FACTORS AFFECTING ADOPTION OF WIRELESS ACCESS FOR HEALTH AND ITS ASSOCIATION WITH BEHAVIOR OF RURAL HEALTH WORKERS AND THEIR PREGNANT PATIENTS

CHAPTER ONE

INTRODUCTION

Background of the Study

In the Philippine context, there are already existing evaluative studies looking into the effectiveness of health information technologies. However, there still remains a dearth of timely and evidence-based researches looking into the interoperability and capacity of these technologies in effectively integrating health data from various sources. Also, existing studies hardly explored the behavioural change required both at the level of the individual and at the level of the organization in order for health technological innovations to be adopted and sustained.

Furthermore, there are only a few studies which considered social factors or determinants to the successful integration of modern technologies in a seemingly rigid and archaic structure of the Philippine health information system. Cognizant of the fact that health care is a social phenomenon, this research in particular, focused on exploring various social and infrastructural factors associated with adoption of a specific technology. The aim of which is to provide a more sociological understanding of the adoption of health information technology in the perspective of the health workers themselves.

According to Health Metrics Network (HMN), a national health information system's goal is to "increase availability, accessibility, quality and use of health

information vital for decision-making at country and global levels" (Health Metrics Network, 2007). Recognizing the importance of timely, relevant and accurate health data, there have been several attempts in integrating the use of technological advances in health information system at all levels. This is highlighted in the technical report published by the Institute of Medicine (IOM) in 2001 when the government of the United States began re-assessing its own health care system. In the report, IOM recommends the use of information technology in improving the health care system. The report also underscores the idea that integrating information technology in health care will not be easy knowing that health care is a complex system.

In the past, the Philippine Department of Health has been testing different methodologies in an attempt to improve its health information system. Part of these methodologies is to include modern technologies as a tool for facilitating a speedier and more accurate data gathering process. Evaluations of these programs however lacked consideration regarding social aspects of technology adoption. The use of technology in health information in the Philippines is not only relevant but almost necessary. The primary problem of the Philippine health care system is accessibility (Philippine Health Information Network, 2007) owing to a number of reasons including the archipelagic nature of the country. However, this situation can be mitigated by the use of health information technology which will hopefully provide information to health care practitioners even to the remote areas of the country.

However, introducing a technology is one thing but integrating it in the system institutionally is another. Embracing technological change is a gradual process and social acceptance of such change could take time before it can be fully embraced by its users. In fact, local government units are still used to collecting, processing, and analyzing health data manually despite the integration of health information technologies. To

address such gap, the Philippine Department of Health (DOH) in January 2007 conducted a Health Information System (HIS) Integration Workshop.

The participants of the workshop was able to come up with guidelines in constructing a Philippine Integrated Health Information System (PIHIS) as follows: 1) Build on existing health information systems to integrate content and information functions, 2) Develop/Strengthen policy and regulation for data submission and/or information gathering, 3) Compliance to government policy on Information and Communications Technology (ICT), and 4) Compliance to DOH Department Order 2005-0032 – Standard Operating Procedure and Guidelines on ICT Works in the DOH. These guidelines are based on the conceptual framework of bringing together data from different information systems, to share and disseminate them, and to ensure that health information is used rationally, effectively and efficiently to improve health action or decision-making process.

Health Metrics Network, in its review of the Philippine Health Information System in 2007, emphasizes that the desired outcome for such an electronic system is evidence-based policies and decisions and improved collaboration. The design of PIHIS must therefore be aligned with these ultimate goals. Since then, there have been many attempts both from the government and the private sector to develop health information technologies that would respond to the challenge of strengthening the health information system of the Philippines. Various organizations have been coordinating with the DOH and/or individually piloting their own health information systems each with its own limitations. One of these innovations is the Wireless Access for Health (WAH), a derivative of the Community Health Information Tracking System (CHITS). However, little studies have been conducted regarding impact of WAH on behaviors of its adopters.

Using the Unified Theory of Acceptance and Use of Technology (UTAUT), this particular study focused on looking at four determinants, namely, Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions and how they affect Adoption of Wireless Access for Health by rural health workers in selected municipalities. It also included sociodemographic profiles of rural health workers and presence of enabling conditions such as electricity, internet, cell phone and I.T. hardware. Subsequently, as a modification of UTAUT, this study further focused on how Adoption of WAH influence the behavioural intent to continue using WAH and the health seeking behaviour of the pregnant clients of the rural health workers from latter's perspective.

Review of Related Literature

This section presents extant literature regarding health information system as one building block of any health system. Divided into ten parts, the first section discusses the importance of using health information technology, its role in the local health systems as seen from the experience of other countries and in the Philippines, the Wireless Access for Health, the Unified Theory of Acceptance and Use of Technology, and the four determinants of WAH adoption among rural health workers, concepts on behavioural intent in relation to the intent to continue using WAH, and how technology influence health seeking behaviours. This section also describes the current gaps in the Philippine health information system and how these gaps are being addressed by WAH.

Health Information as a Building Block of a Health System

The WHO's Framework of Action describes six building blocks of health, included among which is Health Information (WHO, 2007). According to the WHO (2007), "a well-

functioning health information system is one that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health system performance and health status." This indicates that the generation and strategic use of information, intelligence and research on health is an important part of leadership and governance function. A health system with a functional health information system must therefore have the capacity to do the following: 1) generate population and facility based data: from censuses, household surveys, civil registration data, public health surveillance, medical records, data on health services and health system resources; 2) have the capacity to detect, investigate, communicate and contain events that threaten public health security at the place they occur, and as soon as they occur; and 3) have the capacity to synthesize information and promote the availability and application of this knowledge (WHO, 2007).

The merging of Health Information with Technology has been loosely referred to as Healthcare Information Technology (HIT). One definition of healthcare information technology is "the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of healthcare information, data, and knowledge for communication and decision-making" (Brailer and Thompson, 2004).

Presently, governments and local health leaders are under incredible pressure to address different challenges: provision of quality health services, rising costs of health services, accessibility, inefficiency, declining satisfaction among health workers, and mounting health human shortages. Dealing with these issues would ultimately lead to better healthcare, but the process appears as complex and overwhelming as the challenges themselves. Information – or lack thereof – is a big part of today's healthcare problems. In a largely pen-and-paper based method of gathering and consolidating of

data, a majority of health policies are based largely on old data which may no longer be relevant. As stated in the Institute of Medicine report (2001), handwritten reports or notes, manual order entry, non-standard abbreviations and poor legibility lead to substantial errors and injuries. Years later, IOM propounds rapid adoption of electronic patient records, electronic medication ordering, with computer- and internet-based information systems to support clinical decisions (National Research council, 2003).

Role of Health Information Technology

Sinha (2010) describes the role of HIT, emphasizing that the key to implement HIT is understanding how to collect, where to collect, whom to report and how these information would be used by whom. He further describes that the role of HIT is to provide the best information support to the healthcare professionals, managers and policy makers for quality decision making, care and treatment. Sinha furthered described five types of health information technology, namely, Electronic Health Records (EHR), Decision Support System (DSS), Hospital Information System (HIS), Computerized Physician Order Entry (CPOE) and District Health Information System (DHIS). In this particular study, the focus was on an EHR type of information technology, expanded to perform other functions such as a capacity to aggregate data and send out a report and an alert system for both care giver and patients.

One of its other functions is to help manage the data for monitoring the attainment of health program targets and objectives (Sinha, 2010). In connection with its national objectives for health, the Philippines in 2000 was among the many countries that agreed to address challenges in poverty and other areas of human development through the accomplishment of the 8 Millennium Development Goals (MDG). Among the 8 MDG's, the 2013 national report indicates that the Philippines would not likely achieve its target

on the following surrogate indicators: proportion of 1-year old children immunized against measles, maternal mortality and proportion of births attended by skilled birth attendants (National Statistical and Coordination Board, 2013). These indicators mentioned are influenced by the quality and consistency of provision of health services, determined by both the behaviour of the health care providers and the clients (health seeking behaviour). A study looking into the influence of technology on the behaviour of the health care providers and the clients is a welcome research enterprise considering its scant literature base. This research gap therefore warrants the conduct of this research.

Health Information Technology in Other Countries

With the advancement of technology, many countries around the world have resorted to more advanced methods of generating health data for the utilization of policy and decision-makers in any health care organization. Finland, for example, is one of the European countries which employ management information systems in health care (Kivinen and Lammintakanen, 2013). Chile in the 1990's adopted a technological platform for their health information system which is still being used today (Capurro, 2007). An analysis of the Chilean's Ministry of Health's integration of Communications and Information Technologies in public health, patient care and health care management indicate that the key goals for the plan include patient-centered service, informed citizens and evidence-based medicine among others (Gobierno de Chile, 2006).

Chaudhry et.al. (2006) in their systematic review of the impact of health information technology on quality, efficiency and cost of medical care and their findings describe how "improvements in processes of care delivery ranged from absolute increases of 5 to 66 percentage points, with most increases clustering in the range of 12 to 20 percentage points." The same observation is made in Elie Geisler's evaluation of

the use of Picture Archiving and Communication System (PACS) as a medical technology innovation. From a sample of 141 hospitals in the United States, preliminary findings revealed that there was a positive correlation between differentiated outcomes from PACS and quality of care (Geisler, 2011). The benefits of having PACS introduced in the system included fewer lost X-ray films, savings in time to read and interpret results, and accessibility of results. Doctors no longer have to be in the hospital to read and interpret X-ray films. These benefits translated to better quality of care. Geisler notes that because of the technology, there have been fewer "repeat X-rays" thus lesser exposure to radiation by the patients, reduced time to diagnosis and thus faster road to therapeutics and faster and more distributed access to experts, hence faster and improved diagnosis.

Schoen, et al. (2006) and Hillestad et. al. (2005) described how advances in Health Information Technology reduced paperwork and workload of health care professionals therefore increasing administrative efficiencies and expanding access to affordable care. Bates et.al. (1998) also emphasized how effective health information technology (HIT) in preventing medical errors by enforcing guidelines and care protocols. However, another study conducted by Eden et. al. (2008) shows that the introduction of HIT does not reduce paper work but increases allotted time for direct patient care. Another recent study indicated that the use of EHR is not associated with better quality of care (Linder, et al., 2007).

Health Information System in the Philippine Setting

For a developing country such as the Philippines, investment in a more modern health information technology can be very costly. It is no surprise therefore that despite the advancement of technology, the Philippine health information system is still largely

paper-and-pen based. The Philippine health care system is dual in nature: the public sector, which is largely financed through a tax-based budgeting system at national and local levels where health care is generally given free (although socialized user charges have been introduced in recent years for certain types of services), and the private sector (consisting of for-profit and non-profit providers), which largely market-oriented and where health care is paid through user fees (Health Metrics Network, 2007).

Under this health system, the public sector consists of the Department of Health (DOH), Local Government Units (LGU) and other national government agencies providing health services. The DOH is the lead agency in health. Its major mandate is to provide national policy direction and develop national plans, technical standards and guidelines on health. It has a regional field office in every region and maintains specialty hospitals, regional hospitals and medical centers. It also maintains provincial health teams made up of DOH representatives to the local health boards and personnel involved in communicable disease control (DOH, 2014).

With the devolution of health services under the 1991 Local Government Code, local government units are mandated to provide direct primary and secondary levels of health services. Under this set-up, provincial and district hospitals are under the provincial government while the municipal government manages the rural health units (RHUs) and barangay health stations (BHSs). In every province, city or municipality, there is a local advisory body to the local executive and the local legislative council on health-related matters (DOH, 2014). At the municipality level, the RHU is the main health service provider. It is manned by RHU health personnel under the supervision of the Municipal Health Officer. This study in particular focused on this level particularly describing the factors influencing the RHU staff in adopting the technological innovation and how this impacts their work flow including the behaviour of the clients they serve.

The DOH, in its quest to strengthen the Philippine health system and make it a vehicle for social change, engineered the *Fourmula* One for Health (F1) in 2005 as the new implementation framework for vital health sector reforms as stated in its HSRA in 1999. F1 became the DOH's guiding philosophy and strategic approach to implement health reforms. On the other hand, the NOH 2005-2010 provides the "road map" of key ideas, targets, indicators and strategies to bring the health sector to its desired outcomes. The DOH remains as the major source of data for the health sector. Its statistics are mostly derived from administrative reporting forms regularly furnished by public hospitals, rural health units and other health units in the lower administrative units of government. The Philippine Health Statistics (PHS) is a report of the National Epidemiology Center (NEC) of DOH. It provides a summary of statistical data on births, deaths and notifiable diseases registered and reported through the Notifiable Diseases Registry of the Field Health Surveillance Information Systems (FHSIS) submitted by the RHUs and BHSs. Diseases, injuries and health conditions are coded using the International Classification of Diseases version 10 (ICD-10).

The FHSIS serves as the major source of data for the DOH. The system provides information on the different public health programs such as: Maternal and Child Health; Nutrition; Family Planning; Expanded Program on Immunization; Dental Health; Communicable Disease Prevention and Control(TB, Malaria, Schistosomiasis, Leprosy); Environmental Health; Vital Statistics (Natality, Mortality, Population); and, Notifiable Disease Reporting System. Data are provided by the local field health personnel through the regional and provincial health offices, and consolidated at the Central Office. These are presented by province, city and region in a publication of the same title.

The Wireless Access for Health

A new technology was recently developed and piloted in Tarlac municipalities. Referred to as “Wireless Access for Health”, the WAH has expanded a function of one of its forerunners, the Community Health Information Tracking System, (CHITS). It expanded the Electronic Medical Record platform that supports data collection and reporting from the barangays through the mobile midwife platform and sends patient alerts through the Synchronized Patient Alert via SMS feature. WAH is a computer-based health information technology which has four levels of operation.

Level 1 is a simple Electronic Medical Record which allows a Rural Health Unit (RHU) to create digital-based data of its patient records. When a patient visits an RHU for consultation, a rural health worker at the Reception Area encodes directly the patient’s history and pertinent information into the WAH software. It then sends the same information through a local area network (LAN) within the RHU to the doctor’s clinic. The doctor retrieves the information, conducts his or her examination of the patient and encodes his or her findings and orders in the same digital record of the patient. The same information is then sent from the doctor’s clinic to either the laboratory or the pharmacy whichever is applicable. If the doctor requires that the patient undergoes laboratory procedures, the data is sent to the lab where the personnel in charge retrieves the information, reviews the order, performs the procedure on the patient and encodes the findings on the same file. Eventually, the data is sent to the pharmacy where the pharmacist would retrieve the information, takes note of the encoded prescription, dispenses the medicines accordingly and prints out the prescription for the patient. These data are stored in a dedicated server which a rural health worker can retrieve anytime. It does not therefore require an internet connection to operate the software.

Level 2 allows the RHU to aggregate the information and generate a digital equivalent of the FHSIS. Rural health midwives therefore need not manually calculate for the rates and ratios and percentages required in the FHSIS forms. The data they would encode in the software, including those already encoded in the Level 1 Electronic Medical Records, will be processed by the software. The FHSIS data generated by the software can then be printed or saved in an external portable hard drive. If the RHU has internet connection, the same report can be sent via email.

Level 3 allows the RHU to send out reminders to its patients and clients regarding subsequent consultation appointments. The Synchronized Patient Alerts via SMS feature of WAH sends out text messages to patients especially to pregnant patients to remind them of their upcoming scheduled prenatal and postnatal consultation with their midwife or doctor. It is also used as a health promotion tool since it can send out information to the patient through their cell phones.

