2009

SMS Mobile Technology Success in Changing HIV/AIDS Behavior through Awareness

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ABSTRACT

This is a research in progress. The study reviews four theoretical modes on mobile technology and proposes a unified model to understand consumer attitude, intention, and behavior when using Short Message Service (SMS) in mobile technology. The proposed model includes SMS success factors, consumer beliefs, SMS success measure, and demographic dimensions. By setting the study in an international context (Scharl et al., 2005; Hong and Tam, 2006) and developing survey questionnaires (Scharl et al., 2005) we follow the recommendation of prior researchers. The study context is HIV/AIDS awareness at a university in a low-income country. Seventeen hypotheses are proposed to test the full model. Some of the questionnaire is already developed, the remaining are in the final stages. The pilot test is scheduled for March 2009. Following a baseline study in the pilot we will proceed to conduct the main study and test the full model.

Keywords

Mobile technology, short message service, SMS, low-income country, model

INTRODUCTION

Information Systems (IS) research on societal issues lacks diversity; a study by Vessey et al (2002) found only 1.6% of the papers published in the top five IS journals between 1995 and 1999 were on societal issues. In her editorial comment Saunders (2007) stated that the papers on [low-income countries] "signal the importance of societal issues to the Information Systems research community" (p iii). Low-income countries, often referred to as developing countries, present a new frontier for IS research and practitioners to address. If implemented correctly IS has the ability to uplift large number of people in low-income countries (Saunders, 2007). This study contributes to the diversity of IS by focusing on a societal issue, HIV/AIDS awareness, in Ethiopia; a low-income country in Sub-Saharan Africa.

The prevalence of HIV/AIDS in low-income countries is well documented (ref). In many countries it has reached a pandemic level threatening the loss of an entire generation of young people (ref). The United Nation's millennium development goals (MDGs) highlighted as critical to chive poverty reduction (United Nation, 2000). The World Health Organization (WHO) has also indicated the importance of health information systems (WHO, 2000). This study focuses on university students to address the HIV/AIDS risk to the youth.

There is an urgent need for strategic information systems for monitoring and evaluating HIV/AIDS patients (WHO, 2003). SMS technology has proven to be successful in monitoring and evaluation as demonstrated by many examples including Cell-Life in South Africa for HIV/AIDS patients monitoring (Lindow, 2004); for management of diabetes patients (Hanauer, et al, 2009); for diabetes management (including test results) among elderly and younger patients (Ferrer-Roca, et al, 2004); and for HIV/AIDS Q&A session in Kenya (Jones, 2008). This study looks at the general consumer, albeit in a university setting, to understand the success of SMS mobile technology to increase HIV/AIDS awareness among youth.

The adoption of mobile technology has become a global phenomenon, mobile phone subscription hit four billion (4 billion) in 2008 (Ochieng, 2008). The younger generation has been credited in the proliferation of mobile technology, sometimes it is a status symbol for the younger people (Jenkins, 2006). What is more significant is that low-income countries that are often cited as laagers in technology adoption is in the forefront in average annual growth of mobile phone subscription (ITU, 2008). With more than 65 million new subscribers added in 2007 alone Sub-Saharan Africa at the end of 2007 had 130 million subscries compared to North Africa at 42 million and South Africa with 85 million. Africa's average annual growth rate between 1999-2004 was 58.2% ahead of Asia (34.3%), Europe (25.4%), Americas (21.9%), and Oceania (20.1%) (Mbarika and Mbarika, 2006). Adoption of mobile phones by the lower income group is one of the main factors for the increased penetration (Patel, 2007; Deepak et al, 2008) this technology penetration downward movement in the income scale is good for economic development (Abraham, 2006). In some regions the rate of mobile technology penetration is greater than Internet penetration (Kolko et al, 2007). Considering infrastructure challenges often observed in low-income countries the success of mobile technology makes it an attractive technology for many applications (Mbarika and Mbarika, 2006).

While the overall African mobile penetration has substantially increased, the penetration in Sub-Saharan Africa is still low, 18% at the end of 2004 (ICT, 2008). This study looks tries to understand if the success of the mobile phone diffusion in low-income countries can be applied to change increase HIV/AIDS awareness.

