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SMS Usage for Doctor-to-the-Barrio Program in the Philippines

An Assessment of the User's Perspectives



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ABSTRACT

Mobile technology can profoundly enhance healthcare services even in some areas where medical services are least heard of, and where there are inequitable distributions of healthcare workers. The use of SMS application in mobile phones is one technology that could solve these problems especially in underdeveloped and developing countries the Philippines. It may eliminate the “gap” between individuals and institutions that can lead to easy and effective sharing of medical information and knowledge.

Through the familiarity and popularity of SMS usage in the Philippines, the University of the Philippines Manila- National Telehealth Center has launched a telemedicine service program in 2007 and they involved the Department of Health “Doctor-to-the- Barrio” (DTTB) or Doctor to the rural area program. One of these telemedicine services is the Short Messaging Service (SMS) Telereferrals, which is the main topic of my study. Thru this service, the DTTB refers problematic cases to clinical expert in the University of the Philippines College of Medicine- Philippine General Hospital with the use of SMS application. The main aim of my study is to assess the DttB`s perspectives in utilizing SMS, as well as those of the other involved users (telehealth physicians, telehealth nurses and domain experts or DEs); their satisfaction and the challenges they encounter in using SMS Telereferrals in their everyday works.

In this study, the qualitative research method was applied in the research design and interpretive research approach was employed so as to understand the social context of this phenomenon of interest. Multiple data collection tools were put to use to look into and obtain likely explanations to the research questions considered. The theories of Information Infrastructures and Actor Network guided the study, too.

The findings of this study primarily revealed that most of the DttBs were satisfied with the SMS Telereferrals and found it useful in their clinical work, specifically if

this was their last resort to help them in decision-making for their patients' medical management.

At the end of the study, however, despite the fact that SMS Telereferrals had proven its potential, still its limitations were found to be greater than the benefits.

Based on the findings and conclusions, it was highly recommended that it should be used only in simple referrals with other healthcare providers (rural nurse, rural midwives), and not for the doctor-to-doctor exchange of relevant information and knowledge.

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Keywords: SMS, Philippines, UPM-NTHC, mHealth, Information Infrastructure, Actor Network Theory and so on.

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LIST OF ABBREVIATIONS

ANT	Actor Network Theory
DE	Domain Expert
DEs	Domain Expert
DOH	Department of Health
DttB	Doctor-to-the-Barrio
DttBs	Doctors-to-the-Barrios
GDP	Gross domestic product
GSM	Global System for Mobile Communications
II	Information Infrastructure
IIs	Information Infrastructures
IS	Information System
ISs	Information Systems
ICT	Information and Communications Technology
LGU	Local Government Unit
LGUs	Local Government Units
SME	Short Message Entity
SMSC	SMS centre
SMSCs	SMS centres
SMS	Short Message Service
UP	University of the Philippines
UPM-NTHC	University of the Philippines Manila- National Telehealth Center
UP-MIU	University of the Philippines- Medical Informatics Unit
UPCM- PGH	University of the Philippines College of Medicine- Philippines General Hospital

CHAPTER 1

INTRODUCTION

Ensuring that people living in remote and rural areas have access to healthcare workers is an enormous challenge for most countries, both in developed and in developing countries. Failure to reach out to these vulnerable communities is a major obstacle to progress in global health and restricts the attainment of the Millennium Development Goals adopted by the United Nations in 2000 (WHO- WHR 2003; Dussault and Franceschini 2006).

Moreover, the absence of well-functioning healthcare services in many parts of the world is partly a result of insufficient number and inequitable distribution of healthcare workers such as doctors in rural and urban areas (Stratton, Dunkin et al. 1995). About half of the world's population lives in rural areas but these areas are served by only 24% of the world's doctors (Zarocostas 2010). Both developed and developing countries have a higher proportion of doctors in urban and wealthier areas than in rural and urban underserved areas (Dussault and Franceschini 2006). In the United States, for example, in rural areas which has 20% of the population, 9% of registered doctors serve, and in Canada, only 9.3% of its doctors serve a quarter of the population in rural areas (WHO 2010). In low- and middle-income countries the shortage is even greater. For instance, in 1996, 46% of the South African population lived in rural areas and were served by only 27% of general practitioners (WHO 2010).

In the Philippines, where there are approximately 21928 doctors in the country, the density is of 11.5 doctors per 10000 populations however 66% of these doctors are in urban areas (WHO- Philippines 2011). It is no wonder that there is a shortage of approximately 5000 doctors in the rural areas (Talbot 2007).

The reasons for this imbalance range from demographic aging, which necessitates enormous demand for chronic care to the globalization of the labour market and the tendency of doctors to leave the countries that invested in their training (Chan 2010).

Additionally, majority of the doctors who decide to stay in the country, particularly the specialists, establish themselves in urban areas for better income from the practice of their profession. This situation creates disparity in health care delivery especially in the remote and underserved areas of the country (Gavino, Tolentino et al. 2010).

Many countries therefore, are becoming aware of this situation and are starting to plan on how to meet these challenges. Some of their clinicians, health services researchers, and allied personnel are starting to experiment on the use of advanced telecommunications and computer technologies to provide solutions to some sensitive health problems in the underserved areas. A key approach to these efforts is the “mHealth”, short for mobile health and a sub-segment of Telemedicine¹(Vital 2009).

The idea behind this is to support healthcare delivery via wide application of all available mobile technologies – mobile phones, personal digital assistances (PDAs), monitoring devices, etc. (Jordanova 2009). The utilization of mobile technologies has been rising in recent years as an application for developing countries, and this has surfaced, together with the rapid rise of mobile phone diffusion, in low-income nations (Vital 2009). Furthermore, the intense development and widespread use of “Short Message Service” (SMS) or text messaging in mobile phones as a medium of communication worldwide have offered new hopes for the promotion of good quality healthcare and immediate delivery of health services (Herman and Marcelo 2004).

In the Philippines, the utilization of SMS or text messaging has been phenomenal and as of this writing, its use is constantly increasing even in far-flung areas where there is network coverage. Actually, the Philippines has come to be known as the 'text-

¹ The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities (WHO1998).

Introduction

messaging-capital-of-the-world' based on a remarkable 1.39 billion text messages from a subscriber base of just 50 million (Salzar, Vallarino et al. 2008). As a result, the University of the Philippines Manila- National Telehealth Center (UPM-NTHC) has launched a telemedicine service program in 2007 which they involved the Department of Health (DOH) "Doctor-to-the- Barrios (DTTB) or Doctor to the Rural Area program" as "beneficiaries" (Marcelo and Pedrena 2011). They utilized the asynchronous SMS and email application, so the DttB could refer problematic cases to clinical experts from the University of the Philippines College of Medicine- Philippines General Hospital (UPM- PGH) (Gavino, Tolentino et al. 2010). While this DOH DttB`s program, is on-going government intervention program that provides means to prevent further depletion of trained medical professionals who can be made available to serve in the most remote areas of the country, it can further be strengthened by the use of telemedicine service via SMS.

This study explores the user`s perspective of this service in utilizing the Telereferrals² sent via SMS or "SMS Telereferrals" as implemented by the UPM- NTHC.

1.1 Purpose of the Study

In some studies that have been done in other countries, there were evidences that demonstrated the potential of the mobile technology to radically improve healthcare services, even in some areas where medical services were least heard of (Alliance 2011). The application of this technology closed effectively the "gap" between individuals and institutions, which led to easier and more effective sharing of information and knowledge (Waegermann 2010). The Philippines, through the UPM-NTHC evaluation survey, showed that SMS Telereferrals was very valuable in consulting specialists and could aid greatly in enhancing professional practices of rural doctors (Marcelo and Pedrena 2011). The result of this evaluation is enclosed in the theory section. Furthermore, Gavino and his group (2010) wrote an article about this project, too wherein they recommended the need to assess the satisfaction of both Doctors-to-the-Barrios (DTTBs) and Domain Experts (DEs).

² Telereferrals means sending medical referrals through telemedicine.

These studies became the starting point in exploring further the effectiveness of SMS Telereferrals in the exchange of medical information between rural doctors and clinical experts in the Philippines.

Thus, the main aim of this study was to determine DttB`s perceptions about utilizing SMS application, as well as those of other involved users (telehealth physicians, telehealth nurses and DEs) and the satisfactions and the challenges that they have encountered in implementing SMS Telereferrals in their everyday work.

1.2 Research Question

The following questions were intended to be answer in the study:

1. How are the user`s perspectives being considered in this program?
2. How do the users assess the usefulness of the SMS referrals in their everyday clinical work?
3. How satisfied are they with the SMS Telereferrals?
4. How did the patients benefit from the program?
5. What challenges or problems encountered by the users in applying this application?
6. What improvements can be recommended for a better application of SMS technology in the delivery of health services?

1.3 Outline of the Thesis

This thesis is organized into six sections.

Chapter One presents the context and introduction of the study.

Chapter Two provides the theoretical framework of the research, which provides support to the study.

Introduction

Chapter Three presents the research setting, which is the Philippines, its profile and the structure of its health system; the background of NTHC and its role in the implementation of SMS application usage in the DttB program.

Chapter Four discusses the method which insight into how the study of SMS application in DttB's program is conducted; how the study use the qualitative research approach whereby interpretive research methods are applied during the data collection which consist of observations, interviews and document review.

Chapter Five presents the findings of the study and its summary.

Chapter Six, the discussion explains the SMS application as an infrastructure by characterizing the Information Infrastructure and its limitations as experienced by the users of SMS Telereferrals; and subsequently, the role of Actor Network Theory in understanding the links between actors in SMS Telereferrals and SMS technology. Comparison of the results of this study with the earlier survey of UPM-NTHC is also included in this section.

Chapter Seven, the conclusion summarizes the results yielded by this study, provides some suggestions to support the sustainability of this SMS Telereferrals program, and identifies other possible areas where SMS application is more suitable. It also includes some recommendations and some ideas for further research.

CHAPTER 2

THEORY

This chapter provides the theoretical framework of the research, which consists of some literature review about the basic structure of SMS application; the complexity of SMS language; the popularity of SMS in the Philippines; the effectiveness of SMS application in the delivery of health service; and lastly, the “Brain Drain” phenomenon that explains why there is unequal distribution of healthcare workers especially the doctors.

Presented too, are the anchor main theories, the Information Infrastructure (II) and Actor Network Theory (ANT). It is a fact that SMS Telereferrals is not constructed from scratch, but rather from what is already in existence, which is the varied range of interdependent socio-technical components that are linked together in conventions of practice and thus influence each other. In this regard, Actor Network Theory can help in mapping out the role of the users involved and their interplay in the network.

2.1 Literature Review

2.1.1 Basic of Short Message Service

The Short Message Service (SMS), is the same as “text messaging”, which is among the simplest and yet most popular mobile data applications available today (Gow and Smith 2006). This was first created as part of the Global System for Mobile Communications (GSM) standard and commercially introduced in the telecommunications market in 1992; but it was only in the late 1990s that the service became widely accepted by the mass-market (Chandra 2003; Gow and Smith 2006).

Furthermore, it was also believed that the first SMS was transferred in 1992, over signalling channels of a European GSM network. Since this successful trial, SMS usage has been the subject of tremendous growth (Le Bodic 2005). A study by Allied Business Intelligence (ABI) Research found that consumers worldwide sent more than 7 trillion SMS messages in 2011 (Tsirulnik 2010).

SMS is a communication's protocol that allows mobile telephone users to deliver short text messages to each other (Terry 2008). This is a form of store-and-forward messaging similar to older style paging systems. *Store and forward* means that messages, once composed, are first stored in a service center or SMS center (SMSC), and then forwarded to the customer when there is available capacity in the network (Le Bodic 2005; Gow and Smith 2006). As a result, it is not 'instant messaging' in the strict sense of the term because SMS can be subject to delays in a busy network (Gow and Smith 2006).

The SMSC can send SMS messages to the end device through a maximum payload of 140 octets. This explains the upper bound of an SMS message to be 160 characters using 7-bit encoding. It is likely to identify other schemes such as 8-bit or 16-bit encoding, which decreases the maximum message length to 140 and 70 characters, respectively (Brown, Shipman et al. 2007).

Text messages can also be consumed for sending binary data over the air. Typically, specific applications on the phone handle messages that contain binary data, for example, to download ring tones, switch on and off animation, exchange picture messages, or change the look and feel of the handset's graphical user interface. The system can segment messages that exceed the maximum length into shorter messages, but then it must use part of the payload for a user-defined header that specifies the segment sequence information (Le Bodic 2005).

The SMS Centre may be integrated as part of the mobile network or as an independent network entity. The SMSC may also be located outside the network and be managed by a third party organization. Practically, it is very common for network operators to acquire one or more SMS centres (SMSCs) since SMS is now considered as a very basic service to be provided by any mobile network. In theory, one single

SMSC could manage SMS for several mobile network operators. However, this latter scenario is seldom encountered in real life and an SMSC is often dedicated to the management of SMS operations in one single mobile network (Le Bodic 2005).

Moreover, Mobile network operators usually have mutual commercial agreements to allow the exchange of messages between networks. This means that a message sent from a short message entity (SME) attached to a network A can be delivered to another SME attached to a mobile network B. This ability for users to exchange messages even if they are not subscribers to the same network and sometimes located in different countries is undoubtedly one of the key features that makes SMS so successful (Le Bodic 2005).

2.1.1.1 Message Structure and Terminology

A *message* refers to the subscriber's perception of the message composed of text and/or elements such as pictures, melodies, etc. For transport purposes and due to limitations at the transfer layer, an application may need to segment the message into several pieces called message segments. A one-segment message is also known as a “*short message*” (Le Bodic 2005).

A *message segment* is an element manipulated by an application. It has a limited payload size. In order to convey a large amount of data, several message segments can be combined into a “*concatenated message*” (In several documents dealing with SMS, a concatenated message is also known as a long message). The message concatenation is handled at the application layer. In order to be transported, the message segment needs to be mapped onto a Transfer Protocol Data Unit (TPDU)³ at the transfer layer as shown in Figure 1 (Le Bodic 2005).

³ In Protocol Data Units (PDU) contains information about the control, address and data to deliver an SMS message (Pettersen 2012).

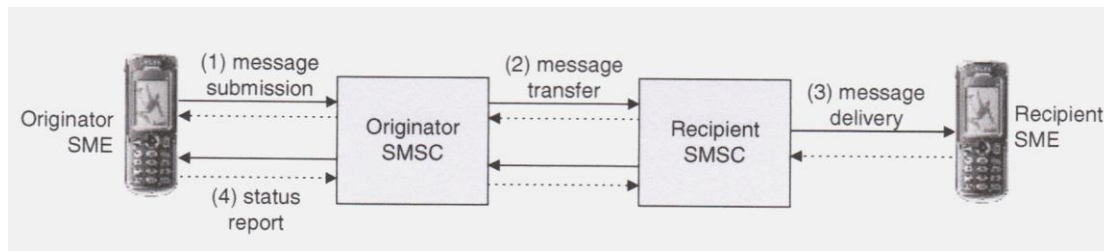


Figure 1: Exchange of message between two subscribers (Le Bodic 2005)

The above configuration that showed the exchange of a message between two subscribers consists of three to four steps. After creation by the message originator, the originator SME submits the message to the originator SMSC (step 1). The originator SMSC forwards the message towards the recipient SMSC (step 2) and the recipient SMSC delivers the message to the recipient SME (step 3). If the message originator requests a status report, then the recipient SMSC generates a status report and transfers it back to the originator SME (step 4).

2.1.1.2 Validity Period

A *message originator* has the possibility of indicating a validity period for a message. This validity period defines the deadline after which the message content is to be discarded. If a message has not been delivered to the message recipient before the expiry date, then the network usually discards the message without further attempts to deliver it to the recipient. For instance, a subscriber may send a message with the following content *“please phone me in the coming hour to get your answer.”* Additionally, the subscriber may wisely indicate that the message validity period is limited to 1 hour. In the situation where the message recipient does not turn on his/her mobile device in the hour following the message sending, then the network can decide to discard the message. Consequently, in this example, the message will never be delivered unless the recipient successfully retrieves the message in the hour following the message sending. Note that mobile operators often assign a default validity period for messages transiting in their network (e.g., 2 days)(Le Bodic 2005).

2.1.2 SMS Language

The limitation of 160 characters and the difficulty of typing messages on mobile phones have led to the development of a more efficient, written form of the text message, called SMS language. This is a term for the abbreviations and slang used because of the needed brevity of mobile phone text messaging. The benefit of SMS language is its efficiency; given the small touch pads and keyboards on smart phones and other mobile devices, it is basically faster and easier to use a shorthand of sorts (Pearson and Zehr 2011). It saves time and energy as well. It's much quicker to type 'u' than 'you'. We also see that sort of abbreviation used in other areas of computer communication where people want to type quickly, such as chat rooms and emails. Furthermore, there's a second reason. Crystal (2010) believed that the users thought it was good fun. They thought it was cool to send messages which played around with spellings – leaving letters out and using symbols to replace letters, such as '8' and '@'. This was something they couldn't do in other kinds of writing.

However, most of mobile users commonly remove the vowels from a word when they send text message, and so the reader is obliged to interpret a string of consonants by re-adding the vowels (e.g. *dictionary* becomes *dctnry* and *keyboard* becomes *kybrd*). While in other language, there are hardly any numbers or letters that can be used to replace a whole word, but there are in English. "2 N8" sounds like "To-n-ight". "C U" for "see you" is already a classic farewell phrase in text message. The reader must interpret the abbreviated words depending on the context in which it is used, as there are many examples of words or phrases that use the same abbreviations (e.g., *lol* could mean *laugh out loud* or *lots of love*, and *cryn* could mean *crayon* or *crying*). So if someone says *ttyl*, *lol* they probably mean *talk to you later*, *lots of love* not *talk to you later*, *laugh out loud*, and if someone says *omg*, *lol* they probably mean *oh my god*, *laugh out loud* not *oh my god*, *lots of love*. Context is the key when interpreting text messages, and it is precisely this shortfall that critics cite as a reason not to use it (although the English language in general, like most other languages, has many words that have different meanings in different contexts) (Mphahlele and Mashamaite 2005). SMS language does not always obey or follow standard grammar and additionally the

words used are not usually found in standard dictionaries or recognized by language academies (Harper, Palen et al. 2005).

2.1.3 Pros and Cons of SMS

Like any other application, SMS has its advantage and disadvantage. According to Le Bodic (2005), the obvious advantage of the SMS is that it has become a ubiquitous service in most GSM networks. One hundred percent of GSM handsets support the SMS. A message can be sent from almost any GSM network and be delivered to *any* other GSM subscriber attached to the same network, to another network in the same country or even to a network in another country.

The main weakness of the SMS is that, only limited amounts of data can be exchanged between subscribers. In its simplest form, SMS allows 140 octets of data to be exchanged. Concatenation⁴ has been established to allow longer messages to be transmitted.

Another obstacle is that only text can be included in messages and this does not allow the creation of messages with content more compelling than text. As well as the lack of content support for SMS prevents the development of commercial applications based on SMS (Le Bodic 2005).

2.1.4 The effectiveness of SMS application in the delivery of health services

The extensive usage of text messaging in various fields has triggered the health care community to take advantage of this technology for health services delivery. Despite of SMS limitations, it has been a popular mobile application in delivering health care to the people and there are different ways SMS message has been applied in the field of health care. In the Philippines, SMS application has been used for example:

⁴ Concatenation is the operation of joining two character strings to form a longer string, an end-to-end strings (Oxford Dictionary 2008).

Theory

In providing health information thru the Medical Information Inc. that provides an SMS service that allows users to ask about disease symptoms and medication information (such as dosage) (Alampay 2012).