Level 4 allows the rural health midwives of the RHU to directly encode on their smart phones, tablets or laptops patient data and information during their field or barangay visits. Referred to as Mobile Midwife, this level makes capturing of real-time data. If the Smartphone or tablet is connected via a 3G network, it can then send the data instantly to the system which can then be retrieved anytime by the doctor or even the local chief executive of the municipality if needed.

A case study of WAH, involving all LGUs in Tarlac which adopted the technology, reveals that patient care has improved and patient visits have increased as they are handled more efficiently, having reduced the four to five minutes needed to search paper records to just seconds (Qualcomm, 2013). The same case study also notes that the ability to easily view, record and share patient information across multiple computers

within a health clinic allows clinicians to complete patient consultations earlier in the day in order to provide more support to community health workers. The ability to easily view, record and share patient information across multiple computers within a health clinic allowed clinicians to complete patient consultations earlier in the day in order to provide more support to community health workers. However, the case study does not include investigating the effect of the use of Wireless Access for Health on the behaviour of not only the health care providers but also of the clients (health seeking behaviour), which this particular research actually also addressed. The said case study also highlights the importance of engaging the local government unit for support, particularly in the budgetary requirements but more importantly in making sure that the political leadership is supportive of the innovation, something which the CHITS training teams and implementers were not able to explicitly address (Shainur, Casebeer and Scott, 2012). To address this, the implementers of WAH has partnered with stakeholders, particularly with Zuellig Family Foundation, to provide health leadership and governance training to potential LGU adopters as a prerequisite in rolling out of the WAH technology in their respective LGUs.

The partnership with the Zuellig Family Foundation, a non-government organization focused on capacity-building and leadership training for local chief executives and local health leaders, is cognizant with the fact that the emphasis on the importance of leadership and governance has been highlighted by both the DOH and WHO. As stated in its National Objectives for Health report:

> *"Good governance also necessitates a clear knowledge of what is happening in the health system in order to develop policies, programs and strategies that support the overall health goals and objectives. The health sector, in general, gathers large amount of information from those collected and compiled by thousands of health personnel most of which are never used. A good health intelligence and knowledge management system needs to be selective in the information it generates to avoid*

> *inefficiencies and a stage of limited resources. It is critical that knowledge is disseminated to provide support for policy and decision-making, to build constituency of public support for health policy, to form part of capacity-building program, and to inform and influence behavior and events within the health system"* (DOH, 2014).

Determinants of Actual Use of Technology According to the UTAUT Model

Recognizing the advantages of using health information technology, the challenge therefore lies on how this huge shift from "manual" to "digital" based data gathering would be adopted by the health workers themselves (individual change of behavior) and how the local government would provide the enabling environment (organizational change) to sustain such innovation. Everett Rogers (2003) describes this as rate of adoption of innovation. He defines this as the relative speed with which an innovation is adopted by members of a social system.

In his theory of Diffusion of Innovation, Rogers believes that the perceived attributes of an innovation are one important explanation of the rate of adoption of an innovation. However he goes on to say that it is actually the concept of relative advantage that is one of the best predictors of an innovation's rate of adoption. Relative advantage indicates the benefits and the costs resulting from adoption of an innovation. It is therefore important that in the attempt to integrate a technological innovation into a system requiring changing certain elements embedded for quite some time, it is important that the adopters of the innovation must be able to distinguish the relative advantage of this innovation from the other strategies it supersedes.

This is highlighted by a study of Folland, Goodman and Stano (2011) when they note that physicians most likely adopt technologies if they foresee profits, if they are well-informed, and/or if they are surrounded by other adopters. In one instance, a physician

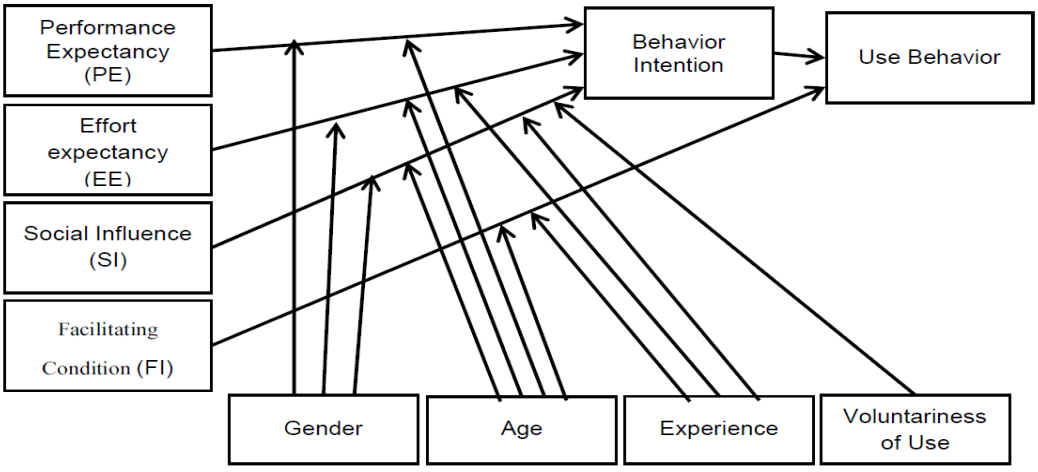
might find technology adoption appealing if the new technology were to attract new patients to his practice.

Davis (1989) likewise acknowledged the importance of perceived attributes of innovation in his Technology Acceptance Model. The Technology Acceptance Model, which is based on the previously described Theory of Reasoned Action, includes two determinants: 1) perceived usefulness (of the technology) and 2) perceived ease of use (of the technology). These influence the adopter's attitude towards using it which eventually influences behavior intention to use and translated ultimately in actually system use. TAM was the most widely utilized theory to study Information system and information technology adoption within the field (Dwivedi et. al., 2008). Bandura and Adams expand on this concept, developing Social Cognitive Theory (1997), highlighting five factors that would influence adoption of a technology: Outcome Expectations-Performance, Outcome Expectations-Personal, Self-efficacy, Affect and Anxiety. Outcome Expectation-Performance is defined as the performance that people expect for efficiency in job-related outcomes. Outcome Expectation-Personal is defined as the effect of performance on behavior. Self-efficacy is the determination to develop the ability to use a form of technology. Affect is an individual's favourite particular behavior to engage in. Anxiety is defined as evoking anxious or emotional reactions when performing a behavior, e.g., stress when approaching unfamiliar technology (Bandura and Adams, 1997).

Combining these two theories, along with other theories on behavior change, Venkatesh et. al. (2003) came up with a Unified Theory of Acceptance and Use of Technology (UTAUT). The Unified Theory proposes that there are predominantly four main determinants of behavioral intention regarding people using information technology: 1) Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and

Facilitating Conditions (FI). Figure 1 describes the relationships of these constructs and moderating factors on behavioural intent and actual use.

Figure 1. The Unified Theory of Acceptance and Use of Technology



Performance expectancy refers to how the technology provides users the expected functions or utility (Venkatesh et. al., 2003). Pai and Huang (2011) also found that perceived usefulness had a positive direct effect on intention to use. Effort expectancy is the degree of ease associated with the use of the technology (Venkatesh et. al., 2003). It was found that effort expectancy has a positive significant effect on intention to use clinical decision support systems (Chang et al., 2007), healthcare information systems (Pai and Huang, 2011), and adverse event reporting systems (Wu et al., 2008). Social Influence is the degree to which the user perceives the importance that others give to whether he or she should utilize the new technology (Venkatesh et. al., 2003). Wu et. al. (2008) indicates that subjective norm has a direct positive effect on Behavioral Intention in using an adverse event reporting system.

Facilitating conditions are the degree to which an individual believes that an organization, in this case the Local Government Unit and/or Rural Health Unit, exist to support the utilization of the technology (Venkatesh et. al., 2003). Chang et. al. (2007) showed that facilitating conditions have a positive effect on physicians' use behavior of

pharmacokinetics-based clinical decision support systems. In another research, performance expectancy was found to have the strongest direct effect on behavioral intention, whereas social influence was found to have no direct effect on behavioral intention, as well as no directly significant effect on total use of healthcare technology behavior (Phichitchaisopa and Naenna, 2013).

Together with these determinants, Venkatesh et. al. (2003) also point out behavioral intent as an influencing factor in the Adoption of the technology. Venkatesh et. al. emphasize that “the role of intention as a predictor of behavior is critical and has been well established” in the field of Information Systems. This statement is grounded on the Theory of Reasoned Action (TRA) (Fishbein and Azjen, 1975) which has become a model for analyzing behavioral intention and its relation with actual behavior.

The theory describes three constructs: behavioral intent, attitude and subjective norms. Simply put, Fishbein and Azjen (1975) summarize that if a person intends to do a behavior then it is likely that the person will do it. Venkatesh et. al. (2003) highly consider this relation between subjective norms and attitude towards behavioural intent, as reflected in the UTAUT model wherein social influences is seen as a determinant of behavioural intent. The UTAUT’s Social Influence construct is similar to the TRA’s subjective norms construct which is “the person's perception that most people who are important to him or her think he should or should not perform the behavior in question" (Fishbein & Ajzen, 1975).

In this particular study, the researcher assumed that the relationship between behavioural intent and actual use is a well-established one. It follows that a person with high intent will most likely have a higher certainty of actual application of the intention. In this case, a health worker who has expressed high intention to use Wireless Access for

Health would have a higher degree of certainty of actually utilizing it. This is somehow similar with the same observation given by Bagozzi (2007) when he criticized the gap between intent and use in his analysis of the Technology Acceptance Model (TAM). Bagozzi goes on further saying that:

> *"By focusing on use, TAM slights the benefits of use and their actual attainment. The use-to-goal-attainment gap is neglected in TAM except as an anticipated belief up-stream in the model. Also more is needed in TAM explicitly focusing on end-state goals/objectives of technology use" (Bagozzi, 2007 p. 245)*

A study done by Mandal and McQueen (2012) affirms this criticism when their findings reveal that "the behavioral intention construct seemed to lose importance in face of desire to achieve their goals determining the latter as the main indicator" of technology adoption. They observe that "as the participants saw usefulness with customers responding to some of their posts they made a proactive effort to use the tool" (Mandal and McQueen, 2012). Mandal and McQueen (2012) however have applied the UTAUT framework in the context of adopting social media in the context of a micro business setting. The same contention was tested in this particular research when it was applied in the adoption of Wireless Access for Health in a rural health unit setting.

Actual Use of Technology and Its Influence on Behavioral Intent to Continue Using

To make the model more appropriate for a post-adoption scenario, this study considers the level of Actual Use of WAH as a variable that will likely influence the behavioral intent to continue using WAH. This research contends that the use of technology itself influences changes in behavior, including the behavioral intent to continue using the said technology.In his paper on Social Practice Theory, Reckwitz (2002) describes how human practices are themselves arrangements of various inter-

connected elements, such as physical and mental activities, norms, meanings, technology use, knowledge, which form peoples actions or 'behavior' as part of their everyday lives. In other words, the tangibles, or non-human actors (Latour, 2005) such as a computer or cell phone connected to the internet have a role to play in drawing out certain behaviours or outcomes from groups or individuals. Latour describes this in his Actor-Network Theory (2005) emphasizing that:

> *"...the meandering path through which most of the ingredients of action reach any given interaction is traced by the multiplication, enrolment, implication, and folding of non-human actors. If the analyst is not allowed to exert some right of pursuit through multiple types of agencies, then the whole question of local and global becomes intractable. But as soon as non-human agents are brought in, another set of connections appears which are as different to those deployed in the preceding section as veins are to neural pathways" (Latour, 2005 p.193)*

Elizabeth Shove, in 2010, writing to the House of Lords Science and Technology Committee (House of Lords, 2014) calling for evidence on behavior change anchored it very well on the same precept, saying that:

> *"...research inspired by theories of practice and by social studies of technology emphasizes the close-coupled relation between objects, infrastructures and 'behavior', again a link that is rarely made in the classic behavior change literature most of which overlooks the material basis of what people do. Put simply, roads, railways, freezers, heating systems, etc. are not innocent features of the background. Rather, they have an active part to play in defining, reproducing and transforming what people take to be normal ways of life" (House of Lords Science and Technology Select Committee Behavior Change, citing Shove, 2010)*

Here lays, therefore, a link between social behavior and the influence of technology, a convergence of some sort between society and its technology. Experts refer to this frame as a socio-technical approach to looking at behavior change, whether at the individual level or at the organizational level (culture). Literature is rich in paradigms when it comes to understanding behaviour and behaviour change. One of the fundamental concepts concerning human behavior is the Theory of Reasoned Action

(TRA). Adopting the principles of TRA, behavioral intent predicts the user's behaviour on what technologies to use. Behavioral Intent is the main determinant for measuring the degree of intention in using those technologies or in making a decision. It is considered based on the individual behavior of the user and other related factors (Fishbein and Azjen, 1975).

The premise of this link between society and technology (socio-technical) is that all technologies are supposedly "socially situated". Any Information Systems or Information and Communications Technology (ICT) is embedded into a social context which both adapts to, and helps to reshape, social worlds through the course of their design, development, deployment and uses (Avgerou, 2001; Walsham, 1993; Orlikowski, 1992). Harrison, Koppel and Bar-Lev (2007) re-affirm this when they suggest to "stop viewing HIT innovations as things but instead treat them as elements within unfolding processes of socio-technical interaction." More than just looking at the role of technology, Socio-technical approach guides the analyst in looking at the interaction between the technology and the user of technology. In fact, a few of the challenging problems related to the analysis and design of a socio-technical system are the problems of understanding the ways technology can support human and organizational operations and the way in which the structure of these activities is influenced by introducing technology (Bryl, Giorgini and Mylopoulos, 2009). The results of HIT innovation can "never be fully determined by the technology. Socio-technical interactions are dynamic, emergent, hard to understand, and often surprising—conditions characterizing complex adaptive systems" (Harrison, Koppel and Bar-Lev, 2007).

Venkatesh et. al. (2003) have performed longitudinal studies analyzing various technologies and settings, including post-adoption settings of the technology. Although UTAUT has been used as a theoretical anchor to explain post-adoption behaviors, there

has been disapproval of this approach, expressing how the theory does not capture the dynamics of the post-adoption behavior of technology use (Limayem et. al. 2003). There has been a rising body of research that specifically addresses post-adoption behaviors. Researchers have attempted to improve the explanation of continued use by examining such factors as the actual usage (Speier and Venkatesh 2002), satisfaction (Limayem et. al. 2003), negative emotion (Chea and Luo 2008), and habit (Limayem et. al. 2003). In this particular research, the UTAUT model was expanded to consider its application in analyzing post-adoption behavior using other factors as cited by other scholars.

Kim and Malhotra (2005), using a TAM-based model, included four mechanisms, Reason-oriented action, Sequential updating of judgments, Feedback and Habit, to come up with an Integrative Framework of Technology Use (IFTU). In their study, the TAM, which represents the Reason-oriented action framework, is complemented by the other three mechanisms to attempt a comprehensive theory of how individuals adjust their evaluations and behavior over time. Kim (2009) further draws on the process model of memory to provide explanation of the four mechanisms underlying technology use. Thus, as an attempt to develop a comprehensive theory of how individuals adjust their evaluations and behaviors over time, Kim and his colleague demonstrate that the reason-oriented action component which represents the traditional frameworks such as TAM and UTAUT can be complemented by three other mechanisms noted earlier.

