Improving Savings Culture in the Informal Sector Using SMS Solution

Vitus Foli Aborogu[1], Joseph Kobina Panford[2], James Ben Hayfron-Acquah[3]

[1, 2, 3]*Kwame Nkrumah University of Science and Technology, Dept. of Computer Science, Kumasi, Ghana*

Abstract - This paper explores how to solve a canker of low savings culture of the informal sector in Ghana, for instance the "kayayei", using more flexible ways of interactivity through the Short Message Services (SMS), using its method of PUSH and PULL. The literature review is structured from previous mobile short message services studies. It attempts to illustrate why examining this research problem is a necessary research endeavour. The methodology used in the research is based on the mixed mode which is quantitative and qualitative modes of data collection. For the quantitative, descriptive statistics was used. In the system design and implementation the Kannel SMS gateway was implemented on a Linux box. Kannel works as SMS gateway. The subscriber recharges phone with top-up voucher and sends an SMS command text "save [amount]" where [amount] is the value to be saved. The SMS solution credits the subscribers' savings bank account with the value.

Key Words*: *Kayayei, Short Message Services, Mobile Switching Center, Home Location Register, Public Switched Telephone Network, Global System for Mobile

1.INTRODUCTION

The research seeks to leverage on the Short Message Services (SMS) on subscriber phones on how SMS can be used as a tool to aid in Savings (depositing CASH) into formal banking services. The research particularly paid attention to the "kayayei" – teenage girls and young women who carry luggage on their heads from market centers for a small fee [1].

The total number of mobile voice subscribers as at the end of December 2015 in Ghana is 35,008,387 which represent a mobile voice penetration rate of 127.63% [2].

1.1 Problem Statement

There is a wide cry of finding solution to improving the savings culture of the Ghanaian [3].

1.2 Research Objective

The main objective of this research is to overcome the problem statement, for which this research is being carried out.

1.3 Scope of Research

The scope of the research is mainly focused on developing the SMS application and the simple banking application.

1.4 Significance of Research

The SMS solution enables users to convert part of their mobile credit into CASH, to be saved into traditional formal banks. This is achieved by sending an SMS command.

2. LITERATURE REVIEW

2.1 Introduction

This section gives a deep overview of the Global System for Mobile (GSM) network architecture and a high level understanding of SMS delivery. The section also, offers a simplified view of an SMS message traversing a GSM based system from submission to delivery.

2.2 Short Message Service

International Telecommunication Union (ITU) reported that in the year 2010, a total of 6.1 Trillion SMS have been exchanged worldwide, from 5.3 billion mobile cellular subscriptions worldwide, including 940 million subscriptions to 3G services, which has jumped from 1.8 Trillion SMS in year 2007. By year 2013 the volume of messages doubled to 10 trillion, the SMS traffic will grow double in coming four years [4].

2.3 Routing a Message

The SMSC needs to determine how to route messages to their targeted mobile devices. The SMSC queries a Home Location Register (HLR) database, which serves as the permanent repository of user data and includes subscriber information (e.g. call waiting and text messaging), billing data, availability of the targeted user and their current location. Through interaction with other network elements, the HLR determines the routing information for the destination device. If the SMSC receives a reply stating that the current user is unavailable, it stores the text message for later delivery. Otherwise, the response will contain the address of the Mobile Switching Center (MSC) currently providing service. In addition to call routing, MSCs are responsible for facilitating mobile device authentication, location management for attached base stations (BS), performing

handoffs and acting as gateways to the Public Switched Telephone Network (PSTN) [5].

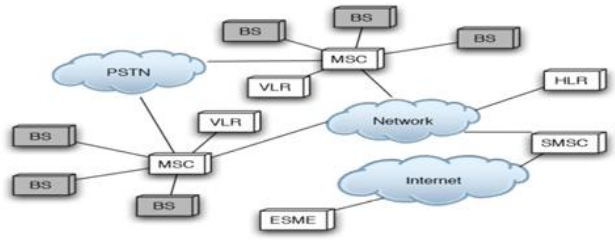

Figure 1: SMS Network

Figure 1. is a simplified example of SMS Network [5].

