UNIVERSITY OF EDUCATION, WINNEBA

TECHNOLOGY APPROPRIATION AND MATERNAL HEALTHCARE: A CASE STUDY OF TWO CHPS COMPOUNDS IN THE EFFUTU MUNICIPALITY

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DECLARATION

STUDENT'S DECLARATION

I, Enoch Mensah Andoh declare that this dissertation, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature: ……..

Date: ……

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Dissertation as laid down by the University of Education, Winneba.

Name of Supervisor: Dr. Christiana Hammond

Signature: …….……

Date: ……

DEDICATION

To my daughter Afia Agyapomaa Andoh and the entire Andoh family.

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ABSTRACT

The study investigated how mobile phone technology is appropriated in two selected CHPS compounds in the Effutu municipality. The study was underpinned by the Technology Appropriation Model. Data was collected through a semi-structured interview and analysed thematically. The findings showed that users appropriated mobile technology through WhatsApp, Voice notes and Video calls. In spite of the problem of poor connectivity and knowledge gap associated with mobile phone technology appropriation, it enhanced the reduction of maternal mortality rates, allows for easy payments, provides users with a lot of satisfaction, and access to information. It recommended that efforts should be made and policies put in place to fully embrace and utilise mobile technology appropriation in the healthcare delivery systems. The study concludes that the appropriation of mobile technology is very relevant and useful in curbing maternal deaths. It may enable Ghana to meet the SDG 3 by 2030 if it is well implemented.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The World Health Organisation (2013) asserts that Africa is faced with many healthcare challenges which affect the effectiveness of healthcare delivery. The "health for all" policy was launched in 1978 and ended in 2000. But more than 70 percent of Ghanaians did not have access to quality health care services (World Bank, 2015). Many people commute more than eight kilometers to the nearest health service provider particularly in rural communities, leading to high maternal and infant mortality rates. Improving access to healthcare delivery, therefore, remains a primary goal of health sector in Ghana (MoH, 2014).

The Millennium Development Goals (MDGs) were launched by the United Nations in the year 2000. MDG Goals 5 emphasized the need to reduce maternal mortality and improve maternal health. In 2015, the Sustainable Development Goals (SDG) were also launched and it again, goal 3 of the SDG reiterated the need for global leaders to curb global maternal mortality figures to less than 70 per 100,000 live births by the end of 2030 (WHO, 2015). In order to achieve the target set by developing countries, there is the need to embark on comprehensive healthcare delivery programme to meet the ever-growing health demands of the citizenry. There is the urgent need for low and middle-income countries such as Ghana to embrace modern technologies and appropriate them to bring healthcare services to the door step of its people.

According to a report by the Ghana Medical and Dental Council (2012), currently the Doctor-Patient ratio stands at 1:4,000 which is way above the WHO standard of 1:600. In some countries in Sub-Saharan Africa (SSA) the healthcare workers serving

the population are very far away from the patients. Sub Saharan Africa is simultaneously faced with a shortage of doctors and other professionals. Mbarika, Okoli, Byrd and Datta (2005) also confirm that the African continent has even fewer than 10 doctors per 100,000 people. Moreover, people lack access to up-to-date healthcare information due to poor roads and expensive internet facilities in rural areas where healthcare services are seriously needed (Mbarika et al, 2005). This is in tandem with Obasola and Mabawonku"s (2017) assertion that illiteracy and the lack of information regarding access and use of proper healthcare information is a huge impediment to proper healthcare delivery. In the current dispensation, dubbed the "information age," indeed, access to information and particularly healthcare information is very critical in meeting the SDG target by 2030. These feats could be easier to achieve if access to information on healthcare is available to those who urgently need it.