Hou and Ma (2011), incorporating the IFTU, modify the UTAUT, which represents the Reason-oriented Action Framework in the IFTU, into a Longitudinal UTAUT (LUTAUT), using UTAUT as a "as theoretical backdrop or the development of a longitudinal model of continued use" (Hou and Ma, 2011). In this particular study, the research makes a similar attempt to integrate concepts from IFTU to modify UTAUT in order to use it in a post-adoption setting. In this particular research, it actually focused on

the influence of the frequency of actual use (habit) among others on the behavioral intent to continue using WAH by the health care providers.

Impact of Use of Technology on Health Seeking Behaviour of Clients

Having established that there is a certain influential interaction between the human user and health information technology, this study focuses on particular behaviours that Wireless Access for Health specifically attempts to influence. When it comes to the impact of utilizing health information technology on behaviour, empirical data are mounting to support the beneficial impact of health information technology on various aspects of health. On the part of the clients, one of the behaviours Wireless Access for Health attempts to influence is the utilization of health services and facilities. As previously mentioned, 3 of the surrogate indicators under the Millennium Development Goals which the Philippines will likely not achieve are related to utilization of health services, if not health facilities. Utilization of health services is a complex behavioural phenomenon and there are various determinants to such behaviour, such as education, accessibility to health services and perceived severity of illness (Chakraborty, et. al., 2003; Muriithi, 2013).

Gold et. al. (2011) explored the idea of using technology and determining its impact on sexual health promotion among young people. The research showed that using Text Messages appears to be feasible and effective method of sexual health promotion to young people with a low withdrawal rate and observed improvement not only in their knowledge about sexual health but also in subjecting themselves to Sexually Transmitted Infection testings (Gold et. al., 2011). Evidence is not yet available on programs that use SMS reminders and health updates to encourage healthy and health-seeking behavior in women (Walters, Hatt and Peters, 2002; Schlein and Montagu, 2012), but studies from

other health areas (such as smoking cessation) suggest that these approaches can be successful (Free, et. al., 2011). Furthermore, there seems to be a significant demand for women's health-related information using SMS technology in areas where reproductive health information is difficult to obtain (Long, van Bastelaer and Woodman, 2012; Prata, Montagu and Jefferys, 2005).

Gaps In The Philippine Health Information Technology

The Philippine Health Information System is riddled with gaps, ranging from information gaps, to poor utilization of data, poor reliability and validity of data and the inappropriateness of data (Pons Melahi and Schwefel, 1993; Jayasuriya, 1995). Marcelo et. al.(2004), in their evaluative study in three of six pilot sites, namely Samar province, Baguio City and Cotabato City of the Decentralized FHSIS (DFHSIS) discover that the DFHSIS reduced the number of required national indicators collected by local health personnel and simplified the data flow as intended. For these reasons, the DFHSIS was preferred over the Modified FHSIS (MFHSIS). Despite this however, the new system "did not generate enough information needed by the national program managers" (Marcelo et. al., 2004). Furthermore, it did not result into better data accuracy, timeliness, and completeness, nor did it encourage the implementers, such as the local health personnel, to customize the system for their local health needs. The software component of the DFHSIS was considered "incomplete by end-users and therefore not useful" (Marcelo et. al., 2004) Reasons noted for these problems include lack of policy or implementing rules and regulation, poor support systems and structures, lack of financing, and lack of capacities at the community level for health data utilization for program improvement. The same problems of inaccuracy, incompleteness, and delay that hounded the original FHSIS and MFHSIS also plagued the pilot implementation of the DFHSIS. Thus, it was recommended that the DFHSIS, as planned and implemented in the three pilot sites, not

be adopted in other areas of the country unless fundamental management systems and structures at all health system are put in place.

It is with the same intent when different groups in the Philippines have started developing technology-based innovations that would address the gaps in the Health Information System of the country. These innovations vary in form, from telemedicine to electronic medical or health records. In 2005, Tolentino et. al. emphasize the importance of community-based primary care information system as one of the essentials for national health information system. Working on their Community-based Health Information Tracking System (CHITS), the technology design is anchored on the four cornerstones of Medical Informatics as proposed by Lorenzi. Accordingly, Lorenzi (2000) describes four foundations of medical informatics: It must be able to a) produce structures to represent data and knowledge so that complex relationships may be visualized, b) develop methods for acquisition and presentation of data so that overload can be avoided, c) manage change among people, process, and information technology so that the use of information is optimized and d) integrate information from diverse sources to provide more than the sum of the parts, and integrating information into work processes so that it can be acted on when it can have the largest effect (Lorenzi, 2000).

Tolentino et. al. identify challenges in the rolling out of the CHITS as an HIT innovation, one of which is the apparent lack of confidence of indigenous health workers in using the technology. In 2012, an evaluation of the CHITS was made and was found that:

> *"...technologically, it is likely that following significant investments in equipment and training for CHITS, a more innovative and cost-effective technology will emerge that influences system sustainability. Culturally, CHITS sustainability is, and will continue to be, heavily influenced by the*

> *attitudes, willingness and adaptability of its users"* (Shainur, Casebeer and Scott, 2012, p.195).

Synthesis

The health information technology, in its various forms, contributes to the improvement in certain aspects of the health care system. Its impact lies on how, as the various sociological theories support, the dynamics between technology and humans enrich the system that contains them. Using the UTAUT model, the adoption of a technology depends on how the users perceived the functional value of the technology (Performance Expectancy), how easy it is to use (Effort Expectancy), how others in the organization influence them to use it (Social Influence) and the presence of internal and external resources that support the use of the technology (Facilitating Conditions). In addition, other models also suggest that the actual use of the technology contributes to the perceived improvement in health seeking behaviour of clients as manifested in their increased utilization of services. The level of actual use of technology (habit) also influences the behavioural intent of the user whether or not to continue the use of technology. Drawing from other theoretical models, the UTAUT frame has been re-framed to analyze technology acceptance in a post-adoption setting.

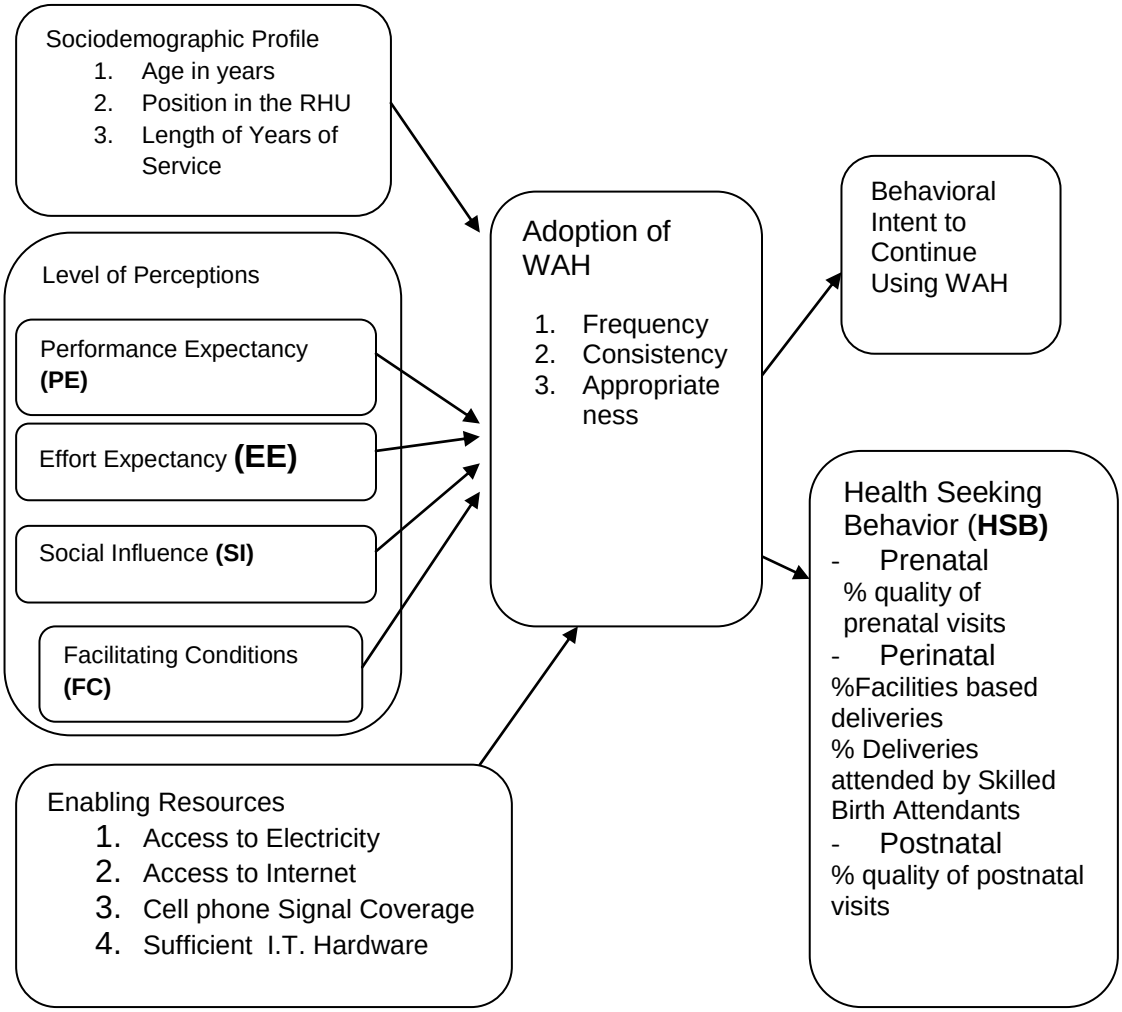
The goal of having an improved manner of accurate and timely gathering of health data is to eventually influence health governance into producing sound health policies that not only will influence the behaviour of clients by promoting and enhancing their usage of health services and facilities rendered especially by the Local Government Units through their respective Rural Health Units, but will also enable the achievement of improved over-all health outcomes of a municipality, if not of the country as a whole.

Conceptual Framework

As previously mentioned, this study adopted and modified the UTAUT model in assessing the determinants that influence adoption and acceptance of Wireless Access for Health as a particular technological innovation limiting only on the four major determinants, namely Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions and replacing some of the Moderators and limiting only to Age, Position/Rank in the Office and Length in Service, which were collectively referred to as Socio-Demographic Profiles. In addition to these variables, the study also included the influence of physical infrastructures in the municipality such as electricity, internet and technical hardware. They were collectively referred to as Enabling Resources.

The modification in the UTAUT model shall consider how these determinants influence the actual use of the Wireless Access for Health by the rural health workers. Integrating other revisions in the UTAUT, this study considered the influence of actual use of WAH on the intent to continue using the technology and how the current level of actual use influence the achievement of the goals of WAH, which is to improve health seeking behaviour of the clients. This modified UTAUT model is adjusted to use the UTAUT as a theoretical foundation in analyzing behaviour related to accepting or adopting a technological innovation and extends it to be used as an analytical framework in a post-adoption scenario. This conceptual framework indicates that Behavioral Intent to Continued Using WAH is the best indicator for the adoption of WAH. Venkatesh et. al. (2008) affirm this contention. The conceptual framework pushes it even further to include outcomes in health seeking behaviour as an indicator of success for the adoption of WAH, a research gap which this study aims to address.

Figure No.2: Conceptual Framework



Sociodemographic Profile refers to the individual qualities of the respondents, namely, age, position in the RHU and length of years in service. Age is measured in years and it is presumed that the older the respondents, the lower the level of adoption of technology as shown in the study of Czaja et. al. (2006). Position in the RHU refers to their primary role and function in the facility which is the Medical Doctor, Nurse or Midwife. The flow of accountability and operations in the RHU is hierarchical. It is expected therefore that front liners such as midwives and nurses would have a higher level of adoption of WAH compared with the medical doctors. Length of Years in Service

refers to the amount of time the respondent has been working in the facility. It is expected that the longer the length of years in service of a respondent, the lower the level of adoption of a new technology or innovation such as the WAH.

Performance Expectancy deals with the health worker's perception about the usefulness of WAH and how it makes their work more efficient and productive. It is measured as High, Moderate or Low. It is expected that a high level of Performance Expectancy would result to high level of adoption of WAH. Effort Expectancy deals with the health worker's perception about the relative ease in the learning and usage of WAH. It deals with their perception about how easy or difficult it is to use and learn using the technology. It is measured as High, Moderate or Low. It is expected that a high level of Effort Expectancy would result to high level of adoption of WAH.

Social Influence deals with the health worker's perception about the support and influence he or she receives from his or her co-workers, supervisors and other important individuals that would enable him or her to use WAH. It is measured as High, Moderate or Low. It is expected that a high level of perceived Social Influence would result to a high level of adoption of WAH. Facilitating Conditions deal with the health worker's perception about internal and external capacities to enable him or her to use WAH. Internal capacities refer to his or her knowledge and skills inherent in him or her that would enable him or her to use WAH. External capacities refer to outside support that would enable the health worker to use WAH. It is also measured as High, Moderate or Low. It is expected that a high level of perceived Facilitating Conditions would result to a high level of adoption of WAH.

Enabling Resources refer to the physical infrastructure available in the municipality that can influence the level of adoption of WAH. It includes access of the

facility to electricity, access of the facility to Internet, coverage of cell phone signal and sufficient I.T. hardware in the facility such as number of computers, number of routers and number of external hard drives dedicated for the use of WAH. Access to Electricity and Access to Internet are measured as None, Sometimes, Most of the Time and Always. Cell phone Signal coverage is measured according to the percentage of barangays with consistent and strong cell phone signal coverage. Available I.T. Sufficiency of hardware is measured according to the minimum number of computer units and router required to operate WAH given the size of the facility especially in the number of patients and number of health workers based at the rural health Unit.

The Adoption of WAH deals with the frequency, consistency and appropriateness of current use of WAH by the health worker. Frequency refers to the amount of exposure of the respondents to the use of WAH and is measured as Never, Sometimes, Most of the Time and Always. Consistency refers to the regularity and constancy of use of the technology throughout the entire information process: from data gathering, data consolidation and data reporting and is measured as Never, Sometimes, Most of the Time and Always. Appropriateness of use of WAH refers to the loyal use of WAH as intended. WAH is originally intended to be used as an Electronic Medical Record which replaces the manual or paper-based Individual Treatment Record and a Data Aggregator that replaces the manual consolidation of data in the FHSIS and paper-based forms used to report FHSIS. It is measured as Never, Sometimes, Most of the Time and Always.

As shown in the conceptual framework, adoption of WAH is determined by the Socio-demographic Profiles of the Respondents, their perception on the performance expectancy, effort expectancy, social influence and facilitating conditions and the Enabling Resources present in the municipality. The Behavioral Intent to Continue Using WAH deals with the probability of the health worker to continue using the technology. It is

measured as High, Moderate or Low Behavioral Intent. As shown in the conceptual framework, the level of frequency of actual use determines the level of behavioural intent to continue using WAH. It is expected that rural health workers with high levels of adoption of WAH would have high level of behavioural intent to continue using WAH.

Health Seeking Behavior deals with the behaviour of pregnant clients and their utilization of services throughout the entire spectrum of care: from prenatal, perinatal to postnatal care. Prenatal Care is measured by the percentage of quality prenatal care given by the rural health workers. Perinatal Care is measured by the percentage of facilities-based deliveries (FBD) and percentage of deliveries attended by skilled birth attendants (SBA). Postnatal Care is measured by the percentage of quality post-natal care given by the rural health workers. It is expected that facilities with high level of adoption of WAH would have significant improvements in the Health Seeking Behavior of their clients.

