user), and the lack of common technology platform for all mobile devices, network coverage, security and regulatory risks.

### 1.2 Research Problem

Mobile phones have become a common commodity in todays' day to day activities such as communiqué and transaction of businesses which has offered a vast number of retailers the opportunity to cash out on that privilege.. Its ubiquitous status came along with the development of e-platforms that promotes the smooth transaction of businesses involving money payments through a mobile service provider.

In most developing countries like Ghana, physical cash transactions have dominated the act of transacting businesses. This system of transaction is termed as the "cash and carry system" which transcends all transactions.

Currently, there are increasing number of people who have migrated unto the mobile money system for sending of money and doing businesses. However, the mobile money system is bedeviled with external challenges like fluctuations in network systems, occasional breakdown of the servers from the network provider. The lack of sufficiency is not only applied to the e-mobile transaction but also the cash and carry system poses a challenge in situations where one has to transact business with large sums of money leading to security treats.

Developing an electronic payment system like the MPS in Ghana will help find remedy to the "cash and carry system" and it will reduce the rate at which our currency gets worn out due to the high circulation of cash among the populace. It will also increase the neatness and durability of our currency, provide convenience in making payments, and increase e-commerce and m-commerce transactions in the country.

The focus of this research is to find out the assessment of technologies and its security problems to the embracement of the use of mobile phone for money related transactions in Ghana and what can be done to address these.

### 1.3 Research Questions

The following are the research questions the paper seeks to address.

- i. What are some of the technologies employed in the mobile money transfer
- ii. What are some of the advantages of using the mobile money transfer over other transaction medium?
- iii. What are some of the challenges faced by the vendors of the mobile money providers?

### 1.4 Hypotheses

#### Hypotheses 1

$H_0$ : There are no effective technologies in the implementation of mobile money transfer system.

$H_1$ : There are a number of technologies that service providers can use in implementing and providing mobile money transfer services to customers.

#### Hypotheses 2

$H_0$ : There are no advantages of using the mobile money transfer over other transaction Medium.

$H_1$ : Mobile money transfer has a lot of advantages over traditional banking systems and other means of transferring money.

### Hypotheses 3

$H_0$ : There is low patronage of the mobile money system by member of the public.

$H_1$ : Patronage of the mobile money system in the country is very booming

### 1.5 Research Objectives

- i. To identify the various technologies employed in mobile money transfer.
- ii. To find out how people are patronizing the mobile money transfer.
- iii. To assess the advantage of using the mobile money transfer over the other transaction modes.

### 1.6 Significance of Research

This study will be significant to the country as a whole because it will gradually reduce the burden of carrying physical cash and specifically to the various mobile telecommunication companies in the country. This study also is to benefit those in the rural communities as to give them other alternatives in receiving remittances from their relatives outside their vicinity or locality.

## 2. LITERATURE REVIEW

The majority of African countries still have cash and cheque economies (Vinod, 2008). In the case of M-Pesa in Kenya, which was developed by Vodafone and Safari.com and first piloted in 2005, customers use their mobile phones like a bank account or a debit card, where they credit their account at a local air-time dealer, and can then transfer money to a recipient simply using SMS (Anna, 2007). Some analysts believe that the mobile phone will replace smart cards as a means of payment, due to the fact that, mobile phones have an embedded chip that can be used to store value or provide secure authorization and identification, and does not have to rely on a card reader (Deans, 2005). Experts in the Silicon Valley say many hurdles still need to be cleared to move the mobile payment system into the mainstream. These include technological difficulties as well as high up-front costs, security and enough of the right type of phone (Shiels, 2009).

According to Gross (2009) of CNN, smart phones security threats are likely to rise due to Worms, spam, viruses and hackers, aimed at targeting individuals for personal, financial information and this may adversely affect people's confidence in Mobile Payment System.

## 3 METHODOLOGY

For easy accessibility of respondents, the researchers placed the population into 10 strata (regional based) of which

Ashanti was selected because of the heterogeneity of its population.

Within this stratum, purposive sampling was adopted to sample 20 staff across MTN, Tigo, Vodafone, and Airtel, the providers of mobile money services in Ghana, based on their level of information in the subject area and their willingness to provide the necessary information.