Access to health information plays a fundamental role in ensuring the success of health systems (World Health Organisation, 2012). Particularly, the kind of information designed to assist clinicians and healthcare professionals to provide effective healthcare services to majority of people across the length and breadth of communities globally. Healthcare institutions in low and middle-income economies continue to face numerous challenges regarding the provision of quality, affordable and universal access to health care (Trevor et al., 2012). A global report on inequities in rural health protection compiled by the International Labour Organization (2015) indicates that 56 % of people living in rural areas across the globe are denied critical healthcare access as compared to those in the urban areas, especially, in developing countries. The report also argues that, in spite of the fact that half of the world,,s population living in rural communities, only 23 % of global healthcare personnel are

deployed there. Further, out of a global estimate of 59.2 million health workforce, only 3% are found in Africa. In 2009, the health sector workforce density per 1000 population was 2.3 in Africa compared to 24.8 in developed continents like the Americas. This has affected access to good quality healthcare and service delivery in Africa and African countries are far from achieving the health-related Millennium Development Goals (MDGs) by 2015 (Ooms et al, 2010).

According to Zurovac, Talisuna and Snow (2012), the problem of ineffective healthcare in Africa is attributed to the lack of exposure to readily available healthcare information systems, consistent and reliable channels of communication between patients, healthcare providers and any other healthcare stakeholders; unavailability of information and appropriate health care information on proper healthcare delivery services. Advancement in technology and informatics could tremendously impact on improving healthcare delivery (Ogunyemi & Cederic, 2010). Access to information on healthcare through the appropriation of relevant technologies will provide better care for patients and help them achieve health equity. It also supports the recording of patient data to improve healthcare delivery and allows for analysis of information by healthcare practitioners and other relevant health-related agencies.

Technology in the form of mobile phones can be appropriated to provide valuable information on healthcare in this era (Mendoza, Okoko, Morgan, & Konopka, 2013). Mobile phones have metamorphosed from a simple gadget, hitherto used for receiving and making simple calls to a complex device used to conduct a number of activities including disease surveillance, bank transactions, remittances and payment of bills amongst others. Mobile health (mHealth) is a component of e-Health which has gained popularity. It involves the use of mobile technologies (mobile telephones and

other wireless handheld devices for health service delivery (Mendoza, Okoko, Morgan, & Konopka 2013).

Mobile phones have seen a tremendous rise in its ownership in developing economies particularly in the Sub-Saharan Africa in recent times. The use of mobile phones has garnered various pilot projects and full-scale projects implemented in countries around the world to provide healthcare (Fiordelli, Diviani, & Schulz, 2013). Mobile phones have become the most prevalent technology in most rural areas (Mechael et al. 2012). The International Telecommunication Union (ITU) estimates that about 5.8 billion mobile cellular subscriptions in developing countries with an estimated 772 million mobile phone subscriptions in Africa (International Telecommunication Union, 2016). In Ghana, approximately 38 million mobile cellular subscriptions were recorded at the end of October 2016 from an initial 900 subscriptions in 1992 (National Communications Authority, 2016). This growth in subscriptions has prompted attempts to incorporate mobile technology into healthcare delivery (Mechael et al, 2012).

Appropriating the mobile phone combined with Frontline Healthcare provider under the Community-Based Health Planning Services (CHPS) was initiated by the Ministry of Health in collaboration with the Ghana Health Service as a national policy and a kind of alternative healthcare for Ghana. With the widespread coverage and ownership of mobile phones, improvement in maternal health could reduce maternal mortality as stipulated in the Sustainable Development Goal 3 by the year 2030.

1.1.1 Emergence of Mobile Phone Technology and Usage

According to the International Telecommunication Union (2016), the world has become a digital society. The entire world has seen substantial increase in the number of people who have access to mobile phones (Index Mundi, 2018). Currently, there are over 7 billion mobile phone users worldwide (ITU, 2015). According to GSMA (2014) mobile phone dispersion and use is paramount in Ghana‟s digital revolution. The original design of the mobile phone did not have the average consumer in mind, however, there has been an enormous widespread of diffusion of mobile phones even to the remotest part of the world. Mobile phones are the leading form of communication worldwide (ITU, 2015). It provides the most inclusive and pervasive means of connecting to the internet which is very important to the growth of every country including Ghana (Grameen Foundation, 2015). According to Tobbin (2012), the facility of pre-paid tariffs from telecommunication networks in Ghana may have contributed immensely to the spread of mobile phone usage with over 35 million mobile voice subscriptions (NCA, 2016). Hence, the justification for its appropriation to provide healthcare services particularly, to expectant and postpartum mothers on their general well-being.