Statement of the Problem

This research examined the determinants of the adoption of the Wireless Access for Health (WAH) among rural health workers in selected ZFF partner rural health units in the Philippines. It likewise investigated how adoption of WAH is related with the behaviour of health care providers and their pregnant clients.

More specifically, this study was aimed to answer the following specific questions:

1. What are the sociodemographic profiles of the rural health workers?
2. What are their perceptions with regards to performance expectancy, effort expectancy, social influence and facilitating conditions in relation to adoption of WAH?

3. What are the enabling resources in the facility in terms of access to electricity, access to the Internet and sufficiency of appropriate hardware?
4. What is their level of adoption according to frequency of use, consistency of use and appropriateness of use of WAH?
5. What is their level of behavioral intent to continue using WAH?
6. What are the health seeking behaviors of their pregnant clients in terms of maternal health care?
7. What is the relationship between their socio-demographic profiles, perceptions on performance, effort, social influence, facilitating conditions and enabling resources and their level of adoption of WAH?
8. What is the relationship of their level of Adoption of WAH with their intent to continue using WAH and perceived and actual changes in health seeking behavior of their clients?

Definition of Terms

1. Sociodemographic Profile refers to the personal characteristics of the respondents, particularly their age, position in the RHU and length of years in service.

2. Determinants of Adoption of WAH refers to the factors that influence the Adoption of WAH. Using the UTAUT model, there are four determinants, namely:

a. **Performance Expectancy (PE)** is the anticipated function of the information technology for the user (Venkatesh et. Al., 2003). In this research, it refers to the perceived usefulness of the Wireless Access for Health in terms of productivity, efficiency, work completion and time availability for patient care. It is measured as high, moderate or low performance expectancy.

b. **Effort expectancy (EE)** is the degree of ease associated with the use of the technology (Venkatesh et. al, 2003). This is similar with the concept of Relative Advantage (Rogers, 1995). In this research, it refers to the perceived easiness to operate, user-friendliness and comfort of learning to operate WAH. It is measured as high, moderate or low effort expectancy.

c. **Social Influence (SI)** is the degree to which the user perceives the importance that other people give to whether he or she should utilize the new technology (Venkatesh et. al., 2003). In this research, it specifically refers to the influence exerted by fellow health care providers, immediate supervisors and other influential people in the community that would promote usage of the technology by the respondent. It is measured as High, Moderate or Low Social Influence.

d. **Facilitating Conditions (FC)** is the degree to which an individual believes that an organization, in this case the Local Government Unit and/or Rural Health Unit, exist to support the utilization of the technology (Venkatesh et. al., 2003). In this research, it refers to the internal and external resources identified and perceived by the health care providers that would enable them to use the WAH. Internal resources refer to knowledge and skills of the health worker. External resources refer to outside technical support that addresses gaps in the knowledge and skills, as well as logistics and working arrangements, which would enable them to use WAH. It is measured as High, Moderate or Low facilitating conditions.

3. Enabling Resources refers to the external resources available to support the operation of WAH. It is similar to **Facilitating Conditions** described by Venkatesh et. al.

(2003). In this particular study, it specifically refers to the availability of electricity, accessibility to the Internet, coverage of cellphone signal and sufficiency of I.T. Hardware.

4. Adoption of WAH refers to the regular utilization of a Wireless Access for Health. In this research, it pertains to the frequency, consistency and appropriateness of use by the rural health workers of the Wireless Access for Health. It is measured as high, moderate or low frequency of Adoption.

5. Behavioral Intent refers to a person's perceived likelihood or "subjective probability that he or she will engage in a given behavior" (Committee on Communication for Behavior Change in the 21st Century, 2002). In this research, it pertains to the intended plan of the rural health workers to continue utilizing WAH in the immediate and long-term future regardless of their current circumstances. It is measured as High, Moderate or Low Behavioral Intent.

6. Health Seeking Behavior (HSB) has been defined as any action undertaken by individuals who perceive themselves to have a health problem or to be ill for the purpose of finding an appropriate remedy (Ward, Mertens, and Thomas, 1997). In this research, it pertains to the utilization of services and facilities available and accessible in the rural health services as an individual’s response to a perceived illness or health condition. More specifically, the health seeking behavior in focus in this research pertained to maternal health, particularly, the use of facilities and services provided by the health care providers at the RHU for prenatal, perinatal and post-natal services.

a. Prenatal services are referred to consultations or visits made by the client prior to giving birth.

b. Perinatal services pertain to utilization of birthing facility and/or services of a skilled birth attendant regardless of the place of delivery during childbirth.
c. Postnatal services pertain to consultations or visits made by the client after childbirth.

HSB is measured as High, Moderate or Low: the higher the HSB, the higher the utilization of prenatal, perinatal and postnatal services of the clients. For this particular study, it also referred to the perceived changes in the health seeking behaviors by the rural health workers among the pregnant clients. It is measured as High, Moderate or Low.

Significance of the Study

This study addresses the research gap on the knowledge regarding influence of Adoption of WAH on the health seeking behaviour of pregnant women in ZFF partner municipalities. It addresses the research gap on the application of UTAUT model in a post-adoption setting in ZFF partner LGUs.

In the field of health social science, it provides an in-depth analysis and validation of the Unified Theory of Acceptance and Use of Technology (UTAUT), broadening the sociological perspective of the role of technology in influencing the behaviour of the health care provider and their clients. It attempts to contribute to the development of the UTAUT model proposing the integration of Adoption as the predictor for intent of continued used and accomplishment of goals, in this case, improving health seeking behaviour of pregnant clients. In the same area of study, it provides a deeper understanding of how an innovation, such as the use of technology, gets adopted as an

integral element of a social unit such as the local health system, highlighting the vital elements and factors that facilitate the diffusion of such innovation.

It provides preliminary data that can stimulate further researches concerning other factors that can influence or determine the adoption and sustainability of adoption of Wireless Access for Health. It provides the basis for advocating for more efficient and effective health information system which, as according to the WHO, one of the most neglected of the 6 building blocks of a health system. This study also contributes more knowledge on the actual impact of low-cost effective and efficient digital-based technology as a means for gathering health information on health outcomes.

Scope and Delimitations

The proposed study focuses on the impact of a specific health information system, in this case Wireless Access for Health. It did not compare this digital-based health information system with other forms of health information system. It did not also consider the influence of the other 5 building blocks of a health system as described in the WHO framework of action. It should be acknowledged that Venkatesh et al. (2003) arrived at identifying the determinants and moderating factors in the UTAUT framework by performing longitudinal studies across technologies, organizations, industries, business functions, nature of use, whether it is mandatory or voluntary, and users' experience. On the other hand, this research was conducted with a single time frame which is the post-adoption period without consideration on moderators such as prior experience on use of any particular technology, gender, and voluntariness of research participants that may diminish or intensify the relationship between independent and dependent variables. It did

however include other demographic variables such as age, position and length of years in service.

The Wireless Access for Health is not only applicable to maternal health services. It is used also in other types of patients. However, this study limited itself in focusing on the influence of WAH on pregnant patients, recognizing the importance of contributing to the body of knowledge that can help address the constant concern of high maternal deaths in the Philippines.

CHAPTER TWO

METHODOLOGY

This section describes the research design, population and sampling method, research locale, instrumentation, data gathering procedures, plan of data analysis and methodological limitations.

Research Design

This study is a descriptive research. As widely accepted, the descriptive method of research is a fact-finding study that involves adequate and accurate interpretation of findings. Descriptive research describes a certain present condition. It seeks to gather information about the present existing condition (Creswell, 2002). The purpose of employing the descriptive method is to describe the nature of a condition, as it takes place during the time of the study and to explore the cause or causes of a particular condition. Since this study is focused on the perception of the rural health workers with regards to their actual and intent to continue using the Wireless Access for Health, including changes in the health seeking behaviour of their pregnant clients, the descriptive method was the most appropriate method to use. In terms of approach, the study employed quantitative approach. The quantitative approach focused on obtaining numerical findings that used the survey questionnaire method using a Likert scale.

Population and Sampling

The study included respondents directly from the Rural Health Units of the partner LGUs of ZFF adopting WAH. Specifically, the rural health workers of the RHUs were randomly selected as respondents in the survey. The rural health workers included municipal health officers, public health nurses, rural health midwives and other health

staff such as the medical technologists or microscopists, dentists and pharmacists. Among the rural health workers, the doctors, nurses and midwives are those providing direct maternal care services. Other rural health workers who also participated in the study such as the dentists, pharmacists, medical technologists, microscopists, nursing aides and clerks perform secondary roles in the provision of maternal care services in the RHUs.

It must be noted that while all LGUs had doctors, nurses and midwives, not all of them have medical technologists, microscopists, pharmacists, dentists, clerks and nursing aides. Some midwives and nurses perform dual roles (e.g. nurse and pharmacist, midwife and microscopist) however in this study those staff with dual roles were told to choose their primary role in the office as their position in the RHU.

Only rural health workers who have been trained in WAH and were expected to utilize the technology have been included in the list. A list of names of the rural health workers in all ZFF partner LGUs was from each RHU and was encoded in computer software that randomly generated a sample list. The sample size was determined using a confidence level of 95% and a confidence interval of 5. Therefore, with the population size of 273 health workers, the calculated sample size for the study was 160.

Research Locale

There were 15 ZFF partner LGUs that initially adopted WAH at various levels (see Appendix A). These 15 ZFF partner LGUs have been adopting WAH for at least 12 months and have already progressed to the subsequent levels. There are recently some ZFF partner-LGUs that have started adopting WAH. They were not included yet in the list

due to the short time of implementation nor have they yet to progress to the next higher levels of operation of WAH, unlike the first 15. The ZFF partner LGUs were from across different regions: 6 from Luzon, 2 from the Visayas and 7 from Mindanao. Appendix A shows the characteristics of the ZFF partner LGUs according to income class and 2013 municipal maternal mortality ratios (per 100,000 live births).

Instrumentation

A survey form was provided to the Rural Health Workers through their Rural Health Units (Survey Form No. 1). The instrument underwent pre-testing using face validity among selected rural health midwives from LGUs not included in the target participants. Feedback on the layout of the survey form including ambiguity of the questions was obtained and subsequent changes were made.

The UTAUT frame specifies 5 attitudinal measurements: Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions and Intent to Use. To make the instrument more fit for a post-adoption analysis, the Intent to Use is redefined to Intent to Continue Use preceded by Adoption which in this instrument is further defined according to frequency, consistency and appropriateness of use by the rural health workers. The same instrument also includes perception of the rural health workers on how their Adoption has influenced the health seeking behaviour of their clients, a measure not included in the UTAUT frame. Table 1 shows the constructs used in the instrument.

Table 1: Variables For Survey Form No. 1

Key Domains	Variables
Sociodemographic Profiles	Age in Years Position in the RHU Length of Years in Service
Determinants of Adoption	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions
Adoption of WAH	Frequency of Use Consistency of Use Appropriateness of Use
Behavioral Intent to Continue Using	Continued Use of WAH
Health Seeking Behavior	Perceived Improvements In Prenatal Visits Facilities-based Deliveries Skilled Birth Attendants Post-natal Visits

The 32-item questionnaire is largely adapted from UTAUT model of Venkatesh et. al. (2003). Appendix B shows the survey questionnaire. In this study, the instrument was revised to make it more suited for the actual setting. In addition to the constructs used in the UTAUT study, 2 additional constructs are included: Adoption of WAH (5 items) and Health Seeking Behavior (4 items). The rest of the items in the other constructs are re-worded and items were changed or added to make the instrument for fit for the study. A total of 6 items are originally constructed and added in the questionnaire adopted from UTAUT: 2 under PE, 1 under EE, 1 under SI, and 2 under FC.

The scale used in this instrument was adapted in full from the UTAUT study. All items will be measured on a seven point Likert scale, where 1 = completely disagree, 2 = moderately disagree, 3 = somewhat disagree, 4 = neutral (neither disagree nor agree), 5 = somewhat agree, 6 = moderately agree, and 7 = completely agree. The questionnaire was in English with the assumption that all the respondents are fluent in the English language. The survey also included the following information of the respondents for

profiling purposes: Name of Municipality, Age in years and Number of years working in the RHU.

A second survey form (Survey Form No. 2) was also designed to collect information regarding the municipality's Enabling Resources and Actual Data on Prenatal Visits, Facilities-based deliveries, Deliveries attended by skilled birth attendants and Postnatal Visits. Table 2 shows the variables used in this survey form.

Table 2: Variables for Survey Form No. 2

Key Domains	Variables
Enabling Resources	Access to Electricity Availability of Internet Cell phone Signal Coverage Sufficiency of I.T. Hardware
Health Seeking Behaviours (HSB)	Percentage Prenatal Visits Percentage of Facilities Based Deliveries Percentage of Deliveries Attended by Skilled Birth Attendants Percentage of Post-natal Visits

A multiple choice questionnaire was used for Survey Form No.2. Responses to Access to Electricity and Availability of Internet included four options: Always (24 hours a day), Most of the time (Less than 24 hours a day but more than 12 hours a day), Often (Less than 12 hours a day) and None. Responses to Cell phone Signal Coverage included the following options: 100% of the entire municipality, less than 100% but more than 50% of the barangays, less than 50% of the barangays and None.

To derive the data for sufficiency of I.T. Hardware, the survey form listed the minimum hardware needed to operate WAH. Whenever they were available, they were ticked as Yes and if not, they were ticked as No. The hardware items indicated in the survey form were: Computer at OPD, Computer at Consultation Room, Computer at Laboratory, Computer at Pharmacy, Dedicated Main Server, Router and External Hard Drive. Out of the 7 hardware items, the researcher categorized the sufficiency of I.T.

Hardware of an LGU by either At Least 75% Hardware Complete, Less than 75% Hardware but more than 50%, Less than 50% Hardware.

Finally, respondents filled up the Health Seeking Behavior section of Survey Form No. 2 by extracting data from their FHSIS reports from 2008 to 2013 their municipal data on Prenatal Visits, Facilities-based deliveries, Deliveries attended by Skilled Birth attendants and Post-natal Visits (Appendix C).

Data Gathering Procedures

The primary data were derived from the answers respondents gave in the self-administered survey. Survey Form No. 1 was sent out mostly via email and snail mail addressed to the local chief executive of the LGU, specifically requesting that the Municipal Health Officer distribute the survey forms to his or her selected rural health workers. Included was a letter addressed to the Mayor describing the objectives of the study and seeking permission for their participation in the study. A separate letter was addressed to the MHO highlighting the same but also adding other instructions such as making explicit the importance of confidentiality and anonymity of the answers of the rural health workers. A list of the names of the rural health workers randomly selected to answer the survey was provided to their respective municipal health officers. The MHO was also requested to ensure that all survey forms have been filled up, which means no question was left unanswered or blank, before the forms were sent back to the researcher either via email or snail mail. Whenever possible, the researcher picked up the forms personally in the vicinity or nearby municipality or city in case the MHO found it difficult to send the forms back.

The LGUs were given 14 days to fill up and return the survey forms either via email or snail mail. The MHOs were also given specific instructions that they would also

personally answer Survey Form No. 2. Their responses, particularly on the Health Seeking Behavior section, were validated using their official FHSIS reports previously submitted either at their respective Regional Offices, Provincial health offices or Zuellig Family Foundation Knowledge Management (KM) Unit. Phone calls were also made to follow up the submission of forms from the municipalities.

Data Analysis

Data gathered were encoded using statistical software which is Statistical Package for Social Science (SPSS). The mean scores for each construct were calculated and encoded using the same software. During the data presentation, the calculated mean scores for each construct were subjectively categorized whether they are Low, Moderate or High. Table 3 shows the categorization of the scores.