The nature of the data required for this study (interview/questionnaire responses from mobile money users and key staff from the case study company) influenced the locations for data collection. Primary data were collected using structured questionnaires. Secondary data were gathered from existing information present at the National Communication Authority (NCA) and the various data available at the mobile communication were provided. The data collected were analyzed according to the research questions and the hypotheses using Statistical Package for Social Sciences also known as Statistical Product and Service Solution (SPSS vs16). Descriptive statistics of mean, frequencies, standard deviation and percentage were used to answer the research questions with results presented using tables, charts and graphs while Pearson Chi-Square test of independence was used to test the hypothesis at 5% level of significance. Independent T-test and correlation matrix were also used to establish association between the variables. Qualitative data were analyzed using trends and quotes from the interviewees.

#### 4 ANALYSIS AND RESULTS

People with higher levels of education turn to highly patronize the MMT service indicating from the fact that 26.5%, 29.0% and 23.5% of the MMT users had certificate of diploma, bachelor's degree and postgraduate degrees respectively which represents 79% of the sampled MMT users. It was a plus to note however that the MMT agents are more easily accessible unlike traditional banks that are mostly distance away from customers ( $M=4.40$ ,  $p< 0.021$ ). It was identified that no minimum balance is needed to keep MMT account ( $M=4.24$ ,  $p< 0.021$ ). With a mean rating of 4.24, users reported that the transactional time with MMT is relatively shorter than traditional banking. Users were relatively comfortable with the fact that it is not very possible to lose all money when your phone is stolen or missing with as high as 70.0% reporting their monies are safe in the loss of the phone. It was identified that MMT services are quite expensive for non-registered MMT users ( $M= 4.48$ ,  $p<0.001$ ). A careful study of the results indicated

that, female vendors were significantly more likely in reporting that the mobile networks offering MMT cannot be trusted ( $r= 0.659$ ,  $p<0.01$ ). From the experiences of the Mobile Money Transfer (MMT) vendors, they have rated very high the recommendation for a more cashless society and services at a mean rating of 4.65 at  $p<0.016$ . Network challenges could have a serious compromise in the security of Mobile Money Transfer (MMT) service ( $M= 3.54$ ,  $p<0.015$ ). Detailed results are shown in Table 1 to Table 6.

**Table -1: Demographic Characteristics of Respondents**

Variables	Frequency	Percentage
<b>MMT Users</b>		
<b>Gender</b>		
Male	105	52.5
Female	95	47.5
<b>Age Group</b>		
Below 25	33	16.5
26-35	94	47.0
36-45	47	23.5
46-55	11	5.5
56-65	8	4.0
66 and above	7	3.5
<b>Educational level</b>		
No formal Education	5	2.5
Basic	6	3.0
SHS	20	12.5
Cert/Diploma	53	26.5
Bachelor's degree	58	29.0
Postgraduate degree	47	23.5
Others	2	1.0
<b>Occupation</b>		
Former sector	90	45.0
Informer sector	58	29.0
Unemployed	7	3.5
Students	41	20.5
Other	4	2.0

#### MMT Vendors

Variables	Frequency	Percentage
<b>Gender</b>		
Male	29	53.7
Female	21	38.9
<b>Age range</b>		
15-25	11	20.4
25-45	36	66.7
45 and above	3	5.6
<b>Educational level</b>		
No formal educational	2	3.7
Basic education	8	14.8
SHS	11	20.4
Tertiary education	29	53.7

**Table -2: Advantages of MMT over other Medium to Users**

Advantages of Using MMT over other Medium to Users
High charges for unregistered members
Mobile money agents are easily accessible
No minimum balance is required
Transaction time with MMT is shorter than traditional banking
MMT is supported by the government and law

- Any type of phone can support MMT
- Limited number of transaction per day/week
- Transactional notifications are prompt and timely
- Easy and user friendly transactional procedures
- Non mobile users can also access MMT services
- Network distractions affects MMT
- MMT makes bill payments easier
- Any amount can be transferred and withdrawn at any time
- Less transactional charges compared to traditional banking
- Every mobile network support MMT
- MMT can be used for all payment and purchases
- You can get overdraft on your wallet
- MMT allows inter-network transfers
- I can earn some profit on moneys in my MMT account

