# Role of Modern Technology in Fighting Stigma Related to HIV/AIDS

**Kyalo Richard[1], Mutua Nicholas Muthama[2], Mutua Nicholas Mung'ithya[3]**

[1, 2, 3]Taita Taveta University College (A Constituent College of Jomo Kenyatta University of Agriculture & Technology), School of Science & Informatics, Department of Mathematics and Informatics, P.O BOX 635-80300, Voi, Kenya

**Abstract:** ***Sting Stigma Eradication Application forms the lifetime of fighting Stigma related to HIV/AIDS in Kenya and other developing countries in Africa. However, through this project there is remarkable improvement in approach of dealing with people affected or infected by HIV. It is therefore a turning point to a long journey of fighting the diseases in the entire continent. The IT initiative has encouraged various organizations to develop systems to facilitate their day to day operations. SSEA incorporates various modules for automating service delivery and enhancing communication between the concerned parties and thus help in saving time and operations thus increasing efficiency. The purpose of this solution is to present the software engineering approach for development which focuses on the set of activities and associated results to develop a Sting Stigma Eradication Application meant to perform some of services delivery necessary for individuals affected by HIV/AIDS automatically at their comfort by use of widely used technology, mobile and web technology.***

**Keywords:** Sting Stigma Eradication Application (SSEA), Short Messaging Service (SMS), Information Technology (IT), Antiretroviral Drug (ARV).

## 1. Introduction

Discrimination occurs when negative thoughts lead people or institution take, or omit to take, action that treats a person unfairly and unjustly on the basis of their presumed or actual HIV/AIDS, from the start of the AIDS epidemic, stigma and discrimination have fuelled the transmission of HIV and have greatly increased the negative impact associated with the epidemic HIV-related stigma and discrimination continue to manifest all over the country thus creating challenges to preventing further infections. Visibility and openness about AIDS are prerequisites for the successful mobilization of the entire world to respond positively to the epidemic. Stigma associated with AIDS is underpinned by many factors which include understanding of the illness, misconception of how HIV is transmitted, lack of access to treatment and irresponsible media reporting on the epidemic. Global consensus on the importance of tackling AIDS related stigma and discrimination is highlighted by the declaration of commitment adopted by the United Nation General Assembly Special Session on HIV/AIDS in June 2001 which state that stigma and discrimination is prerequisite for effective prevention and care. Apart from discrimination and stigma those who are tested HIV-positive should be able to receive available treatment, care and prevention counseling to protect others from infection and themselves from re-infection. Simply people living with HIV/AIDS should be able to receive medical support, social support and relevant counseling within their communities.

## 2. System design and implementation

### 2.1 System overview

SSEA is built on various platforms since it consists of Standalone application a mobile application and a web based application. The stand alone application built to run on a server connected to a remote database is built on VB.Net 2010, crystal report and MYSQL .The stand alone application is built to serve the following.

- To process service request a by patient and offer automated support.
- Control Financial transaction services for service delivery charges payments
- Collecting and storing information gathered through crowd sourcing regarding patient complains and compliments.

**Table 1:** SSEA Platforms

| | |
|---|---|
| *Education awareness* | Basically one way communication programs to the patients via SMS/text messaging in support of public health, behavior change campaigns |
| *Data/health record access* | Application designed to use mobile phones or computers to enter and access patient data |
| *Monitoring/ Medication compliance /appointment* | One way or two way communication to patient to monitor health conditions, maintain care giver appointments or even ensure strict medication regimen adherence. |
| *Analysis and consultations* | Applications developed to provide support for diagnostic and treatment activities of remote care givers through internet access to medical information data bases or to medical staff. |

### 2.2 System modules

The main function of the system includes:

1. Volunteers who wish to know their status on respective Health centers are tested and their records entered in the system.

2. If the infected want to be receiving ARV and other consultation while at home they indicate this and register with the mobile number they will be using.

3. After registration they will be in a capacity of being attended by their respective staff allocated to work for a

certain region. This attendance will be informed of often consultations by use of SMS and prescription of ARV.

4. This system also support labor export by introducing a mobile application capable of performing Medication prescription and also viewing registered patient complains and compliments from a Google map which will use Google cloud sourcing technique to collect such information. Doctors allocated to specific region will be in a position to deliver their service from wherever they are by use of this mobile application.

