

Effect of Attitude towards SMS Technology and Its Applications on Blood Donation Behaviour

Harry H. Gombachika and Maganizo D. Monawe

The Polytechnic, University of Malawi
Private Bag 303, Chichiri, Blantyre 3, Malawi
{Hgombachika,mmonawe}@gmail.com

Abstract. This paper assesses the effect of attitude towards SMS technology and SMS based reminders on blood donation behaviour through a survey using a self-administered questionnaire. Specifically, the study assesses the attitude towards SMS technology and content of SMS based reminders among blood donors of the Malawi Blood Transfusion Service. Furthermore, the paper assesses the relationship between attitude towards SMS technology and SMS based reminders on one hand and blood donation behaviour on the other.

The paper has shown that blood donors at the Malawi Blood Transfusion Service have positive attitude towards the SMS technology and SMS message content on all dimensions. Although the results have shown that blood donors attitude towards SMS technology was positive irrespective demographic variations, the results have also shown that level of education of the donors moderates their attitude towards the content of SMS message with donors without formal education qualification exhibiting relatively negative attitude compared with those with formal qualification. However, the survey was limited to effects of overall attitude towards SMS technology on intention to donate blood. Since intention to donate blood is a socially accepted behaviour, the results may have been biased by respondents who may have given socially acceptable responses while their actual position may have been different. Furthermore, dimensions that significantly contribute to these relationships were not examined.

Keywords: Short Message Service (SMS), Attitude towards SMS Technology, Blood donation behaviour.

1 Introduction

The demand for blood in Malawian hospitals exceeds the available supply because of high prevalence of anaemic conditions such as HIV/AIDS, malaria, malnutrition and others. Although individuals can donate blood up to four times a year, trends have shown that most do not come back for a repeat donation [1]. Voice call reminders have been used to encourage repeated blood donations; however, they are expensive [2]. Although, there has been an increase in the use of mobile phone short message service [3], little or no effort has been made to use them to encourage repeated blood donations.

On the other hand, there has been an increase in the number of sectors that have deployed Short Message Service (SMS) function of a mobile phone. An SMS is GSM functionality that uses the signalling channel of the GSM network. The SMS started as a supplementary service to voice communication through transmission of simple text message limited to 160 characters by the mobile application part (MAP) protocol in GSM [4]. The technology has however been used to address an array of issues in recent years. Furthermore, several studies have been conducted to understand attitudes towards SMS in commercial activities such as advertising [2,5,6] and in activities that are of benefit to individuals [7-10].

In health sector, SMS applications have been used to improve the convenience, speed, and accuracy of diagnostic tests; monitoring chronic conditions, medication adherence, appointment keeping, medical test result delivery; and improving patient-provider communication, health information communication, remote diagnosis, data collection, disease and emergency tracking, and access to health records [11]. Specifically, research studies on the use of SMS technology to provide reminder service have received much attention mainly for health promotion and monitoring, and appointment keeping for patients [12]. Koshy et al., [13] investigated the effectiveness of mobile-phone short message service (SMS) reminders for ophthalmology outpatient appointments and they found that non-attendance rate was 38% lower for patients who received the SMS reminders than in those who did not receive. Similarly, Liew et al. [14] investigated if text messaging reminders can help reduce nonattendance of hospital appointments. They found that attendance was high in those who received SMS reminders than in those who did not. Furthermore, Armstrong et al. in [8] evaluated the effect of text messaging to sunscreen application adherence. They found that adherence was high in those who received SMS reminders than those who did not with a difference of 26.1%. These results however contradict research by Ollivier et al. [15] who found no difference in chemoprophylaxis compliance, partly due to respondents' negative attitude towards the chemoprophylaxis and not necessarily the SMS reminders. We can therefore conclude that SMS reminders can help change the behaviour of respondents. These studies were however limited to applications where the individuals had a direct benefit from the reminders. It could be interesting to find out if similar results are obtained in applications where individuals are not benefiting directly from the activity such as blood donation. In other words, little focus has been put on exploring attitudes and behaviour towards the use of SMS technology in voluntary activities where the individuals are not directly benefiting.