N=200, p= 0.05, (1=strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree)

**Table -5: 4. Spearman's Correlation of Challenges faced by MMT vendors by Demographic**

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	M	
1 Gender	1	.046	.378 <sup>a</sup>	.659 <sup>a</sup>	-.109 <sup>a</sup>	.048	.231 <sup>a</sup>	.116	-.598 <sup>a</sup>	.711	-.105	.113	-.405 <sup>a</sup>		
2 Age		1	.144	.234	.124	.027	.103	-.490	-.544	.649	-.616	-.461	-.589		
3 LE			1	-.476 <sup>a</sup>	.292 <sup>a</sup>	.333 <sup>a</sup>	.191 <sup>a</sup>	.282 <sup>a</sup>	.174 <sup>a</sup>	.506 <sup>a</sup>	.120 <sup>a</sup>	.260 <sup>a</sup>	.322 <sup>a</sup>		
4 MNT				1	.058	.020	.120	.016	.144	.073	.032	.062	.047	2.82	
5 TMD					1	.702 <sup>a</sup>	.488 <sup>a</sup>	.627 <sup>a</sup>	.475 <sup>a</sup>	.286 <sup>a</sup>	.305 <sup>a</sup>	.641 <sup>a</sup>	.585 <sup>a</sup>	4.66	
6 MDT						1	.632 <sup>a</sup>	.757 <sup>a</sup>	.594 <sup>a</sup>	.359 <sup>a</sup>	.317 <sup>a</sup>	.688 <sup>a</sup>	.644 <sup>a</sup>	3.47	
7 SCE							1	.665 <sup>a</sup>	.530 <sup>a</sup>	.368 <sup>a</sup>	.215 <sup>a</sup>	.571 <sup>a</sup>	.645 <sup>a</sup>	3.38	
8 DCB								1	.671 <sup>a</sup>	.396 <sup>a</sup>	.348 <sup>a</sup>	.666 <sup>a</sup>	.650 <sup>a</sup>	3.27	
9 NSC									1	.522 <sup>a</sup>	.442 <sup>a</sup>	.626 <sup>a</sup>	.648 <sup>a</sup>	4.61	
10 MMS										1	.441 <sup>a</sup>	.435 <sup>a</sup>	.383 <sup>a</sup>	4.89	
11 IRG											1	.442 <sup>a</sup>	.331 <sup>a</sup>	2.90	
12 USW												1	.654 <sup>a</sup>	3.44	
13 DSA													1	4.28	

N=200, p= 0.05, (1=strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree)

**Table -3: User Perception on MMT Security Challenges**

MMT Security Challenges (Users Perception items)	MNT	The mobile networks offering this service cannot be trusted	NSC	It is not always safe to have cash at hand in the evenings.
	Agree	Neutral	Disagree	Mean
1. People can easily steal money in your mobile money wallet when phone is hacked	78.0	7.5	14.5	3.38
	TMD	Transactional mistakes are difficult to resolve	MMS	Money can only be sent to mobile numbers that belong to same network
2. Anyone with access to your PIN can withdraw money from your wallet	91.25	0.0	8.75	5.01
	MDT	Messages are delayed at times	IRG	The Identity and the reputation of the vendors is guaranteed
3. Some agents extort money through Mobile Money Transfer	SCE	Service providers charge exorbitantly and give less profit	76.05	Users sometimes give the wrong numbers
	DCB	It is sometimes difficult to get cash down running the business	DSA	It is difficult to sign up as an agent for the service
4. You could lose all money when your phone is stolen or missing.	26.5	3.5	70.0	4.25
5. The mobile networks offering this service cannot be trusted.				
6. It is safer to carry cash in some cases				
7. Agents cannot be trusted				
8. The identity of the receiver is always confirmed				
9. The sender is previewed about the receiver's detail before transfer is executed				
10. Learning from MMT, I will recommend more cashless services and society.				
11. You could lose money when your PIN is compromised				
12. People think we extort money through Mobile Money Transfer.				
13. Anyone can withdraw money from my wallet with little carelessness				
14. People think it is safer to carry cash.				
15. Network challenges could compromise the security of MMT				
16. The selection process for MMT vendors is comprehensive enough				
17. I am comfortable putting my live savings in MMT account				
18. People don't trust us				
19. It is difficult to hack or breach the security of MMT				
20. I have insured my business in case of any eventuality				