1.1.2 Maternal Health Delivery

Maternal health involves the healthcare of women during pregnancy, childbirth and the postpartum period. It encompasses healthcare dimensions of family planning, pre-natal and post-natal care in order to ensure a positive and fulfilling experience in most cases and reduce maternal morbidity and mortality (WHO, 2015). The World Bank (2015) estimate that 289,000 women died of pregnancy or childbirth related causes in 2013. These causes range from severe bleeding to obstructed labour. As more woman gain access to family planning and skilled birth attendance with back up emergency

obstetric care within the last few years, the global maternal mortality ratio has fallen from 380 maternal deaths per 100,000 births in 1990 to 210 deaths per 100,000 live births in 2013. An indication that, many countries have halved their maternal mortality death rates (World Bank, 2015). Even though there has been a decline in worldwide maternal mortality rates, high rates still exist, particularly, in impoverished communities with over 85 per cent living in Africa and Southern Asia (World Bank, 2015). Research shows the need to reduce the global estimate of 210 per every thousand births is an indication that, a lot more could be achieved as mobile phone technology is appropriated to provide quick access and response to critical health information to both mothers and health officers. This is especially so in rural communities which is characterized by constant maternal mortality casualties. The appropriation of mobile phones in the healthcare delivery process is one of the major breakthroughs since several women could be reached for the provision of the needed health information and services.

1.1.3 Mobile Health in Low and Middle-Income Economies

Mobile health (mHealth) is the use of mobile communication devices such as mobile phones, tablets and computers for health services (Frank et al, 2012). Mobile health technologies have been implemented in many developing countries to address challenges of maternal and child health. Most mHealth interventions have been found to enhance the performance of healthcare workers in underserved rural areas in Uganda, Kenya, Mozambique and other places in Africa (Källander et al., 2013a). The widespread use of mobile phones particularly, in low and middle-income economies has led to growing calls to harness the potential of mobile and wireless technology to improve health care delivery (WHO, 2015). Throughout the last decade, over 600 mHealth pilot strategies and programs have been introduced globally

(Awoonor-Williams, et al., 2015) to provide access to relevant health information (Nchise, Boateng, Shu & Mbarika 2012a) improve efficiency in health delivery; advance clinical care (Noordan et al., 2011); and promote behavioural change in patients (Trevor, Synowiec, Lagomarsino, & Schweitzer, 2012). The rapid adoption of mHealth interventions in addressing maternal health issues could be due to the increasing access and use of mobile phones by women (Dahdah, Du Loû, & Méadel 2015).

Ghana has made some strides towards the universal access to quality healthcare, such as improvement in Doctor-patient ratio. However, rural-urban inequalities still persist because the inadequate health sector workforce has a challenge and the geographical imbalances of 68 % urban to 32 % rural set up poses a serious threat towards the increasing efforts at achieving the health-related MDGs 4 and 5 (Alhassan et al., 2013).

1.1.4 Community-Based Health Planning and Services (CHPS)

The Community-based Health Planning and Services (CHPS) initiative is a programme for improving the accessibility, efficiency and quality of health and family planning services in Ghana (Binka et al., 1995; Pence et al., 2001 & Debpuur et. al. 2002). Community Health Nurses (CHNs) or Community Health Officers (CHOs), have been regarded as effective and powerful interventions for improving community healthcare especially, in the rural areas. CHNs directly provide essential services by creating an essential bridge for health services in rural areas (Anderson et al., 2012) whereas the Community-Based Health Planning and Services (CHPS) are for zones or facilities in rural communities where these essential health workers are placed for the provision of essential primary healthcare services (Nyonator et al.,

2005). They provide services such as family planning, immunisations, health promotion, and the treatment of minor illnesses through static clinics and routine home visits.