To take advantage of the Philippine's facility with SMS, the University of the Philippines- Medical Informatics Unit (UP-MIU) initiated the development of an open source SMS appointment reminder system for pregnant mothers attending urban health centres. The application was tested in two health centres in Pasay City, Philippines. Initially, posters and hand-outs were provided as a marketing tool for the reminder system. Patients were then registered during their initial visit or subsequent follow-up appointment. On its first month of operation, 60 patients on initial consults and eight patients on follow-up visits were registered. Pregnant women, who registered for this service in their respective health centers, received two SMS reminders starting two days prior to a scheduled follow-up appointment. The health center personnel at the two centres sent SMS reminders using the MIU's SMS gateway. Preliminary results showed that SMS reminders improved prenatal follow-up visit compliance. Subjective feedback was also positive. An SMS appointment reminder system seemed to be a promising tool for increasing the compliance rate in prenatal follow-up appointments (Banez et. al. 2010).

Lastly, the evaluation studies done by the UPM-NTHC in the Philippines showed that SMS Telereferrals has been very useful in consulting the clinical specialist and can contribute greatly to the increased enhancement of professional practices of rural doctors. Below in figure 2 are the recent analyses of the Telereferral (Marcelo and Pedrena 2011).

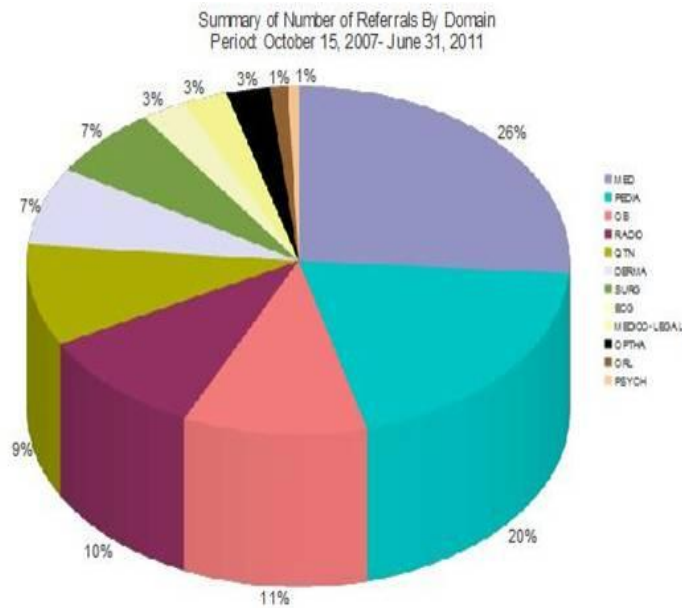


Figure 2: Summary of numbers of referrals (Marcelo and Pedrena 2011)

The summary of referrals by domain period October 15, 2007-June 31, 2011 (Marcelo and Pedrena 2011)

The following were gleaned from the data in Figure 2. It presented most of the Telereferrals (87%) sent via SMS, while (13%) were sent via Email.

- When Telereferrals were sent via SMS, information needs of referring physicians were directed to Case Management (53%). When sent via email, information needs were directed towards Diagnosis (53%).

- The DEs have responded to 43% of SMS Telereferrals within 15 minutes. 48% of emails Telereferrals were answered within 48 hours.

- The most frequent specializations utilized were Internal Medicine (26%), Paediatrics (20%), Obstetrics and Gynaecology (11%) and Radiology (10%).

- The remaining percentages included; General Health Information Inquiries (9%), Dermatology (7%), Surgery (7%), Medico-legal (3%), ECG readings (3%), Ophthalmology (3%) and lastly Psychiatry (1%) and ORL (1%).

Theory

Additionally, Marcelo and Pedrena (2011) reported that most of the Telereferrals were sent via SMS (87%), while 13% were sent via email. Related analysis of SMS and email Telereferrals showed that the medical information needs of referring physicians were directed towards case management (51%) and 49% were towards diagnosis. Majority of the SMS Telereferrals (43%) to the DE have been responded within 0-15 minutes. Hence, most email referrals (48%) were answered within 48 hours. Not surprisingly, email referrals explained clinical cases more thoroughly and many of them were intended to transfer to higher-level health facilities for more complex care.

Meanwhile, the 109 currently enrolled referring physicians evaluated the telemedicine service program (SMS Telereferrals) on how it aided their professional practice in February and March 2011. Common responses were that the telemedicine service has been *“very helpful”* because *“we trust the source,”* *“responses from the clinical specialists are relevant and applicable to community needs”* and their referrals were answered readily. Their capabilities were also enhanced which made them do their work better (Marcelo and Pedrena 2011).

Then in July- August 2011, an evaluation survey of usefulness of SMS Telereferrals had also been done among 109 referring physicians. It showed that 55% of them said that the responses of the clinical specialists were *“very useful,”* 45% said, *“it’s useful,”* while 0% said *“it’s not useful”* (Marcelo and Pedrena 2011) (see figure 3).

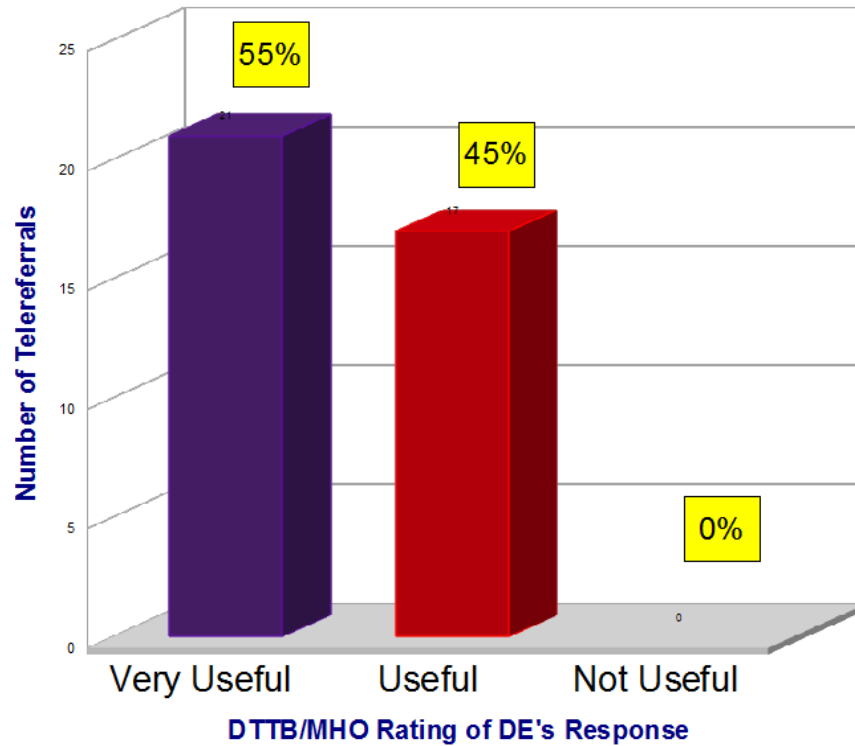


Figure 3: Evaluation data about the usefulness of SMS Telereferrals (Marcelo and Pedrena 2011)

In other studies done in other countries, SMS application had been proven effective in the delivery of health service. For example, Ferrero-Roca et al. (2004) studied about using SMS in chronic disease management. In an eight-month period of study, 23 diabetic patients used the service. Patients used SMS to transmit data such as blood glucose levels and body weight to a server. The server automatically answered with an SMS acknowledgement message. A monthly-calculated glycosylated haemoglobin result was also automatically sent to the patient by SMS. During the trial, the patients sent an average of 33 messages per month. Although users showed good acceptance of the SMS diabetes system, they expressed various concerns, such as the inability to enter data from previous days. Nonetheless, the trial results suggested that SMS might provide a simple, fast and efficient adjunct to the management of diabetes. It was particularly useful for elderly persons and teenagers, age groups that are known to have difficulty in controlling their diabetes.

Theory

SMS application had been used as well in Health prevention. The pilot study done by the group of Juzang et al. (2011), explored the feasibility of engaging young black men in a 12-week text-messaging program about HIV prevention. There were two non-randomized groups of 30 young men each. The participants were aged 16–20 years, self-identifying as black or African-American, sexually active, who owned a mobile phone and lived in Philadelphia. They received three text messages per week for 12 weeks. People in the intervention group received text messages about HIV prevention, while those in the control group received text messages about nutrition. The intervention participants showed trends in increased monogamy at follow-up compared to controls. Awareness of sexual health was significantly higher in the intervention group. Condom norms were significantly higher for the control group. There were no differences in the proportion of protected sex acts. The participants embraced the project and were enrolled and retained in numbers, which suggested such an intervention was worth examining for efficacy.

The 2008 Mobile Doctors Network (MDNet)/Medicareline program in Ghana, which provides free mobile-to-mobile voice and SMS services to all the physicians in Ghana, is currently registered with the Association. A one-way bulk SMS is also facilitated, allowing the Ghana Medical Association (GMA) to send information to doctors about national emergencies and meetings, as well as to contact doctors within a particular specialty. Mobile Doctors Network (MDNet) is the first service of its kind being implemented in Africa, and it aims to promote the transfer of knowledge between physicians in Ghana using mobile phones. Mobile phone is mostly the only means of communication most doctors in rural and urban areas of the country already use in their daily practice (WHO- mHealth 2011).

The MDNET's initial concept was to develop an online communication tool for physicians; yet, the lack of access to computers and the low penetration of Internet services, particularly in rural areas of the country, made it evident that cellular telephony was a more efficient and culturally responsive means to provide the service (WHO- mHealth 2011).

According to a 2009 survey of MDNet users conducted by Switchboard⁵, doctors considered that MDNet has improved communication about patient management among physicians throughout Ghana's health delivery system. In the same way, district and rural medical practitioners reported that they were increasingly reaching out to more experienced colleagues for advice on the management of complex medical cases and they were using MDNet to solicit information regarding specialists, bed availability, and clinic times, thus, facilitating the referral of patients to higher levels of care (WHO- mHealth 2011).

2.1.5 Brain Drain Phenomena

It is acknowledged that migration of health workers such as doctors is one of the contributing factors in the imbalance distribution of health workers in the world. Health workers from developing (source) country migrate to a developed (receiving) country because of various reasons. Evidently the outcome of this migration is the receiving country gains extra skills and resources. On the other hand, the source country loses highly skilled manpower and human capital. This phenomenon is well known as the "brain drain."

The issues surrounding brain drain are complex because it suggests that there is an unequal distribution of the advantages and disadvantages of global migration (Kupfer, Hofman et al. 2004). Brain drain provides benefits in the form of services to the recipient countries, while the source countries get their benefits in the form of remittances (from Metrics), which can also contribute to the developing countries' economy (Kupfer, Hofman et al. 2004). Nevertheless, the cost associated with the "brain-drain" phenomenon includes reduced quality of care in public hospitals in the developing country, loss of public educational investment and intellectual capital, fewer and poorer health services, and understaffing of services (Olalekan, Adeniran et al. 2011).

⁵ Switchboard is a US-based non-profit-making organization. It was also previously known as Africa Aid and changed its name in early 2011 (Africa aid 2012).

Theory

The factors influencing this phenomenon are the so-called “push and pull” factors. “Pull” factors are identified as those forces that attract an individual to a new destination (Dolea 2009). These might include active and passive recruitments by high-income countries, job vacancies with high salaries, higher standard working conditions and facilities, and better opportunities to higher training and continuing professional development (Olalekan, Adeniran et al. 2011). “Push” factors, on other hand, are those circumstances that act to repel the individual from a job location. These mirror often difficulties in employment opportunities, perennial low wages, unchecked poor working conditions and low job satisfaction. The latter of which is contributed by lack of better equipment, sufficient medications, and other wherewithal of the profession. While the “push” factors result to providing better form of health services to developing countries and thus maintaining the well being of their human capital, the “pull” factors, if benefiting from the robust inward flow of remittances, suffer costly reduction of quality health care in public hospitals, loss of public educational investment and intellectual capital, fewer and poorer health and staffing services (Dolea 2009).

Many theories are advanced to reflect the factors involved in health workers’ mobility. One is that of Neo-Classical Wage theory where it is assumed that all human decision making is driven by the pursuit of individual pleasure/happiness. Thus, to attain this individual fulfilment of happiness of a worker, his wage must be equal to the value of his contribution to the overall value of the commodity produced (Mtholyoke 2012). Thus, a worker, if not satisfied with the wage he receives in his own country will pursue it in another country where he can get it. Another factor that explains the migration of people is the Maslow’s theory of hierarchy of needs. Of the five levels of these needs, the most immediate are the physiological needs –that of air, water, nourishment and sleep or the basic accumulated needs to sustain one’s life and the safety needs—safe area, medical insurance, job security and financial reserves. Only after these basic needs are attained it is the only time that the worker would think of the three other levels of needs (AbsoluteAstronomy 2011). Parallel to Maslow’s theory is that of Herzberg’s “Dual Structure theory”, but with a new dimension added to a low-order needs of workers. The first one is the “motivation factors” which included achievement, recognition, nature of work itself, responsibility, promotion and growth. The other is the “hygiene factors” which are

pay and benefits, company policy and administration, relationship with co-workers and supervision. One can surmise that Herzberg theory underlies the perpetual migration of workers, leading to the trans-nationalization of labor in the world today (Wikipedia 2012). These factors of migration are more applicable to the present flight of health personnel than those in the other fields of work during the past.

2.2 Information Infrastructure

According to Bowker and Star (1999), theoretical understanding of infrastructure is essential to its design, use, and maintenance. This knowledge plays a vital role in associated fields such as informatics, library science, and new media – all fields that underpin communication in large-scale and long-term collaborative science. In their analysis, they extend conventional understandings of infrastructure as “tubes and wires” to the technologies and organizations which enable knowledge work. Understanding the concept of Information infrastructure (II) will provide more insight on how mobile technology develop and contribute in delivering health service.

Bowker and Star (1999) noted in their book that II is a tricky thing to analyse. Good, usable systems vanish almost by definition. The simpler they are to use, the harder they are to see. Along with the bigger they are, the harder they are to see. While, Star and Ruhleder (1994) articulated that infrastructure characteristically exists in the background. It is invisible, and it is often taken for granted. It is usually perceived as something “just there,” ready-at-hand, completely transparent, something upon which something else “runs” or “operates” (a system of railroad tracks upon which rail cars run; a computer network upon which a research lab operates or disseminates data like the www or the world wide web) (Star and Ruhleder 1994). Then, Shapin (1989) and Star (1991) stated also that the work of infrastructure and its maintenance is itself often that of undervalued or invisible workers (Shapin 1989; Star 1991). Adding to that is Star & Ruhleder (1996) statement, which is about infrastructure as relational: the daily work of one person is the infrastructure of another. This is true for people in practice, connected to activities and structures. It consists of both static and dynamic elements, each equally important to ensure a functional system.

Theory

Some authors such as Bowker and Star (1999) laid down descriptions of “infrastructure”. They meant that infrastructure is a set of collective equipment necessary to human activities, such as buildings, roads, bridges, rail tracks, channels, ports, and communications networks. Moreover, infrastructure in the information systems (ISs) as described by Zwass (2011) in Encyclopedia Britannica, is “an integrated set of components for collecting, storing, processing, and communicating information.” It has also been used to denote basic support systems like operating systems, file servers, communication protocols, printers, etc. The term *infrastructure* was presented to separate between such underlying support services and the applications using them as the complexity of computing in organizations rose.

Hanseth and Monteiro (1998) explained the II as a combination or merger of information and infrastructure technologies. It can be perceived as a step in the development of information technologies, as well as a step in the development of infrastructure technologies. Information Infrastructures (IIs) share a number of aspects with other kinds of IIs while having some unique aspects making them distinctive. To illustrate more the differences of II from information system (IS), Hanseth and Monteiro (1998) suggested the following 6 key aspects of II.

Enabling. II has a supporting or an *enabling* function. This insinuates that it is intended to support a wide range of activities, not especially tailored to one. It is enabling in the sense that it is a technology meant to open up a field of new activities, not just improving or automating something existing (Hanseth and Monteiro 1998).

Shared. II is one complex unit *shared* by a larger community (or collection of users and user groups). It is complex for the reason that it is the same “thing” employed by all its users (although it may appear differently). It cannot be divided into separate parts being used by different groups independently. Although, it may, of course, be disintegrated into separate units for analytical or design purposes. The fact that IIs are shared indicates that their parts are linked and they are defined as shared standards. This means that standards are not only economically important but an essential constituting factor (Hanseth and Monteiro 1998).

On the contrary, as Hanseth and Monteiro (1998) also explained, that this is opposed to the traditional view on ISs (applications) as individual tools, which are developed for a specific purpose (like an accounting system), and for definite and limited group (like the accounting department in an organization). The Internet and telecommunication in the sectors of health care are examples of shared resources. The term-shared resources is explained as, when one application is integrated with other application through information exchange (i.e. the other applications get access to the data initially registered by means of and owned by the first application), these applications become dependent on the data they receive from the first. Consequently, as the number of specific applications integrated increase, the character of application changes, too: from an ordinary application supporting a particular set of activities towards an infrastructure for a larger set of activities within a larger community.

Socio-technical. II is more than “pure” technology but somewhat *socio-technical networks*. This is similar with the IIs in general, since they will not work without the support of users using it properly. The flight-booking systems, for instance, do not work for one particular user unless all booked seats are registered in the systems. But this aspect is usually overlooked when it comes to the designing of ISs as well as in the IIs (Hanseth and Monteiro 1998).

Open. II is open. Openness in this context denotes lack of borders. For an infrastructure, there is no border considering the number of elements it may include (applications being integrated, computers linked to the Internet, etc.). It means as well that there are no restrictions for the number of users, stakeholders, vendors involved, nodes in the network and other technological components, application areas, network operators, etc. II has also no limitation to who might participate and contribute to its design and implementation. Its development has no beginning or ending – its development time is open (Hanseth and Monteiro 1998).

Heterogeneous. II is heterogeneous since it includes components of multiple sorts – diverse technological components as well as multiple non-technological elements (individual, social, organizational, institutional etc.), which are essential to support and operate the infrastructure. These components are linked in complex ways and they change constantly. This type of heterogeneity indicates that IIs can and must be

organized for future evolution through technical, institutional and social layering that enables controlled growth of heterogeneity. For this reason, architectural control, architectural design principles and clean interfaces between layers of the architecture are significant not only in enabling heterogeneity, but also for amplifying it (Hanseth and Monteiro 1998).

To exemplify further, layers of IIs are constructed upon each other such as the foundation TCP/IP⁶ services of the Internet is built upon a wide range of more basic telecom infrastructures like ordinary telephone service, mobile phone services, satellite communication; the email and the web infrastructures; e-commerce infrastructures are built on top of email and web infrastructures, and so on. Nonetheless, II is also heterogeneous because it includes sub-infrastructures based on different versions of the same standard (such as during a transition period - which may be very long - from one version to another) or different standards covering the same area in terms of functionality. For instance, different infrastructures running different e-mail protocols, electricity infrastructures linking together AC and DC⁷ based networks, a computing infrastructure of both Windows and Linux PC's, etc. (Hanseth and Monteiro 1998).

Evolve. II is not static; it is evolving in ways that reflect its initial components as well as ambitions for its growth. It does evolve continuously and unexpectedly since its limitations are not fixed beforehand. II evolution infers anticipation of a continuous change in the II's scale, scope and functionality. Because of this evolution, information services and associated components in the II will expand (or sometimes shrink) in time and space in an organic manner. This change does not essentially connect to any specific plan or goal like with traditional ISs. The design necessities for IIs consequently differ from those with single ISs where the growth is predictable and locally bound. Moreover, the fact that II evolve over a long period of time and have no clearly definite margins in scale, scope and functionality, they have critical

⁶ TCP/IP Transmission Control Protocol/Internet Protocol, the obligatory standard to be used by any system connecting to the Internet (Oxford Dictionary 2008).

⁷ AC and DC- Power distribution to IT equipment in a data center or network room can be accomplished using AC or DC power. AC power is typically distributed at the local mains voltage of 120 V, 208 V, or 230 V. DC power is typically distributed at the telecommunications standard voltage of 48 V (Rasmussen 2012).

implications in understanding *how* the evolution unfolds, and what kind of strategies can be adopted for the design of II. As soon as a part of an infrastructure is changed or improved, each new feature, or each new version of a component has to fit with the as-is infrastructure. This as-is infrastructure – i.e. its *installed base* - and its organization heavily impacts on how a new infrastructure or its part can be designed, and, in fact, how it can evolve (Hanseth and Monteiro 1998).