Table 3: Categorization of Mean Scores

Calculated Mean Scores	Categorization
1.0 – 3.5	Low
3.6 – 5.5	Moderate
5.6 – 7.0	High

Correlation Analysis

As mentioned earlier, the measures of whether or not the adoption of WAH has been successful are the fact that the rural health workers have intent to continue using the technology and that the technology itself is perceived to be improving the health seeking behaviour of their clients. Since it is the aim of this study to investigate whether or not the determinants of adoption as proposed by the UTAUT model do influence these measures of successful adoption, the study would be looking at relationships between these constructs.

Relationship No. 1: Between the Sociodemographic Profiles of Respondents and WAH Adoption

To investigate whether there were relationships between age and Adoption of WAH and length of years in services and Adoption of WAH, a Pearson product-moment correlation coefficient was calculated. Whenever the analysis revealed a significant correlation, a one-way analysis of variance test was used to analyze the difference in the means among the respondents when grouped according to certain age groups and length of years in service. The same test was done to check the difference in means among the respondents according to their positions in the RHU. It was the initial expectation of this study that there would be relationships between age and Adoption of WAH, position in the RHU and Adoption of WAH and length of years in service and Adoption of WAH.

Relationship No. 2: Between the Determinants of WAH Adoption and Adoption

It was the initial expectation of this study that high mean scores in Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Facilitating Conditions (FC) would positively influence the mean scores in Adoption of WAH. Pearson product-moment correlation coefficient was calculated to check whether there was any correlation between the four and Adoption of WAH. Whenever the analysis revealed a significant correlation, a one-way analysis of variance test was used to analyze the difference in the means among the respondents when grouped according to High, Moderate and Low.

Relationship No. 3: Between Enabling Resources and Adoption of WAH.

The responses of the respondents on their Adoption of WAH were aggregated and the calculated to arrive at the average municipal Adoption of WAH. The means were then analyzed with the Enabling Resources. A one-way Analysis of Variance was used to

check any significant difference in the means among the LGUs when they are grouped according to their availability of electricity, accessibility to Internet, cell phone signal coverage and sufficiency of I.T. Hardware. It was the initial expectation of this study that there would be significant differences in the Adoption of WAH among LGUs when they are grouped according to their availability of electricity, accessibility of internet, cell phone signal coverage and sufficiency of I.T. Hardware.

Relationship No. 4: Between Adoption of WAH and Intent to Continue Using WAH

It was the initial expectation of this study that high mean scores in Adoption of WAH (AU) would positively influence the mean scores in the Intent to Continue Using WAH (ICU). The mean scores of both variables were assessed using Pearson r correlation test. The choice of Pearson r correlation is appropriate because the types of data involved are both intervals (Adoption and Intent to Continue Using) and that the sample, having been randomly selected, is assumed to be normally distributed.

To indicate whether the relationship between the two variables are weak or strong, Table No. 4 shows the following guidelines adopted in this research during the interpretation of the data.

Table 4: Guidelines in the Interpretation of Pearson R Coefficient

Strength of Correlation	**Coefficient, r**	
	Positive	Negative
Low	0.10 – 0.30	-0.10 - -0.30
Medium	0.31 – 0.50	-0.31 - -0.50
High	0.51 – 1.0	-0.51 - -1.0

Relationship 5: Between Adoption and Health Seeking Behavior

It was the expectation of this study that high mean scores in Adoption of WAH (AU) would positively influence the mean scores of the perception of the health workers

on the Health Seeking Behaviours (HSB) of the pregnant patients. The mean scores of both variables were assessed using Pearson r correlation test and adopted the same guidelines for interpretation as described in Table 6. A one-way analysis of variance was also used to significantly test the difference in the means when grouped according to High, Moderate or Low perception of the health workers on the health seeking behaviours of the pregnant clients.

Meanwhile, the municipalities were grouped according to High, Moderate and Low Adoption of WAH and their actual municipal data on Health Seeking Behaviours of the pregnant patients particularly Prenatal Visits, FBD, SBA and Post-natal Visits, were analyzed descriptively.

Methodological Limitations

The study was done as part of an internal evaluation of ZFF among its partner-LGUs in the aspect of program implementation. It might have had mimicked a Hawthorne effect among the respondents of the study (McCarney et. al., 2007). The survey was also self-administered and it obtained perceptions of the respondents which could in turn be influenced by bias. The ZFF partner LGUs come from different income classifications, regions and cultural backgrounds which would be uncontrolled in this study and might produce intervening effects in the variables. The ZFF partner LGUs also had variations in the levels of operation of the WAH, ranging from Level 1 to Level 3. This was also not controlled in the study and might have had an intervening effect in the variables of the study. The ZFF partner LGUs may have been using in the past or concurrently using a different health information technology which could have influenced also their adoption of WAH. The experience of the respondents in the use of technology in the past was also not controlled in the study and might have had also an intervening effect.

CHAPTER THREE

RESULTS

This chapter presents the results of the study. The first section deals with the sociodemographic profile of the respondents. The succeeding section describes the level of perceptions of the respondents towards WAH. The third section indicates the enabling infrastructures particularly the availability of electricity, access to internet, network coverage, and I.T. hardware capital among the 11 purposively selected municipalities. The fourth section examines the respondents' level of adoption of WAH. The fifth section describes the level of behavioural intent to continue using WAH by the respondents. The sixth section accounts the health seeking behaviours of the pregnant mothers, from prenatal care to postnatal care, in the selected municipalities. The last section establishes the relationships of the different variables of the study.

Sociodemographic Profiles

A total of 160 respondents from 11 out of 15 different local government units participated in the study. However, out of the 160 respondents, 4 responses were invalidated thus only 156 were included in the analysis. The respondents are generally in their middle adulthood years. In fact, the average age is 39.96 years old (see Table 5). 50% of the respondents are at least 41 years old and above. The youngest is 20 years old and the oldest being 63 years old. Majority of the respondents are working as midwives in the Rural Health Units (RHU). The average length of years of service rendered in the RHU of the respondents is

12.79 years. Table 5 shows the sociodemographic profiles of the respondents in the study.

Table 5. Sociodemographic Profile of the Respondents, N = 156.

Variables	Frequency (%)
Age in years	
20-30 years old	52 (33.3)
31-40 years old	25 (16)
41-50 years	40 (25.7)
Above 50 years old	39 (25)
Mean Age	39.96
Age Range	20 – 63 years old
Position	
Doctor	7 (5)
Nurse	31 (20)
Midwife	92 (59)
Others (Dentist, Medical Technologists, Pharmacists, Clerks)	27 17)
Length in years of service	
5 years and less	59 (38)
6-15 years	46 (29)
16 years and longer	51 (33)
Mean	12.79
Range	1-39 years

It was observed that a majority of those serving the Rural Health Units for less than 12 months are nurses deployed by the Department of Health through its Nurse Deployment Program formerly known as the RN HEALS program. These young nurses, many of whom just recently passed the licensure examinations, are deployed in their areas of choice although preference is given to their hometown. Majority of the respondents have been working in the RHU for more than 6 years. In fact, 24.4% of them have been employed for at least 22 years.

As already mentioned, most of the respondents for the study are midwives. This indicates that bulk of the health human resources of the country are

midwives. They manage not just specific health programs but also catchment areas within the LGU. Meanwhile, about 17% of the respondents were municipal dentists, medical technologists, assistants, clerks, and auxiliary staff. It should be noted that not all RHUs have the capacity to hire other health care human resources other than nurses, midwives and doctors. Hiring of such personnel is dependent on the job availability and financial capacity of the LGUs. Sometimes, hiring of such personnel is difficult owing to scarcity of personnel who are willing to work in rural areas.

Levels of Perception on Wireless Access for Health

Following the UTAUT framework four determinants of behaviour, namely, performance expectancy, effort expectancy, social influence, and facilitating conditions were used to analyse the perceptions of the respondents regarding the of use of WAH. Overall, the respondents seemed to have a high level of perceptions towards the technology. In fact, the mean score of all the determinants is 5.75 out of 6 (see Table 6).Although the difference is not statistically significant, the respondents specifically scored higher in the social influence and facilitating conditions as compared to the performance expectancy and effort expectancy.

Table 6. Mean Scores on Perceptions of Respondents on Determinants of Behavior

Levels of Perception of Determinants of Behavior	Mean Scores
Performance Expectancy (PE)	5.7
Effort Expectancy (EE)	5.7
Social Influence (SI)	5.8
Facilitating Conditions (FC)	5.8

In terms of frequency counts, 92 respondents (59%) have high performance expectancy towards WAH (see Table 7). Around 97 respondents (62%) have high effort expectancy towards WAH. 106 respondents highly regard WAH owing to the perceived support they receive from peers and supervisors (social influence). 112 respondents perceived that there are facilitating conditions that influence them to use WAH.

Table 7. Number of Respondents According to Levels of Perception, N = 156

Determinants of Behavior	Respondents' Levels of Perception (%)			Mean Score
	Low	Moderate	High	
Performance Expectancy	6 (3.8)	58 (37.2)	92 (59)	5.7
Effort Expectancy	2 (1.3)	57 (36.5)	97 (62.2)	5.7
Social Influence	2 (1.3)	48 (30.8)	106 (68)	5.8
Facilitating Conditions	2 (1.3)	42 (26.9)	112 (71.8)	5.8

Enabling Resources of Rural Health Units

The LGUs involved in the study have varying levels of WAH usage (see Table 8). The dissonance could be attributed to the availability of resources at the LGU and their year of adoption. Of the 11 LGUs, only two are in the level one while many are already in the levels 2 and 3.

Table 8. Number of Respondents per LGU and Current Level of WAH, N = 156

Municipality (LGU)	Number of Respondents (%)	Level of WAH
Barobo	9 (5.8)	Level II
Cervantes	19 (12.2)	Level II
Dao	10 (6.4)	Level III
Salvador Benedicto	7 (4.5)	Level II
Hinatuan	27 (17)	Level II
Libon	21 (13.5)	Level II
Magdiwang	13 (8.3)	Level I
Panglima Sugala	8 (5.1)	Level I
San Fernando	7 (4.5)	Level III

Tungawan	14 (9)	Level III
Upi	21 (13.4)	Level II
Total	156 (100)	

As previously described, Level 2 allows the RHUs to aggregate the information and generate a digital equivalence of the FHSIS. Rural health midwives need not manually calculate the rates, ratios, and percentages required in the FHSIS forms. The FHSIS data generated by the software can then be printed or saved in an external portable hard drive. If the RHU has internet connection, the same report can be sent via email. The Wireless Access for Health Technology is dependent on the availability of electricity and the possession of computers. Access to electricity is therefore a precursor for the LGUs to be able to make use of the WAH.

Of the 11 LGUs, 8 of them have access to electricity almost without interruption while some of the LGUs have either separate electrical supply or stand-by generators which they could use in case of power interruptions. In terms of internet availability, 6 of the 11 RHUs do not have access to the internet. This in the process hampers their ability to transmit data to external databases. It is however important to note that even without internet connection, health workers can still encode their data on the WAH software only that transmission is not possible. Table No. 9 summarizes the number of LGUs and their level of access to electricity and internet.

Table 9. Number of LGUs and their Levels of Access to Electricity and Internet, N = 11

Utilities	Levels of Access (%)			
	Always	Most of the Time	Often	None
Electricity	8 (72.7)	3 (27.3)	0	0
Internet	1 (9.1)	3 (27.3)	1 (9.1)	6 (54.5)

Cell phone coverage is important especially when an RHU starts operating at Level III of WAH. As described, Level 3 allows the RHU to send out reminders to its patients and clients regarding subsequent consultation appointments. Referred to as Synchronized Patient Alerts via SMS (SPASMS), the SPASMS feature of WAH sends text messages to patients especially pregnant patients to remind them of their upcoming scheduled prenatal and postnatal consultations with their midwife or doctor. It is also used as a health promotion tool since it can send out information to the patient through their mobile phones.

Of the 11 LGUs, 7 of them reported that they have network signal covering at least 50% of the total number of barangays. Only one LGU enjoys 100% network signal availability. Table No. 10 shows the number of LGUs and their level of cell phone network coverage based on the percentage of barangays with access to a cell phone signal from any network provider.

Table 10. Coverage of Cell phone Signal, N = 11

Coverage	Number of RHUs (%)
100%	1 (9.1)
More than 50% but less than 100%	7 (63.6)
Less than 50%	3 (27.3)

To fully function, the Wireless Access for Health requires certain number of electronic devices linked together through a local area network. Results indicated

that all the RHUs own a computer placed at least at the OPD, a main server, a router, and an external hard drive. Of the 11 RHUs, only 7 have a computer designated at the pharmacy and only 5 have a computer designated at the laboratory. Table 11 shows a list of minimum hardware requirements for a typical RHU and the number of LGUs with available hardware. Looking at the sufficiency of IT hardware in the LGUs, only 1 has reached at least 75% while 6 have reached 50%-74% of the requirements. 4 LGUs were not able to comply at least 50% of the required IT hardware.

Table 11. Frequency of Availability of IT Hardware, N = 11

Hardware	Available	Not Available
Computer at OPD	11	0
Computer at Consultation Room	10	1
Computer at Laboratory	5	6
Computer at Pharmacy	7	4
Dedicated Main Server	11	0
Router	11	0
External Hard Drive	11	0

Level of Adoption of WAH

Adoption of Wireless Access for Health is measured in terms of the frequency, consistency, and appropriateness of WAH utilization. Results indicate that there is a moderate adoption of WAH among the respondents in general. As table 12 indicates, the mean score for the overall adoption is 2.77 (5 as the highest possible score).

Table 12. Adoption of WAH in the RHUs, N = 156.

Adoption of WAH	Level of Adoption (%)			Mean Score
	Low	Moderate	High	
Frequency of Use	81 (51.9)	53 (34)	14 (9)	2.48
Consistency of Use	46 (29.5)	54 (34.6)	56 (35.9)	2.86

Appropriateness of use	22 (14.1)	80 (51.3)	54 (34.6)	2.85
Over-all Adoption of WAH	18 (11.5)	86 (55.1)	52 (33.3)	2.77

In terms of frequency of use, only 34% of the respondents seemed to utilize the WAH more often. Consistency-wise, about 35% of the respondents indicated that they regularly use WAH in all aspects of their work, from data gathering to submission of report. About 33% of the respondents indicated that they use WAH appropriately according to its intended design. 52% of the respondents seemed to have a low level of frequency use while the rest of them have moderate to high frequency of use. Data revealed that 43% of the respondents who seemed to have a low level use of WAH (frequency) also had low consistency use. Only 9.6% of the respondents reported that they have high frequency and high consistency of use of WAH.

Likewise, data reveal that among the low frequent users of WAH, 57% reported a moderate appropriateness of use of the technology. Only 7% of the respondents reported both having high frequency of use and high appropriateness of use. Data also reveal that only 6% of the respondents reported to have high level of over-all adoption and high levels of frequency of use, consistency of use and appropriateness of use. Among the respondents who have high levels of over-all adoption of WAH, 37% of them reported to have moderate frequency of use, high consistency of use and high appropriateness of use .

Intent to Continue Using WAH

Of the 156 respondents, a majority (n=117) of them indicated their intent to continue using WAH in the short-term and long-term period. In fact, 75% of the respondents specifically indicated a high behavioral intent to continue using WAH for the next 6 months and when WAH is upgraded from its current level to the next level of operations. Table 13 shows the level of behavioral intent to continue using WAH.