Although the cheaper SMS texting has been found to be as effective as the expensive voice call reminders [2] no further research has been conducted to assess the relationship between attitudes towards SMS reminders and behaviour towards blood donation. Therefore this study assessed the influence of attitude towards SMS technology and SMS based reminders on blood donation behaviour. Specifically the study assessed the attitude towards SMS technology and content of SMS based reminders among blood donors. Furthermore, the study assessed the relationship between attitude towards SMS technology and SMS based reminders on one hand and blood donation behaviour on the other.

The remainder of the paper is arranged as follows: Section 2 reviews the available literature while section 3 presents the methodology that was used in this study. Section 4 presents and discusses the results of the study. Finally, section 5 concludes the paper.

2 Theoretical Framework

Conceptually, attitude is used to understand and predict people's reaction to an object or change and how behaviour can be influenced [16] and is defined as a learned orientation, or disposition, toward an object or situation, which provides a tendency to respond favourably or unfavourably to the object or situation [17]. There are three models used to understand attitudes towards technology, however, only two models are applicable to SMS technology.

The first model focuses on the acceptance of the SMS technology based on Theory of Planned Behaviour (TPB) [18] and Theory of Reasoned Action (TRA) [19] resulting in Technology Acceptance Model (TAM). TAM represents the antecedents of technology usage through beliefs about two factors: the perceived usefulness (PU) and perceived ease of use (PEOU) of a technology. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his or her job performance while perceived ease of use refers to the degree to which a person believes that using a particular system would be free of effort. A comprehensive meta-analysis of TAM is presented in [20,21]. Recently, the perspective of subjective norms was included. Subjective norms refer to the extent to which an individual believes that people who are important or influential to him or her think he or she should perform the behaviour in question [22].

Several researchers have assessed the attitude towards SMS technology using TAM. Yan, et al. [23] used TAM to assess attitude towards SMS technology and usage and found that perceived usefulness, ease of use, and subjective norms lead to attitudinal changes towards text messaging and usage. Similarly, Aripin and Omar [24] found that attitude towards SMS usage is influenced by perception that SMS is easy to use, useful, fun, and expressive. However, Tang and Wong [25] investigated the role of permission towards the attitudes of SMS message recipients. They found that consumers had negative attitude towards mobile text messaging as a communication channel. These studies, however, focused on commercial applications.

The second model focuses on the attitude towards content of the SMS message. Differentiating between attitudes towards the technology itself and attitude towards usage is important because it is possible for people to hold positive attitudes towards the technology and negative attitude towards its usage [20]. Towards that end, Ducoffe [26] developed a model depicting the dimensions of entertainment, informativeness and irritation used to determine consumers' attitudes towards Internet advertising. Furthermore, Brackett and Carr [27] added a dimension to the model namely credibility and used the model to test consumer attitudes towards web advertising. Therefore the model that is used to assess attitude towards the content of the SMS message in this study has four dimensions: entertainment, informativeness, irritation and credibility which have been used widely to study attitudes towards SMS technology in advertising.

Tsang et al. [19] investigated consumer attitudes towards mobile advertising using Short Message Service. Similarly, Suher and Ispir [2] found that the respondents held negative attitudes towards receiving mobile ads because they found them irritating. However, they found out that respondents attitudes were however favourable for

advertisements that were sent with permission. These findings agree with early researchers [28] although SMS advertising has been stated to be a more effective medium to generate consumer response [29].

The process of donating blood is a reasoned action requiring cognitive evaluation of available information before making the decision to donate. For a voluntary blood donor who has received an SMS reminder, the reminder becomes one input into the cognitive process of deciding the behaviour of either donating or not donating.