2.3 Actor Network Theory

Actor- Network Theory (ANT) is derived from the science of sociology and was pioneered by French scholars Bruno Latour (1986) and Michel Callon (1987). The theory's objective is to characterize a society of humans and non-humans as equal actors bound together into networks built and maintained in order to achieve a particular goal (Walsham 1997).

ANT is also an approach to structuring and explaining the links between society and technology. It offers explanations of how technology becomes acceptable and is taken up by groups in society. It suggests how technology is socially constructed. For instance: How do mobile phones become widely accepted? Why does MS-Windows dominate the PC market? How is Linux becoming popular? Why does the same IS fail in one organization and succeed in another? (McBride 2003).

Law (2003) also gives the example of how users think of a television: most of the time a television to its uses is a single and coherent object with relatively few apparent parts, but in fact it is an extremely complicated actor-network. It is only when that television breaks down, do the users become aware of the complexity of that actor-network; a network of electronic components and human interventions is unveiled. These networks remain hidden because in practice we cannot cope with endless network ramification. Indeed, much of the time we are not even in a position to detect network complexities (NGRF 2012).

Hanseth and Lyytinen (2004) exploited the primary motivation behind the development and use of ANT. They stated that ANT assists to enhance our

understanding of the relationships between scientific and technological issues on the one hand and social, organizational, political issues on the other. It has similarly been used to describe the establishment of scientific theories and facts and working technologies as the building of dense socio-technical networks, where elements of various kinds (technologies, humans, institutions, etc. – called actants) are translated (i.e. modified or re-interpreted) and enrolled into aligned actor-networks. Individual actors, whether these are humans, technologies or organizations, are also seen as heterogeneous networks (Callon 1991). It is heterogeneous, because of that there is an open-ended array of “things” that need to be aligned including work-routines, inducement structures, training, and ISs modules and organizational roles (Monteiro 1998). For example, rather than saying Newton “founded” the theory of gravitation seemingly as though he were alone in a vacuum, ANT emphasizes and considers all surrounding factors — no one acts alone. Galileo’s past experiences, his colleagues, his connections with the Astronomer Royal, John Flamsteed, his use of Euclidean geometry, Kepler’s astronomy, Galileo’s mechanics, his tools, the details of his lab, cultural factors and restrictions placed upon him in his environment, and various other technical and non-technical elements would all be described and considered in his actor-network (Walsham 1997).

Thus, ANT is also well suited in studying mobile and wireless networks in light of future ubiquitous computing scenarios, which envision a world of networked people and objects. Another advantage of using ANT is its emphasis on ‘following the user’ in order to disclose relevant practices, technologies and places (Hyrkkanen 2011).

To understand further the relationship of technologies, ANT offers a rich set of concepts such as actor, inscription, translation and black box.

Actor. In order to give emphasis to the symmetrical treatment of both human and non-human elements in the actor network, the term ‘actants’ are used instead of actors and artefacts (Akrich and Latour 1992). An actant is any technical or social element that is connected in a network through its properties— behaviours and/or interests. Examples of actants in mobile infrastructures are antennas, speech codecs, air interface standards and associated chip sets, formatting standards, regulators, operators, manufacturers, users, etc. (Yoo, Lyytinen et al. 2005).

To elaborate more, Ritzer (2004) acknowledged that the ANT network is conceived as a heterogeneous unification of textual, conceptual, social, and technical actors. The “volitional actor” for ANT, called *actant*, is any agent, collective or individual, that can associate or disassociate with other agents. Ritzer (2004) explain too that actants enter into networked associations, which in turn define them, name them, and provide them with substance, action, intention, and subjectivity. Otherwise, actants are considered foundationally undefined, with no a priori substance or essence, and it is via the networks in which they associate that actants derive their nature.

In addition, Latour (1986) wrote in his book of Science in Action, that Actor implies that the elements represented in texts act, that they do particular things. Outside the text, the elements are actants, entities that have an independent reality. Inside the text, they become actors, entities that do things, hopefully those things the texts were written for. Their action is precise because they are represented in the text. A text can be presumed as a network aligning heterogeneous elements (people, other texts, equipment, procedures, institutions, and more). Each one of these aligned elements has a reality outside the text. This reality outside the text allocates enforcement of the meaning and of the strength of the text. For instance, if microbes wouldn't exist independently of a scientific text, then representing them in such a text would be meaningless. However, it took a Louis Pasteur to align them in his texts with all kinds of other elements and turn them into the acknowledged source of infections, thus making them (social) actors.

Inscription. The term inscription refers to the fact that an artefact never begins as a blank slate; it usually embodies the innovators’ beliefs, social and economic relations, previous patterns of use, legal limits, and assumptions about the artefact (Akrich and Latour 1992). This is also used when designers formulate and shape technology in order to lead and control users. It also refers to the way technical artefacts embody some patterns of use, which includes user programs of action. The term encompasses too, the role users and the system play (Berg 1999; Monteiro 2000).

Many actors actively seek to inscribe their vision and interests into the artefact, since inscription can guide users to join or behave in a way that forces a definition of the form and function of the technology. A good example is Netscape’s inscribed

additional hypertext mark-up language “HTML”⁸ functionality in its browser in order to set it apart from other browsers that simply followed the HTML standard. We can assess how actors directly affected the technological artefact’s functionality by studying inscription over time, and thus affected the overall technological trajectory. (Faraj, Kwon et al. 2004).

Translation. Translation describes a variety of ways in which actors actively try to interest others in supporting the construction of a claim, enrolling them directly or indirectly in a coalition dedicated to building a fact or a machine (Latour 1987). As the evolution of a new technology usually involves various actors with diverse sets of interest, backgrounds, motivations and prejudices, those seeking to build such coalitions must build on their own strengths in order to align others’ interpretations and interests with their own (Monteiro 2000). Translation may take different forms for various actors. In this process, each actor develops an interpretation to channel his or her energy in a new direction that will advance the coalition’s goals. Once an innovator’s beliefs and interests are embodied in the forms of inscription and technical arrangements, networks of actors with their own chains of translations can react to them. These actors can form an alliance of interests and compete for standards (Faraj, Kwon et al. 2004).

Black Box. As Callon (1991) said "A black box contains that which no longer needs to be considered, those things whose contents have become a matter of indifference." A black box, therefore, is any setting that, no matter how complex it is or how contested its history has been, is now so stable and certain that it can be treated as a fact where only the input and output counts.

The term itself is derived from cybernetics, where it signifies a piece of machinery or a set of commands that might be very complex but can be substituted by a box because it is regular and stable (Stalder 1997).

⁸ HTML, hypertext mark-up language, a form of standard generalized mark-up language (SGML) which is intended for use on the World Wide Web (Oxford Dictionary 2008).

The stability of a black box is influenced by the costs of reopening it. This is not only determined by the social groups and procedures sealed into the black box, but also by the materials which are included. The media into which such a setting is sealed are a crucial element for understanding its overall dynamics. Turned into a black box, hardware tends to be too closed. It took, for example, an earthquake to open (literally and metaphorically) the black box of the Interstate 880 in Oakland, CA and uncover the corruption and construction errors, which it had enclosed. Software, on the other hand, is constantly reopened and sealed again because of its fluidity and low production costs. This is the process of constantly questioning some elements of the box (finding bugs) and trying to seal it again in a new up-grade (Law 2003).

The more a box appears to be closed, the more are the networks it includes assumed to be reliable and stable themselves. Latour (1987) stated that the more automatic and the blacker the box is, the more it has to be accompanied by people. To isolate a black box and conceptualize it with a trajectory of its own right means to presuppose as a given all the conditions that keep that box closed. In one sentence: a black box contains a sealed network of people and things.

CHAPTER 3

METHOD

This chapter provides information on how the study of SMS application in DttBs program was conducted. The study adopted the qualitative research approach in which interpretive research methods were used during data collection. These consisted of observation, interview and document review.

3.1 Research Approach

3.1.1 Qualitative Approach

This approach was preferred with the aim to gain an in-depth understanding of issues or particular situations by investigating the perspectives and behaviour of the people in these situations and the context within which they acted. This is a discipline that investigates the why and how of decision-making, not just of what, where, and when (Anderson and Aydin 2005).

Qualitative research methods are often called “naturalistic”, which means that “reality” or “truth” is considered multiple and socially constructed. The nature of inquiry is interpretive and the purpose of inquiry is to figure out a particular phenomenon, not to generalize on a population (Farzanfar 2005). Therefore, the qualitative researcher must explore things in these natural settings, attempting to make sense of, or interpret phenomena in terms of the meanings people bring to them and at same time use this data in the form of words rather than numbers (Denzin and Lincoln 2011).

Moreover, qualitative research usually involves systematic and detailed study of individuals in natural settings, instead of in settings arranged by the researcher, often

using open-ended interviews intended to elicit detailed, in-depth accounts of the interviewee's experiences and perceptions on specific issues, situations, or events. Qualitative methods use data in the form of words: transcripts of open-ended interviews, written observational descriptions of activities and conversations, and documents and other artefact's of people's actions. Such data are analysed in ways that retain their inherent textual nature. This is because the goals of qualitative research typically involve understanding a phenomenon from the points of view of the participants, and in its particular social and institutional context. These goals largely are lost when textual data are quantified and aggregated (Anderson and Aydin 2005).

Actually the phrase "qualitative research", as added by Strauss and Corbin (1998), can be perplexing because it can be interpreted in different ways to different people. Some researchers gather data by means of interviews and observations, and such techniques are normally associated with qualitative methods. However, they code the data in a manner that allows them to be statistically analysed. They are, in effect, quantifying qualitative data. In speaking about qualitative analysis, Strauss and Corbin (1998) are referring not to the quantifying of qualitative data but rather to a nonmathematical process of interpretation, carried out for the purpose of discovering concepts and relationships in raw data and then organizing these into a theoretical explanatory scheme. Data might consist of interviews and observations but also might include documents, films or videotapes, and even data that have been quantified for other purposes such as census data.

In agreement, Popay and Williams (1998) asserted that qualitative research is not the opposite of quantitative research. The concept of "measurement" is not absent. Qualitative research can and does involve a number of different approaches to measurement words and phrases such as "a lot," "a little," "many" and "most" and themes arising from the research may be described as "more or less", prominent, etc. In some studies, "cases" may actually be counted, reflecting what has been termed "cautious positivism."

Subsequently, qualitative research in information systems has been manifested in a wide variety of ways. Since the 1970s, and arguably even before, systems researchers have looked to other disciplines to apply qualitative methods to problems such as

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decision making, user`s responses to computing, and human computer interaction (HCI)(DeGross 1997). Nonetheless, this method must be in each reconcile two forces.

The first is the technique and standard that is expected in the discipline from which the method is taken. The second is to ensure that the technique, or the associated theoretical baggage from that other discipline, does not diminish the information system`s purpose and importance. This is not an easy task, as DeGross (1997) stated, because sometimes researcher feels that the issue at stake is too pertinent to information systems as a discipline that they can or should overlook or circumvent the standards that the contributing discipline applies. At other times, they are so taken up by the techniques that have proven so effective in sociology, for example, that they lose sight of the information systems` issues they started with.

3.1.2 Interpretive Research Approach

Interpretive research method was applied during data collection because it does not predefine dependent or independent variables, does not set out to test hypotheses, but aims to produce an understanding of the social context of the phenomenon and the process whereby the phenomenon influences and is influenced by the social context (Walsham 1995).

But, first of all, it is important to draw a distinction between interpretive research and qualitative research in order to provide a definition of interpretive research. Consistent with Klein and Myers (1999), there is no clear distinction written between these two researches, and they denote it as well to Chua`s (1986) studies that qualitative research can be done with a positivist, interpretive or critical stance (Klein and Myers 1999). Walsham (1995) correspondingly stated too, that qualitative research could be interpretive or positive depending on the philosophical assumptions of the researcher.

To draw attention towards some of the overlaps as well as differences between qualitative research, on one hand, and interpretive research, on the other, I briefly address this confusion stating that, interpretive research is more appropriately viewed as a subset of qualitative research. In other words, although one may usefully think of

all interpretive organizational research as belonging to the qualitative domain, not all qualitative research is necessarily in keeping with the spirit of interpretive inquiry (Denzin and Lincoln 2000).

To lessen the perplexity surrounding qualitative and interpretive research, it is necessary to disentangle these varied approaches from one another. To begin with, therefore, researchers need to recognize that although the different interpretive approaches do share a common ground, each of these approaches is also based on relatively unique methodological considerations that guide the conceptualization, design, and implementation of individual research projects. That is to say, the various individual approaches differ from one another with respect to research questions raised, research directions pursued, research procedures employed, and so on. Developing an appreciation and understanding of such differences will go a long way in addressing the sense of confusion that sometimes seems to attend organizational researchers' engagement with qualitative and/or interpretive research (Denzin and Lincoln 2000).

Interpretive research accentuates that the reality is socially constructed. It acknowledges the intimate relationship between the researcher and what is being explored, and the situational constraints shaping this process (Walsham 1995). What is considered important is that our conception of reality is gained through social constructions such as language, consciousness, shared meanings, documents, tools, and other artifacts (Klein and Myers 1999; Ellingsen 2002).

An interpretive field study comprises in-depth case studies and ethnographies. These two deviate from each other in terms of the time to be spent in the field. Ethnographic methods depend substantially or partly on "participant observation". But like the case study, ethnographies also depend on document analyses, interviews and video analyses. These techniques assist the researchers to capture the actual events on a small-localized level, that is, how the users interrelate with each other and with the artifacts in the given social setting (Ellingsen 2002).

To clarify the Interpretive approach, Klein and Myers's (1999) set of *principles for interpretive IS research* were used further as guides to understand the basic thought of

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interpretive study. In addition, they also helped in conducting and evaluating interpretive field studies in Information System.

The first principle is that of “The Fundamental Principle of the hermeneutic circle.” This principle is the groundwork to utterly interpretive work of a hermeneutic⁹ nature and it is in effect a meta-principle¹⁰ upon which the following six principles expand. The significance of this principle is that individual interpretations ought to be handled as parts in terms of the whole and vice versa. This approach is not simply to understand a researcher’s intentions better by interpreting the world-view behind them. Rather, the process is to move beyond original meaning by reaching a shared understanding between the researcher and the subject regarding some “parts” of the whole phenomena. Thus, when a phenomenon is familiar (i.e. ‘present-at- hand’) to a researcher, one will possess a prejudice- laden pre-understanding of it. A contention process of enquiry with the phenomena will enable the researcher to identify its parts. Operating from a holistic perspective, each part will be interpreted, and its meaning and relationship to the whole will be consolidated into an emergent understanding of the phenomena (Klein and Myers 1999; Naarmala 2009).

The second one is “The Principle of Contextualization.” This principle involves an analytical reflection on the social and historical background of the research setting. Subsequently, the intended audience can perceive how the current situation under study emerged (Klein and Myers 1999).

The third principle is “The Principle of Interaction between the researchers and the subjects.” It entails analytical reflection on how research material (or “data”) is socially created through the interaction between the researchers and participants (Klein and Myers 1999).

The fourth one is “The Principle of Abstraction and Generalization.” This principle involves connecting the idiographic details disclosed by the data interpretation within

⁹ Hermeneutics is used to refer to the interpretation of the meaning of cultural objects (texts, documents) and social practice (Answers 2012).

¹⁰ Meta-principle, the 'umbrella principle' under which other principles follows as corollaries or as natural consequences (BBC 2012).

the application of Principles 1 and 2 to the theoretical. The general idea is to describe the nature of human understanding and social action (Klein and Myers 1999).

The fifth is “The Principle of Dialogical Reasoning.” This principle calls for sensitivity to apparent contradictions concerning the theoretical preconceptions, theoretically guiding the research design and the actual findings (“the story which the data tell”) with the following cycles of modification (Klein and Myers 1999).

The sixth is “The Principle of Multiple Interpretations.” This principle requires sensitivity to possible differences in interpretations among the participants and this are typically expressed in multiple narrative or stories of the same sequence of events under study. In addition, the principle of “thick description” may apply in here. A thick description of a human behaviour is one that explains not just the behaviour, but its context as well, such that the behaviour becomes meaningful to an outsider (Klein and Myers 1999). As Gilbert Ryle suggested, quoted in the Walsham (1995) article, that if someone winks at us without a context, we don't know what it means. It might mean that the person is attracted to us, that one is trying to communicate secretly, that he or she understands what you mean, or anything. As the context changes, the meaning of the wink can also change.

The last is the seventh principle, “The Principle of Suspicion.” This requires sensitivity to potential “biases” and systemic “distortions” in the narratives collected from the participants (Klein and Myers 1999).

3.2 Data Collection

The empirical data in this study were collected from October to November 2011 in the UPM-NTHC. Observations and interviews of the users had been the main approach in collecting the data. Semi-structured interviews, casual talks with various users involved in the project and analyses of relevant documents have also been done.

Method

At the start of the study, a letter was sent to the director of UPM-NTHC in February 2011 to inquire about if the telemedicine service program was going on. The said agency provided me with some information on “SMS usage in the DTTB’s program.”

3.2.1 Literature Study

The gathering of data for the study started with a literature review. Searching for related studies had been done before in order to gather the basic information about Philippines, mobile technology and implementation of mHealth.

I searched and read more articles in the Internet to familiarize and acquaint myself with the research topic and read other articles about how the Philippines have been utilizing telemedicine. At the same time, the search was further extended to other countries achievements in using SMS Telereferrals and mHealth in delivering health service to their people. These updated my background about the SMS Telereferrals and other related on-going telemedicine service program in and outside the Philippines. Learning about the potential users’ life world was considered relevant to the present study. The knowledge and insight gained aided greatly in contextualizing and analysing observations and interview data.

The main search engines were the Google.com, PubMed, BIBSYS Ask and I availed myself of the library services for reference books. Search phrases were SMS application use in mHealth, mobile technology, Telereferral and among others.

3.2.2 Object of the Study

The objects of the study were the key actors and users of SMS Telereferrals. They included the rural doctors, who are called DttBs, the clinical specialist called domain expert or DE, registered nurse called as telehealth nurse and physician in-charge of the project called telehealth physician. Their involvement and perspective in this

program played an important role in the study and in the successful utilization of SMS Telereferrals.

REGIONS	# of DttBs
I (Ilocos Region)	--
II (Cagayan Valley)	8
III (Central Luzon)	1
IVA (Calabarzon)	5
VB (MIMAROPA)	5
V (Bicol)	8
CAR	12
NCR	--
VI (Western Visayas)	3
VII (Central Visayas)	7
VIII (Eastern Visayas)	9
IX (Zamboanga Peninsula)	7
X (Northern Mindanao)	3
XI (Davao Region)	2
XII (SOCCSKSARGEN)	1
XIII (CARAGA)	4
ARMM	3
TOTAL	78

Table 1: DttBs enrollees in the Telemedicine Program (Marcelo and Pedrena 2011)

Shown above (Table 1) is the number of doctors who enrolled in the program in February 2011. According to the director of the NTHC, 202 total rural doctors were involved in this program from 2007 -2010. These 78 DTTBs (28th batch) were distributed around the country (see figure 4).

Method



Figure 4: Distribution of DttBs in the Philippines

A letter requesting for DttBs information (names, address and email) to the office of DOH was sent to the DOH in October 2011. After two weeks of waiting, the DOH sent only 44 out of 78 names and emails of the DttBs who were involved in the program. Only 6 DttBs out of 44 responded to the request for interview, with an additional 4 recommended the DttBs.

3.2.2.1 Brief description of Users

The 10 DttBs were mostly new (1-2 years) medicine graduates and most of them had just finished the 6-month blended learning course with 2-day face-to-face learning activities, followed by field practice and mentoring, capped by another 1-day face-to-face seminar workshop. This training was part of their Continuing Medical Education provided by the DOH and UPM-NTHC. These DttBs preferred to work in some depressed and hard to reach areas for two (2) years and at the same time they were enrolled in the UPM-NTHC telemedicine service program (one of them is the SMS Telereferrals). The DttBs were given an attractive incentive package, which included a competitive salary and Magna Carta benefits and other bonuses. Access to a vast network of government as well as non-government institutions also formed part of the professional support for the DttBs. In particular, the DOH partnered with the Development Academy of the Philippines in developing the Master in Public Management Major in Health Systems and Development Course specifically tailored for DttBs in recognition of the learning opportunities deeply embedded in the program. This course was supposed to provide the DttBs academic and technical support for the duration of the program and to enable them to earn a degree after finishing it (News 2009).