The success of mobile technology (termed as multipurpose information appliances by Hong and Tam, 2006) has blurred the boundaries between work and personal life (Hong and Tam, 2006). The blending of work and personal life as a result of multipurpose information appliances demands investigation by researchers (Hong and Tam, 2006); many theoretical frameworks have been suggested to study this phenomenon including adoption of multipurpose information appliances (Hong and Tam, 2006), consumer acceptance of mobile marketing (Bauer et al, 2005), successful SMS advertizing (Scharl et al, 2005; Dickinger et al, 2004), and online consumer behavior (Koufaris, 2002). This study looks at these models and proposes a unified model to understand HIV/AIDS awareness and behavior change.

This research in progress uses Short Message Service (SMS) mobile technology to disseminate HIV/AIDS information to college students at a regional university in Ethiopia. The study develops a research model and questionnaire and sets up for a pilot study to addresses the research question: Can SMS mobile technology change participant behavior about HIV/AIDS?

In the next section we discuss alternative models and argue why we need a unified model to study HIV/AIDS awareness. In the theoretical framework section we propose a new unified more followed by a section on methods and analysis. We then present the hypotheses and measures section and finish with a conclusion.

LITERATURE REVIEW

Alterative models for technology acceptance and diffusion in general and mobile technology in particular have been proposed by researchers (Hong and Tam, 2006; Bauer et al, 2005; Scharl et al, 2005; Dickinger et al, 2004; and Koufaris, 2002). This study looks at each of these models and presents a unified model to understand the success of mobile technology for HIV/AIDS awareness.

Hong and Tam (2006) reviewed the extant literature on individual adoption of information technology (IT) innovation including Davis et al (1989), Ajzen (1991), Rogers (1995), Venkatesh and Vitalari (1992), Kraut et al. (1999), Kim et al. (2002), and Lee (2003). They concluded that prior studies looked at individual adoption of IT innovation in the workplace context (Hong and Tam, 2006). Following Venkatesh and Brown (2001), Hong and Tam (2006) proposed an integrated framework to study individual adoption of IT innovation in non-work settings. While the non-work environment and some of the constructs used by Hong and Tam (2006) is applicable to the current but the focus of their study is about IT adoption. The current study looks at behavior change hence needs a modified model.

Koufaris (2002) tested "the constructs from information systems (Technology Acceptance Model), marketing (Consumer Behavior), and psychology (Flow and Environmental Psychology)" and proposed "framework of online consumer behavior" (p205) to study the consumer that is both a shopper and a computer user. The focus of their study was a Web-based store visitor particularly his/her intention to return and their likelihood to make unplanned purchases. While the consumer behavior aspect matches the current study it differs, however, in its primary focus of purchases compared to the communication of content focus in the current study.

Bauer et al. (2005) highlighted the increased penetration of mobile phones, highlighted the dearth of research in the field, and called for more study. They proposed a model of consumer acceptance for mobile marketing to investigate "factors that induce consumers to accept the mobile phone as a means of communicating promotional content" (Bauer et al., 2005, p 181). While the subject focus, use of mobile phones as a means of communicating promotional content and consumer behavior, matches the current study their model targets the mobile market in general. The current study, is focused on a specific part of mobile technology, SMS, hence needs a modified model.

Scharl et al. (2005) and Dickinger et al. (2004) proposed a model of successful SMS marketing in a journal and conference outlets, respectively. They reviewed the extant literature and conducted a quantitative content analysis of the Fortune Global 500Web sites and qualitative interviews with experts. Their primary focus, use of SMS technology for communication, matches the current study. However, since their target subject was content analysis some consumer related beliefs used in other models, e.g. enjoyment, were not included. The current study uses the overall structure of the Scharl et al. (2005) model but updates some of the constructs to create a unified model.

THEORETICAL FRAMEWORK

Scharl et al (2005) categorize their SMS success model using three dimensions: success factors, beliefs, and success measures. The current study adds demographics to these general dimensions.

The proposed unified model is depicted in Figure 1. This section defines each construct and provides a rationale for inclusion.