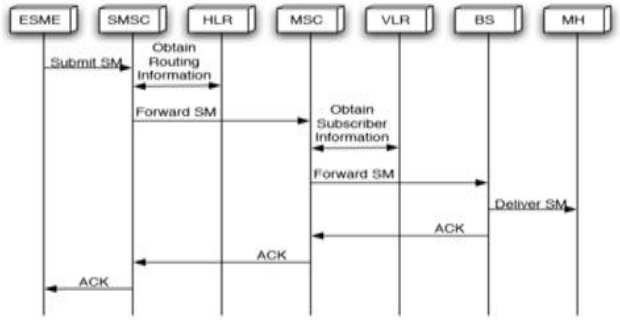

Figure 2: Simplified example of SMS Message Flow through the network.

Figure 1 and Figure 2 show a mobile network, when a text message arrives from the SMSC, the MSC fetches information specific to the target device. The MSC queries a database known as the Visitor Location Register, which returns a local copy of the targeted device's information when it is away from its HLR. The MSC then forwards the text message on to the appropriate base station for transmission over the air interface [5].

3.0 METHODOLOGY

3.1 Introduction

The methodology used in the research is based on the mixed mode which is quantitative and qualitative modes of data collection. For the quantitative, descriptive statistics was used. The choice to use a variety of complementary research methods which were largely qualitative through interviews with "kayayei" and examination of documentary evidence was in order to form case studies, but with some initial quantitative research to gather background evidence of using SMS solution to improve the savings culture in the informal financial sector in Ghana. The adopted methodology to accomplish this research used the following techniques: the information about the research design, research population, questionnaire design, statistical data analysis, content validity and pilot study.

3.2 Analysis and Results

Table -1: Monthly SMS utilization average from responses

SMS Utilization	Coefficient	Standard Error	*t*	*P* > *t*	95% Confidence Interval	
Have Phone	0.2539683	0.1180932	2.15	0.033	0.0205886	0.4873479
Constant	1	0.1085968	9.21	0	0.7853874	1.214613

As shown in Table 1, it can be deduced that there is a significant difference between mobile phone usage and the monthly SMS utilization statistically, as the *p* values is 0.033 at a confidence interval of 95%.

4.0 SYSTEM DESIGN AND IMPLEMENTATION

4.1 Introduction

SMS is the component of the GSM phone that allows subscribers to send a text message of not more than 160 characters from one phone to the other [6].

4.2 Design and Architecture

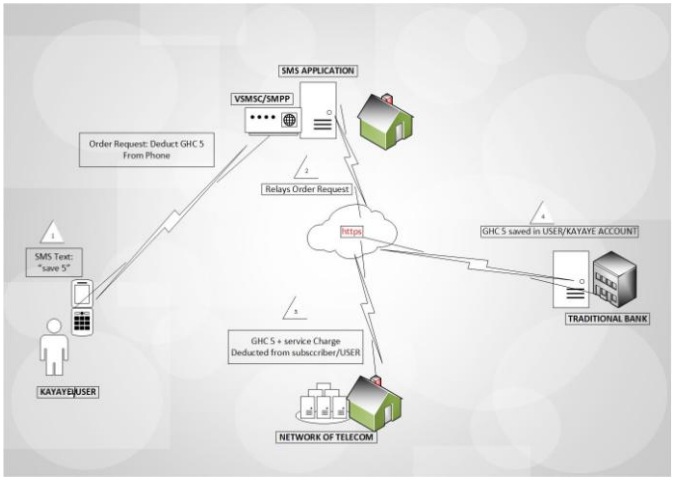

Figure 3: Physical Integration of SMS Application, Telco, and Bank.

Figure 3 describes SMS text flow from the kayayei who is the initiator of the communication to the SMS application which relays to the Telco to perform deduction and pushes to the Bank who finally credits kayayei (customer) account, after successfully transaction kayayei receives feedback in a form of text message indicating success.