Other users who also included in this study were the following: one telehealth physician, who was in-charge of the field operations and who used to classify difficult cases in the referral; five telehealth nurses, who usually triage the referral and send it to the appropriate clinical specialist (Domain Expert); two DEs, who were volunteer doctors from various specialties and who used to answer the referral; one software developer, who used to be responsible for the SMS application software; and one chief medical officer of UPM-NTSP (telehealth physician).

3.2.3 Observation

Prior to the study, an authorization letter and permission requesting to do fieldwork to the UPM-NTHC and DOH was obtained.

Method

All in all, I have conducted 10 hours of observation; five-times visit to the office; have spent 30min- 60 minutes time together with the users in the office. The observation was done in the office of UPM-NTHC that used to be the place where all coordination of the telemedicine program and SMS Telereferrals were being held.

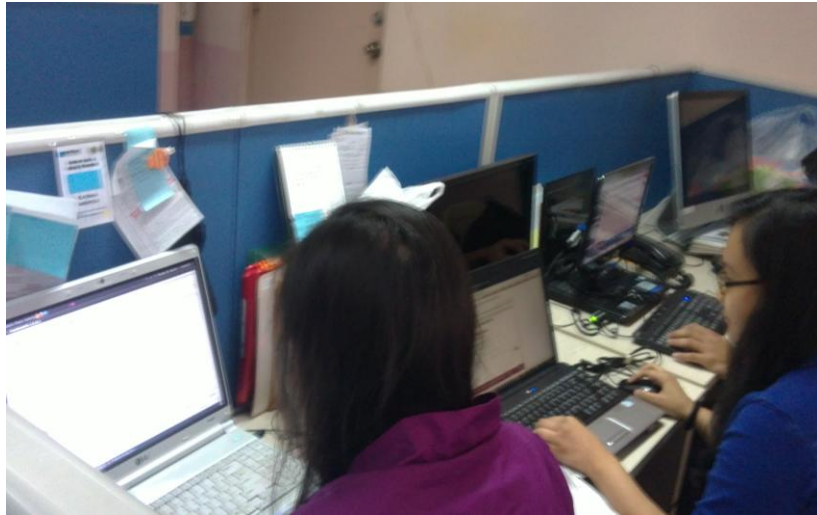


Figure 5: At the office of National Telehealth Center

The above-mentioned observations were only carried out at the workstation of the telehealth nurses, telehealth physician and software developer in the office of UPM-NTHC.

During the time that I have spent in the UPM-NTHC, I have observed how the users worked with the project and the system, as well as watched their work routine; and how they collaborated with other users and triaged doctor's referral. I got the chance to ask questions during these observations, to write down as much notes as possible about the activity and the discussions that were going on; at the same time wrote down the artifacts used, how they were used, by whom and in what situations.

Handwritten field notes were transcribed immediately afterwards, usually later the same day. This jotting down of notes assisted me in recollecting events, personal impressions, thoughts and interpretations on some occasions. It had been useful in

composing a question to be used in interviewing another user.

A digital camera was also used in order to document situation where it was difficult to describe in words such as the users' working areas and the software the users were using in this project.

The observation enabled me to directly enter the experience of using the system and documenting the user's experience as it occurred. It was easy for them (staffs of UPM-NTHC) too, to show rather than say which challenges have they encountered in using the system. At the same time, I have observed how the users fixed problems when they occurred.

3.2.4 Interview

During the data collection, I was able to conduct out a total of 20 interviews, with time ranging from 45-60 minutes, and those were conducted in the office of UPM-NTHC and in some places outside the hospital. The interviews were done through face-to face (2 DE, 4 telehealth nurses, 4 DttBs, 1 telehealth physician, 1 chief medical officer of NTSP and 1 software developer), telephone calls and email exchanges (6 DttBs, 1 telehealth nurse) (see table 2). I wrote an email letter and sent some follow up SMS to every user with the usual introduction of myself and the aim of the interview/study. As required, I usually requested for permission and schedule for interview in this letter.

Method

Interviewee	Number interviewed	Interaction kind	Hours of interview
DttBs	4	Face-to-face	2h
DEs	2	Face-to-face	2h
Telehealth Nurse	4	Face-to-face	1h -1h 30min each
Software developer	1	Face-to-face	15 minutes
Telehealth Physician	1	Face-to-face	1h
Chief medical officer of NTSP	1	Face-to face	1h
Telehealth Nurse	1	Email and telephone	30 minutes
DttBs	6	Email and telephone	30 minutes

Table 2: List of Interviewees

At the start of interview, as a researcher, I usually presented myself and tried to find some commonalities around which I could share to establish rapport during conversation. This technique had created a comfortable and relaxed environment that put the interviewee and me at ease during the interview.

For the interviews, I made use of some semi- structured and open- ended questionnaires. I prepared an “interview guide” or a list of general questions to be addressed during the interview. The interview was made flexible in the sense that questions were not necessarily ordered in a rigid way. The order had been adapted and the questions were based upon my own discretion of which would be most appropriate to ask. Willingness in the part of every user was shown in reply to the issues raised. (Please see copy of interviewed Guide Questions used in Appendix A, B, C, & D)

However, the interview was made systematic in taking up the same topics or areas of concern with a number of different users. Furthermore, as a researcher, I tried always to bear in mind that the interview was a conversation, not a question-and-answer session. There were no assigned orders to the questions, observing what had Farzanfar (2005) stated that, “In a free flowing conversational environment, sticking to an ordered list could be confusing, interfering with the ease and flow of the conversation.”

Audio tape recording was used as well in most of the interviews, with of course, permission from the users. I believed that recording all interviews were significant because it provides a full account of what was said. As Bernard (1988) said, “the memory cannot be relied on and tape recorders should be used to record exact words.” Additionally, the content of interview is sometimes difficult. Technical terms and abbreviations such as initials or acronyms- are challenging to catch and to comprehend. One time when I got confused in transcribing an interview, I tried at once to resolve it by sending email, which the user replied immediately.

3.2.4.1 Drawbacks during Interview

Nonetheless, being a researcher I too, had experienced difficulty in booking an appointment and spent a lot of time waiting for response from the requested interview. As it was mentioned earlier, the DOH gave me only 44 names with email of the DttBs out of 78 participants of this project and it took two weeks before I received these names. Emails requesting for interview were sent to the DttBs at once, and it took another two to four weeks before the DttB responded to the request. Some of the DttBs did not have the opportunity to meet me because of their distant location. I have experienced the same thing. I was not able to travel to the DttB’s place of assignments because of hardship in travel, distance and perceived danger in the place. So, I got the alternative to carry out the interview with some of the users by calling them and talking with them thru telephone to discuss their answers to the questions, or sending questionnaires thru email.

It is also worth mentioning that when I was getting frustrated from not having more users to contact, especially a face-to-face interview, which I wanted to experience, I decided to ask for the assistance of the UPM-NTHC director. Finally, after another week of waiting for response from the later, I was able to receive some more users' names, which were those of a DE and a telehealth nurse who could be interviewed. Fortunately, when this DE came for interview, he tagged with him a former telehealth physician, which enabled me to conduct two interviews in one session. After these interviews, the two users introduced me to four more DttBs.

3.3 Reflections on the Method

3.3.1 The Researcher and her Role

I had in mind several reasons for choosing SMS usage in DttB program in the Philippines for this study. The main reason was my intention to explore the DttB's satisfaction and the effectiveness of using SMS application in their everyday work. As a graduated nurse from the Philippines, I came to know the advantage and importance of using SMS in rural areas and the support of medical experts in better diagnosing the patients. Another reason for choosing this project was my curiosity about telemedicine. I have been living in Norway for many years and have been familiar with the modern technologies, which were available within the reach of every citizen. It made me wonder about the progress of Telemedicine in the Philippines.

Above and beyond, being a Filipino nurse, I have been familiar with Philippine culture, medical, nursing and health care system. These gave me advantage in data collection process. Aside from that, the opportunity to work in same medical field as the users, gave me the background knowledge and familiarity with what the users were talking about. As Atkinson (1995) wrote in his book, to be able to understand a cultural domain such as medicine, it is often necessary to acquire some degree of "insider" knowledge because in the exploration and analysis of a domain such as medicine, it is virtually impossible in the absence of the will and capacity to make sense of the technical content of working knowledge. Thru this familiarity, my role in

the data collection could be described and would give me the privilege to be an “insider”.

However, despite being an insider, I did not feel competent to be an accurate observer. Due to my long absence in the Philippines, I was no longer familiar with new health issues in my country of origin. But, in a way, I did believe that being an “outsider” had an advantage too, because I could see things that may not be perceivable to an insider and such factor worked best in collecting data. As Forsythe (1999) argues, “ethnographer’s job is not to replicate the insider’s perspective but rather to elicit and analyse it through systematic comparison between inside and outside views of particular events and processes. This task includes detecting tacit knowledge, something that by definition is generally invisible to insiders.”

3.3.2 Access to the field

As was mentioned earlier that at the start of the study, I had to search the Internet regarding the SMS Telereferrals in DttB’s program in regards to the following: Who are involved in this program? Who are going to be the interviewees? Who takes the responsibility for a decision about the access and whereabouts of the program?

This was not an easy task. Getting access to the field had been a great challenge even though I considered myself an insider or should we say, a Filipino nurse. It was the long waiting for response to request from the people in higher position in the organization that had been encountered. However, the time when I finally got the first user’s name from the director, it opened up all the doors for me. The first interviewees (DE and telehealth physician) had served as my “sponsors” or “gatekeepers”. As Randall (2007) said, “sponsors” and “gatekeepers” are valuable in gaining access to the organization because they know who to contact to. They helped a lot in showing the right way, introduced the researcher to the right users and organization, so the time in searching had been shortened. Thru these sponsors, I was introduced to other DttBs and was able to do a face-to-face interview with them. By the time that I got the names and telephone numbers, booking appointment for interviews had not been a

problem. Most of the users were willing to be interviewed and willing to contribute in this study.

In addition, I was able to obtain the user`s trust because they were familiar with the person who recommended me to them, and this contributed to a relaxed atmosphere during the interview. The users easily opened up their experiences, which resulted to more information that I obtained from them.

I developed the feeling that I was easily accepted as an observer, and I received a lot of assistance from the UPM-NTHC being introduced as “a researcher and a student from Norway”.

3.3.3 Reflection on the interpretive approach

In conducting the study, the Klein and Myers (1999) set of principles for interpretive research approach served as a framework in evaluating the validity of data about the SMS usage in DttB`s program. As a researcher, I had referred to this principle and tried to explain how this set of principles had been applied in this study.

It is claimed that “The Principle of the hermeneutic circle” is the over-arching principle upon which the other six principles develop. Thru the guidance of this principle, I have repeatedly transcribed and analysed the results of interview. I classified them according to similarities, their difference and other new topic that I did no know before that had come up during interview. The data that I had collected have yielded ideas on how to approach further the study, and the kind of data to gather in order to understand the phenomena behind the SMS Telereferrals program. This process had made my study more credible and reliable.

Regarding principle two, “The Principle of Contextualization,” my short stay in the Philippines for the data-gathering period brought back memories on how things work in the Philippines. “One could not rush things, and one should have a lot of patience waiting when one wants something from the government”.

Likewise, being back home in the Philippines had reoriented me in the environment, the living conditions of the people, health care system, and most of all, the infrastructure of Information technology, road and transport and electricity. These factors contributed to understanding the users' situation, their actions, their perspectives and how they adapt to their environment. It enlightened my mind about the program. It was easier to see and experience being there at the research site rather than by just reading about it.

With regards to principle three, "The Principle of Interaction between the Researchers and the subjects", I prepared some questions in order to guide the subject and me during interview. This guided towards more fruitful conversation and experience during interview. But, I have to admit that I am a novice researcher and likely that I have missed important clues or information, misjudge or misinterpret and even go unobserved of important facts given the fact that even a well-experienced researcher can do errors.

However, every interaction with the users, such as informal talks, suggestions and even gossips had made the program more interesting and made me become even more curious. I could say that I learned more as the interview went on, and the information obtained became the foundation for new questionnaire for the next interview.

Following principle four, "The Principle of Abstraction and Generalization", the notion on II and the ANT, were applied in the interpretation of data that have been collected. This principle guided me in understanding the phenomena behind the SMS Telereferrals, for instance, SMS technology have the same qualities as II. While in ANT, I was able to identify the different actor's role in SMS Telereferrals network who have one need and goal in participating in this network.

Principle five, "The Principle of Dialogical Reasoning", was applied to my researcher's background knowledge of the program that changed my attitude after I started interpreting the data collected. Aside from some preconceptions at the start of the data collection, it changed as the more data collected. Besides, I pursued to approach the study with clear and open mind, so that the arising new dimensions of SMS Telereferrals program could easily be captured.

Method

Applying Principle six, “The Principle of Multiple Interpretations”, the various versions of “the story” that I have gathered from interviewing the different users had been uncovered via data interpretation, disregarding the fact that these users have different interests that may influence their views about SMS Telereferrals. Consequently, there was a need to analytically assess their views to rule out any personal interests and their positions in the organization that may influence their opinions. Hearing different opinions made the study more interesting and enhanced the credibility of the study.

The last principle is “The Principle of Suspicion”. This required that I, as a researcher, had to pay attention to possible biases and distortions in the narrative collected from the users. The data have been examined to exclude possible biases that reflect their interests.

Therefore, as stated above, data that were collected from different users with different and similar point of views about the same questions was presented in the section of “case study.” These data were chosen because they yielded answers to what I was looking for in this study, thus it helping me to reach my goal.

CHAPTER 4

THE RESEARCH SETTING

This chapter illustrates and provides a picture of where this study was carried out. It begins by presenting the Philippines and its profile and the structure of its health system. The foundation of UPM- NTHC and its role in the implementation of SMS usage in the DttB program, together with the procedure on how to send and receive SMS Telereferrals, are also being discussed.

4.1 The Philippines, Its Profile

4.1.1 Geography

The Philippines is an archipelagic nation of 7,107 islands located south of mainland Asia. It is surrounded on the west by the South China Sea, on the east by the Pacific Ocean, on the north by the Bashi Channel, and on the south by the Sulu and Celebes Seas. It has no land borders with any nation. Its nearest neighbours are Malaysia, Indonesia and Brunei. There are 79 provinces and 17 regions. The largest island is Luzon and the site Manila, the capital of the Philippines (CIA- The World factbook 2012).



Figure 6: Map of the Philippines (CIA- The World factbook 2012)

GEOGRAPHY	
Location	Southeastern Asia, archipelago between the Philippine Sea and the South China Sea, east of Vietnam
Area	Total: 300,000 square km Land: 298,170 square km Water: 1,830 square km
Area-comparative	Slightly larger than Arizona (295,00 square km) Slightly smaller than Norway (323,802 square km)
Land boundaries	0 km
Coastline	36,289 km
Climate	Tropical marine; northeast monsoon (November to April); southwest monsoon (May to October)
Terrain	Mostly mountains with narrow to extensive coastal lowlands
Natural resources	Timber, petroleum, nickel, cobalt, silver, gold, salt, copper

Table 3: Geography Information about the Philippines (CIA- The World Factbook, 2012)

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PEOPLE and SOCIETY	
Population	103,775,002 (July 2012 est.)
Major cities population	Manila (capital) 11,449 million; Davao 1.48 million; Cebu City 845,000; Zamboanga 827,000 (2009)
Nationality	Noun: Filipino (s), adjective: Philippine
Languages	Filipino (official; based on Tagalog) and English (official) and other eight major dialects.
Population growth rate	1.873% (2012 est.)
Birth rate	24.98 births/1,000 population (2012 est.)
Death rate	4.98 deaths/ 1,000 population (July 2012 est.)
Life expectancy at birth	Total population: 71.94 years Male: 68.99 years Female: 75.03 years (2012 est)
Net migration rate	-1.27 migrant(s)/1,000 population (2012 est.)
Urbanization	Urban population: 49% of total population (2010) Rate of urbanization: 2.3% annual rate of change (2010-15 est.)
Health expenditures	3.8% of GDP (2009)
Physicians density	1.153 physicians/1,000 population (2004)
Hospital bed density	0.5 beds/1,000 population (2006)

Table 4: People and Society Information about the Philippines (CIA- The World Factbook, 2012)

4.1.2 Political situation

The Philippines is a democratic and republican state subscribing to the presidential form of government. There are three branches of government—the executive, legislative and judicial branches. The country has a unitary form of government and a multiparty political system. Executive power is vested in the President, who is the head of state and commander-in-chief of the armed forces. The Cabinet members are the heads of agencies and assist the President in drafting executive laws, policies and government programmes. The Constitution ensures direct election by the people for all elective positions from the President down to members of the barangay (village) councils (CIA- the World Factbook 2012).

In 1991, the Local Government Code transferred some of the powers of the national government to local government officials. The Code devolved basic services,

including health, giving responsibility to local government units (LGUs). The country is made up of political local government units of provinces, cities, municipalities and barangays. A local chief executive heads each local government unit (LGU). Administrative autonomy enables the LGUs to raise local revenues, to borrow and to determine types of local expenditure, including expenditure on health care (WHO-country 2011).

Since May 2010, the country has been under a new administration led by President Benigno "Noynoy" Aquino III, the 15th President of the Republic.

4.1.3 Economy: an overview

Philippine Gross Domestic Product (GDP) grew 7.6% in 2010, spurred by consumer demand, a rebound in exports and investments, and election-related spending, before cooling to 3.7% in 2011. The economy weathered the 2008-09 global recessions better than its regional peers due to minimal exposure to troubled international securities, lower dependence on exports, relatively resilient domestic consumption, large remittances from four- to five-million overseas Filipino workers, and a growing business process outsourcing industry. Economic growth in the Philippines averaged 4.5% during the Macapagal-Arroyo (former President) administration. Despite this growth, however, poverty worsened during her presidency. The Aquino administration is working to reduce the government deficit from 3.9% of GDP, when it took office, to 2% of GDP by 2013. The government has had little difficulty issuing debt, both locally and internationally, to finance the deficits. The Aquino administration reduced public debt to below 50% of GDP and obtained several rating upgrades on sovereign debt so that the Philippines is now close to investment grade.

However, the lack of government spending, especially on infrastructure, was one of several factors, which slowed GDP growth in the second half of 2011, leading the government to announce a stimulus effort and increased public spending on infrastructure in 2012. President Aquino's first budget emphasized education, health, conditional cash transfers for the poor, and other social spending programs, relying

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mostly on the private sector to finance important infrastructure projects. Weak tax collection, exacerbated by new tax breaks and incentives, has limited the government's ability to address major challenges. The Aquino administration has vowed to focus on improving tax collection efficiency - rather than imposing new taxes - as a part of its good governance platform. The economy still faces several long-term challenges, including reliance on energy imports and foreign demand for overseas Filipino workers (CIA- The World Factbook, 2012).

4.1.4 Risks and Vulnerabilities

Due to its geographical location along the so-called Pacific Ring of Fire and the typhoon belt, the country faces various natural disasters such as typhoons, landslides, volcanic eruptions and earthquakes. Since 2006, the Philippines has consistently been among those countries around the world most often hit by natural disasters and, in 2009, it topped the list, ranking third in terms of mortalities (1334 deaths) and second in terms of number of victims (13.4 millions) (Rodriguez et. al. 2010). At the same time, the chronic emergency due to armed conflict in Mindanao has been on going for more than four decades. Intensification of fighting alternating with periods of relative calm has led to displacement of those in affected communities and currently there are around 20000 families seeking refuge in evacuation centres and host communities (WHO- country 2011).

4.1.5 Communicable and non-communicable diseases, health risk factors and transition

Tuberculosis continues to plague a sizeable segment of the population although, in recent years, effective case finding, disease management using the directly observed treatment, short-course (DOTS) strategy, and partnership with the private sector have made inroads in the prevention and control of the disease (WHO- country 2011).