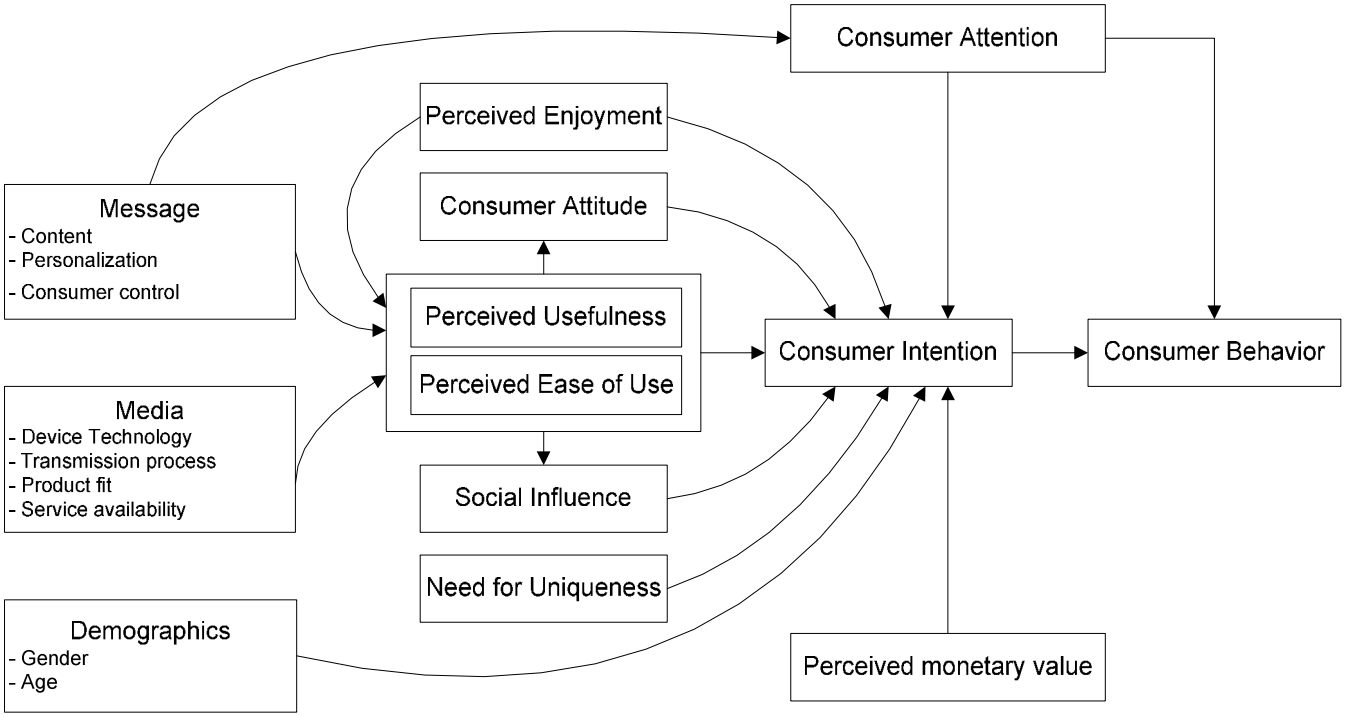

Figure 1: SMS Success Model for Consumer Behavior

Success Measures

Scharl et al. (2005) categorize consumer attention, consumer intention, and consumer behavior as dimensions of SMS technology success measure. These measures are used by information systems (Davis, et al., 1989; Venkatesh et al., 2003; Hong and Tam, 2006) and marketing (Bauer et al., 2005) hence adopted for this study.

Consumer attention: Experts agree that most consumers read SMS messaging and "the impact of the messages vanishes quickly, messages usually urge recipients to act on the spot" (Scharl et al., 2005, p169).

Consumer intention: Consumer intension is found to be a good predictor of behavior (Ajzen, 1991).

Consumer behavior: Hong and Tam (2006) argue that consumer intention in lieu of consumer behavior should be used as the dependent variable because "the IT artifact is still in the early stages of its diffusion cycle" (p165). But we choose to follow Scharl et al. (2005) and use consumer behavior because our focus is the SMS message not the IT artifact.

Beliefs

The proposed model includes seven belief constructs including perceived usefulness, perceived ease of use, consumer attitude, perceived enjoyment, social influence, need for uniqueness, and perceived monetary value.

Perceived Usefulness: Perceived usefulness refers to the perception of the user on whether or not the technology is useful. This construct has been rigorously tested by IS researchers (Davis, et al., 1989; Venkatesh et al., 2003; Hong and Tam, 2006).

Perceived Ease of Use: Perceived ease of use refers to the perception of the user on how easy the technology is for use. This construct has been rigorously tested by IS researchers (Davis, et al., 1989; Venkatesh et al., 2003; Hong and Tam, 2006).

Consumer Attitude: Individuals evaluate and consider several criteria before performing a behavior (Ajzen and Fishbein, 1980)

Perceived Enjoyment: is defined as "the extent to which the activity of using an innovation is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated (Hong and Tam, 2006, p167). "Most people have playfulness and therefore providing games and prizes via text messaging yields high participation and helps attract and keep customers" (Scharl et al., 2005).