3 Methodology

The study took place at the Malawi Blood Transfusion Service (MBTS). MBTS is a Government of Malawi institution mandated to coordinate the process of blood supply to hospitals. Both the MBTS and the Ministry of Health in Malawi provided clearance for the study.

Data was collected through a self administered questionnaire that was developed based on models for assessing attitude towards SMS technology and attitude towards content of SMS messages. The questionnaire consisted four parts. Firstly, the questionnaire consisted of items that measure respondents' attitude towards SMS technology based on TAM's 3 dimensions. Secondly, it consisted of items that measure respondents' attitude towards the content of SMS message. Thirdly, the questionnaire had an item that measures the respondents' intention to donate blood after receiving an SMS based reminder. All items were measured on a five-point Likert scale (1=strongly disagree to 5=strongly agree). Finally, the instrument included questions related to demographic data.

The sample was randomly drawn from a population of blood donors who had previously received SMS based reminders to donate blood. A total of 120 questionnaires were distributed to a randomly selected sample from a population of 1137 blood donors. However, only 114 questionnaires were correctly completed and returned representing a response rate of 95%.

Both descriptive and inferential statistical analyses were carried out using SPSS. Descriptive statistical analysis was used to summarize the results while inferential statistics was used to test the relationships.

This research ensured that particulars of respondents were anonymous so that the data collected would not be traced back to them. Furthermore, permission was sought and granted from relevant authorities before conducting the research to ensure that all ethical issues were taken on board. The Malawi Blood Transfusion Service was requested to provide clearance to access blood donor data and the Ministry of Health was requested to provide ethical clearance.

4 Results

Demographic Characteristics of the Respondents

Table 1 summarizes the demographic characteristics of the respondents. The results show that the majority of the respondents (41.2%) were young (18-24 years) while

some (8.7%) interestingly were in the senior (45years and above) age category. In addition, the results show that most of the respondents (38.9%) had a secondary school qualification (MSCE) while 9.8 % were primary school dropouts. Furthermore, the results showed that most of the respondents (72.8%) were male. Finally, the results showed that the majority were single (61.8%). Interestingly 1.8% of the respondents indicated that they were widowed.

Table 1. Characteristics of the Respondents

Variable	Attribute	Percent
Age (years)	55 and above	2.6
	45-54	6.1
	35-44	17.5
	25-34	32.5
	18-24	41.2
Academic Qualification	Postgraduate	8.8
	Bachelors	12.4
	Diploma	7.1
	MSCE	38.9
	JCE	16.8
	PLSCE	6.2
	Primary school dropouts	9.8
Gender	Female	27.2
	Male	72.8
Marital Status	Single	61.8
	Married	36.4
	Widowed	1.8

SMS Technology Acceptance

Table 2 presents the survey results on attitude towards SMS technology using technology acceptance model on three dimensions, namely, Ease of Use, Usefulness, and Subjective Norms.

Firstly, the results show the items used to measure respondents attitude towards SMS technology were reliable on all the three dimensions, with Cronbach's Alpha values above the conventional minimum of 0.70 [30]. This means that there was internal consistency among the items used for measurement scales for the three technology acceptance model dimensions. This supports meta-analysis results of the TAM model reported by Yousafzai et.al [20,21] that perceived usefulness and perceived ease of use are robust constructs with high predictive validity and they concluded that these constructs can be used in varying technological and organization context.

Secondly, the results show that the respondents had an overall positive attitude towards SMS technology ($M=4.200$, $SD=0.723$) on a five points scale. Furthermore, the results show that the respondents had a positive attitude towards SMS technology on all the three dimensions; ease of use ($M=4.414$, $SD=0.785$), usefulness ($M=4.194$, $SD=0.932$) and subjective norm ($M=3.994$, $SD=0.974$). This means that blood donors

at the MBTS have a positive attitude towards SMS technology and can use SMS technology for various applications including receiving reminders for blood donation. This contradicts the results reported by Tang and Wong [25] who found that consumers had negative attitude towards SMS sent without prior permission. Furthermore, this contradicts Muk [31] who found that most of online consumers found receiving mobile adverts through their mobile phones irritating and intrusive.