Table 13. Level of Behavioral Intent, N = 156

Level of Behavioral Intent	Number of Respondents (%)
High	117 (75)
Moderate	38 (24.4)
Low	1 (0.6)

Actual Health Seeking Behaviours of Pregnant Clients

In terms of health seeking behavior, the study made use of data on prenatal and post natal visits as well as facilities-based deliveries and deliveries attended by skilled birth attendants. The average percentages were calculated to compare the indicators before and after WAH installation. The average percentage of prenatal visits prior to the installation of WAH is 56.5%. A decrease in prenatal visit however is observed during the period after the installation of WAH (52.37%). The municipality of Magdiwang reported the highest percentage of prenatal visits following the installation of WAH with 95.60%. The average percentage of post-natal visits prior to the installation of WAH is 64.52%. A slight

increase is observed in the percentage of postnatal visits during the period after WAH was installed (66.98%). Table 14 shows the data of the municipalities on the health seeking behaviour indicators before and water WAH.

Table 14. Municipal Health Data on Health Seeking Behaviours Before and After WAH Installation, N = 11

Municipality and Level of WAH	Before Installation of WAH				After Installation of WAH			
	Quality Prenatal Care	Quality Postnatal Care	Facilities-based Deliveries	Skilled Birth Attendants	Quality Prenatal Care	Quality Post natal Care	Facilities-based Deliveries	Skilled Birth Attendants
Barobo Level 2	68.20	76	37.15	39.65	53.94	77.11	74.30	74.6
Cervantes Level 2	64.20	61.20	52.90	74.82	52.70	65.32	86.61	86.88
Dao Level 3	58.44	48.60	69.42	69.42	61.17	57.01	96.53	96.53
DSB Level 2	31.24	58.33	22.73	30.05	47.60	74.27	65.47	65.90
Hinatuan Level 2	59.60	71	69.8	77.20	55	69	83	88
Libon Level 2	64.80	72.40	47.6	62.33	26	57	89	89
Magdiwang Level 1	72.86	97	83.93	83.93	95.60	100	100	100
Panglima Sugala Level 1	10.00	12	4.80	69.10	11	13	5.80	64
San Fernando Level 3	52.94	60.76	63.13	88.92	35.53	63.74	93.46	93.26
Tungawan Level 3	56.34	66.88	40.57	54.30	52.55	71.28	85.96	85.96
Upi Level 2	83	85.60	52.60	59.40	85	89	57	57
Total Mean	56.5	64.52	49.51	64.5	52.37	66.98	76.1	81.92

The average percentage of facilities-based deliveries before the installation of WAH was 49.51%. Following the installation, facilities-based deliveries increased to 76.1%. The same has been observed with the percentage of deliveries attended by skilled birth attendants. Before installation, 64% of births

were attended by skilled attendances. Following WAH installation, this increased to 81.92%.

Facilities-based deliveries and deliveries attended by skilled birth attendants require that the patients are meticulously followed up and tracked especially once they have been identified and tagged. It is expected that a good information system would allow the health workers to have the information on the status and whereabouts of these identified pregnant patients and therefore continuously track them until they deliver their babies in a birthing facility or at least attended to by a health professional.

Socio-demographic Profile and Level of Adoption of WAH

This study hypothesized that the socio-demographic profile of the respondents, particularly their age, position in the RHU, and length of years in service, would likely influence the level of adoption of Wireless Access for Health in the RHUs. Using Pearson r, data shows that there is no correlation between the age of the respondents and their over-all level of adoption. When compared individually with the three aspects of adoption, namely, Frequency, Consistency and Appropriateness of WAH use, age in years has a significant negative correlation with consistency only. In other words, the older the respondents, the less consistent they are in their use of WAH. Table 15 shows the summary of the correlations between age and adoption of WAH.

Table 15. Correlation coefficients between age and Adoption of WAH, N = 156

Adoption of WAH	Correlation coefficient with age in years	P value
Frequency of Use	-0.146	0.069
Consistency of Use	-0.159	0.047*
Appropriateness of Use	-0.098	0.226
Over-all Level of Adoption	-0.146	0.068

* *significant*

When grouped according to age groups and level of adoption, the level of adoption of age groups appears to be similar. In fact, the level of adoption of WAH in older age groups is not far from the level of adoption of WAH in younger age groups. This is perhaps due to the fact that, as previously mentioned, many of the rural health units have been receiving young nurses through the Nurses Deployment Program (NDP) of the Department of Health. Majority of these nurses being deployed are young and mostly current board passers. The structure in the rural health unit makes the NDP's the front liners, along with the midwives, either at the Rural Health Unit itself or in their assigned barangay (village) health stations. It is most probably the nature of their functions which are similar to the rural health midwives that influence their level of adoption of the technology.

A one-way ANOVA was used to test level of adoption differences among the different positions in the RHU. Data showed that level of adoption among the different positions in the RHU did not differ significantly, *F (3, 152) = 2.051, p = 0.109.* The same has been observed when the adoption of WAH has been further segregated according to frequency of use, consistency of use and appropriateness of use of WAH (see Table 16). Overall, the adoption of WAH

among all the respondents was moderate even when grouped according to their positions.

Table 16. Cross Tabulation of Adoption of WAH of Respondents and Grouped According to Positions in the RHU, N = 156.

Adoption of WAH	Mean Scores of Respondents According to Positions in the RHU				P value
	Medical Doctors	Nurses	Midwives	Others	
Frequency of Use	2.93	2.47	2.38	2.70	0.058
Consistency of Use	3.09	3.01	2.72	3.09	0.125
Appropriateness of Use	3.07	2.95	2.79	2.87	0.462
Over-all Level of Adoption	3.06	2.87	2.68	2.91	0.109

A Pearson product-moment correlation coefficient was computed to assess the relationship between length of service in years (tenure) and mean scores of over-all adoption of the respondents. Analysis reveals that there is indeed a significant negative correlation between the two variables ($r = -0.164$, $n = 156$, $p=0.041$). The negative correlation between the two variables indicate that the longer the tenure in RHU the lower the adoption of WAH among the respondents. The p value however indicates that the correlation is not strong.

Performance Expectancy and Level of Adoption of WAH

A Pearson product-moment correlation coefficient was computed to assess the relationship between the respondents' performance expectancy scores and scores of over-all adoption of the respondents. Analysis reveals that there is a strong significant correlation between the two variables ($r = 0.488$, $n = 156$,

p=0.000). This strong positive correlation indicates that as the performance expectancy scores of the respondents increased, their level of adoption scores also increased.

When the respondents' are grouped according to the level of Performance Expectancy, a one-way Analysis of Variance has been done to investigate difference in the mean scores of level of adoption. Data showed that adoption of WAH mean scores among the respondents grouped according to their level of Performance Expectancy differ significantly, *F (2, 153) = 27.313, p = 0.000.* Tukey post-hoc comparisons of the three groups indicate that the respondents with High Performance Expectancy (*M* = 3.03, 95% CI [2.92, 3.14]) gave significantly higher adoption ratings than the respondents who have Moderate Performance Expectancy (*M* = 2.39, 95% CI [2.26, 2.52]), *p* = .0.000 and the respondents with Low Performance Expectancy (*M* = 2.45, 95% CI [1.87, 3.03]), *p* = .0.026. Comparison between Moderate Performance Expectancy and Low Performance Expectancy were not statistically significant at $p < 0.05$. Table 17 shows the number of respondents grouped according to their level of Performance Expectancy and their level of adoption. Gamma statistical test reveal that there is a significant relationship between the two variables ($\gamma = 0.725$, $p = 0.000$).

Table 17. Cross tabulation of Level of Performance Expectancy and Adoption of WAH, N = 156

Adoption of WAH	**Level of Performance Expectancy (%)**			**Total (%)**
	Low	Moderate	High	
Low	2 (1.3)	11 (7.1)	5 (3.2)	18 (11.5)
Moderate	3 (1.9)	43 (27.6)	40 (25.6)	86 (55.1)
High	1 (0.6)	4 (2.6)	47 (30.1)	52 (33.3)
Total	6 (3.8)	58 (37.2)	92 (59)	156 (100)

Effort Expectancy and Adoption of Wireless Access for Health

A Pearson product-moment correlation coefficient was computed to assess the relationship between the respondents' effort expectancy scores and scores of over-all adoption of the respondents. Analysis reveals that there is a strong significant correlation between the two variables (r = 0.475, n = 156, p=0.000). This strong positive correlation indicates that as the effort expectancy scores of the respondents increase, their level of adoption scores also increase.

When the respondents were grouped according to the level of Effort Expectancy, a one-way Analysis of Variance has been done to investigate difference in the mean scores of level of adoption. Data showed that adoption of WAH mean scores among the respondents grouped according to their level of Effort Expectancy differ significantly, *F (2, 153) = 29.249, p = 0.000.* Tukey post-hoc comparisons of the three groups indicate that the respondents with High Effort Expectancy (*M* = 3.02, 95% CI [2.91, 3.12]) gave significantly higher adoption ratings than the respondents who have Moderate Effort Expectancy (*M* = 2.35, 95% CI [2.22, 2.48]), *p* = .0.000. Comparison with Low Effort Expectancy (*M* = 2.95, 95% CI [1.04, 4.86]) were not statistically significant at p < 0.05.Table 18 shows the number of respondents grouped according to their level of Effort Expectancy and their level of adoption.

Table 18. Cross Tabulation of Level of Effort Expectancy and Adoption of WAH, N = 156

Adoption of WAH	Level of Effort Expectancy (%)			Total (%)
	Low	Moderate	High	
Low	0 (0)	13 (8.3)	5 (3.2)	18 (11.5)
Moderate	1 (0.6)	40 (25.7)	45 (28.9)	86 (55.1)
High	1 (0.6)	4 (2.6)	47 (30.1)	52 (33.4)
Total	2 (1.3)	57 (36.5)	97 (62.2)	156 (100)

Social Influence and Level of Adoption of WAH

A Pearson product-moment correlation coefficient was computed to assess the relationship between the respondents' Social Influence scores and scores of over-all adoption of the respondents. Analysis reveals that there is a strong significant correlation between the two variables (r = 0.434, n = 156, p=0.000). This strong positive correlation indicates that as the Social Influence scores of the respondents increase, their level of adoption scores also increase.

When the respondents' are grouped according to the level of perceived Social Influence, a one-way Analysis of Variance has been done to investigate difference in the mean scores of level of adoption. Data showed that adoption of WAH mean scores among the respondents grouped according to their level of Social Influence differ significantly, *F (2, 153) = 12.049, p = 0.000.* Tukey post-hoc comparisons of the three groups indicate that the respondents with High Perceived Social Influence (*M* = 2.93, 95% CI [2.82, 3.03]) gave significantly higher adoption ratings than the respondents who have Moderate Perceived Social Influence (*M* = 2.44, 95% CI [2.27, 2.60]), *p* = .0.000. Comparison with Low Social Influence (*M* = 2.55, 95% CI [-0.627, 5.73]) were not statistically significant

at p < 0.05. Table 19 shows the number of respondents grouped according to their level of Social Influence and their level of adoption.

Table 19. Cross tabulation of Level of Social Influence and Adoption of WAH, N = 156.

Adoption of WAH	Level of Social Influence (%)			Total (%)
	Low	Moderate	High	
Low	0 (0)	13 (8.3)	5 (3.2)	18 (11.5)
Moderate	2 (1.3)	29 (18.6)	55 (35.3)	86 (55.1)
High	0 (0)	6 (3.8)	46 (29.5)	52 (33.3)
Total	2 (1.3)	48 (30.8)	106 (68)	156 (100)

Facilitating Conditions and Level of Adoption of WAH

A Pearson product-moment correlation coefficient was computed to assess the relationship between the respondents' Facilitating Conditions scores and scores of over-all adoption of the respondents. Analysis reveals that there is a strong significant positive correlation between the two variables (r = 0.416, n = 156, p=0.000). This strong positive correlation indicates that as the Facilitating Conditions scores of the respondents increased, their level of adoption scores also increased.

When the respondents' are grouped according to the level of Facilitating Conditions, a one-way Analysis of Variance has been done to investigate difference in the mean scores of level of adoption. Data showed that adoption of WAH mean scores among the respondents grouped according to their level of Facilitating Conditions differ significantly, *F (2, 153) = 17.930, p = 0.000.* Tukey post-hoc comparisons of the three groups indicate that the respondents with High Facilitating Conditions (*M* = 2.93, 95% CI [2.83, 3.03]) gave significantly higher

adoption ratings than the respondents who have Moderate Facilitating Conditions (*M* = 2.34, 95% CI [2.16, 2.51]), *p* = .0.000. Comparison with Low Facilitating Conditions (*M* = 2.95, 95% CI [1.04, 4.86]) were not statistically significant at p < 0.05. Table 20 shows the number of respondents grouped according to their level of perceived Facilitating Conditions and their level of adoption.

Table 20. Cross Tabulation of Level of Facilitating Conditions and Adoption of WAH, N = 156.

Adoption of WAH	**Level of Facilitating Conditions (%)**			**Total (%)**
	Low	Moderate	High	
Low	0 (0)	12 (7.7)	6 (3.8)	18 (11.5)
Moderate	1 (0.6)	26 (16.7)	59 (38)	86 (55.1)
High	1 (0.6)	4 (2.6)	47 (30.1)	52 (33.3)
Total	2 (1.3)	42 (27)	112 (71.8)	156 (100)

Enabling Resources and Adoption of WAH

Access to Electricity and Adoption of WAH

Respondents were grouped according to their municipalities and mean scores for the rest of the variables were calculated. When the municipalities are grouped according to the level of Access to electricity, a one-way Analysis of Variance has been done to investigate difference in the mean scores of level of adoption. Data showed that adoption of WAH mean scores among the municipalities grouped according to the level of Access to Electricity do not differ significantly, *F (1, 9) = 1.784, p = 0.214.* All of the municipalities have electricity most of the time. For the 11 LGUs, access to electricity is not a factor in using the technology. Irregular or lack of access to electricity can be considered a constraint to the system and for some of the LGUs that are used to these conditions,

especially those that do not always have access to electricity, they have devised ways to compensate and adjust to this condition. Table 21 shows the number of municipalities grouped according to the level of Access to Electricity and their level of adoption.

Table 21. Cross Tabulation of Level of Access to Electricity of Municipalities and their Adoption of WAH, N = 11

Adoption of WAH	Level of Access to Electricity (%)		Total (%)
	Most of the Time	Always	
Moderate	3 (27.3)	5 (45.5)	8 (72.7)
High	1 (9.1)	2 (18.2)	3 (27.3)
Total	4 (36.4)	7 (63.6)	11 (100)

Availability of Internet and Adoption of Wireless Access for Health

While majority of the municipalities do not have access to internet, it was not a hindrance for them to be able to make use of the WAH. After all, the WAH is not 100% internet connection dependent. Results indicated that the levels of adoption of WAH among the RHUs are either moderate or high. Six RHUs did not have internet connection but still had a high level of WAH adoption. Even among RHUs which had internet connection most of the time, their WAH adoption was not high (see Table 22).

Table 22. Cross Tabulation of Level of Availability of Internet of Municipalities and Their Adoption of WAH, N = 11.