Social influence: Social influence is defined as that users believe that "important others" would approve or disapprove of their performing a given behavior (Ajzen, 1991). Hong and tam (2006) cite that social influence influences consumer behavior (Bearden and Etzel, 1982; Fisher and Price, 1992) and IT adoption in non-work settings (Venkatesh and Brown, 2001). The Scharl et al., (2005) study used "peer influence", while we agree peer influence is a factor we believe the broader term "social influence" used by Hong and Tam (2006) is more appropriate.

Need for uniqueness: Need for uniqueness is defined as "the indivitual's tendency to seek uniqueness" (Hong and Tam, p167). Need for uniqueness has not received much attention in research, however, individuals have a desire to feel different in addition to the need to have congruent behavior, social norms, with others (Hong and Tam, 2006). Hong and Tam (2006) found that 'both the desire to be unique in a community and the need to comply with a social group can exist at the same time" (p172).

Perceived Monetary Value: Unlike in work setting usage cost for non-work users is an important consideration (Hong and Tam, 2006). Research indicates that affordability enhances the acceptance of SMS (Scharl et al., 2005; Heng et al., 2002). Text messages in Asia were found to be lower than that of US and Europe (Marcussen, 2002), we see similar patterns in Ethiopia where SMS messages are cheaper, especially compared to Internet access costs. The cost of incentives to convince the consumer to opt-in or cost of purchasing mobile phone numbers should be addressed as part of the media cost. In the Scharl et al. (2005) study media cost was used as a determinant to perceived usefulness and perceived ease of use; however, because this study is targeting on the use not adoption of the technology we chose to replace media cost by perceived monetary value following Hong and Tam (2006).

Success Factors

Success factors include message and media (Scharl et al. (2005). Success factors message include content, personalization, and consumer control and the modified indicators for media include device technology, transmission process, product fit, and service availability.

Content: SMS is limited to 160 characters and it should be utilized effectively; good content was found to be short and to the point, funny and entertaining, relevant, eye catching, and informative (Scharl et al., 2005). Wording of SMS advertisement is crucial (Scharl et al., 2005). As in the case of instant messaging, it is common to use abbreviations and spitfire conversation in SMS messaging (Lee, 2002).

Personalization: Personalization in SMS messaging can be done based on local time zone, location, and preferences (Watson et al., 2000, Balasubramanian, et al., 2002).

Consumer control: SMS messaging should respect the privacy of the receiver and incorporate permissions including the option to opt-out, to disclose on how to stop receiving further messages, and to opt-in, restricting unsolicited messages (Scharl et al., 2005). User acceptance may stifle due to unsolicited SMS messages (Hinde, 2003), "mobile phones cannot distinguish between spam and genuine communication automatically" (Scharl et al., 2005, p168).

Device technology: The design of SMS technology, limited to 160 characters, in a way is limiting to communicate detailed health information. Using the technology despite this limitation is part of the content design considerations for this study. Another major challenge is the difficulty in constructing the message, keying text in a mobile phone is difficult.

Transmission process: Transmission process does not offer guarantees for delivery. By design SMS data communication does not guarantee 100% delivery success nor delivery within fixed time-frame; however, SMS messages are projected to arrive 99% of the time (Scharl et al., 2005).

Product fit: The design of SMS messaging makes it appropriate for frequently purchased items (Barwise and Strong, 2002). We anticipate SMS messaging to fit the HIV/AIDS information intend to transmit. This study is cognizant of the expert opinion that SMS advertizing works when used as part of the marketing mix (Scharl et al., 2005).

Service availability: Service availability is the extent of the SMS message provides pervasive and timely connection (Hong and Tam, 2006). Scharl et al. (2005) did not include service availability in their model. Hong and Tam (2006) included it but used perceived service availability instead. In our study we intend to measure the network uptime and hence included it as part of the media as service availability.

Demographics

Demographics factors are often included in marketing and IT adoption research. Even though Scharl et al. (2005) did not include demographics data in their SMS success model, we followed Hong and Tam (2006) and added gender and age as factors for our model.

METHODS AND ANALYSIS

Research methods

A combination of quantitative (surveys) and qualitative (interviews) methods will be employed for this study. Survey methods are capable of collecting background information (Busha and Harter, 1980). Interviews with selected participants will provide deeper understanding. Research including attitudes, ideas, comments, and public opinion are well suited for survey methods (Sproull, 1995).