Table 2. Attitude towards SMS technology

Dimension	Mean (standard Deviation)	Scale Reliability (Cronbach's Alpha)
Perceived Ease of Use	4.413 (0.785)	0.778
Perceived SMS Usefulness	4.194 (0.932)	0.865
Subjective Norms	3.994 (0.974)	0.778
Overall SMS Technology acceptance	4.200 (0.723)	

Finally, the difference in means of the overall attitude towards SMS technology based on respondents characteristics (age, education qualification, marital status and gender) were analysed using one-way analysis of variance (ANOVA). The results show that there was no significant statistical difference in means of the overall SMS technology acceptance based on age $F(4)=0.378$, $p>0.05$; qualification $F(7)=1.197$, $p>0.05$; marital status $F(2)=0.356$, $p>0.05$; and gender $t(112)=-0.508$, $p>0.05$. This means that these donors have positive attitude towards SMS technology irrespective of age, education level, marital status or gender. However, Yousafzai *et. al* [20,21] suggested that respondents or subjects characteristics accounted for the large size variances in the TAM variables.

Attitude towards SMS Message Content

Table 3 presents the survey results on attitude towards SMS message content on four dimensions, namely, entertainment, informativeness, irritation, and credibility.

Firstly, the results show the items used to measure respondents' attitude towards SMS message content were reliable on all the four dimensions, with Cronbach's Alpha values above the conventional minimum of 0.70 [30]. This means that there was internal consistency among the items used for measurement scales for the attitude towards SMS message content dimensions. As stated earlier on, this suggests that the four dimensions are robust and have high predictive validity. We can therefore conclude that the model can be used in various technological and organization context.

Secondly, the results show that the respondents had an overall positive attitude towards SMS message content ($M=4.265$, $SD=0.725$) on a five points scale. Furthermore, the results show that the respondents had a positive attitude towards SMS message content on all the four dimensions; entertainment ($M=4.429$, $SD=0.913$), informativeness ($M=4.496$, $SD=0.833$), irritation ($M=3.903$, $SD=1.160$) and credibility ($M=4.248$, $SD=1.007$). This means that blood donors at the MBTS have an overall positive attitude towards SMS message content.

Table 3. Attitude towards SMS message content

Dimension	Mean (standard Deviation)	Scale Reliability (Cronbach's Alpha)
Entertainment	4.429 (0.913)	0.825
Informativeness	4.496 (0.833)	0.782
Irritation	3.903 (1.160)	0.769
Credibility	4.248 (1.007)	0.767
Overall attitude towards Content	4.265 (0.725)	

Finally, the difference in means of the overall attitude towards SMS message content based on respondents characteristics (age, education qualification, marital status and gender) were analysed using ANOVA. The results show that there was no significant statistical difference in means of the overall attitude towards SMS message content based on age $F(4)=0.669$, $p>0.05$; marital status $F(2)=0.022$, $p>0.05$; and gender $t(112)=0.616$, $p>0.05$. However there was a statistical significant difference in the overall attitude towards SMS message content based on education qualification $F(7)=2.397$, $p<0.05$. The attitude towards SMS message for primary school dropouts ($M=3.443$, $SD=0.705$) was lower than that for those with MSCE ($M=4.398$, $SD=0.593$), or JCE ($M=4.395$, $SD=0.788$) and the differences were statistically significant $p<0.05$, and $p<0.05$, respectively. This suggests that education level moderates attitude towards SMS message content. Primary school dropout donors exhibited relatively negative attitude towards the content of the SMS message compared with those with higher educational qualification supporting the argument that there exists a differential capacity in terms of education, social skills, connection and language which exacerbates the digital gap [32].