Adoption of WAH	Availability of Internet (%)				Total (%)
	None	Often	Most of the Time	Always	
Moderate	3 (27.3)	1 (9.1)	3 (27.3)	1 (9.1)	8 (72.7)
High	3 (27.3)	0	0	0	3 (27.3)
Total	6 (54.5)	1 (9.1)	3 (27.3)	1 (9.1)	11 (100)

A one-way Analysis of Variance has been done to investigate difference in the mean scores of level of adoption. Data showed that adoption of WAH mean scores among the municipalities grouped according to the Availability of Internet do not differ significantly, *F (3, 7) = 1.476, p = 0.301.*

Cell phone Signal Coverage and Adoption of Wireless Access for Health

Cell phone signal coverage is important especially at the Level III operations of WAH wherein targeted pregnant patients receive SMS alerts automatically generated by the WAH system to remind them of their scheduled visits with their midwife or doctor. Since most of the 11 LGUs are operating at Level II which does not yet require the need for interaction through cell phone, it is possible that the respondents did not perceive this to be a constraint in their current adoption. Notwithstanding the limitation, they still had moderate level of WAH adoption. RHUs which had 50% network signal coverage in all their barangays did have moderate to high level of WAH adoption (see Table 23).

Table 23. Cross Tabulation of Level of Cell phone Signal Coverage of the Municipalities and their Adoption of WAH, N = 11.

Adoption of WAH	**Coverage of Cell phone Signal (%)**				**Total (%)**
	None	Less than 50%	More than 50%	100%	
Moderate	0	3 (27.3)	4 (36.4)	1 (9.1)	8 (72.7)
High	0	0	3 (27.3)	0	3(27.3)
Total	0	3 (27.3)	7 (63.6)	1 (9.1)	11 (100)

When the municipalities are grouped according to the coverage of cell phone signal in the area, either by a single telecommunications network or more, a one-way Analysis of Variance has been done to investigate difference in the mean scores of level of adoption. Data showed that adoption of WAH mean

scores among the municipalities grouped according to the coverage of cell phone signal do not differ significantly, *F (2, 8) = 1.232, p = 0.342.*

Sufficient I.T. Hardware and Adoption of Wireless Access for Health

As seen in Table 24, LGUs with High Adoption of WAH have at least 50% of the I.T. Hardware requirements. While it appears that limitations in I.T. Hardware is not influential enough to constrain adoption of WAH, it is encouraged that at least 50% of the minimum hardware requirements should be available to ensure higher adoption rates of the technology. Table 24 shows the number of municipalities grouped according to the Sufficiency of I.T. Hardware and their level of adoption.

Table 24. Cross Tabulation of Level of Sufficiency of I.T. Hardware of Municipalities and their Adoption of WAH, N = 11.

Adoption of WAH	**Sufficiency of I.T. Hardware (%)**			**Total (%)**
	Less than 50%	50% - 75%	More than 75%	
Moderate	1 (9.1)	4 (36.4)	3 (27.3)	8 (72.7)
High	0	2 (18.2)	1 (9.1)	3 (27.3)
Total	1 (9.1)	6 (54.5)	4 (36.4)	11 (100)

When the municipalities are grouped according to the Sufficient I.T. Hardware, based on minimum requirements, a one-way Analysis of Variance has been done to investigate difference in the mean scores of level of adoption. Data showed that adoption of WAH mean scores among the municipalities grouped according to Sufficiency of I.T. Hardware do not differ significantly, *F (2, 8) = 0.030, p = 0.971.*

Adoption of WAH and Behavioral Intent to Continue Using WAH

A Pearson product-moment correlation coefficient was computed to assess the relationship between the respondents' Current Adoption of WAH scores and scores of Behavioral Intent to Continue Using WAH. Analysis reveals that there is a strong significant correlation between the two variables ($r = 0.478$, $n = 156$, $p=0.000$). This strong positive correlation indicates that as the Current Adoption of WAH scores of the respondents increase, their behavioral intent to continue using WAH scores also increase.

The same is true when behavioral intent is compared with the individual aspects of current Adoption: frequency of use, consistency of use and appropriateness of use. Multiple regression analysis was used to test if any of these three aspects of adoption predicted respondents' ratings of behavioral intent to continue using WAH. The results of the regression indicated that one predictor explained 23.6% of the variance ($R^2 = 0.236$, $F (3, 152) = 15.65$, $p<0.05$). It was found that appropriateness of use predicted intent to continue using WAH ($\beta = 0.302$, $p = 0.003$). Table 25 shows the mean scores for behavioral intent to continue using WAH of respondents when grouped according to Level of Adoption of WAH.

Table 25. Mean Scores of Behavioral Intent to Continue Using WAH Grouped According to Level of Adoption of WAH, N = 156.

Level of Current Adoption of WAH	Behavioral Intent to Continue Using Mean Scores
High	6.60
Moderate	6.00
Low	5.15

A one-way Analysis of Variance has been done to investigate difference in the mean scores of behavioral intent to continue using WAH among respondents when grouped according to their current level of adoption of WAH. Data showed that behavioral intent to continue using WAH scores among the respondents differ significantly, *F (2, 153) = 20.173, p = 0.000.* Tukey post-hoc comparisons of the three groups indicate that the respondents with High Adoption of WAH (*M* = 6.6, 95% CI [6.42, 6.78]) gave significantly higher intent to continue using WAH ratings than the respondents who have Moderate Adoption (*M* = 6.00, 95% CI [5.8, 6.21]), *p* = .0.000 and the respondents with Low Adoption (*M* = 5.15, 95% CI [4.68, 5.62]), *p* = .0.000.

Adoption of WAH and Health Seeking Behaviours of Pregnant Clients

Respondents were asked about their perception regarding the health seeking behaviours of their pregnant clients. At the same time, actual health indicators which measure the health seeking behaviours of pregnant clients for each municipality were also gathered and compared before and after the LGUs adopted WAH in their respective RHUs.

With respect to the perception of the respondents regarding observed health seeking behaviours of their pregnant clients, A Pearson product-moment correlation coefficient was computed to assess the relationship between the respondents' Current Adoption of WAH scores and scores of perceived Health Seeking Behaviours of their pregnant clients. Analysis reveals that there is a significant correlation between the two variables (r = 0.283, n = 156, p=0.000). This positive correlation indicates that as the Current Adoption of WAH scores of

the respondents increase, their perception of their pregnant clients' health seeking behaviours also increase. Table 26 shows the mean scores for perception of respondents on the health seeking behaviours of their pregnant clients when grouped according to Level of Adoption of WAH.

Table 26. Mean Scores of Perceived Health Seeking Behaviours of Respondents Grouped According to Level of Adoption of WAH

Level of Current Adoption of WAH	Health Seeking Behavior Mean Scores
High	5.48
Moderate	4.86
Low	4.54

A one-way Analysis of Variance has been done to investigate difference in the mean scores of perceived health seeking behaviours of pregnant clients among respondents when grouped according to their current level of adoption of WAH. Data showed that perception scores on health seeking behaviors of pregnant clients among the respondents differ significantly, $F\ (2, 153) = 5.334,\ p = 0.006.$ Tukey post-hoc comparisons of the three groups indicate that the respondents with High Adoption of WAH (M = 5.48, 95% CI [5.08, 5.88]) gave significantly higher intent to continue using WAH ratings than the respondents who have Moderate Adoption (M = 4.96, 95% CI [4.73, 5.18]), p = .0.034 and the respondents with Low Adoption (M = 4.54, 95% CI [4.03, 5.05]), p = .0.011.

Using actual health indicators, municipalities grouped according to their over-all level of adoption of WAH were cross tabulated with the actual health indicators comparing them before and after they have installed WAH. As indicated in the table below, the municipalities with high level of WAH adoption (i.e., Dao,

DSB, and San Fernando) had an increase in pre natal and post natal visits, facilities-based deliveries, and birth deliveries attended by skilled attendants. Among those with moderate level of WAH adoption experienced decrease in some of its indicators. Of all the RHUs, Panglima Sugala and Hinatuan had experienced decrease in two health seeking behavior indicators (Table 27).

Table 27. Summary of Changes in Health Seeking Behavior Indicators after Installation of WAH among the Municipalities Grouped According to Level of Adoption of WAH, N = 11.

Level of Adoption of WAH	Municipality	After Installation of WAH			
		Prenatal Care Visit	Postnatal Care Visit	Facilities-based Deliveries	Skilled Birth Attendants
High	Dao	Increased	Increased	Increased	Increased
	DSB	Increased	Increased	Increased	Increased
	San Fernando	Increased	Increased	Increased	Increased
Moderate	Barobo	Decreased	Increased	Increased	Increased
	Cervantes	Decreased	Increased	Increased	Increased
	Hinatuan	Decreased	Decreased	Increased	Increased
	Libon	Decreased	Increased	Increased	Increased
	Magdiwang	Increased	Increased	Increased	Increased
	Panglima Sugala	Increased	Increased	Decreased	Decreased
	Tungawan	Decreased	Increased	Increased	Increased
	Upi	Increased	Increased	Increased	Decreased

Comparing the changes in the four health indicators before and after the WAH installation, it appears that the municipalities that reported to have high adoption of WAH experienced higher changes in the health indicators before and after WAH installation compared with the municipalities that reported to have moderate adoption of WAH. None of the LGUs reported to have low adoption of the technology. Table 28 shows the summary of the changes in the percentages in all four health indicators before and after adoption of WAH.

Table 28. Summary of Mean Differences in the Health Seeking Behavior Indicators of the Municipalities after Installation of WAH when Grouped According to Level of Adoption of WAH

Level of Adoption of WAH	Prenatal Visits	Post natal Visits	Facilities-based deliveries	Skilled birth attendants
High	0.56	9.17	33.39	22.4
Moderate	-5.91	-0.05	24.04	15.6

As shown in Table 28, LGUs with High level of adoption of WAH have shown increase in prenatal visits, increase in post natal visits, increase in facilities-based deliveries and increase in deliveries attended by skilled birth attendants after adoption of WAH. More pregnant clients from LGUs with high level of WAH adoption delivered in a health facility (33.39) as compared with those from LGUs with moderate level of WAH adoption (24.04). At the same time, more pregnant clients were attended to by skilled birth attendants during delivery in municipalities with high level of WAH Adoption (22.4) than those with moderate level of adoption (15.6).

Summary of Results

Data from 156 respondents were tabulated and analyzed for this study. The average age of the respondents is 39.9 years old with 50% of the respondents aging 41 years old and above. The average length of years in service of the respondents is 12.8 years, with 59% of them working as midwives.

Generally, respondents have high levels of Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Of the 11 LGUs, 73% of them have available electricity always. Fifty-five percent of the LGUs do not have

access to the Internet. Sixty four percent of the LGUs experience 50%-100% cellphone coverage in their areas. The same percentage of LGUs have at least 50% of the minimum required I.T. hardware to operate WAH.

The respondents have a moderate level of over-all adoption of WAH although 52% of them reported low frequency of use of WAH. Seventy-five percent of the respondents have high level of behavioral intent to continue using WAH. Among the LGUs, a slight decrease in prenatal visits is observed after installation of WAH. A slight increase however in their post natal visits is observed after installation of WAH. An increase in their Facilities-based deliveries and deliveries attended by skilled birth attendants have been observed after installation of WAH.

Length in years in service, performance expectancy, effort expectancy, social influence and facilitating conditions are significantly correlated with levels of current adoption of WAH. At the same time, current level of Adoption of WAH is also significantly correlated with behavioral intent to continue using WAH and the perception of the respondents with regards to the health seeking behavior of their pregnant clients. There appears to be a more positive change in the actual health indicators of the municipalities before and after the adoption of WAH. The positive change is greater among High adoptee-LGUs than Moderate adoptee-LGUs.

Table 29. Summary of Results of Statistical Analysis

Independent Variable	Dependent Variable	Result
Age in Years	Level of Adoption of WAH	No significant relationship
Position in RHU		No significant relationship
Length of Years in Service		Significantly Correlated
Performance Expectancy		Significantly Correlated
Effort Expectancy		Significantly Correlated
Social Influence		Significantly Correlated
Facilitating Conditions		Significantly Correlated
Access to Electricity		No significant relationship
Availability of Internet		No significant relationship
Cell phone Signal Coverage		No significant relationship
Sufficient I.T. Hardware		No significant relationship
Level of Adoption of WAH	Behavioral Intent to Continue Using WAH	Significantly Correlated
	Health Seeking Behavior	Significantly Correlated

CHAPTER FOUR

DISCUSSION

This study has identified three broad categories that can influence the adoption of the Wireless Access for Health (WAH). These are the socio-demographic profile of the individual, his or her perceptions towards the technology and presence of enabling resources that could support the operation of the technology.

Influence of Sociodemographic Attributes

As mentioned in the preceding chapter, majority of the respondents have been working in the RHU for more than 6 years, some having been employed for at least 22 years. Thus, many of them were able to witness the transition of the health system of the country from a centralized to a devolved one. In addition, their relatively long years of service perhaps denote their familiarity of the public health systems. It is assumed that the longer the length of years in service, the more exposed and well experienced the health service providers could become. Some of the health programs of the country have been implemented for quite a long while already one of which is the Field Health Surveillance Information System (FHSIS).

More than the wealth of knowledge and experience, this also implies that at least 2 out of the 10 respondents have been used to do data gathering, tabulation, consolidation and processing manually. Although the study did not inquire about the length of exposure of the health workers to technological devices such as a

computer, it is safe to assume that for many of these rural health facilities, the presence and use of computer has only been done recently, for some of them only during the adoption of Wireless Access for Health. Transitioning from pen-and-paper to IT based data generation may be difficult for those who have been used to the former for quite a long time. In fact, the data reveals a negative correlation, albeit weak, between length of years in service and adoption of WAH.

This observation that respondents who have been serving in the RHU longer than the rest have low adoption of technology can be likened to resistance to change. The results of this study affirm what Yeattes et. al. (2000) described with regards to long-tenured employees in the workplace, “that there is a propensity for long-tenured employees to lag behind in knowing how to apply new tools and techniques as well as an inability to see how their work performance can be improved through the implementation of new knowledge or new skills.” Many of these long-tenured rural health workers have been used to doing their work manually and it can be a difficult transition shifting from pen-and-paper based type of work to technology-based work such as Wireless Access for Health.

It was initially assumed that age in years would be associated with adoption of WAH in the same way the latter is associated with length of years in service. However, age does not appear to influence the way the respondents adopted the technology. It does not follow therefore that the older the individual is, the more likely the respondent will not adopt the technology. It is more likely the length of exposure to a certain way of doing things rather than age that tends to influence the respondents’ openness to change.

This is perhaps due to the fact that many among both older and younger age groups have reported similar levels of adoption of WAH, particularly in the frequency of use. Note that the data revealed low frequency of use among 52% of the respondents. Majority of the younger respondents were nurses and deployed by DOH through the Nurse Deployment Program. Being relatively new (and many), the limited number of computers may have constrained their usage to WAH.

Perception towards WAH and Its Influence on Adoption

Results indicated that the perception of the respondents towards the technology, particularly WAH, and towards their environment, influence their behaviour. Levels of perception among the respondents for these four determinants range from moderate to high. Generally, they find WAH as beneficial to their work as public health workers and easy to learn and use. The default comparison is always with their prior manner of doing things in the RHU which is largely manual. However, it is also possible that the respondents have been basing their perception of WAH on its comparison with other existing Information Technology made available in their RHU. The Department of Health has also recently launched other forms of digital-based information systems which also require the use of similar technological hardware. It would be interesting to note the differences in perception among the public health workers with regards to performance and effort of use towards a variety of available technology in the RHU.