This study will use a structural equation model (SEM) to analyze the results.

Study background

This study was motivated by a discussion between an instructor at a regional university in Ethiopia, who was on a fellowship in Cape Town, South Africa, and a group called Cell-Life (http://www.cell-life.org/) that is implementing SMS technology for HIV/AIDS patient care. The parties agreed to collaborate in replicating the study in Ethiopia.

The regional university targeted for this study is Bahir Dar University in Northern Ethiopia, it has over 32,000 students.

Pilot study

A small fund in the amount 18,000.00 Ethiopian Birr (about $1,500.00 US Dollars) was received from HAPCO (HIV/AIDS Prevention and Control Office) in Ethiopia to conduct the study feasibility.

Although mobile phone penetration rates and SMS usage is part of the feasibility study, yet to be investigated, anecdotal reports indicate high level of penetration.

Main study

Because health program in low-income countries are fragmented securing funding is challenging (Braa et al., 2007). It is believed that upon successful completion of the pilot study funding agencies including HAPCO will seriously consider funding this study.

Prior to commencing the main study the measurement instrument (survey questionnaire and interview transcript) will be evaluated for face and content validity.

HYPOTHESES AND MEASURES

Facilitating conditions, like service availability, are found to influence perceived ease of use (Venkatesh, 2000) and "perceived service availability is expected to directly affect perceived usefulness of the technology" (Hong and Tam, 2006, p166). Therefore following Hong and Tam (2006) we hypothesize:

H1a: service availability has a positively affect on perceived usefulness.

H1b: service availability has a positively affect on perceived ease of use.

We anticipate that improved media features like device technology and transmission process positively affect perceived usefulness and perceived ease of use. We also expect that SMS messaging to fit the intended HIV/AIDS awareness information, which then influences user perception. We formally hypothesize:

H2a: device technology has a positively affect on perceived usefulness.

H2b: device technology has a positively affect on perceived ease of use.

H3a: transmission process has a positively affect on perceived usefulness.

H3b: transmission process has a positively affect on perceived ease of use.

H4a: product fit has a positively affect on perceived usefulness.

H4b: product fit has a positively affect on perceived ease of use.

Having a well structured content, a personalized message, and SMS message that affords user control are expected to have positive effect on consumer attention and their perception. We adopted four measures for consumer control from Koufaris (2002) including when I received my last SMS I felt confused (reversed), when I received my last SMS I felt calm, when I received my last SMS I felt in control, and when I received my last SMS I felt frustrated (reversed). We formally hypothesize:

H5a: message content has a positively affect on consumer attention.

H5b: message content has a positively affect on perceived usefulness.

H5c: message content has a positively affect on perceived ease of use.

H6a: personalization has a positively affect on consumer attention.

H6b: personalization has a positively affect on perceived usefulness.

H6c: personalization has a positively affect on perceived ease of use.

H7a: consumer control has a positively affect on consumer attention.

H7b: consumer control has a positively affect on perceived usefulness.

H7c: consumer control has a positively affect on perceived ease of use.

Significant differences between men's and women's perception of IT adoption was found and men were found to have greater interest in IT products than women (Mitchell and Walsh, 2004). Therefore we hypothesize:

H8: the SMS message will have higher HIV/AIDS awareness for men than women.

Rogers (1995) found that younger individuals, because of their tendency to pursue innovativeness, are more likely to adopt new technologies. Therefore we hypothesize:

H9: the SMS message will have higher HIV/AIDS awareness for younger than older people.

Perceived usefulness and perceived ease of use have been rigorously tested in IT adoption research (Davis et al., 1989) to influence consumer attitude and intention. We adopt six perceived usefulness measures from Venkatesh et al. (2003) including using SMS for HIV/AIDS awareness will increase my knowledge more quickly, using SMS would improve my HIV/AIDS awareness, using SMS would increase my productivity in my daily life, using SMS would enhance my HIV/AIDS awareness, using SMS would make it easier to be aware of HIV/AIDS, and I would find SMS to be useful for HIV/AIDS awareness. Therefore we hypothesize:

H10a: perceived usefulness has a positively affect on consumer intention.

H10b: perceived usefulness has a positively affect on consumer attitude.

H10c: perceived usefulness has a positively affect on social influence.