5. In relation to prescription the system will register various courier services to respective regions to perform the duties of ARV delivery door to door so immediately patient is prescribed ARV he/she will be notified via SMS and be requested to pay certain amount through MPESA to cater for door to door delivery and immediately the payment is transacted respective courier service from the region will be notified to pick the ARV for delivery.

6. Apart from ARV prescription and adherence the system is in a position to respond to clients query for instance if a person want to know something about HIV and related support available he/she will just need to use a short message and the system will give instance feedback. the system is so intelligent that its uses various combination of search algorithm to search if the question asked exists in its database and if not found the system goes further to locating any registered doctor from your region forwards the question to him/her for response and if there is response to the system it forward it to the relevant person.

7. Lastly as a concerned citizen you can give opinions and compliments concerning any measure you would like being implemented to improve fight against HIV/AIDS this module will use Geo tagging on Google map to group data from different region.

Feature of the new system:

- Immediate response to User queries and Compliments
- Easy to store and retrieve information
- Complains and compliments gathering through crowd sourcing
- Effective adherence To ARV attendance
- Improved Care and support thus reducing stigma
- Cost Effective

One of the main reason why the new system is cost effectiveness is it saves the amount spend on manual system as well as overall cost of conducting support and care to the infected and affected people.

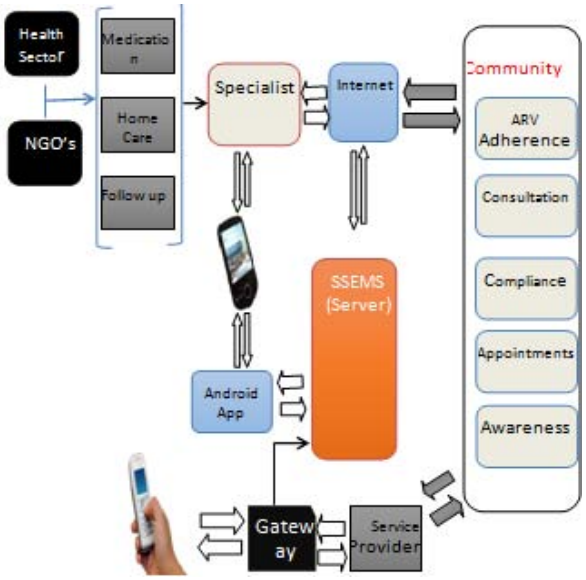


**Figure 1:** System Overview

### 2.3. Critical Factors

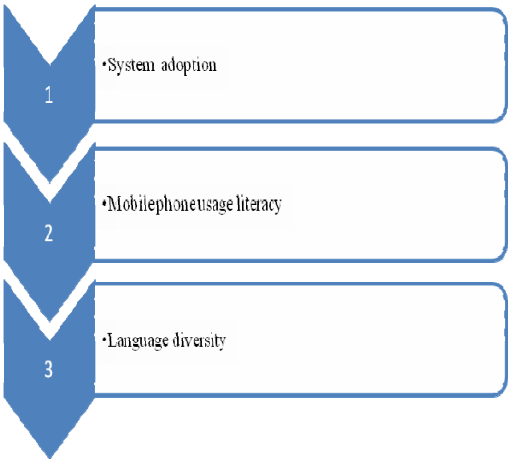


**Figure 2:** The ROA Difference/Active Listening Model

## 3. Literature review

### 3.1Remembering to Remember

The issue of remembering to take medication for HIV and medication for TB are not dissimilar – both involve regular taking of medication over prolonged periods. “Forgetting” and “being busy” are two of the most common reasons that HIV-infected individuals miss medications doses (Chesney, et al, 2000). A person with limited awareness of their prospective memory deficit (remembering to remember to take their medication!) may not employ otherwise effective compensatory strategies (e.g., use of a pillbox) and thereby be at risk for mismanaging their medication regimen (Woods, et al., 2008). For such patients, it has been suggested that a programmable electronic device that prominently notifies the patient when it is time to take a medication with a detailed text message that includes the medication, dosage, and particular conditions under which it should be taken (e.g., with food) might be maximally effective (Andrade, McGruder , Wu, Celano, Skolasky, & Selnes, 2005). A voicemail message has also been proposed (Leirer, et al, 1991).