Mosquito-borne diseases, such as malaria, dengue and filariasis, are an ever-present danger in endemic areas. Although malaria is no longer a leading cause of death, it was the ninth leading cause of morbidity in 2007, affecting 10.6 million people who live in hilly, mountainous and hard-to-reach areas of the country (DOH 2007). Commonly affected population groups are farmers relying on forest products, migrant workers, indigenous cultural groups, settlers in frontier areas, soldiers, communities affected by armed conflicts and pregnant women and children (WHO- country 2011). Dengue fever also remains a threat, with cyclical outbreaks every three to five years. Early in 2008, there was resurgence in the number of cases and case fatality rate of 0.9%. In 2009, the age group with the highest (44.4%) number of cases was 5-14 year-olds (WHO- country 2011).

Mortality and morbidity rates for non-communicable diseases have been increasing steadily since the 1970s. In 1990, diseases of the heart dislodged infectious diseases as the leading cause of mortality. Latest statistics (2005) show that cardiovascular diseases, cancers, chronic respiratory diseases and diabetes continue to be among the country's top 10 killers. Hypertension and diseases of the heart was ranked as the fourth and ninth among the ten leading causes of illness in 2008 (WHO- country 2011).

4.2 Health Care Delivery system in the Philippines

The Philippines has a dual health system consisting of the public and private sectors. The public sector is largely financed through a tax-based budgeting system at the national and local levels. In this sector, health care is generally given free at the point of service, although socialized user charges have been introduced in recent years for certain types of services. The private sector consists of for-profit and non-profit providers. It is largely market-oriented; health care is paid through patient's fees at the point of service (Rosell-Ubial 2008).

In public sector, there are also three largely independent segments or sets of providers: (1) national government providers, which include, among others, hospitals run by national government agencies (e.g., hospitals of the Department of Health and

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the Department of National Defense), and central and regional offices of the Department of Health; (2) provincial government providers, which include provincial hospitals, provincial blood banks and the provincial health offices; and (3) local (municipal or city) government providers, including rural health units or RHUs, city health centres and barangay health stations or BHSs (WHO- country 2011).

Furthermore, there are three levels of healthcare workers; the first level, which is the primary healthcare workers, who are the first contacts to the communities and reside in the rural health clinics. They participate not only in community healthcare and midwifery but also assist in the efforts to improve the community such as food production. The next level is the intermediate healthcare workers who are the first source of professional healthcare and attend to problems beyond the scope of the first level. They provide support to the first line of workers that includes training, services and supplies. The third level consists of the hospital personnel who include specialty doctors, dentists, pharmacists and well-schooled health professionals. They provide back up for cases that require hospitalization and work closely with the intermediate level healthcare workers (Health Care 2012).

4.2.1 Organization of Health Services

The control and influence of the Department of Health, the executive department charged with looking after the health concerns of the people, lessened significantly with the transfer of responsibility for health to about 1,600 local government units (LGUs) under the Local Government Code of 1991. With the decentralization of health services to LGUs, fragmentation of services became evident. The provincial governments now supervise provincial and district hospitals, while the municipal governments handle rural health units (RHUs) and barangay (village) health stations (see figure 6) (WHO 2011).

In spite of this, the Department of Health still maintains specialty hospitals, regional hospitals and medical centres (see figure 7).

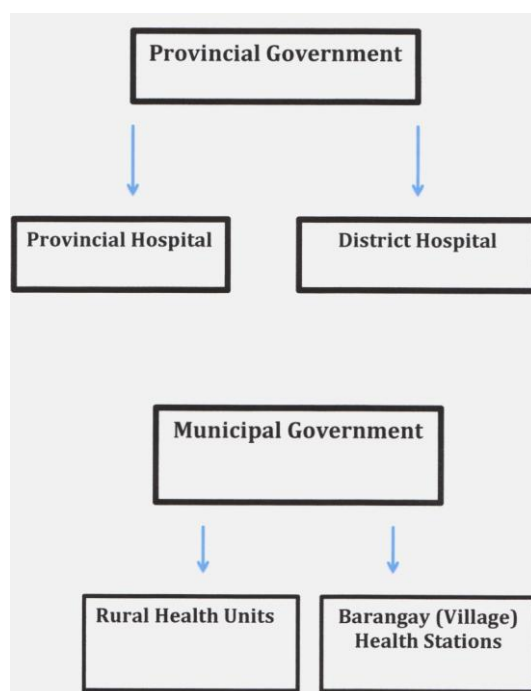


Figure 7: Organization of Health Services

Health service provision is regarded as 'dual', consisting of both the public and private sectors. The public sector has three largely independent segments or sets of providers: (1) national government providers, which include, among others, hospitals run by national government agencies (e.g., hospitals of the Department of Health and the Department of National Defense), and central and regional offices of the Department of Health; (2) provincial government providers, which include provincial hospitals, provincial blood banks and the provincial health offices; and (3) local (municipal or city) government providers, including rural health units or RHUs, city health centres and barangay health stations or BHSs. Each BHSs is staffed by a midwife, and each RHU is staffed by a doctor, a nurse and midwives (WHO 2011).

The Department's role after transfer the devolution of responsibility to LGUs is focused on regulation, technical guidelines/orientation, planning, evaluation, and inspection, while the provincial government takes responsibility for provincial and municipal hospitals, health centres and health posts, although funding flows do not exactly match it.

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The role of the municipal-government level is not well described and their capacity to perform is reportedly weak. With decentralization of health service delivery, local chief executives became core players in the health sector. The number of actors involved multiplied and hence the need for coordination and policy monitoring (WHO 2011).

Under a devolved setting, the LGUs serve as agents of the local health system and as a result they are required to formulate and enforce local policies and ordinances related to health, nutrition, sanitation and other health-related matters in accordance with national policies and standards. They are also in charge of setting up an environment conducive to establishment of partnerships with all sectors at the local level (WHO 2011).

4.2.2 Human resources for health

The Philippines is purportedly the leading exporter of nurses to the world and the second major exporter of physicians. Paradoxically, there are shortages of physicians and a fast turnover of nurses in the country, especially in rural areas. The high unemployment rate among health professionals, in spite of the considerable number of vacancies in rural areas, is another irony. Prevailing challenges include unmanaged emigration of Filipino health workers, weak and inadequate human resources for health (HRH) information system, and the existing distribution imbalance, among others (WHO- Philippines 2011).

4.2.3 Health referral system impacts

Grundy et.al (2003) remarked that, the distinction between levels of health service was being lost in the Philippines because understaffing (despite high expenditure on personnel), critical lack of operating expenses and decaying infrastructure. In many cases primary and secondary hospitals were sited next to rural health units, but were largely performing the same basic outpatient health center functions. Referral systems

lacked clear definition. Under- financing and under-resourcing had resulted in the primary and secondary hospitals no longer having the capability of providing referral services to the health centres in rural areas. The result of this was reduced access to essential surgical and obstetric services in the primary/secondary hospitals. As well as, access to essential obstetric care was dictated less by need and more by the ability to pay for care in more distant towns and cities.

The continuing reforms in health service delivery are designed in improving the accessibility and availability of basic and essential health care for all, particularly the poor. Public primary health facilities are apparent as being low quality, and are thus frequently bypassed. Clients are displeased due to long waiting times; alleged inferior medicines and supplies; poor diagnosis that result in repeated visits; and obvious lack of medical and people skills of the personnel available, especially in rural areas.

Consequently, the result is that secondary and tertiary facilities are flooded with patients needing primary health care. Since public primary facilities are more accessible to households and are mostly visited by the poor, improving the quality of those services particularly demanded by the poor would improve their health. Furthermore, referral mechanisms among different health facilities across local government units need to be strengthened (WHO 2011).

4.3 SMS in the Philippines

Philippine Long Distance Telephone company (PLDT) introduced the first cellular mobile phone service, PILTEL in 1991 (Lallana, 2004). The current leading providers, Smart and Globe, entered the market in 1994. In 2003, a third provider, Sun Cellular entered the market, offering lower priced unlimited SMS and voice service. By 2005, it already had 1.8 million subscribers in the Philippines, or roughly 5 per cent of the market and was growing (NTC, 2007).

SMS was originally introduced in 1994 as a free service (Celdran 2002). Only in 2000 did mobile providers begin charging for SMS use, but partly due to great consumer

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resistance and pressure, the prices have remained reasonable (Lallana 2004). SMS allowed people to stretch their telecommunications budget given that it costs less to use than voice calls. The relative low cost of SMS in the Philippines has also helped foster a culture of texting (Mendes et.al. 2007).

Mendes et.al. (2007) stated that it was difficult to overstate the impact of SMS in the Philippines, as evidenced by the sheer volume of messages sent by Filipinos. For example, in 2001, Smart and PILTEL was already averaging 50 million text messages a day. This translated to at least six messages per subscriber per day. Four years later, the figure had multiplied five times, with the National Telecommunications Commission (NTC) estimating that the Filipinos exchanged an average of 250 million messages a day in 2005. This showed that while cellular companies started charging for SMS in 2000 and had been reducing free text message allocation to their subscribers, the number of text messages exchanged had continued to rise. As a result, text messaging related services in 2005 amounted to about 45% of Smart and PILTEL's cellular revenues, while it accounted for about 36% of Globe's wireless revenues.

This increase in use of text messages is also a result of increased competition. With the entry of a third player, Sun Cellular, text messaging reached a high in 2006, when Smart and Globe, following Sun Cellular's lead, issued unlimited text promotions for a low fixed price. By the end of 2006, there were approximately 500 million SMS per day through Smart Communications. This meant that it is likely that the daily SMS total in the Philippines exceeds one billion – over 10 SMS per day for every man, woman and child in the country (Mendes et.al. 2007).

4.4 The UPM- National Telehealth Center in the Philippines and SMS Telereferrals

In 1985, the first telemedicine activity in the Philippines was documented when the country became part of the SatelLife/Healthnet project that linked medical centres in the US and the Philippines. The system provided e-mail communications and other

services via the LEO Health satellites. In 1991, the Makati Medical Center started a series of videoconferences with Stanford University Hospital. This was the first hospital in the Philippines to regularly use videoconferencing for real time consultations with doctors from other institutions (Domingo 2002).

Then, in June 1998, the UPM-NTHC was established through a resolution of the University of the Philippines Board of Regents. The UPM-NTHC was given the mandate to enhance access to health care services through Information and Communications Technology (ICT) (UPM-NTHC 2010).

The UPM-NTHC, as the leading agency, cooperated with the DOH in the conceptualization of the “Implementation of BuddyWorks: Use of Telehealth Services in Community Partnership Programs” or simply, the Buddyworks Telehealth Project. This was enabled by the eGovernment Fund from the Commission on Information and Communications Technology (CICT). This was a three-year project that began in November 2004, and implemented with 10 partners –local government units and health academic institutions -across the country (Marcelo and Pedrena 2011).

In 2007, the UPM-NTHC altered strategies and instituted two important changes to address many technical problems identified in the BuddyWorks project. First, they involved the DOH -DttBs as 'beneficiaries' of telemedicine. The University of the Philippines (UP), through the National Telehealth Center (NTHC) and the UP College of Medicine -Philippine General Hospital (UPCM-PGH) clinical specialists, has been supporting primary care DTTBs through asynchronous SMS and email-based telemedicine services. It was only in September 2009 that the memorandum of agreement between the UP Manila and DOH stating that the NTHC are the DOH's partner in eHealth and telemedicine was officially authorized (Marcelo and Pedrena 2011).

Second, the Information and Communication Technology (ICT) platform was changed to one that essentially used mHealth which uses mobile (phone) technology for DTTBs to send clinical information for referral cases to UPCM-PGH clinical experts and to receive responses from the same. (This was the opposite in comparison

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to the web-based Buddyworks portal in the original design) (Marcelo and Pedrena 2011).

After the Buddyworks Telehealth Project fund ended, telemedicine services of the NTHC were continued through the funding of the Philippine Council for Health Research and Development, Department of Science and Technology (DOST – PCHRD) as part of the research called “Instituting National Telehealth Service Program (NTSP)”, from 2008 to 2010. This had two components -[1] protocol development to formalize telehealth services, and [2] the development of a prototype telemedicine device for remote health facilities (RxBox), that are capable of transmitting signals to the UPCM-PGH specialists in assisting the DTTBs in their clinical decision making (Marcelo and Pedrena 2011).

In addition, through the DOST –PCHRD funding, the UP-NTHC established a support training and feedback activities on telemedicine with the DTTBs, and this is embedded into the bi-annual continuing medical education forums organized by the DOH in 2008 to 2009 (Marcelo and Pedrena 2011).

In October 2010, the UP Board of Regents approved the National Telehealth Service Program which include SMS Telereferrals, email Telereferrals, and Image- Based Telereferrals to be implemented nationwide providing reliable and sustainable telemedicine services, in collaboration with partners. Up to the present time, the UP continues to support the telemedicine services provided to the DTTB and Municipal Health Officers (Marcelo and Pedrena 2011).

Since October 2007, a total of 1,768 Telereferrals have been facilitated by the National Telehealth Center. These were sent by over 200 remote doctors from all over the country – as far as Batanes to Tawi-Tawi (Marcelo and Pedrena 2011).

4.4.1 The UPM-NTHC Work Routine

According to the telehealth physicians, “*The idea of using SMS Telereferrals in DttB program started when they found out that a lot of newly graduate doctors used to*

consult their friends, colleagues or acquaintance-specialists and send referrals about some cases that they were not capable to solve alone. Most of the DttBs were fresh graduates who need guidance from the Domain Expert (DE), and they were still lacking in medical knowledge and experience.” The UPM- NTHC got the idea from this practice and from then on, the SMS Telereferrals project was started.

Since then, whenever a DttB encountered a patient with complicated case, he/she easily consulted a clinical specialist (a DE) by sending an SMS or email to UPM-NTHC. Only short information about the disease of the patient and non-emergency cases could be sent via SMS Telereferrals. The UPM-NTHC, then immediately forwarded the referrals to the appropriate clinical specialists who were based in the UPCM-PGH. *“The DE usually answers back within 30min to 1 hour,”* according to a telehealth physician. But there were times when some of the DttBs sent some simple questions or inquiries, which the telehealth nurses or the telehealth physicians could immediately answer because they believed there was no need to forward them to the DE.

A telehealth physician, four telehealth nurses, and nineteen Domain Experts from various specialties are managing the SMS telemedicine program in UPM-NTHC. Every morning, a telehealth nurse who is assigned for the day, normally checks all the DttBs referrals and DEs responses that had been received and saved in the FrontlineSMS. All referrals except general questions are being automatically forwarded to the preferred DE. *“As telehealth nurses, we act and reply on general questions concerns only. We see to it that our answers that we relay are from reliable sources”*, explained the telehealth nurses. Thenceforward, the referrals and responses are being sent to their senders/recipients, respectively.

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Figure 8: The front view of the UPCM-PGH

Initially, the UPM-NTHC used two SMS-capable cellular phones to receive the text messages. The telehealth nurses manually encoded the referrals from the phones to a spreadsheet database. All SMS Telereferrals transactions (receiving from the DttB, sending to the DE, and vice versa) were done using the two mobile phones. After two months of this process, the SIM cards were then connected to a Global System for Mobile (GSM) modem so that incoming text messages were readily made available in a computer interface. The UPM-NTHC utilized the open source software FrontlineSMS and iPath, for SMS and email referrals respectively, to manage all the incoming and outgoing SMS transactions.

With this FrontlineSMS and iPath, the UPM-NThC redesigned or reprogramed this application according to their needs. They were using the keyword system, which was easier to customize. For instance, the word “Pedia”, whenever the DttBs sent their referrals, they have to write “to Pedia”. This would be directly automated to the Pediatrician. The same procedure was taken when DEs send back their answers; they have to write the keyword of the DttB (for example DttB 06) who have sent the referrals. It made the flow of communication easier between DttBs and DEs and lessens works for the telehealth nurses. So even in the evening, any DttB concerned could send SMS to the DE and the DE could respond at once. To monitor the system

when there was a need for intervention such as wrong sending of SMS was the sole responsibility of the telehealth nurse.

This FrontlineSMS (Figure 9) had been installed in a laptop computer, which was always being kept on the –on- position. With its help, the DttBs and DEs could send their medical referrals and responses whenever they want, 24 hours a day and 7 days a week. The UPM-NTHC was connected to the backup generator of the UPCM-PGH in case of electricity blackout.

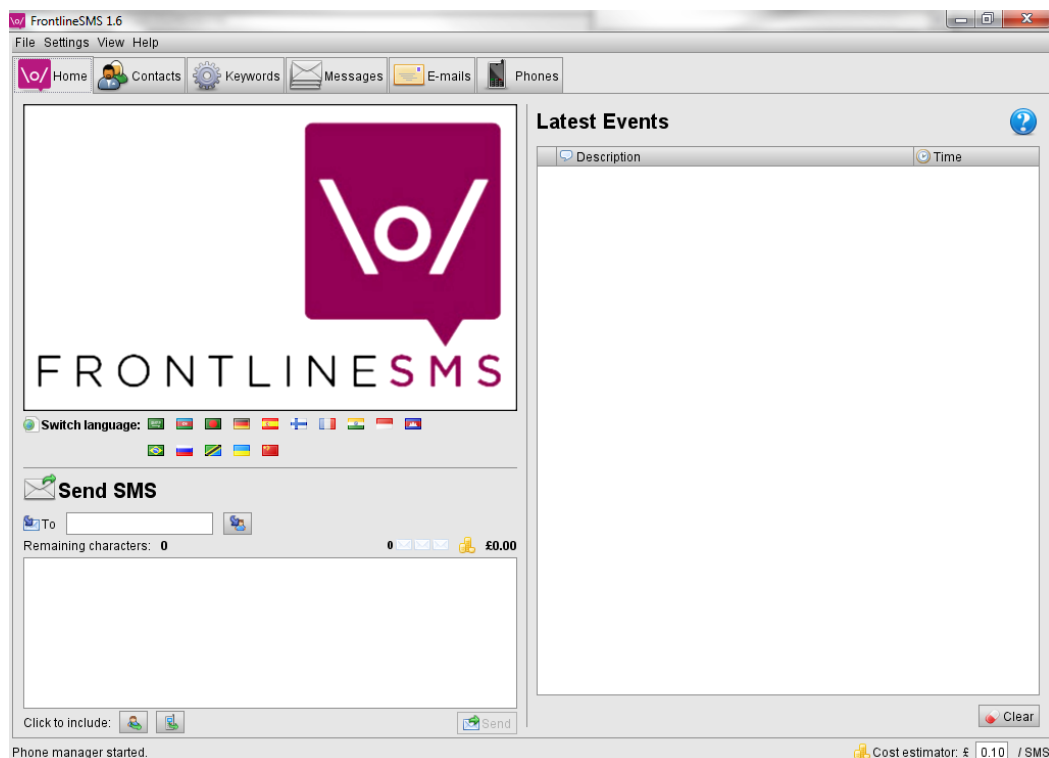


Figure 9: FrontlineSMS Interface (FrontlineSMS 2012)

4.4.2 Sending and Receiving SMS Telereferrals

In order to use the SMS Telereferrals, the DttBs have to register first in the UPM-NTHC’s SMS Telemedicine contact manager storage by sending their names, assigned municipality and province to the UPM-NTHC’s official Telemedicine mobile number (see figure 10). They have to construct this information (e.g. names

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with the prescribed syntax) and send to the UPM-NTHC's mobile number. Then, they have to wait for an automated reply to be sent by UPM-NTHC's system because their information have to be registered in the FrontlineSMS contacts manager (see figure 11).