And for perceived ease of use we adopted six measures from Venkatesh et al. (2003) including learning to operate SMS would be easy for me, I would find it easy to get SMS do what I want it to do, my interaction with SMS would be clear and understandable, I would find SMS to be flexible to interact with, it would be easy for me to become skillful at using SMS, and I would find SMS easy to use. Therefore we hypothesize:

H11a: perceived ease of use has a positively affect on consumer intention.

H11b: perceived ease of use has a positively affect on consumer attitude.

H11c: perceived ease of use has a positively affect on social influence.

Attitude was found to influence intention (Ajzen and Fishbein, 1980). We adopted two measures from Bauer et al. (2005) including I find receiving HIV/AIDS awareness information via SMS positive and I appreciate receiving HIV/AIDS awareness information via SMS. Therefore we hypothesize:

H12: consumer attitude has a positively affect on consumer intention.

Perceived enjoyment was found to affect consumer intention (Hong and Tam, 2006). Perceived enjoyment is also hypothesize to affect perceived usefulness and perceived ease of use. Hong and Tam (2006) found perceived enjoyment as a

strong predictor of perceived usefulness. We adopt four measures from Hong and Tam (2006) including I expect that using SMS would be enjoyable, I expect that using SMS would be pleasurable, I expect to shave fun using SMS, and I expect that using SMS would be interesting. Therefore we hypothesize:

H13a: perceived enjoyment has a positively affect on perceived usefulness.

H13b: perceived enjoyment has a positively affect on perceived ease of use.

H13c: perceived enjoyment has a positively affect on consumer intention.

Need for uniqueness was found to affect consumer intention (Hong and Tam, 2006). We adopt four measures from Hong and Tam (2006) including I often think of the things I buy and do in terms of how I can use them to shape a more unusual personal image, I am often on the lookout for new products or brands that will add to my personal uniqueness, I actively seek to develop my personal uniqueness by buying special products or brands, and I actively seek buying and using products that are interesting and usually assists me in establishing a distinctive image. Therefore we hypothesize:

H14: need for uniqueness has a positively affect on consumer intention.

Young people are not using mobile technology services like SMS were found to appear struggling to maintain their social links (Carroll et al., 2002) and those that use mobile technology may improve status within a social group (Hong and Tam, 2006). We adopt three measures from Hong and Tam (2006) and Bauer et al (2005) including people who are important to me would want me to use SMS, people who influence my behavior would think I should use SMS, and people whose opinion I value would prefer me to use SMS. Therefore we hypothesize:

H15: social influence has a positively affect on consumer intention.

Perceived monetary value was found to affect consumers' attention to adopt a product, with higher perceived monetary value associated with more likelihood for adoption. We adopt three measures from Hong and Tam (2006) including I expect that SMS message would be reasonably priced, SMS message would offer a good value for the money, and I believe that at the current price SMS would provide a good value. Therefore we hypothesize:

H16: perceived monetary value has a positively affect on consumer intention.

Attention is often measured as recall to measure influence of consumer action (Scharl et al., 2005). Prior research indicates that mobile advertizing has a higher recall rate (Windwire, 2000 as cited in Scharl et al., 2005). We adopted four attention measures from Koufaris (2002) including when I received my last SMS I was absorbed intensely in the message, when I received my last SMS my attention was focused on the message, when I received my last SMS I concentrated fully on the message, and when I received my last SMS I was deeply engrossed in the message. Therefore we hypothesize:

H17a: Consumer attention has a positively affect on consumer intention.

H17b: Consumer attention has a positively affect on consumer behavior.

Consumer intension is found to be a good predictor of behavior (Ajzen, 1991). We will adopt three intention measures from Hong and Tam (2006) including I intend to use SMS messaging in the future, I expect that I would use SMS messaging in the future, and I expect to use SMS messaging frequently in the future. Therefore we hypothesize:

H18: Consumer intention has a positively affect on consumer behavior.

CONCLUSIONS

This study has presented a unified model to understand the success of SMS mobile technology for HIV/AIDS awareness. It is in the process of conducting a pilot study. Scharl et al. (2005) suggest future research to focus on cultural impacts and in developing questionnaire; this study plans to do both by expanding the study to an international context and designing the survey instrument. Subsequent to the pilot stud a full scale study will be conducted to test all hypotheses.

This study has broad implications for society. The ubiquitous mobile technology applied to increasing awareness in a pandemic like HIV/AIDS opens a frontier for the application of emergent technologies to address societal issues. The success of this study may offer some solution in bridging the dichotomy between the lack of IT infrastructure and the high prevalence of health pandemics like HIV/AIDS.

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