It has been reported (Ministry of Health, 2012) that, CHNs work in remote places where physical access to health Centre is a challenge to the community members. Also, CHNs is occupied with other clinical duties and are often unable to conduct community outreach activities including immunisation defaulter tracing, home visits and health education which forms some of the core duties. Ideally, CHNs are to identify and trace clients who miss scheduled care appointments but this is impossible because the CHNs are poorly resourced to carry out home visits. (MacLeod et al., 2012a). The use of the mobile phone technology has therefore been touted to improve the scope and efficiency of field health workers in low income regions (Braun, Catalani, Wimbush, & Israelski, 2013a).

According to WHO (2018), about 13.6 million women are estimated to have died globally from maternal causes between 1990 and 2015. Also, it has been reported that, about 830 women die daily from pregnancy or childbirth related complications in sub-Saharan Africa. In Ghana, it is estimated that about 319 per 100,000 live births are recorded (WHO, 2018). In 2009 the Grameen Foundation in collaboration with the Ghana Health Service introduced the „Mobile Technology for Community Health" (MOTECH) as a response to the urgent need for remediation. The main aim of MOTECH was therefore to use the mobile phones to increase the quantity and quality of antenatal, neonatal and postnatal care in rural Ghana (Awoonor-Williams, 2013).

Another innovation in Ghana has been the use of the mobile midwife. The Mobile Midwife delivers individualized health messages and upcoming appointment

reminders to pregnant women and mothers of infants weekly. These messages were pre-recorded voice messages in local languages. The messages span the full duration of pregnancy and the first twelve months of a newborn‟s life and were tailored to suit to the gestation of the pregnancy or the age of the infant for expectant and postpartum mothers.

1.2 Statement of the Problem

The Millennium Development Goal 5 emphasizes the need to improve maternal health, thus, urging member countries to reduce maternal mortality ratio by 75 per cent by the end of the year 2015. Furthermore, the Sustainable Development Goals 3 (SDGs) makes mention of ensuring healthy lives and promote well-being for all at all ages by the end by 2030. It further reiterated the need for developing countries to continually work fervently in reducing the maternal mortality figures further down by 70 per 100 000 live births. Currently, in Ghana, the figure is around 319 per 100,000 live births (World Bank, 2015). Hence, the need to integrate technology, particularly, mobile phones in the healthcare delivery process (WHO, 2018). There exists literature on mHealth (Amoako et al, 2018; Dasuki et al, 2018; Diese et al, 2018 & Meigounpoory, 2014), however, the majority of these tend to focus on design and implementation of mHealth projects and few studies have evaluated mHealth interventions in assessing maternal healthcare outcomes from the perspectives of the end users (Nyemba-Mudenda & Chigona, 2018).

For instance, a study by Meigounpoory (2014) identifies factors affecting mHealth service quality required by health clients in small and medium-sized enterprises in Iran. The study was qualitative and it involved the use of semi-structured interviews with 12 professionals and experts on information technology and e-health fields. It

concluded that clients are able to access the system as and when they need it and the system is highly accessible for clients and patients able to receive services.

In another study by Diese et al. (2018), the opinions of Community members on the use of mobile phone by nurses and village health volunteers in the surveillance of maternal and child health in rural Kenge health zone was examined. The study employed the mixed method approach with focus group discussions and revealed that community members were like the use of mobile phone in collecting data on maternal and child health.

A cluster randomized control study by Amoako et al (2017) in the Eastern Region of Ghana also studied the effect of a clinical decision-making mHealth support system on maternal and neonatal mortality and morbidity in Ghana; was conducted in 16 eligible districts (clusters) in the Eastern Region of Ghana. This was to assess the effect of Clinical Decision on mHealth Support System (CDMSS) for maternal and neonatal healthcare services on maternal health. The CDMSS intervention consisted of an Unstructured Supplementary Service.