N=200, p= 0.05, (Disagree = strongly disagree + disagree, Agree = agree + strongly agree)

**Table -4: Advantages of MMT to by vendors**

Advantages of MMT to by vendors Items	Mean	SD	$\chi^2$	sig
1. Mobile Money Transfer is very expensive especially for the unregistered users	4.84	1.12	20.4	.001
2. The more people make transaction the more the profit margin	1.28	6.3	.099	
3. Not all networks support mobile money transfer	4.14	1.34	23.9	.000
4. There are too many agents providing the service.	3.84	1.12	20.4	.000
5. The profit margin on some networks is better than the others				
6. You can use Mobile Money Transfer service to buy everything.				
7. Ghanaians are positive towards cashless society				
8. It makes bill payment difficult				
9. Mobile money wastes a lot of time				
10. You can transfer money between different networks				
11. I can make some interest for keeping money on my wallet				

N=200, p= 0.05, (1=strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree)

**Table -6: Vendor Perception MMT Security Challenge**

**21.25 MMT Security Challenges (Vendor Perception items)**

1. Learning from MMT, I will recommend more cashless services and society.
2. 17.5 You could lose money when your PIN is compromised
3. People think we extort money through Mobile Money Transfer.
4. 17.5 Anyone can withdraw money from my wallet with little carelessness
5. People think it is safer to carry cash.
6. Network challenges could compromise the security of MMT
7. The selection process for MMT vendors is comprehensive enough
8. 10.0 I am comfortable putting my live savings in MMT account
9. 10.0 People don't trust us
10. It is difficult to hack or breach the security of MMT
11. I have insured my business in case of any eventuality

N= 200, p= 0.05, (1=strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree)

**5.0 CONCLUSION, RECOMMENDATIONS AND FUTURE WORK**

- Summary of Findings**
- i. Unlike other table-top businesses predominated by less educated individuals, and mostly women, the MMT business however is dominated by male and individuals with appreciable levels of education.
  - ii. Among the three (3) telecommunication providers providing MMT services in Ghana, MTN holds close to half the MMT subscriber base.
  - iii. High charges for unregistered users, limited withdrawal rate, network failure, non-ability to support all forms of bill payment in Ghana, non-profitable no matter how long money sits in your

wallet and lack of inter-network transfers where disadvantages MMT poses to users.

Shiels, M. (2009). *Challenges to a 'cashless' world*. Retrieved October 20, 2009, from BBC: [www.bbc.co.uk](http://www.bbc.co.uk)

## 5.1 Conclusion

Mobile Money Transfers has come to redefine the banking services provided in Ghana and other African countries especially for the informal sector and the non-banked monies in the African economy. It is important to improve the security and transactional lapses associated with mobile money transfers to increase user confident in the mobile money transfer system.

Vinod, M. (2008). *A Review of Payment System in Africa*. Retrieved October 12, 2009, from GTNews: <http://www.gtnews.com/ReviewofPaymentSysteminAfrica.htm>

## 5.2 Recommendations

There is the urgent need for banks, telecommunication companies and the Government of Ghana to collaborate to implement SMS Savings Solution as a tool to help improve the savings culture of the informal sector and the Ghanaian as a whole.

## 5.3 Future Work

1. Since all transactions depend on the network of the service providers, the improvement in the network uptime will improve the security of the MMT services.
2. Inter-network transactions will allow much more people to patronize the services of the MMTs.
3. As PIN sharing was identified as one of the major causes of consumer driven fraud, it is recommended that the service providers must set up password age parameters for the users to change their passwords every quarter. This must further be authenticated through answering personal identification questions.

## REFERENCES

Gross, D. (2009). Smartphone Security Threats likely to rise. Retrieved October 27, 2009 from CNN: <http://www.cnn.com/2009/TECH/10/25/smartphone.security/index.html>.

Maybank, Anna. "M-Pesa: Mobile Phone Usage in the Developing World", Luton Sixth Form College, 20-5-2007, pp 2-3.