4.3 Database Architecture

Figure 4 illustrates a logical architecture of database design showing the various modules.

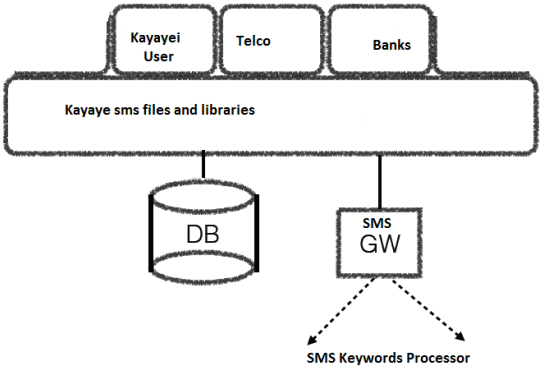

Figure 4: Logical containers for storage of the various modules of the SMS savings system.

4.4 System Overview

- The subscriber ("kayayei") initiates the process of saving into bank account through the SMS solution system by texting, for example, "save 5" and sends it to a short code say "1722".
- The system receives the command and interprets it as, debit the subscriber's savings bank account with GH₵5.
- The subscriber receives a first message from the system saying "command received to save GH₵5 into your mobile savings account. Thank You"
- The subscriber receives a final message from his/her bank such as "Your bank account has been debited with GH₵5, Your Balance as at 29-11-2013 16:00 GMT is GH₵45.

4.5 Redrawing from Savings

Send SMS command "request [amount]" to the short code, where request is the keyword and amount refers to the amount being requested.

4.6 Requesting for bank statement

To request for bank statement simply send SMS command "statement" to a short code.

5.0 CONCLUSION, RECOMMENDATIONS AND FUTURE WORK

5.1 Conclusion

The findings from the data analysis according to descriptive Statistics table clearly indicate respondents' approval of using SMS solution as a means of depositing money into their bank accounts. They also touted the reliability and suitability of using SMS as a medium of depositing cash into the commercial banks, as it will save them great considerable amount of time using the SMS method of saving money because they will avoid long queues which is normally characterized by these commercial banks. Respondents have also found it to be usable, beneficial, efficient and convenient since it achieves their major aim of bank savings.

The intention is to alter the informal sectors behaviour in relation to access to the formal banking services especially savings or deposits. In this manner the technology use could be defined as persuasive according to Fogg's (1999) description that requires a technology application to intentionally alter client behaviour and make an activity easier [7].

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

Android, iOS, USSD, Windows interface version for the SMS Savings Solution would be implemented in the future.

REFERENCES

[1] Opare, J.A. (2003). Msuedu. Retrieved 25 June, 2016, from http://pdfproc.lib.msu.edu/?file=/DMC/African Journals/pdfs/social development/vol18no2/ jsda018002003.pdf

[2]Ncaorggh. (2016). Ncaorggh. Retrieved 25 June, 2016, from http://www.nca.org.gh/73/34/News.html?item=584

[3] Pwccom. (2011). Ghana Banking Survey 2011 Sustaining growth: challenges and opportunities. Retrieved 25 June, 2016. Available from: https://www.pwc.com/gh/en/pdf/ghana-banking-survey-2011.pdf

[4] Keithw. (2016). Some 75 trillion SMS messages will be sent globally in 2014 says texting report. Retreived 26 June 2016. Available from: http://www.telecomsmarketresearch.com/blog/?p=1152

[5] William Enck, Patrick Traynor, Patrick McDaniel, and Thomas La Porta. (2005). Exploiting Open Functionality in SMS-Capable Cellular Networks.

[6] Kannelorg. (2016). Setting up a SMS Gateway. Retreived 26 June 2016. Available from: http://kannel.org/download/kannel-userguide-snapshot/userguide.html

[7] Fogg, B. J. (1999). Persuasive Technologies. Communications of the ACM 42(5):27-29.