### 3.2 Medication Event Monitoring System

The introduction of electronic monitoring for assessing medication non-adherence has enabled clinicians to gather detailed data about medication-taking behavior Electronic monitoring systems such as MEMS® (Medication Event Monitoring System) use pill containers fitted with a small electronic processor that record the date and time of each cap opening, resulting in a more detailed non-adherence measurement. Compared to other methods (e.g. assay, self-report, collateral reporting prescription refills), electronic monitoring captures more of the dynamics medication-taking behavior (Liu H, et al, 2001).

### 3.3. Directly Observed Treatment Short Course (DOTS)

The DOTS approach was first adopted in studies in India and Hong Kong as early as the 1960s (Bayer & Wilkinson, 1995). Today DOTS is widely recommended for the control of tuberculosis (Bass, et al, 1994) (Chaulk & Kazandjian, 1998) (Enarson, et al, 2000) and to prevent relapse and the development of drug resistance (Frieden & Sbarbaro, 2007). The main advantage of DOTS is that people can be closely monitored and that there is a social process with peer pressure that may improve adherence. On the other hand, the disadvantages associated with DOTS are that it moves away from adherence models of communication with cooperation between patient and provider back to a traditional medical approach with the patient as the passive recipient of advice and treatment.

### 3.4. Using SMS to Fight Disease in Africa

As healthcare projects deploying text messaging multiply in Africa, researchers are beginning to evaluate their effectiveness. Dinfin Mulupi reports on some of the emerging results. A relatively new technology is making headway in fighting some of the African continent's most pernicious epidemics. With adoption of mobile phones increasing rapidly in Africa, the use of health tools involving text messaging is also spreading. Text messaging is being deployed to fight malaria, encourage child immunizations and help people living with HIV/AIDS, among other uses. While many of these projects are in the early stages, some initial evaluations of SMS-text-messaging projects suggest they are effective in helping people get treatment, understand how to protect themselves and their families or get tested early. After a study was conducted showing favorable outcomes of the use of SMS to connect HIV-positive Kenyans with medical practitioners, plans were made to expand the project significantly.

### 3.5. SMS Text Message Reminders and SIMpill

In 2002, Green, a medical practitioner and consultant in the Western Cape, South Africa, developed a system using the telecommunications SMS to alert tuberculosis patients to take their medication (Green, ICT-Enabled Development Case Studies Series: The Compliance Service uses SMS technology for TB treatment, 2003). The names of patients are entered onto a computer database, and at the appropriate time, the computer reads the database and sends personalized SMS text messages to the patient, reminding them to take their medication. This reminder is sent regardless of whether or not the patient remembered to take their medication. Following the success of the SMS text messaging approach to alert TB patients to take their medication, Green collaborated with a the Tellumat telecommunications technology company (Tellumat Ltd, 2009), to develop the next generation of MEMS-Based medication packaging a semi-intelligent product known as SIMpill (SIMpill, 2008).

### 3.6. Kenya Connects Patients with Providers

The study prompting this expansion was conducted by WelTelKenya, which released its results in November 2010. The "WelTel Kenya1" study, written by Dr. Richard Lester and colleagues, assessed the effectiveness of SMS-text messaging in improving patients' adherence to ART. The SMS model being studied was designed in 2007 by Dr. Lester, of the British Columbia Centre for Disease Control in Vancouver, along with Kenyan clinicians and scientists working in HIV/AIDS care. The study's results showed that sending reminders via SMS to patients to take their medication achieved a significant increase in patients' adherence "This study shows that mobile health innovations can improve HIV treatment outcomes," wrote Dr. Lester in the report published in the Lancet. "Patients who received the SMS support were more likely to report adherence to ART and were more likely to have their viral load suppressed below detection levels than patients who received the standard care alone." The study concluded that mobile phones might be effective tools to improve patient outcome in settings with limited resources.