Blood Donation Behaviour and Attitude towards SMS

Person correlation analysis between blood donation behaviour and attitude towards SMS were carried out. The results show that there was a positive and statistically significant relationship between blood donation behaviour on one hand and attitude towards SMS technology acceptance $r(112)=0.40$, $p<0.05$ and the content of SMS message $r(112)=0.30$, $p<0.05$, on the other. These results suggest that intention to donate blood after receiving an SMS message is positively influenced by donors' attitude towards SMS technology and SMS message content. However, the influence of the individuals' characteristics on the direct and strength of the relationship was not examined.

5 Conclusion

In this paper, we have assessed the effect of attitude towards SMS technology and SMS based reminders on blood donation behaviour through a survey using a self-administered questionnaire. Specifically, we have assessed the attitude towards SMS technology and content of SMS based reminders among blood donors. Furthermore,

we have assessed the relationship between attitude towards SMS technology and SMS based reminders on one hand and blood donation behaviour on the other.

The paper has shown that blood donors at the Malawi Blood Transfusion Service have positive attitude towards the SMS technology and SMS message content on all dimensions. Furthermore, the results have shown that level of education of the donors moderates their attitude towards the content of SMS message with primary school drop outs exhibiting relatively negative attitude compared with those with formal qualification. However, the survey was limited to effects of overall attitude towards SMS technology on intention to donate blood. Since intention to donate blood is a socially accepted behaviour, the results may have been biased by respondents who may have given socially acceptable responses while their actual position may have been different. Furthermore, dimensions that significantly contribute to these relationships were not examined.

Acknowledgement. This study was conducted with funding from the University of Malawi – Polytechnic Research and Publication committee. We therefore accordingly acknowledge such financial support.

References

1. Manda, T.D.: Understanding Opportunities and Challenges in Using Mobile Phones as a Means for Health Information Access and Reporting: A Case Study from Malawi. Master of Science in Information Systems thesis, University of Oslo (2009)
2. Suher, H.K., Ispir, N.B.: SMS Advertising in Turkey: Factors Affecting Consumer Attitudes. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi* 21, 447–458 (2009)
3. Scherr, D., Zweiker, R., Kollmann, A., Kastner, P., Schreier, G., Fruhwald, F.M.: Mobile phone-based surveillance of cardiac patients at home. *Journal of Telemedicine and Telecare* 12, 255–261 (2006)
4. Agarwal, N., Chandran-Wadia, L., Apte, V.: Capacity Analysis of the GSM Short Message Service. In: *The Proceedings of the National Conference on Communications, Bangalore, India (2004)*, <http://www.cse.iitb.ac.in/~varsha/allpapers/wireless/ncc03cam.pdf>
5. Tsang, M.M., Ho, S.C., Liang, T.P.: Consumer Attitudes Toward Mobile Advertising: An Empirical Study. *International Journal of Electronic Commerce* 8(3), 65–78 (2004)
6. Haghirian, P., Madlberger, M.: Consumer Attitude toward Advertising via Mobile Devices - An Empirical Investigation among Austrian Users. In: *Proceedings of European Conference of Information Systems, Regensburg, Germany (2005)*, <http://aisel.aisnet.org/ecis2005/44/>
7. Downer, S.R., Meara, J.G., Da Costa, A.C.: Use of SMS text messaging to improve outpatient attendance. *Med. J. Aust.* 183(7), 366–368 (2005)
8. Armstrong, A.W., et al.: Text-message reminders to improve sunscreen use: A randomized, controlled trial using electronic monitoring. *Archives of Dermatology* 145(11), 1230–1236 (2009)
9. Foley, J., O'Neill, M.: Use of mobile telephone short message service as a reminder: The effect on patient attendance. *European Archives of Paediatric Dentistry* (2009), <http://www.thefreelibrary.com/>
10. Mao, Y., Yantao, Z., Suodi, Z.: Mobile phone text messaging for pharmaceutical care in a hospital in China. *Journal of Telemedicine and Telecare* 14, 410–414 (2008)