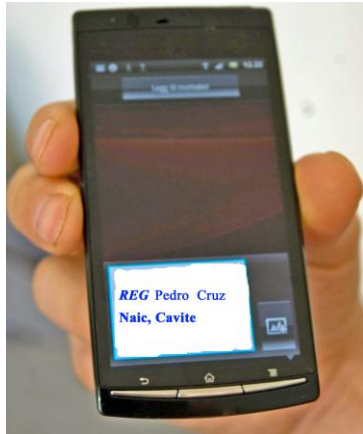


Figure 10: Register thru SMS

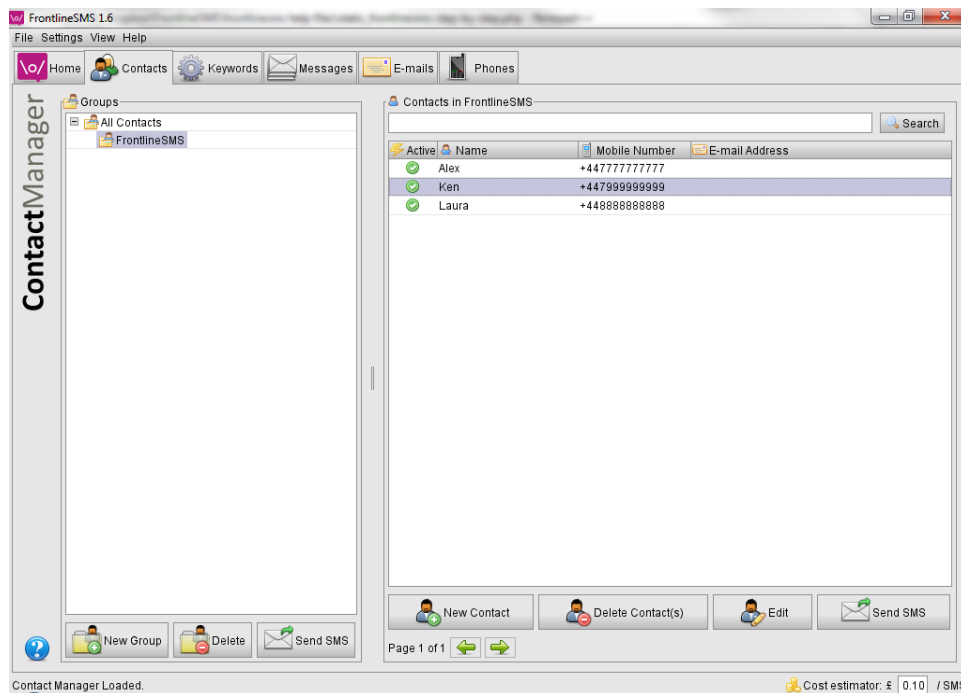


Figure 11: Contact Manager Interface (FrontlineSMS 2012)

Subsequently, they would be asked to validate their registration by texting back their email addresses. Once they have validated their registration, they would receive assigned Telemedicine IDs that would also confirm that they are now registered in SMS Telereferrals. This Telemedicine IDs became the only DttB's permanent and unique identification which have the DB## format. DB stands for Doctor to the Barrio, and the DB number corresponds to the order of registration (e.g. DB109).

Same registration was also applied to the DEs who would join the program and would receive Telemedicine IDs, too.

The DttBs and DEs have to write their Telemedicine IDs and keywords at the start of their text messages to enable UPM-NTHC to classify the cases and where the messages were addressed to; and at the same time they indicated the Patient code, too. Thru these keywords the anonymity of all the involved parties were being preserved. The keywords were designed to be use in FrontlineSMS and the UPM-NTHC has been allowed by the developer of the program to have its own keyword. FrontlineSMS has been used in different areas, but the UPM-NTHC has just adopted the concept and recently redesigned it for their own uses.

Moreover, the text messages would be automatically registered and saved in the FrontlineSMS software (Figure 12) and the telehealth nurses would forward the referrals to the appropriate DEs who were being based in the UPCM-PGH. The DEs were being alerted via SMS for any incoming referrals addressed to them at any time. Then, in turn, the DEs send back their expert opinions to the inquiring DttBs. In case the DttBs were not satisfied with the answers, then again, the UPM-NTHC would send the referrals back to DEs or to other specialists.

The DttBs have to write text message in their mobile phones by writing the assigned keywords for SMS Telereferrals for the DEs that they intend to send referrals to, followed by the Patient Code. Then send their referrals to UPM-NTHC official Telemedicine mobile number. Patient Initials </slash> Age </slash> Gender (e.g.. RV/65/M).

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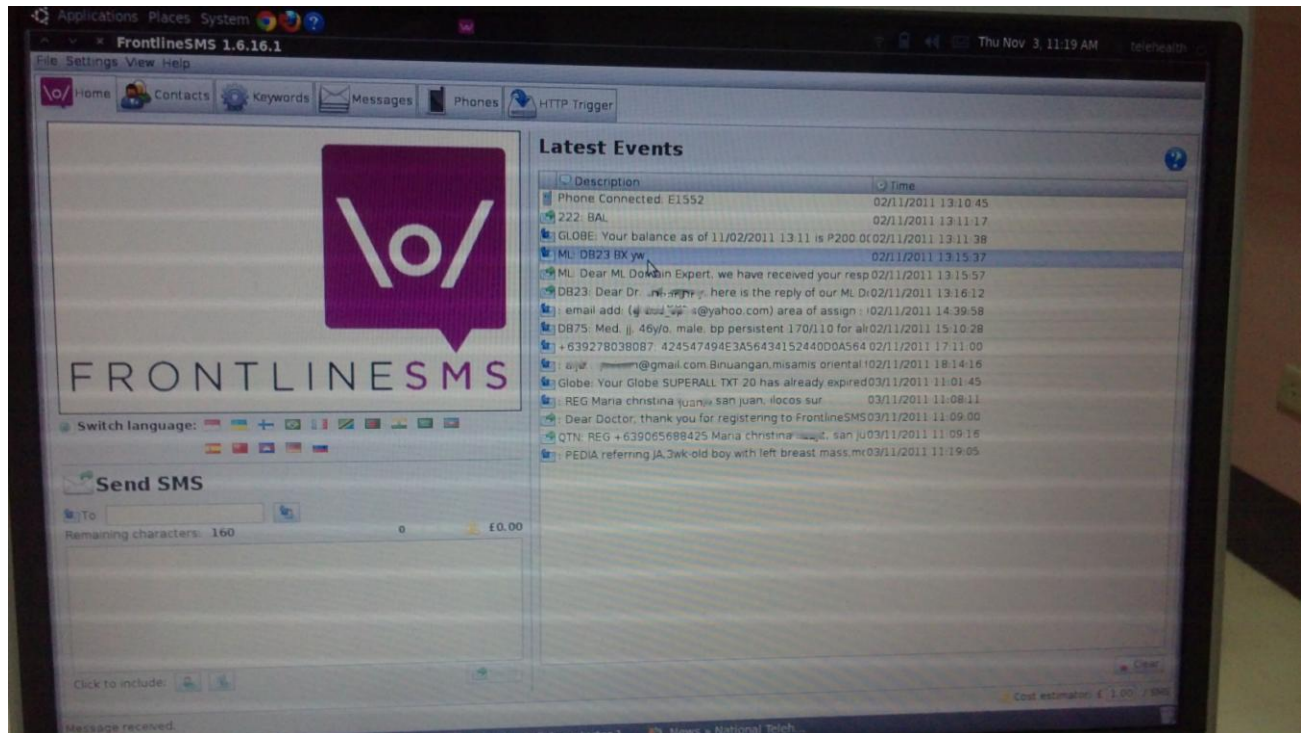


Figure 12: FrontlineSMS Interface

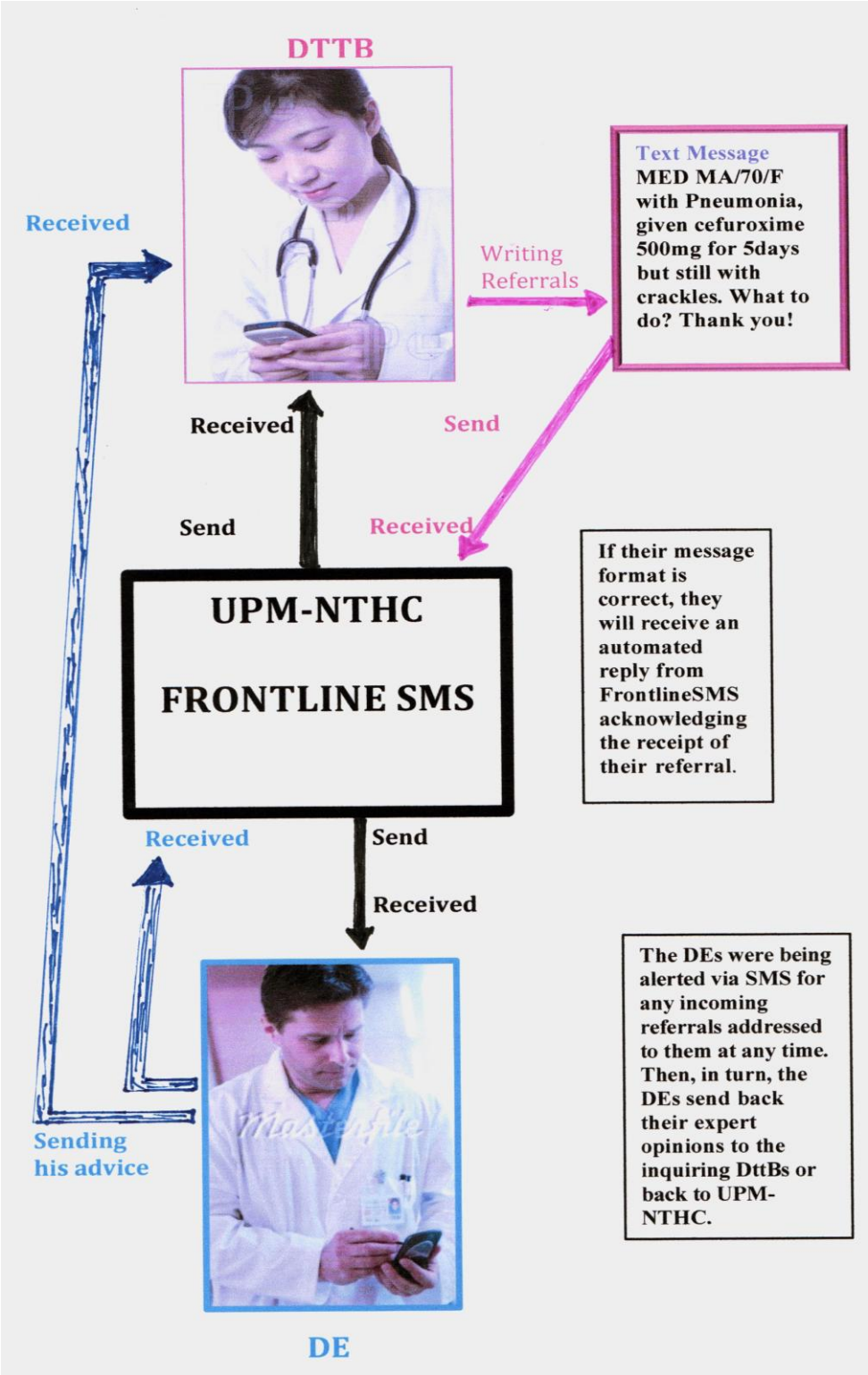


Figure 13: How to send and receive SMS Telereferrals illustration

CHAPTER 5

THE FINDINGS OF THE STUDY

The results of my interviews, some observations of the users of SMS Telereferrals, detailed description of how user`s perspectives are being considered, their assessment and satisfaction in utilizing the program, the patient`s benefits, the challenges that the users encountered and their recommendations are presented in this chapter.

5.1 Consideration of user`s perspectives

The application of the SMS technology in the program is\ kept simple to enable the users to gain maximum utility. The simplicity of SMS application and familiarity in using mobile phones has aided them in accepting the system. The introductions of SMS Telereferrals thru training or orientation have contributed too in using SMS Telereferrals and this enable the users to easily adapt to the system. The following are the user`s experiences:

5.1.1 DttB`s Experiences

The majority of the DttBs got involved in the SMS Telereferrals when they attended the two-day biannual continuing medical education course organized by the DOH and UPM-NTHC. The referrals thru SMS and email were introduced in this course and a hands-on training on how to send SMS thru mobile phone was provided. They were given some guidelines and standards on how to use the application.

After the hands-on training, most of the DttBs gave assurance that they felt confident utilizing the SMS application. *“It was easy to learn how to use the SMS Telereferrals because of my background in using a mobile phone,”* remarked one DttB. Familiarity

with the SMS technology helped them to adopt the system and made sending referrals easier.

5.1.2 DE`s Experiences

The DEs became involved in this project when they were asked by the dean, faculty of medicine of the University of the Philippines, to be the DEs for the DttBs. They did not receive any formal training in the SMS Telereferrals, but were simply told to answer the referrals. *“I was given instructions by the dean of the college of medicine that someone would send a referral in form of SMS which I would need to answer,”* expressed one of the DEs. They did not mind whether there was no training conducted for them because most of them were already familiar with the SMS application. Besides, they were very much willing to assist the DttBs, especially the new graduates and young doctors. *“I did not care about the training, as long as I can help other doctors or my former students. I joined the project because I really wanted to help the young doctors.”*

5.1.3 Experiences of the Telehealth physician, Telehealth nurses and Software developer

The experiences and perspectives of telehealth physicians, telehealth nurses and software developers had been put together here, considering that they were the main users who were running the project. I found out that they had almost the same involvement and ideas about the project.

The telehealth physicians, telehealth nurses and software developers were hired by the UPM-NTHC to make the SMS Telereferrals project works and be carried-out in the under-served areas. Usually, all of them have had no prior training when they joined this project. They were only given an orientation. *“I had little training from my senior nurse and the rest I learned as I go through the system. Besides, handling SMS referrals was not that complex,”* commented by one of the telehealth nurses.

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Similarly, one telehealth physician asserted that, *“I just did some self-study and self-learning of the system. I was oriented by a telehealth nurse who had been working in UPM-NTHC and familiar with the system.”* While, another telehealth nurse expressed that, *“Like everyone else having their first times, I was nervous and ignorant the first time I used it. With my knowledge regarding the use of mobile phones, I was able to adjust to the system. Mobile phone interface and FrontlineSMS interface have mostly the same features.”*

The greater part of their training was on basic handling of messages and referrals in the FrontlineSMS and iPath software and to the users needs for support. Besides, as one telehealth nurse specified: *“It emphasized more on how to maintain the patient’s privacy and confidentiality knowing that their information is being passed through several people.”*

Hence, when they met some problems, they just asked questions or sent email to the persons who have been in the program for a while. *“They let me ask questions and do some hands-on sessions.”* But most of them found SMS Telereferrals and the software Frontline SMS easy to learn and adopt, *“It’s indeed a user-friendly software application.”*

Likewise, they got the impression that they could get help at once when they encountered problems, *“I felt that I was not alone and was being supported at all times.”* As well as, when it comes to technical problems, the support groups of the software were willing to help them. Prompt responses were made when they sent emails.

5.2 Assessment of the usefulness of SMS Telereferrals

5.2.1 DttB’s Assessment

After the two-day course and training, the DttBs went back to their assigned places to work and to start the implementation of the SMS Telereferrals in their daily clinical

work. One DttB stated that, *“The project is very helpful in the management of cases in our areas of assignments where specialists are hard to find and reach.”*

Nearly, every DttB had sent more or less 10 SMS referrals in a year, although a few of them sent only one or two in a month. *“I sent 20% of my cases in SMS Telereferrals and handled 80% of them on my own,”* admitted one DttB. So, even though most of them were assigned in isolated areas and had to rely on their own, they tried to solve difficult cases by themselves before sending referrals to clinical specialists. SMS Telereferrals became their last resort.

Most of the DttBs believed that SMS Telereferrals could give them confidence, security and support in providing health service to the patient. One DttB acknowledged that, *“SMS Telereferrals had helped us in uplifting our confidence when we were faced with perplexing cases, because we knew that we have the DEs to support and assist us.”* At the same time, they knew that there was always someone they could turn to when faced with certain medical dilemma.

Besides, they observed that the medical information sent by the DEs were updated management and evidence-based treatments. *“I assumed that whatever the DEs sent us was effective in treating my patients, and I did experience that my patients got better after following the advice of the DEs,”* perceived one DttB. With confidence and support given them by the DEs, they asserted too that, *“It augmented our experiences in some specialized medical problems encountered in managing our patients.”* The DttBs also found these experiences were advantageous to use whenever similar situations presented themselves.

5.2.2 DE`s Assessment

In joining this project, according to the DEs, they received only small amount of financial support or just a small honorarium/donation for every referral and most of the time they even used their own money when sending SMS. However, compensation for their services was a small matter for them. One of the DEs` remarked that: *“Even though I live in an urban area, it does not mean that I do not*

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care with the people in the rural areas. Besides, I'm happy that there are SMS Telereferrals which give me the opportunity to help and reach out." And she added, *"I used to work with a non-government organization (NGO). I had experienced what the DttBs were experiencing and what the rural doctors needed in working outside the city."*

The DEs concurred that the SMS Telereferrals could give tremendous benefits in providing health services to the people of rural or remote areas. *"As a clinical specialist, I can facilitate more help to patients thru SMS Telereferrals rather than visiting them in rural areas in some outreach programs."* They added too, that their referrals could also save patient`s unnecessary trip to specialist hospitals, which sometimes became too late due to the severity of their health conditions.

5.2.3 Telehealth Physician`s and Telehealth Nurse`s Assessment

Most of the Telehealth physicians and Telehealth nurses believed that SMS Telereferrals were beneficial to the patients and to the rural doctors, especially those who were in the under-served areas. One telehealth physician confessed: *"I believed in this project. When I was a newly graduate doctor, I felt that my knowledge was not enough to be left alone in an isolated place or in a barrio. A fresh graduate doctor still needs some guidance. Thru a project like this one, a doctor can help a lot of people."* Another telehealth physician added, *"I believed in the future of SMS, because of the need to perpetual access of health information for more people."*

Additionally, SMS Telereferrals proved to be beneficial in the improvement of health services, as mentioned by one telehealth nurse, *"SMS is very useful in our country since most of the people have mobile phones. SMS service is a great help for doctors who are assigned in rural areas where they don't have anyone to refer their cases immediately."*

5.3 SMS Telereferrals user's satisfaction

Nearly all the users were satisfied with the whole program, especially the DttBs, whose satisfaction was attained thru the suggested treatments by the DEs through the referrals. The majority of the DttBs replied, *“Yes, I believe that most of the given advices through Telereferrals on how to treat patients so far were all satisfactory,”* Other DttBs had the same response: *“I had sent few referrals, and I was satisfied with the answers to most of them. They were good.”*

The DttBs acknowledged the effectiveness of the suggested management in handling the patients. Along with knowing that there was always someone to turn to whenever they encountered certain medical dilemma, the SMS Telereferrals gave the DttBs assurance in taking care of their patients.

Also, most DttBs and DEs were satisfied with regard to the support and services of the UPM-NTHC. Their needs were met and they received assistance whenever they encountered technical problems. They received email or SMS from UPM-NTHC when there were problems in their text messages. Of course, there were some who were not satisfied because sometimes, they did not know whom to contact when they had problems in their referrals. They considered that familiarity with the staff of UPM-NTHC could contribute in having faith in the efficacy of SMS application. Knowing people from UPM-NTHC built up confidence in DttBs.

5.4 Patient's benefits

The most important beneficiaries of this SMS Telereferrals program were the patients. A telehealth physician attested, *“Thru this project the patients could save money and time. Most of the patients are farmers who cannot leave their farms or they do not have money to finance their travel to the district hospitals or to specialist hospitals in Manila,”*

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Also, *“By the time the patients come to specialist hospitals, all the information were already sent and the specialists could start at once with other treatment, not needing to start from the beginning, because it was already done by the DttB. The patients are not the only ones who have benefited in this project, but the specialist hospitals as well. It minimizes the overcrowding and unnecessary stay of patients in the hospitals,”* added a telehealth nurse.

5.5 Challenges encountered by the users in utilizing SMS Telereferrals

5.5.1 DttB`s Challenges

Generally, the DttBs had encountered some challenges in using the SMS in sending and receiving referrals to the DE, such as the following:

One of the DttBs expressed that she needed some time in training to apply what she had learned during the two-day course. She did not feel 100% confident in using it in her everyday work after the course.