The primary outcome of the intervention was to determine the incidence of institutional maternal and neonatal mortality. The outcomes were assessed through an analysis of data on maternal and neonatal morbidity and mortality extracted from the District Health Information Management System-2 (DHIMS-2) and health facility-based records. The quality of maternal and neonatal healthcare was assessed in two purposively selected clusters from each study arm. The trial was registered at ClinicalTrials.gov on 7 September 2015 (trial identifier: NCT02468310) and the Pan African Clinical Trials Registry on 9 December 2015 (trial identification number: PACTR20151200109073). Registration at the Pan African Clinical Trials Registry

was done retrospectively after the trial commenced. The recruitment for the trial commenced on 10 August 2015 and was expected to be completed by the end of January 2017. During the initial 6 months of the CRCT, there were over 2500 requests made to the USSD platform. These requests were made from 94% of health facilities participating in the CRCT. The above studies examine the use of mobile phone on the design and implementation in the healthcare delivery process.

In a more recent study by Dasuki and Zamani (2019) in Jos Local Government hospital in northern Nigeria, on the „use of mobile phone by pregnant women to access to healthcare", the study examined the benefits derived by pregnant women to enhance their choice to push for quality healthcare and enhance access to emergency services. The study concluded that mobile phones have the capacity to support and contribute to improved delivery of maternal healthcare services and human development. It also identified that social, economic and infrastructural constraint that hinders the full conversion of mobile phone into freedom in this particular context. However, the study was limited to only one health facility, only six (6) pregnant women and the use of mobile phone call and mobile texting.

From the on-going discussions it appears there is scant literature on how technology can be appropriated for maternal healthcare delivery constituting the need to initiate discussions to fill the gap in literature. This study therefore, seeks to fill the gap by investigating the appropriation of mobile technology in two different health facilities, from the point of view of the end users comprising expectant mothers, postpartum mothers and healthcare personnel at two CHPS compounds in the Effutu Municipality.

1.3 Research Objectives

1. Investigate how mobile phone technology is appropriated at two CHPS compounds in the Effutu Municipality.
2. Examine perspectives of users of mobile phone technology in maternal healthcare at two CHPS compounds in the Effutu Municipality.

1.4 Research Questions

1. How is mobile phone technology appropriated at two CHPS compounds in the Effutu Municipality?
2. What are the perspectives of users of mobile phone technology on maternal healthcare at the two CHPS compounds in the Effutu Municipality?

1.5 Significance of the Study

Issues of health is a priority on every national agenda (Atinga et al., 2011) and the adoption of modern technologies such as mobile technology has been experimented to have yielded positive outcomes (MoH, 2011). This study will undoubtedly enrich current discourses on maternal health issues contributing to literature on mobile phone usage and maternal healthcare.

Furthermore, the findings of the study will provide insights on policy briefs to help shape policies and strategies by the Ministry of Health, Ghana Health Service and Non-Governmental Organisations who will be interested in maternal health issues and the use of technology in this technological era.

1.6 Delimitation

This study focuses on the appropriation of mobile phone technology by health personnel, expectant mothers, and postpartum mothers in the healthcare delivery. Mobile phone technology has revolutionized healthcare delivery by shifting the focus of healthcare delivery from curative to preventive measures. The population for this study is limited to health personnel, expectant mothers and postpartum mothers who visit two selected CHPS compounds within the Effutu Municipality. These facilities are selected on the basis that, they are in the remotest part of the municipality and so they often refer cases to the major health facility within the municipality. The selection of these facilities enables the researcher to collect reliable information on the use of the mobile phone technology.

1.7 Organisation of the study

This study is organised in five chapters. Chapter one is the introduction to the study, which comprise subtopics such as; statement of the problem, research objectives, research questions, significance of the study, scope of the study and significance of the study. Chapter two presents a review of the relevant literature to the study. The chapter also discusses the theoretical framework for the study. Chapter three discusses the methods in the data collection processes. It comprises the research approach, research design, population, sample strategy and sample size, data collection procedures, data analysis plan and ethical consideration. Chapter four presents the findings and discussions of the study. Chapter five is the summary, conclusions from the findings and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews works related to the use of mobile phone technology and its impact on maternal health delivery processes particularly in low and middle income economies such as Ghana. The chapter also discusses the Technology Appropriation model proposed by Carroll et al., (2001); Bar, Pisian and Weber (2007) as the framework for the analysis of the data.