### 3.7. HIV/AIDS and Mobile Phones

A study took place in Kenya between May 2007 and October 2008, researching the effects of short message service (SMS) on the adherence of antiretroviral treatment for HIV&AIDS in 538 participants. The study was funded by the US President's Emergency Plan for AIDS Relief (PEPFAR) and was based on the notion that mobile phone communication could be used as a method to improve delivery of health services. The explicit aim of the study was to assess whether mobile phone communication between health-care workers and patients starting antiretroviral therapy in Kenya could improve drug adherence and suppression of plasma HIV-1 RNA load.

## 4. Conclusion

Since Spread of HIV/AIDS has grown rapidly in the last few years it has therefore resulted to increased Stigma in the society related to HIV/AIDS, finding from the study may result in expansion of SSEMS project across the country and a proven benefit will be expected to impact on greater numbers of HIV/AIDS sufferers and potentially other conditions where SSEA supported management may be of benefit. The results will thus influence policy of health management in the entire world.

## 5. Other Recommendations

We recommend more research to be done extend this to a large geographical area with more sophisticated tools and platforms. This is the only way technology can make sense to computer scientists and technologists.

## References


[1] Chesney, M., Ickovics, J., Chambers, D., Gifford, A., Neidig, J., & Zwickl, B. (2000). Self-reported adherence to antiretroviral medications among participants in HIV clinical trials: the AACTG adherence instruments. AIDS Care, 12:255–266.

[2] Donner J, Research Approaches to Mobile Use in the Developing World: A Review of the Literature, the Information Society, 24 (3), 2008. Scott N, The Impact of Mobile Phones in Africa, Commissions for Africa, 2004.

[3] Macq, J., Theobald, S. Dick, J. Dembele, M. (2003). An exploration of the concept of directly observed treatment (DOT) for tuberculosis patients: from a uniform to a customized approach. International Journal of Tuberculosis and Lung Disease, 7(2):103–9.

[4] Liu H, G. C. Maldonado, T., Duran, D., & Kaplan, A. (2001). A comparison study of multiple measures of adherence to HIV protease inhibitors. Ann Intern Med, 134:968-977.

[5] SIMpill. (2008). SIMpill. Retrieved September 2008, from SIMpill: http://www.simpill.com/Herek, G. M. and J. P Capitanio. 1997. “AIDS stigma and contact with persons with AIDS: Effects of direct and vicarious contact,” Journal of Applied Social Psychology 27(1): 1-36.

[6] Emlet, C. A. (2005). "Measuring Stigma in Older and Younger Adults with HIV/AIDS: An Analysis of an HIV Stigma Scale and Initial Exploration of Subscales." Research on Social Work Practice 15(4): 291-300.

[7] Forsyth, B., A. Vandormael, T. Kershaw and J. Grobbelaar (2008). "The political context of AIDS-related stigma and knowledge in a South African township community." Sahara J-Journal of Social Aspects of Hiv-Aids 5(2): 74-82.

[8] Garcia, S., M. A. H. Koyama and S. Grp Estudos Populacao (2008). "Stigma, discrimination And HIV/AIDS in the Brazilian context, 1998 and 2005." Revista De Saude Publica 42: 11.


## Authors Profile

**Richard Kyalo** received the B.S. degree in Mathematics and Computer science from Taita Taveta University College in 2011. Currently he is completing his MSc. Applied Statistics in JKUAT. He has been developing software for various firms since then.

**Nicholas Muthama** received the BSc (Mathematics & Physics) and MSc. in Applied Mathematics and MSc in Information Systems engineering from JKUAT and University of Sunderland in 2004 and 2009, respectively. He joined JKUAT in 2010 and moved to Taita Taveta University College by 2012 as an Assistant lecturer. Currently he is the chairman of department in the department of mathematics and informatics, Taita Taveta University College, a constituent College of Jomo Kenyatta University of Agriculture and Technology (JKUAT).

**Nicholas Mung’ithya Mutua** received the B. Sc in Mathematics and Computer Science from JKUAT in 2006. Currently Nicholas is in his thesis level of M. Sc. Computer systems at Taita Taveta University College, a constituent college of JKUAT and he works with Safaricom limited as a data support analyst and is a resource person in the department of mathematics and informatics. In addition, he holds CISCO qualifications namely; IT Essentials, CCNA, CCNP as a student and instructor.