11. Cole-Lewis, H., Kershaw, T.: Text Messaging as a Tool for Behavior Change in Disease Prevention and Management. *Epidemiologic Reviews* 32(1), 56–69 (2010)
12. Blake, H.: Innovation in practice: mobile phone technology in patient care. *British Journal of Community Nursing* 13(4), 160–165 (2008)
13. Koshy, E., Car, J., Majeed, A.: Effectiveness of mobile-phone short message service (SMS) reminders for ophthalmology outpatient appointments: Observational study. *BMC Ophthalmology* 8(9), 1471–2415 (2008)
14. Liew, S., et al.: Text messaging reminders to reduce non-attendance in chronic disease follow-up: a clinical trial. *British Journal of general practice* 59(569), 916–920 (2009)
15. Ollivier, L., et al.: Use of short message service (SMS) to improve malaria chemoprophylaxis compliance after returning from a malaria endemic area. *Malaria Journal* 8(236), 1475–2875 (2009)
16. Fishbein, M., Ajzen, I.: *Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research*. Addison-Wesley, Reading (1975)
17. Gross, R.: *Psychology: The Science of Mind and Behaviour*. Hodder and Stoughton, London (2001)
18. Ajzen, I.: The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes* 50(2), 179–211 (1991)
19. Tsang, M.M., Ho, S.C., Liang, T.P.: Consumer Attitudes Toward Mobile Advertising: An Empirical Study. *International Journal of Electronic Commerce* 8(3), 65–78 (2004)
20. Yousafzai, S.Y., Foxall, G.R., Pallister, J.G.: Technology acceptance: a meta-analysis of the TAM: Part 1. *Journal of Modeling in Management* 2(3), 251–280 (2007a)
21. Yousafzai, S.Y., Foxall, G.R., Pallister, J.G.: Technology acceptance: a meta-analysis of the TAM: Part 2. *Journal of Modeling in Management* 2(3), 281–304 (2007b)
22. Venkatesh, V., Davis, F.D.: A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science* 46(2), 186–205 (2000)
23. Yan, X., Gong, M.T., James, Y.L.: Two tales of one service: user acceptance of short message service (SMS) in Hong Kong and China. *Journal of Policy, Regulation & Strategy for Telecommunication, Information & Media* 8(1), 16–28 (2006)
24. Aripin, N., Omar, S.Z.: Perception and Attitude of Short Messaging Services (SMS) Among Students of Universiti Utara Malaysia. Paper presented at the International conference on Media, Culture and Society, Malaysia (2007)
25. Tang, E.P.Y., Wong, M.M.T.: Consumers' attitude towards mobile advertising: The role of permission. *Review of Business Research* 8(3), 181–185 (2008)
26. Ducoffe, R.H.: Advertising value and advertising on the web. *Journal of Advertising Research* 36(5), 21–35 (1996)
27. Brackett, L.K., Carr Jr., B.N.: Cyberspace advertising vs. other media: Consumer vs. mature student attitudes. *Journal of Advertising Research* 45(5), 23–32 (2001)
28. Zano, E.: Public attitudes toward advertising: The American experience. *International Journal of Advertising* 13, 3–15 (1984)
29. Barnes, S.: Wireless digital advertising: Nature and implications. *International Journal of Advertising* 21(3), 399–420 (2002)
30. Nunnally, J.C., Bernstein, I.H.: *Psychometric Theory*, 3rd edn. McGraw-Hill, New York (1994)
31. Muk, A.: Consumers' intentions to opt in to SMS advertising. *International Journal of Advertising* 26(2), 177–198 (2007)
32. Toyoma, K.: Can technology end poverty, *Forum* (November/December 2010)