Most of the DttBs were using their own mobile phones when sending SMS and they commented that not all their mobile phones were applicable to the system of SMS Telereferrals.

In sending text messages, a few DttBs articulated that they could not write all the symptoms all at once because of lack of space, and one DttB explained that, *“It’s hard to explain some of the symptoms because I felt that there was language barrier.”* The contents of text message sent by the DttBs had to be shortened because of the limitation to 160 characters in SMS; however, they acknowledged that this limitation had never been a problem to them. *“I shortened my text messages whenever I sent them and did not experience that my queries had been misunderstood, although there were times when the DEs sent back follow-up questions.”*

During times when DttBs needed to send long detailed information about the patients, they just sent consecutive SMS about the same case, or if they have a connection to Internet, they sent them via email. Furthermore, they manifested that they used basic abbreviation of medical terms instead of uncommon abbreviations of words in texting. Fortunately, they have not encountered any misunderstanding in texting messages. *“I believed that the medical community understood each other. I used basic abbreviation of medical terms rather than uncommon abbreviation of words in texting,”* reacted one of the DttBs.

Occasionally, some DEs gave advice that was not applicable in rural settings where there were lack of facilities, medical instrument and supply. They advised the DttB to use certain medicines that were not available in the clinics, or an examination like biopsy that was not accessible in the rural area. A DttB related, *“I just respond in a polite way that there are no medicines here like that. One time, the DE recommended trying another medicine and transferring the patient as soon as possible to the provincial hospital. But I found it difficult because of the extreme weather which made transferring the patient by boat impossible”* (The DttB was assigned in an island). There were instances when they just agreed with management, or they just did not respond anymore when they cannot give me more advice.

Lastly, the greatest challenge was the response time of SMS Telereferrals. Most of the DttBs experienced that they received answers to their referrals in more or less an hour, the fastest was within 3-5 minutes to 7-8 minutes and the longest was 48 hours. Most of them waited even much longer for the response from the DE and sometimes they did not receive any answer at all. They tried to call the UPM-NTHC, but mostly, they replied that they already sent back the responses from DEs. One DttB commented on this by articulating, *“This was not due to network coverage, but I heard that it came from the UPM-NTHC. They were having problems (slow sending) with sending back the responses.”*

On such occasion like, when the DttBs couldn't wait for responses anymore or when the cases were not urgent, they just stabilized the patients and advised them to wait for a little while. Oftentimes they did the following: *“Call a friend or look for the answers from medical books;” “Just ignore it, or treat my patient alone. I cannot do*

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anything with the (lack of) network signal;” “Give time to management and wait for their opinion or advice, which fortunately is the same with what I have started;” “I just used other alternative, like that of calling other DttBs, or just searching for other sources through the Internet (this was from a DttB who had access to Internet);” “If I have not received any response yet, I just continue with my management because I just couldn’t stop and must do something.”

5.5.2 DE`s Challenges

Most of the challenges that the DEs encountered in the use of SMS Telereferrals were related to the content of referral/text message. Sometimes, they were confronted with dearth of information about the conditions of the patients, so they had to inquire most of the time from the DttBs to send more details such as how the patients were before and the results of their blood tests if any. At times, as one DE uttered *“I have to guess on what really the DttBs meant in their text messages, but when I sought clarifications from them, they simply would not reply back.”* So the DEs just assumed and concluded that the DttBs had problems with their mobile phones such as no more prepaid load, out of battery, incorporable network services, power cut-offs or network breakdown. The DEs were conscious of the danger of stipulating which could lead to misinterpretation of diagnosis or could lead to inadequate or even wrong treatment. *“Sometimes, I was worried that I might just be guessing even though my intention is only to help,”* remarked one DE.

Furthermore, there was the risk of shortening the text messages sent by the DttBs through SMS Telereferrals. Some DEs believed that, *“In sending a shortened message, one must abbreviate some words. But some of the DttBs came from different medical schools and universities which used different ways of abbreviating medical terminologies.”* There was no protocol or standard in abbreviating medical terminologies in the Philippines. There might be confusion during the exchange of communications between DEs and DttBs. One DE explicated too that, *“If I would remove some vowels when replying to referrals, there could be a risk that the DttB might not understand what I was trying to say.”* Sending shortened or abbreviated referrals to the DE thru SMS might lead to confusion and misinterpretation. There

might be misunderstanding of the whole context of the text messages sent and received or vice-versa.

Regarding the advice that the DEs sent, they pointed out that some of the DttBs did not give immediate or adequate feedback about the advice they have sent, There were instances when they were wondering whether their advice was followed or not. *“Sometimes, I was curious if my advice were helpful and effective, or even carried out.”*

Another issue that had been a challenge to the DEs was the practice of sending long messages in the Philippines, wherein the mobile network supplier usually cut the message into two or three parts and sent not according to syntactic order of a sentence. *“Unfortunately, it could have happened that the last part of a message would be sent first and the first part would be sent last.”* In this case, the DEs believed that the chain/circle of communication between the DEs and DttBs would be broken.

Lastly, some DEs found out that the capacity of mobile phones for storage of referrals were limited. The referrals could not easily be organized in their own mobile phones, which unfortunately lack of store and forward platforms for this kind of application. *“If there is conversation that is going on between us and the DttB, I could not trace back what we have said or done before.”*

5.5.3 Challenges met by the telehealth physician, telehealth nurses and technical engineer

The challenges that this group (the UPM-NTHC staff) had encountered at the start of the project and how they addressed these problems were as follows: First was their concern on how to earn the trust of the DttBs to send referrals to the DEs. *“Knowing that they don't see the clinical experts, and moreover, how hesitant they are to trust the whole system,”* remarked by one telehealth nurse. *“But this was addressed to by inviting some of the DEs to deliver short talks regarding their expertise during the Bi-annual session with the DttBs. We've also provided general community information*

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which we thought might be useful to them, and usually, we got information from reliable sources such as the Department of Health, WHO and etc.”

Secondly, the technical issues such as the security of information being transmitted were being safeguarded: *“We have developed a system wherein messages are stored in our own database to which only our office staff has access tot.”*

The third challenge for them was the legal issues for the Telereferral system. Hence they remarked, *“Since there is no specific law regarding the practice of Telemedicine, we conducted a round table discussion for Telemedicine legal framework. The participants of this discussion were lawyers from different sectors and doctors who were involved in the system. Later on, the results were discussed to the DttBs and the legal framework of Telemedicine was presented.”*

The fourth was the decline of number of referrals from the DttBs. Thru the discussion between the UPM-NTHC staff and the DttBs last October 2010, they found out the problems and the reasons why they did not send referrals any more. The DttBs argued that the SMS Telereferrals were not reliable anymore because of the slow response time of the DEs. However, the UPM-NTHC staff reasoned out that, *“Sometimes the DttBs send an emergency SMS during the night when there was no telehealth nurse who could send it forward to the DE, and a response from the concerned doctors was not possible anymore. Oftentimes, there were a lot of referrals during the night which the telehealth nurses can only access during office hour (daytime), so the referrals became unanswered. So, those were the reasons why they lost faith in the system.”* With these earlier challenges, the UPM-NTHC was encouraged to improve their system. They tried automation and the use of FrontlineSMS and iPath open source software. After the UPM-NTHC changed its system, the working conditions of the health personnel and the exchange of communications between the involved users had improved a lot.

However, despite the improvement of the system used by UPM-NTHC, there were still some challenges left which had to be met. One was the incompatibility of the software FrontlineSMS and iPath. As of now, a DttB could send email from his phone and could send it to FrontlineSMS and iPath, too. But the email that would come from

the iPath could not be sent to FrontlineSMS and be converted into SMS message. Two different programs were involved, so they had to do this manually. *“In the future we are planning to move to other better program,”* declared a technical engineer (software developer) from UPM-NTHC.

5.6 Improvements recommended by the DttBs and DEs for a better delivery of health services through the use of SMS technology

5.6.1 DttB`s Recommendations

“Upgrade our phones to what best suits the technology and provide more days of training with more applications.”

“Some may not have prepaid credits to be able to refer thru SMS. Provide allowance?”

“Faster referral, by sending a pool of similar cases to the domain expert and await the reply. A referral could also make aware of the receiver to send a faster reply.”

“There are limitations to what you can put into an SMS such as availability of signal, capability of the phone, capability of the user and receiver to understand the message, and availability of the consultant. It is difficult to provide signal to every geographically isolated and disadvantaged areas in the Philippines. The thing you can do is just to assure the availability of the consultants.”

“The project is quite commendable. I recommend expanding the project to all health personnel, to rural health nurses and rural health midwives assigned in remote Health stations for referral purposes also.”

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“If SMS application will be used, the area should be capable first before utilizing this service. For example, in case where there is no signal, the UPM-NTHC should have to capacitate the area first, the infrastructure and the environment, in order to utilize telemedicine better.”

“The DEs should have indigenous knowledge, and they should be oriented on what is available in the community. In their recommendations, they should give more emphasis or more options on how to treat patients. They should give their best in serving the patients.”

5.6.2 DE`s Recommendations

Some of the DEs have different ideas on whom SMS Telereferrals could be most useful. One DE believed that SMS Telereferrals served as the primary tools of the DttBs in bringing health reliefs to the rural population, because of its accessibility to the majority of Filipinos. *“It is most economical to send text and MMS. SMS is also instantaneous, you send it and it is received at once at the other end”*. Despite this advantage, one of the DEs considered that SMS should be used as the channel of interaction between patient and the doctor, not between doctors. One DE remarked, *“I believe that there is a lot of critical information involved when sending referrals and they are difficult to put together and send back through SMS.”* And he imagined too, *“a three-way communication between DEs, DttBs and patients in the future when mobile phones are more capable of handling 160 characters.”*

5.7 Summary of the Results

In summary, the simplicity of SMS application has assisted the users of SMS Telereferrals program in using and easily adapting to the system. Through this simplicity, most of the involved users felt that there was no need for more training or time to learn because they were already familiar in sending and receiving text messages. But still, there were some users who felt that they need more proficiency and time in learning it.

The DttBs acknowledged the advantage of using the SMS Telereferrals and the proof of its implementing capability in their daily works. It proved to increase their self-confidence and it offered assistance in giving appropriate and better medical management to their patients in the rural areas in the Philippines. With the aid of the SMS Telereferrals, the flow of communication between the DttBs and DEs had improved. Due to this improvement, the DttBs were able to send more referrals.

It is so inspiring to state that, nearly all the users of SMS Telereferrals were satisfied with the whole program and the DttBs acknowledged its effectiveness of the suggested management to their patient. Along with knowing that there was always someone to turn to whenever they encountered certain medical dilemma, the SMS Telereferrals have given them assurance in taking care of their patients.

The most important beneficiaries of this SMS Telereferrals program were the patients. Thru the DttBs and DEs exchange of medical information, the patients could receive right and updated medical management. This would lessen the patients' suffering. At the same time, it could prevent unnecessary travel to the specialist hospital and overcrowding of patients in hospitals. Thru this program the patients could save money and time.

The DttBs have showed their independence and courage in solving conflicted cases. Even though they were assigned in isolated areas, they were still trying to find other solutions in helping their patients on their own. SMS Telereferrals became their last resort because they knew that it has limitations, and besides, they often experienced that the response to their referrals were always delayed. There were times when the medical management occasionally proposed by the DE was sometimes unrealistic and was not applicable to the situation where there were limited medical resources and equipment.

Sending referrals have boundaries also, due to its 160-character limitation. The DttBs could not write and explain all medical information and history of their patients, so, most of the time it took a long time to write and reply. This could have led to misunderstanding of the context of referrals from the DttBs. However, the DEs

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usually did not tire to ask for more information, not until they understood what the urgent needs were.

Hence, some of the DttBs still appreciated sending their referrals through email with detailed information or calling up the DE for faster response.

But, the major stumbling block in using SMS application was the delayed response or the validity period due to the limited capacities of mobile phones for storage of referrals. The referrals could not easily be organized in their own mobile phones because of lack of space or the capacity for storing previous referrals. Another challenge was limited supply electricity or absence of electricity in distant areas, which prevented the users to turn-on their low- battery -mobile phones, or to charge them.

CHAPTER 6

DISCUSSION

Being discussed in this chapter are the descriptions of SMS application as an infrastructure, the SMS Telereferrals program, the drawback of this SMS infrastructure as experienced by the users of SMS Telereferrals, the cost of SMS Telereferrals, and the role of Actor Network Theory in understanding the links between actors and the SMS technology. The last part deals on the comparison between the evaluation survey of the UPM-NTHC and the present study.

6.1 SMS Application and Information Infrastructure

SMS application has common features as with II. It has supportive or enabling function that can cover a wide range of tasks, people and organization. It can be shared by a larger group of users. SMS does not only provide limitless shared resources, but there is also openness in it which users or technical components can integrate into. It evolves continuously, a heterogeneous and social- technical network of technological and social components.

It has enabling functions. As Hanseth and Monteiro (1998) explained, infrastructure should be used where and as needed, as needs changed and user's opportunities are discovered. A good example is the one I stated before that SMS was a communication protocol that has been originally designed to be part of the maintenance layer of the GSM infrastructure and was intended to be a means of exchanging limited amounts of information between two mobile phone subscribers. It has become popular as a means for social networking (Taylor and Vincent 2005).

Furthermore, because of this supporting or enabling function, it becomes the building block for new activities and the development of more compelling services ranging

from the information service, Internet email alerts, download services (i.e. ringtones, pictures) or professional applications such as remote monitoring and fleet tracking (Hanseth and Monteiro 1998; Le Bodic 2005).

In application, SMS served as the communication tools between the DttB and DE because of its flexibility. Both the results of the previous evaluation survey done by the UPM-NTHC and this study revealed that SMS Telereferrals served to be very useful in the daily work of the users. This gave support to rural doctors by facilitating the exchange of medical information that is appropriate in decision-making in treating patients. It also acted as a problem-solving tool and means of getting better access to health services, especially in the rural and remote or underserved communities.

SMS also has a shareable function. In the introduction of the GSM, the mobile network that was implemented in different countries was incompatible with other network. This incompatibility made impracticable the roaming of mobile users across international borders. So, in 1982, the “Conference Europeans des Postes et Telecommunications” (CEPT) founded the “Groupe Special Mobile committee “, in order to get around this system’s incompatibility. The main task of the committee was to standardize a pan-European cellular public communication network in the 900 MHz radio band (Gow and Smith 2006). Then, this compatibility also became the foundation for mobile network operators to have commonly conjoint profitable arrangements allowing the exchange of messages between networks. Thru this agreement, users of SMS Telereferrals could exchange messages although they were not subscribers to the same network and even they were located in different countries. Subsequently, many users had no limitations in sharing and sending SMS, as long as there was mobile network coverage (Le Bodic 2005). Besides, it could be used by larger community such as the health professionals, researchers, organizations and patients due to its application to many areas (Hanseth and Monteiro 1998).

With this shareable function, it facilitated medical information sharing easier for the DttBs and DEs involved in this study. It helped as well the staff of UPM-NTHC occasionally, when they sent some medical information (disease outbreak and prevention messages) updates and reports to all the DttBs. This allowed the dispatching of substantial numbers of messages simultaneously.

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Successively, SMS does not only provide limitless shared resources but there is also openness in it (Hanseth and Monteiro 1998). It means that every user can write and send text messages despite his education background and economic status.

Through this openness, the staffs of UPM- NTHC were able to develop a design that was suitable to the SMS Telereferrals program. Users have influenced the design and functions of SMS application. There were no restrictions and it was opened to all users of mobile phone. This openness feature made SMS easy to use and this contributed a lot in the adaptation of users in the implementation of SMS Telereferrals in their daily work. Likewise, because of this familiarity in SMS, there was no need to spend much time in training the users in sending and receiving message, just simple instruction and guidance would do.

Seeing that SMS was not only having the openness feature, it also had some evolving characteristics similar to II (Hanseth and Monteiro 1998). The concept behind SMS did not originate out of scratch and was not created from nothing. It did not grow instantaneously, but rather it was evolving and continuously improving over time as new ideas, information, technology, and features were added to the older existing ones, its installed base. It also came a long way from telegraphy and telephony (Norris 2002).

Further, the feasibility of SMS over GSM owed much to the earlier achievements of the pager and related paging services. Even though the underlying technologies behind paging and SMS differed significantly, it was the popularity of the paging services and, in particular, the charging models that attracted the mobile network provider in the mobile telephony sector ((Taylor and Vincent 2005).

Additionally, the original design for SMS application was limited. Its broad-based appeal was primarily as a unidirectional system for sending “mobile terminated” messages to customers, for example voice mail notifications (Taylor and Vincent 2005). Unfortunately, it did not attract much attention from the mobile users, but rather SMS was utilized for sending and receiving of text messages to each other. As I mentioned somewhere, it became popular particularly amongst young non-professionals. Consequently, the number of SMS users had increased and among them

were the rural doctors who learned to use and apply it in their everyday clinical work, utilizing SMS results to increase doctors' and patients' satisfaction. SMS, being not static, could create opportunities for improvement and their components could constantly be upgraded to meet the users' needs (Hanseth and Monteiro 1998).

Meanwhile, SMS as a heterogeneous system emphasizes that there are a varied range of interdependent socio-technical components that are linked to conventions of practice, which may influence and are influenced by their practices (Hanseth and Monteiro 1998).

Based on this, the SMS Telereferrals has been considered to have this feature because there were lot of users, organizations, tools and mobile networks that were involved in this program. (This will be illustrated later by describing how the text message could be sent and received.) After the DttBs created their text message (referrals), they sent it, and the said text message first would be sent to the SMS center (DttB's mobile network provider). And then, this mobile network provider would send forward the messages towards the recipient of the messages. This process happened again when the recipient (DE) responded to the text message. Along this process, there were lot of factors (which are to be explained later) that influenced the sending and receiving of the text messages. However, the message would be sent and received no matter what because SMS was created for that purpose.

Lastly, SMS as a socio-technical network is more than "pure" technology that will not work without the support of users using it properly (Hanseth and Monteiro 1998). (This feature will be further elaborated in the discussion about the role of Actor Network Theory in SMS Telereferrals.)

6.1.1 Addressing the Information Infrastructure Challenges of SMS Telereferrals

In my opinion, the possibility of SMS technology (SMS Telereferrals in the DttB program) in the provision of better health services and the implementation is

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promising, but, its limitation especially in regard to the information infrastructure can prevent the users to appreciate and use it in their daily works.

The major stumbling block in using SMS application in mobile phone of the DttBs is the delayed response or the validity period. For emphasis, the Philippines had been the world leader in “SMS usage” (ITU 2002). Almost all the Filipinos have been sending and receiving SMS every minute. The consequence of over- populated usage of SMS could results to the delay of sending and receiving message. There could be network overload or the network provider of the recipient could always be on a busy tone.

Moreover, some parts of the text message sent by the DttBs had been cut when the message happened to be long. The reason for this was the limitation of the transfer layer of SMS. So, the message had to be segmented into several pieces. In order to deliver the long message, they have to combine it into a concatenated message, which could be expensive for the sender.

The capacities of mobile phones for storage of referrals were also limited. The referrals could not easily be organized in their own mobile phones because of lack of space or the capacity for storing previous referrals. So, the users did not have the possibility to review the past exchange of SMS. Besides, not all the users owned up-to-date mobile phones.

Lastly, the geographical location of the DttBs contributed to the interference and limited network coverage. The Philippines is a country with a diverse topography, which included high mountains, extensive valleys and plateaus interspersed with rivers and lakes. The large part of its transportation infrastructure had been poorly developed and many communities remained inaccessible by modern means of transportation. These barriers impeded the advancement and development of Information and Communication technology, specifically in rural and remote areas.

The country being situated within the typhoon belt has always been hit by numerous tropical storms almost every year (ITU 2002). During a storm, consequently, electric supply was out in affected areas. At times, the DttBs were not able to turn on their

low- battery -mobile phones and they couldn't charge them due to limited electrical supply or absence of electricity.