Respondents feel that they have enough support from peers and supervisors and other influential people that will enable them to use WAH. They also perceived high level of facilitating conditions that will support their utilization of the technology. Data shows that Performance Expectancy, Effort Expectancy, perceived Social Influence and Facilitating Conditions influence the level of adoption of WAH by the respondents. The results of the analysis validate the UTAUT's framework that these four are direct determinants of technology acceptance (Venkatesh, et. al., 2003).

How one perceives a technology to be useful and beneficial influences one's behavior to use or intend to use the technology. In this case, the higher the perception that the technology is useful and beneficial, in this case Wireless Access for Health, the more likely the respondents will adopt the technology, similar to the study done by Verhoeven, Heerwegh and De Wit (2010). Respondents consider WAH as something useful to them. They see it as something beneficial to their work. Swamped with paper works, the public health worker sees the advent of technology, particularly WAH, as something that would expedite certain processes at work. This perception influences them to use it frequently, consistently and appropriately.

Similarly, how one perceives a technology to be easy to operate and learn how to operate influences one's behavior to use or intend to use the technology. In this case, the higher the perception that the technology is easy to use and user-friendly, which is Wireless Access for Health, the more likely the respondents will adopt the technology. The result is similar with Wang and Wang's (2010) study on

the user acceptance of mobile internet, wherein they describe how effort expectancy, including perceived value and self-efficacy of the technology influence the intention to adopt and use mobile internet by the respondents. As previously mentioned, for some who are not exposed to complex digital technologies such as a computer or and its other related hardware, the experience can be discouraging. The technology as a whole must be perceived as something easy to adopt, friendly to the user and easy to learn in order to convince the individual to use the technology.

When it comes to social influence, the level of perceived support from peers and supervisors and other influential people to the respondent affects the level of adoption of technology. In this case, the higher the perception of social support from workmates and other influential people to use the technology, the more likely the respondents will adopt the technology. Sykes, Venkatesh and Gosain (2009) highlight this importance of peers in their study, saying that, “an individual’s co-workers can be important sources of help in overcoming knowledge barriers constraining use of a complex system (technology) and interactions with others can determine an employee’s ability to influence eventual system configuration and features.”

When the public health worker sees his or her co-workers using the technology and expressing their positive feedback, it somehow influences them to use the technology themselves. More importantly, the role of the supervisors and managers is seen as influential among the public health workers considering that the management structure in a municipal health office is multi-tiered and the flow

is top-down in most cases. It would be interesting to note in future studies how the level of voluntariness has influenced the respondents' behaviour in adopting the technology since it is possible that the perceived social influence from their managers may have somehow forced them with no option but to use the technology. All the mayors and municipal health officers of the local government units which participated in this study have undergone leadership training with Zuellig Family Foundation and the rural health unit staff received technical training from the Wireless Access for Health Team from the Province of Tarlac. A prerequisite in both capacity-building programs is the active presence and ownership of the Mayor and the Municipal Health Officer. Without the support of the two leaders in the municipality, the technology and other interventions related to the use of the technology will not be rolled out in the rural health units.

More than social influence, the presence of supporting or facilitating conditions, albeit perceived only, can influence the behaviour of the respondents in adopting the technology. Data has revealed that the level of perceived facilitating conditions influences the level of adoption of technology. In this case, the higher the perception of a supportive environment, including high internal capacity, the more likely the respondents will adopt the technology. The results are similar to a study done by Maarop and Khin Tan (2011) concerning the interplay of facilitating conditions and organizational setting in the acceptance of a technology (Teleconsultation) in Malaysian public hospitals. Respondents must at least perceive that they have the capacity to do use the technology either through

the presence of tangible support such as hardware or the intangible support such as trainings and mentoring in order to increase knowledge and skills.

Availability of IT infrastructure and WAH Adoption

Even in the actual absence or limitation of certain enabling resources such as electricity, internet, cell phone coverage and availability of I.T. hardware components, the constraints in these aspects seem to be not affecting the way the respondents are adopting the technology. Most of the LGUs in the study do not have critical problems with electricity and cell phone coverage. However, while majority of them do not have internet connection regularly, it was not perceived as a limitation to the use of the technology.

The current level of adoption of the respondents of the technology is moderate to high and no rural health unit has collectively reported a low adoption of the technology. It appears that majority of the respondents have adopted the technology of WAH and has shown moderate frequency of use, moderate consistency of use and moderate appropriateness of use. Perhaps this level of adoption is tempered by the fact that while the Enabling Resources (i.e. electricity, I.T. hardware, etc) do not seem to affect their manner of adoption, they can somehow restrain it to only a moderate level of adoption and usage of the technology. In fact, as previously mentioned, an LGU to have a high level of adoption of WAH, the LGU must have at least 50% of the I.T. hardware present.

Relationship of Level of Adoption and Behavioral Intent

The current level of adoption of WAH among respondents is associated with their behavioural intent to continue using WAH in the immediate and long-term future. Respondents who have currently high adoption ratings of the technology are more likely to continue using the technology in the short-term and long-term, even when the technology is upgraded and assumed to be more complex in operations. The experience of using the technology in a more regular basis, guided by certain conditions such as office culture, norms and policies, making the use more appropriate, appears to reinforce the thought of continue using the technology, thus sustaining the desired behavior which is adoption of the technology. Following the Transtheoretical Model for Behavior change (Proschka, Johnson and Lee, 1998), the process by which a current Action or behavior transitions to Maintenance Phase involves Reinforcement Management and Stimulus Control. Constant exposure to the technology and ensuring that it becomes part of the way things are done in the office are just ways of reinforcing the behavior of using the technology. It is posited in this study that when further explored and investigated motivations in continuing the use of the technology may be related to such.

It is as expected that those who continuously adopt WAH into their work, the more likely they will continue to use it over the succeeding period of time, even if the technology gets “more complex” through its upgrades. As the needs of the public health workers and public health care are evolving, the development of the WAH technology is also dynamic. The key to sustaining the use of WAH and

therefore adopting a more enhanced method of gathering health information is the constant application of the technology in the work place.

Public Health Workers see the need to continuously apply the technology in their work if they are rewarded. This subscribes to the Expectancy Theory which describes that an individual's motivation to increase his or her performance of a given task depends on two types of expectations: 1) that the effort will result in a desired level of performance and 2) that their performance will result in desired outcomes (Bandura, 1986, Lawler, 1973). In the case of WAH, the more the public health workers adopt and apply WAH, the more they become familiar with the technology, increasing their self-efficacy and mastery of the technology and ultimately empowering them in their work. Between the two motivators, the former describes self-efficacy while the latter describes outcomes expectations which is somewhat related with Performance Expectancy. The more they see the technology as useful and helping them achieve their desired health outcomes, the more they will continue using it.

WAH Adoption and Health Seeking Behavior

Data revealed that those RHUs with high level of WAH adoption have higher increase in Facility-based deliveries, deliveries attended by Skilled Birth Attendants, prenatal visits and post-natal visits compared with the RHUs with relatively lower level of adoption. The data however may not be enough to establish a direct linkage between the use of WAH and the impact on health

indicators of the municipalities. This will require a longer runway for data gathering and observation in order to measure impact of the adoption and utilization of WAH.

Perhaps it is the perceived improving outcomes that are also reinforcing the health workers in using the technology. Data has shown that the respondents have observed improvements in the health seeking behaviours of their pregnant clients from the time they started adopting WAH in their respective RHUs. Their perceptions have been affirmed by the actual numbers. This observation does not only reinforce them to use WAH but may also empower them to be proactive in the other areas of their work as health care workers. WAH only receives information but if there are no patients seeking health care services in their facilities, there will be no health information and data to encode with in the first place and thus dwindling opportunity to use WAH as an electronic medical record technology.

The perception towards health seeking behaviors of their clients that is associated with the levels of adoption of the technology is perhaps influenced by the interaction between the technology and its user. As discussed in the previous chapters, the dynamic relationship between technology and humans help mold human behaviour. Reckwitz (2002) referred to this in his Social Practice Theory described in the early portions of this study. The more a person uses a technology, such as the WAH, the more the person will likely to incorporate it in his or her way of doing things, especially at work. It becomes part of his or her mechanism to interact with other people, in this case a rural health worker

interacting with a patient. At the same time, it also becomes the medium of interaction for the rural health worker in trying to make sense of a more abstract and less tangible yet complex organism that is the health system.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This section contains the summary of the study. It also contains the conclusions derived from the findings and its theoretical and practical recommendations.

Summary

Since the adoption of WAH, little review has been done to investigate the current status of adoption of the technology in rural areas and explore the factors which influence the adoption of the technology among rural health workers. Modifying the Unified Theory of Acceptance and Utilization of Technology (UTAUT), this descriptive study explored the factors which are associated with the utilization of this technology. The study explored the association of age, position in the RHU and length of years in service of the respondents with their current level of adoption of WAH. It also studied the levels of perception of the respondents when it comes to their performance expectancy, effort expectancy, social influence and facilitating conditions according to the UTAUT framework and how they are associated with the level of adoption of WAH. At the same time, it also studied the enabling resources of the RHUs such as access to electricity, availability of internet, cell phone signal coverage and sufficiency of I.T. hardware and how they are associated with the current adoption of WAH at the RHU.

As a deviation from the UTAUT framework, this study explored the association with the current level of adoption of WAH by the respondents and their

behavioural intent to continue using WAH. As a modification of the UTAUT framework, this study also considered the respondents' perception of their clients' health seeking behaviour and its association with their level of adoption and at the same time the association with their current level of adoption and the health indicators of their municipalities pertaining to the health seeking behaviours particularly of their pregnant clients.

A total of 156 respondents from 11 LGUs participated in the study. Statistical tests were applied which were mostly analysis of variance and Pearson r correlation. Data has revealed that the average age is 39.96 years old. The youngest is 20 years old and the oldest being 63 years old. Majority of the respondents are working as midwives in the Rural Health Units (RHU). The average length of years of service rendered in the RHU of the respondents is 12.79 years.

Categorizing the level of perception of the respondents towards WAH, the mean scores in all four determinants of WAH adoption indicate high levels of perception. The respondents highly expect Wireless Access for Health technology as something that will make their job easier to do (PE). The respondents highly expect the technology as something that is easy to learn and easy to use (EE). Likewise, they have high perception of support from peers and supervisors with regards to using WAH (SI) and they have high perception of available resources that will enable them to use WAH (FC).

Pertaining to enabling resources, almost all LGUs have access to electricity. Majority of the LGUs do not have regular access to internet. Cell phone signal coverage of each LGU covers majority of their areas. Majority of the LGUs have at least 50% of the required I.T. hardware to operate WAH. When it comes to adoption of WAH, respondents generally have a moderate to high level of frequency of use, consistency of use and appropriateness of use of the technology. Majority of the respondents expressed intent to continue using WAH. The general perception among the respondents is that their pregnant clients have improved their health seeking behaviour since their RHUs have adopted WAH, especially in the areas of prenatal and post-natal visits, facility-based deliveries and deliveries attended by skilled birth attendants. The indicators seem to confirm the perception, showing a general upward direction of the numbers of facility-based deliveries and deliveries attended by skilled birth attendants.

Length in years in service, performance expectancy, effort expectancy, social influence and facilitating conditions are significantly correlated with levels of current adoption of WAH. At the same time, current level of Adoption of WAH is also significantly correlated with behavioral intent to continue using WAH and the perception of the respondents with regards to the health seeking behavior of their pregnant clients. There appears to be a more positive change in the actual health indicators of the municipalities before and after the adoption of WAH. The positive change is greater among High adoptee-LGUs than Moderate adoptee-LGUs.

Conclusions

The findings of this study offer several conclusive insights relevant to the understanding of the determinants of the use of HIT specifically WAH. First, this study concludes younger health workers seem to be more accommodating than older workers in so far as adoption of WAH is concerned. This implies that those who have been serving in the RHU for a long time may not adopt the technology as readily as those who are relatively new to the RHU. Second, an individual's perception about the importance of WAH in relation to his or her work, its utility and relevance to their job as public health workers, is associated with their subsequent adoption of WAH. The same can be said about their perception towards the technology's less complicated operations, how effortless the utilization of the technology and how straightforward the manner of learning how to use the technology. It is important therefore that a health worker must have a relatively high performance expectancy and high effort expectancy for him or her to adopt the technology.

Third, an individual's perception regarding social influence and facilitating conditions supporting him or her to use WAH also are associated with his or her subsequent adoption of the technology. The health worker must feel or at least perceive him or herself to be surrounded by influential people such as co-workers and supervisors who also support the use of the technology. The more the individual feels the support from peers and supervisors, the more he or she will use WAH in his or her work. The same can be said with his or her perception on facilitating conditions. An individual who feels he or she has the capacity and

logistical support to use the technology will most likely use WAH in his or her work. Even if there are certain actual constraints such as insufficient I.T. hardware or irregular access to the internet, these limitations do not seem to affect the adoption of WAH among ZFF partner LGUs.

Fourth, high intent to continue using WAH especially even when the technology is upgraded is associated with high current use or adoption of the technology. Upgrading of the technology implies more skills training, quality monitoring and more complex operations of the software. In order for the technology's use to be sustained and prolonged in the RHU, the health workers must frequently, consistently and appropriately use the technology.

Fifth, high adoptors of WAH have positive perception of the health seeking behaviors of their pregnant clients. These perceived positive changes in health seeking behaviors correspond with the actual data as shown by the health seeking behaviour indicators. While there is not enough evidence to show a cause-and-effect relationship between the use of WAH and actual improvements in health seeking behaviors of the pregnant clients, the association between levels of adoption and perceived positive changes in health seeking behaviors implies positive reinforcement among rural health workers to continue using WAH in their work.

Recommendations

Based on the findings and conclusions of the study, the following are the recommendations of the researcher:

1. It is recommended that the UTAUT model be also tested in identifying the factors that influence actual usage of the technology which directly influences behavioural intent to continue using the technology. At the same time, it is also recommended that other than gender, age and voluntariness as demographic variables in the UTAUT, tenure or length of years in the position or service be also included in the frame, exploring how this can actually influence not only actual usage but also behavioural intent to use or continue using a particular technology.
2. For practical applications, it is recommended that engagement with ZFF partner LGUs should include inputs through trainings, workshops and orientations that would facilitate better appreciation of the technology, particularly its uses and application at work. It is recommended that special attention is given to staff that have been serving in the RHU for a long while especially in orienting them about the use of the technology and how easy it is to manipulate and how it will make their work faster and easier especially in terms of gathering and analyzing data. “Incentivization” for health workers may promote initial adoption of the technology among the staff. However, this short-term intervention can be sustained by continuous follow up and monitoring especially by the health manager or Municipal health officer ensuring frequency, consistency, appropriateness and quality of usage of the technology.
3. It is also recommended that in order to hasten and smoothen the adoption of the technology at the RHU level, a high support for the technology must

be established first among the Municipal Health officers and the Mayors who are the health managers and supervisors of the rural health workers at the RHU. Their support for the technology will provide a high perception of social influence for the RHU staff and will therefore influence their own adoption and utilization of the technology. It is recommended that the LGU must provide enough technical and logistical support to ensure that enabling resources are available that will help provide facilitating conditions promoting the adoption of WAH.

4. It is recommended finally that for future researches, other factors of adoption of technology will be included such as prior experience or exposure to other forms of technology such as the use of smartphones or computer which is not necessarily related to health information. It is surmised that rural health workers who have prior exposure to other technologies may find adoption of WAH easier than those who have none. Future studies can also include comparing existing technologies being used and advocated among Rural Health Units and predict their adoption in the RHUs given certain factors.

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