All of these factors had an impact in engaging and designating a doctor in distant communities, and were considered as the major obstacles in providing better health service to the people, especially in the rural areas. In addition, it was not only the infrastructure, but there were also other issues, which contributed to the challenges. For instance, most of the medical centres in rural areas suffered shortage of other health workers, medical equipment, insufficient supply of medication, and inadequate economic support from the government. Moreover, a rural doctor had always been expected to successfully manage and maintain a healthy community, and in addition deals with local government bureaucrats, politicians and local government unit leaders.

At the same time, the risk of pestering insurgency in some of the rural areas endangered the life of a DttB. Understandably, with all these challenges, some of the doctors became hesitant to stay and work in these remote communities. Consequently, the people of these areas had been suffering not only from the effects of this conflict, but also from the diminished opportunity to a better health service.

Despite all of these barriers, the involved DttBs chose to work in these rural and isolated areas. Each one claimed that to serve as a doctor to the barrio, one should make some sacrifice. The DttBs demonstrates dedication and endurance despite the hardship of being far away from their loved ones. However, the call for serviced was paramount for them in their desire to help their under-served fellow Filipinos.

6.1.2 Cost of SMS Telereferrals

I agreed with one of the DEs when he explained the financing and cost of the exchange of information between the involved users in SMS Telereferrals. He rationalized, *“When a DttB sends an SMS to the portal (FrontlineSMS), it costs him 1 peso, and when the FrontlineSMS send the SMS to DE, it will cost another 1 peso; when the DE answers back, another 1 peso will be charged again and another peso*

for the DE's message to reach the FrontlineSMS. From the FrontlineSMS, it takes another peso before the advice could finally reach the DttB, and the totality of the amount of charges depends on how many messages being sent back and forth for one case only." It was also convincing that it could be much cheaper just to call the DE or vice-versa instead of sending SMS back and forth. It would not only be the money they could save, but their time, too.

6.2 ANT and its role in understanding the implementation of SMS Telereferrals in the DttB's program

I believed that the theory of Actor-Network could provide us more understanding of the importance of every user's role in this SMS Telereferrals program how the relation between them and how networks of action are being produced through this relationship. Besides ANT's aim to exemplify a society of humans and non-humans as equal actors bound together into networks, it also suggested that both the technical and social aspects form a network that can influence each other. Furthermore, for the theory to be consistent, the relations must be constantly performed, or the network will be dissolved. In this case, the users must be constantly using SMS Telereferrals, and SMS application must constantly be developing for the network to remain (Walsham 1997).

Beforehand, the use of the word "actors" or "actants" in this section was clarified. As I mentioned before about the theory of Actor-Network, it was not only the "users" (human) who were involved in this program. It also included the non-human participants, the mobile phone, network provider and the software FrontlineSMS.

Moreover in the topic of ANT, individual actors (human and non-human) have also been seen as heterogeneous networks similar to II. This could mean that there was an open-ended array of "things" that had to be harmonized including the actors' work-routines, motivation, training, and information systems modules and organizational roles to the networks. These factors could influence the links between actors and the structure of networks (Monteiro 2000). For instance, the SMS Telereferrals network

have been created and implemented because of the DttBs' needs for decision support and access to the updated medical information in treating their patients, so they preferred to send referrals. Also, the DEs were interested and willing to help them by sending their medical advice. The staffs of UPM-NTHC have contributed too, as the organizer and maintenance of SMS Telereferrals. These need and interest were embodied in forms of inscription where the starting point of this network and technical arrangements, networks of actors with their own chains of translations could react to them. ANT showed that the aligning of the interests of actors in the network involved the translation of those interests into a common interest in adopting and using the technology (McBride 2003). For example, the role or work of the telehealth nurses played important part in influencing the work of DttBs and DEs.

Thus, the interests of the actors of SMS Telereferrals network should be linked, and fulfilled by, the interests of a social network involving SMS technology. The actor's interest would then be translated into an interest in SMS Telereferrals. This translation would be achieved in the network through common definitions, meaning and inscriptions attached to the technology (Monteiro 2000).

These actors could also form an alliance of interests, which have to be negotiated because they have to follow some standards that the network has established for all the actors (Hanseth and Monteiro 1998). In this context, I considered "SMS Telereferrals" as a black box or a network of heterogeneous actors.

But, in order to stabilize the network of aligned interest, every role of the actors had to be respected because their parts in the network were very important. As Hirschheim (1991) cited in Lucas (1982), participation could pose a challenge and was intrinsically satisfying, and further reinforcing positive attitudes. So logically, without the DttBs there would be no one to send referrals and there would be a decrease of activity in the network. And, when there were no telehealth nurses, there would be chaos in organizing and maintaining this flow of sending and receiving SMS Telereferrals. Furthermore, in the absence of the DE, there would be no response to referrals.

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The software FrontlineSMS had also an important role. In case this was not functioning, there will be difficulty in documenting all the activities and there would be disruption of communication among actors. Network providers' and other involved actors' work could influence the stability the network to be stable, too.

However, as Callon (1991) argued, the network could become unstable with the entry of new actors, desertion of actors, or change in alliances and upgrading the software. In line with this aspect of ANT, it was found out that although there were certain accepted technologies and applications within the SMS Telereferrals framework, discarding of outmoded or obsolete technologies and standards, arrival of new technologies that replaced existing ones, and the continuous developments could be influenced by the human actors (namely patients as well as medical personnel), which could all lead to opening and reconsideration of the contents of the 'black box' (Eckles, Wightman et al. 2009). In this context, I believed that opening the black box in SMS Telereferrals had its advantage, like what the UPM-NTHC had done in upgrading their system. As the result, the work activity of their staff had improved and became easier. The flow of communication between the DttBs and DE had improved, too. Due to this improvement, the DttBs were able to send more referrals. This ANT in SMS Telereferrals is shown in Figure 18.

Actor Networks

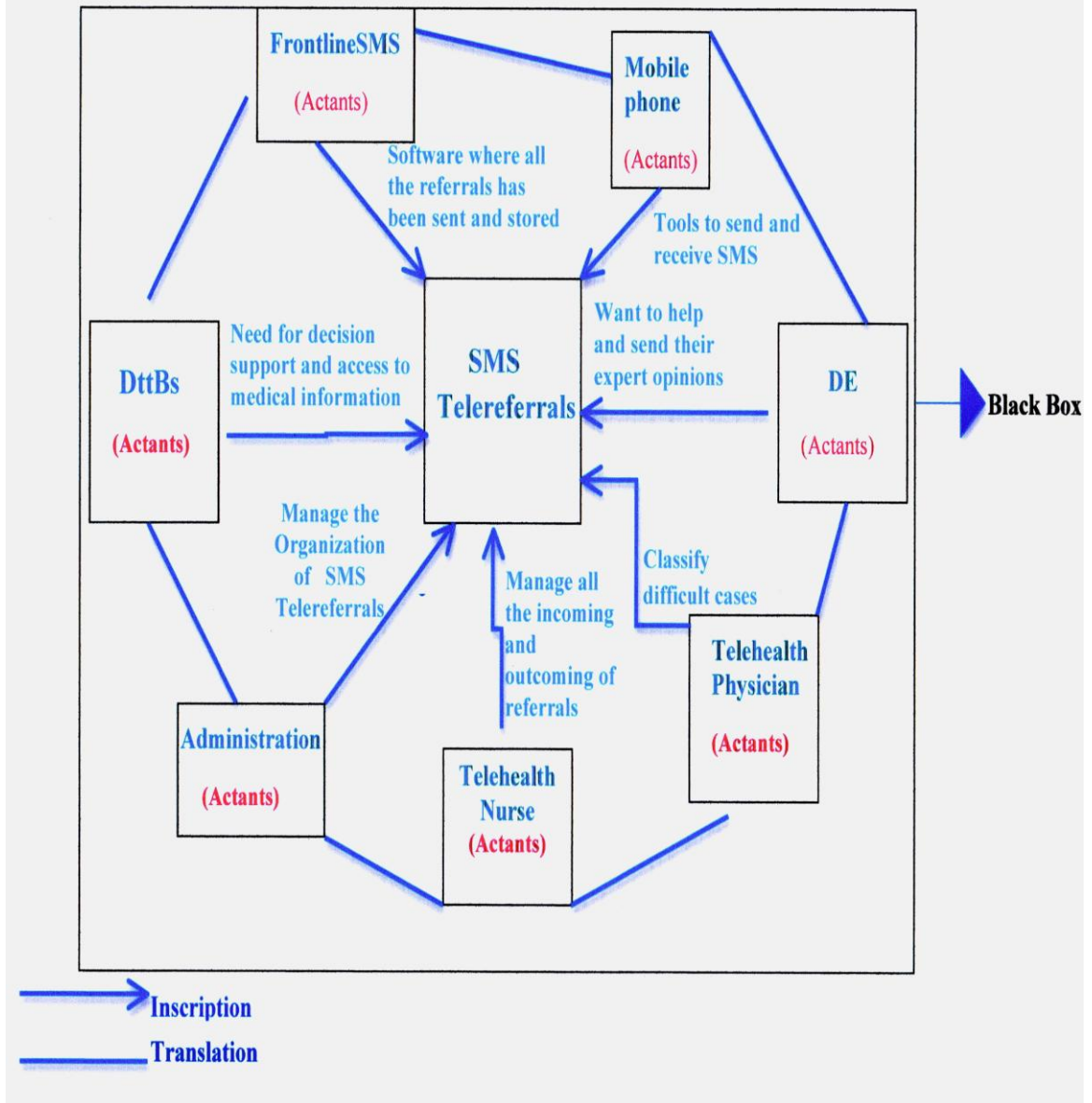


Figure 14: Actor Network Theory illustration

6.3 Comparison of the result of this study with the earlier survey of UPM-NTHC

In comparing the earlier evaluation survey done by the UPM-NTHC with that of my study, made it safe to mention that both have almost similar results in regards to the usefulness of SMS Telereferrals in the professional practices of the DttBs.

The results revealed that SMS Telereferrals supported rural doctors and facilitated medical information that is appropriate in decision-making in treating patient thru this SMS application. It provided them with their confidence, security and support in offering health service to patients.

Although, the UPM-NTHC used more respondents than the present study (I had few DttBs participants), I got the opportunity to explore further, and included other users (involved) in this program. I was able to study to a greater extent the user's experiences, perspectives, satisfaction and challenges that they encountered in using SMS Telereferrals, as well as, the advantages and disadvantages of adapting SMS technology in the delivery of better health service to the people.

Chapter 7

CONCLUSION

The following conclusions were drawn from the findings/result obtained in the study in connection with the application of SMS Telereferrals in the DttBs program in the Philippines:

The perspectives of the various users (DttBs, DEs, telehealth nurses, etc.) are given appropriate consideration in the adoption of the SMS Telereferrals in the Doctors-to-the Barrios program and in improving the infrastructure of the system. Their comments and observations have become guideposts in extending the application of the system to wide coverage of rural communities in the country as is economically feasible.

The usefulness of SMS Telereferrals in providing health service to the Filipinos who require “immediate” medical attention but are not able to avail of it because of lack of appropriate medical workers available in their location and the cost involved in going to urban areas, and more importantly, to the health workers whose desire to help is hamstrung by time, distance and cost constraints, is being consistently demonstrated as the system continues to be implemented thru the UPM-NTHC Telemedicine program.

The satisfaction of the various users is manifested in the growing number of healthcare workers who are attracted to participate and the desire of those already in the program, to continue to upgrade competencies in the use of the technology.

The growing numbers of patients from the “traditionally-not-reached” rural municipalities whose medical conditions have been successfully managed through SMS Telereferrals together with local government units that have taken to participate actively and provide feedback on the benefits derived from the program.

Realistically, SMS Telereferrals as applied in the DttBs program, is not perfect because it has to meet challenges in its growing-up phase like: inadequate DttBs who can be dispersed to other unreached rural communities, “glitches in the system”, delayed response of DEs, limited capacity for sending information (only 160 characters), inadequacy in the use of “text language” and inadequate number of digital equipment, etc.

For the SMS application to be rightly utilized in the delivery of health service and give support to the healthcare workers in rural areas, some of the users recommend that the system’s infrastructure be improved through more equipment, increased number of DttBs, greater number of DEs and willing- to –participate, and better trained “other” healthcare workers.

Based on the study I have done, I may suggest the following recommendation:

The use of SMS Telereferrals should be maintained and sustained as an integral part of the DttB`s program through the concerted efforts of the government agencies presently involved.

The participation of non-government agencies and appropriate private companies should be solicited and formalized by executing Memoranda of Agreements, which will ensure their complementing roles in supporting the program.

More rural doctors and DEs should be “encouraged” and absorbed in the program and those who have shown their commitment should be properly recognized not only with paper recognition but with financial inducements as well.

A technical working group should be organized within the program so it can attend to various technical challenges that occur in the process of using SMS Telereferrals.

A continuing competency-upgrading program should be implemented to orient those newly- involved DttBs and increase the efficiency of those with experience, to improve their role effectively.

Conclusion

Finally, researchers should be encouraged to conduct studies similar to this study, which will involve other health care workers in the country.

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APPENDICES

Appendix A: Guide questions to the DttBs (used in face-to-face and email interview)

Guide questions to the DttBs:

- 1) How did you get involved in this project? And why did you joined?
- 2) Do you believe in this project? How motivated are you in this project? Please explain why?
- 3) Did you get a training or seminar before using this application?
 - a. Yes, How? _____
 - b. No, why? _____
- 4) Who provided this training?
- 5) How confident are you in using this application after the training?
- 6) As a doctor, how do you assess the usefulness of the SMS consultation in your everyday work?
- 7) How do you find your job in implementing this application?
- 8) How satisfied are you with the SMS technology?
- 9) In which situation do you need to send SMS consultation
- 10) How long does it usually take before you get the answer/response from the UPM-NThC? What do you think about that?
- 11) How many consultations have you sent since you joined this SMS project?
- 12) How do you write the text message in SMS?
- 13) As a doctor, what challenges or problems do you encounter in applying this SMS technology in your work?
- 14) Do you receive feedback about misunderstanding in interpretation of your text message? How often? How do you solve it?
- 15) How do you rate the efficiency of the SMS technology? Please explain why?
- 16) How did the familiarity of using mobile phones help you to utilize this application? Please explain why?
- 17) How much new knowledge has you gained in utilizing this SMS technology? Please explain why?
- 18) What improvements can you recommend for a better delivery of health services through the use of SMS technology? Please explain why?

Appendix B: Guide Question to the DE

Guide Questions to the DE

1. How did you get involved in this project?
2. Did you get a training or seminar before using this application?
3. Who provided this training?
4. How confident are you in using this application after the training?
5. Do you believe in this project can give better service and support to the DttB and patient? How?
6. Did you receive support from the National Telehealth Center at the start of this project?
 - a. Yes, in what form? _____
 - b. No, why? _____
7. How do you usually interpret the text message?
8. What challenges or problems are being encountered in using this application?
9. What problems do you frequently encounter in interpreting, in sending and forwarding text messages?
 - a. To Doctors in the Barrio? _____
 - b. To the TeleNurses? _____
10. How are these problems being solved? _____
11. Did you receive feedback about misunderstanding in the interpretation of text messages you send?
 - a. Yes, how much? _____
 - b. No, Why? _____
12. How satisfied are you using this SMS technology ?
13. What additional features or improvement could be recommended by the UPM-NThC to this application?

Appendix C: Guide Questions to the Telehealth physician and manager of SMS Telereferrals

Guide Questions to the Director of the UPM-NThC or to the manager of this program:

1. What is the present status of the project «SMS usage of Doctor to the Barrio» (DTTB)?
2. How many doctors are involved in this project? _____
3. How many SMS referrals have been listed in the project at present? _____
4. How do you call this application? Is this Telereferral or Teleconsultation? Please explain the difference.
5. Is the UPM-NThC satisfied with the development of this project?
 - a. Yes, How satisfied? _____
 - b. No, Why? _____
6. What advantages and disadvantages are being revealed in the use of this application?
 - a. Advantages: _____
 - b. Disadvantages: _____
7. Who is the vendor of the project? _____
8. Do they have a support service?
 - a. Yes, how? _____
 - b. No, Why? _____
9. How is the funding of this project? _____
10. Who is responsible for the financial support of this project? _____
11. Do the users contribute and take part in the designing of this application?
12. How are the user's perspectives being considered at the start of this project? Interview? Please explain.
13. Which actions were performed to gain knowledge and information about the users before the start of the project?
 - a. User surveys
 - b. questionnaires
14. What aspects of the users are being taken into consideration?
 - a. What the users are likely to think
 - b. How the users are likely to respond to this new system
 Please explain
15. Which problem do you encounter at the start and at the present time of implementation and utilization of this application? How did you solve it?

Technical Users' problem
16. How are the satisfaction of both the remote doctors and domain experts being assessed with regards to the implementation of the SMS? Did you Use of questionnaires, Dialogues or Interviews. Please elaborate more.
17. How are their needs, ideas, wants, and limitations as users of the system being given attention at each stage of the design process?
18. Did you gather some feedbacks from users after the project has been implemented and has been functional?
19. What follow-up actions are being done to continuously review the progress of the application?
20. How is the effect on the usefulness and efficiency of the SMS technology being evaluated?

Appendix D: Guide Questions to Telehealth Nurse

Guide Questions to TeleNurse:

1. How did you get involved in this project? And why did you join the project?
2. Did you get a training or seminar before working in this SMS usage for the DttB project?
3. Who provided this training? How did they train you?
4. How confident are you in using this application (frontline SMS) and triage cases after the training?
5. Did you receive support from the vendor (developer) or manager of the project when you encounter problem?
 - a. Yes, in what form? _____
 - b. No, why? _____
6. Did they follow up if you still have problems? How did they do that?
7. What challenges or problems did you encounter in using this Frontline SMS?
How were these problems been solved?
8. As a TeleNurse, how do you usually interpret the text message?
9. What problems do you frequently encounter in interpreting (160 characters), in sending and forwarding text messages?
 - a. To Doctors in the Barrio (rural)? _____
 - b. To the Domain Expert? _____
10. How are these problems being solved?
11. Did you receive feedback about misunderstanding in the interpretation of text messages?
 - a. Yes, how much? _____
 - b. No, Why? _____
12. Do you believe in utilizing SMS technology in delivering or providing health service to the people? Why
13. What improvements can be recommended for a better delivery of health services or better utilization of this SMS technology?

Appendix E: Letter of Reference from UiT

UNIVERSITY OF TROMSØ UiT



FACULTY OF HEALTH SCIENCES
DEPARTMENT OF CLINICAL MEDICINE

Anita Amyla Abueg Østhaug
Garver Ytterborgsvei 105
0977 Oslo

Your reference:
Our reference: 2010/3749
JAO000/516
Date: 08.11.2011

Letter of Reference

To Whom It May Concern

This is to certify that Mrs. Anita Amyla Abueg Østhaug is one of our students at the Master's Programme in Telemedicine and E-health since Autumn 2010. She has finished all the required courses (60 ECTS course credits) last year and is now working on her Master's Thesis (60 ECTS course credits). She is expected to submit her Thesis by the 15th of May, 2012. After approval of all the courses and the Master's Thesis, she will be granted the Master of Science degree in Telemedicine and E-health from the University of Tromsø.

Part of the requirement for writing the Master's Thesis is to conduct a research that involves data collection preferably from the student's home country. Mrs. Østhaug is working on the following project: "SMS usage for Doctor-to-the-Barrio Project in the Philippines: An Analysis of Users' Perspectives" that has been approved by the Department of Clinical Medicine (Case No: IKM F11-11), Faculty of Health Sciences, on the 31st August, 2011. Professor Gunnar Ellingsen is her supervisor.

The data collection will be used solely for academic purposes in relation to the writing of her Master's Thesis. All private and personal information will be treated as confidential, as required by the Research Ethics regulations endorsed by the University of Tromsø, Norway.

We sincerely hope that you will kindly provide the necessary support for this academic exchange!

Thank you very much.

Yours faithfully,

A handwritten signature in blue ink, appearing to read 'Judy Au'.

Judy Yu-Ying Au
Student Advisor
Master Programme in Telemedicine
and E-health

Copy:
Professor Gunnar Ellingsen, Supervisor and Chair of the Programme Committee for Telemedicine and E-health