2.1 Empirical Review

2.1.1 Use of Information Communication and Technology in the Dissemination of Information

The literature indicates that prior to the advent of information and communication technology (ICT), the dissemination of maternal health information as a strategy for preventing pregnancy and birth complications was based on print and oral communication approaches, for example, antenatal classes. This traditional approach seems to have little impact, as studies have indicated little effect of these information methods on health outcomes (Ferguson, Davis & Browne, 2013; Gagnon & Sandall, 2007).

Some authors such as Anya, Hydara & Jaiteh (2008); Parmar (2010) have also highlighted the need to improve information dissemination, as some pregnancy complications and birth experienced in developing countries have been attributed to inadequate MCH information dissemination and limited access to health services. The need to improve maternal health and birth outcome has led to the adoption of ICT for Mother and Child Health (MCH) information dissemination to encourage the adoption

of safe MCH practices disseminated by health workers Agency for Health Care Research Quality (2012); Edwards (1995). The preference for the adoption of ICT in scaling up MCH services has grown widely across sub Saharan Africa. Nigeria too is gradually adopting ICT in public health facilities for MCH care (Oyeyemi, 2014).

Studies have linked negative perceptions by mothers (Castle, Thompson & Karlyn, 2012; Parkkola, 2006a) to unwillingness to use ICT to receive MCH information which affected their participation in ICT based projects. These studies indicate that neglecting the perception of the target group when designing ICT based projects may affect the acceptance of ICT, which will discourage the adoption of MCH information promoted through ICT. The varying perceptions of mothers regarding MCH information products and ICT use need to be addressed to ensure the effectiveness of ICT based projects (Parkkola, 2006a). Focusing on mothers‟ perception could reveal more information that could be central to the design of MCH information products and ICT based projects.

Studies by Fajembola (2011) and Oyeyemi (2012) on the use of ICT for MCH information have focused on the influence on deliveries and referrals, with negligible attention paid to mothers‟ perception of ICT and the MCH information disseminated. As a follow-up to a previous study, further studies were conducted and it focused on perception of ICT disseminated MCH information accessed by women. The current study examined mothers‟ perception of the use of television, radio, mobile phones and the internet. This is to improve the effectiveness of ICT based projects and to provide information which would be useful in developing MCH information products.

Studies accessing mothers‟ perception of the usefulness of ICT and MCH information disseminated through the channel are rare. Intention based theories, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), clearly stress the importance of the perceived usefulness, ease of use, social influence, facilitating conditions and control factors as some of the major factors to consider when planning ICT based programmes (Venkatesh, Morris, & Davis 2003). The UTAUT illustrates how the perceived usefulness and the ease of use of ICT could have profound influence on the adoption of an information system.

Kijsanayotin, Pannarunothai and Speedie (2009) were among the first set of scholars to adapt UTAUT to predict the use of ICT for administrative purposes when implementing e-health projects in Thailand. The results of the study show that if users perceive ICT services as useful, they will choose to use them. Therefore, willingness to use ICT as a source of health information may be dependent on mothers‟ perception of the channel. As a result, expression of interest in the form of demand could be equated with positive perception of ICT by mothers. This can have significant influence on the adoption of ICT tools.

Parkkola (2006a) in a qualitative study on mothers‟ views when designing ICT solutions observed a positive disposition by mothers towards ICT once they were convinced of its benefits. It was also reported that the demand and attitude to use ICT by mothers were closely related. The study indicated that the motivation to use ICT was based on the needs and the characteristics of available ICT. This ultimately affected the use of ICT by mothers to access health information.

In the same vein, Declercq, Sakal, Corr and Applebaum (2006) noted that pregnant women in the United States rely primarily on the internet for their health information needs. The 4year survey revealed that about two-thirds (64%) of the respondents (pregnant women) enjoyed using a smartphone to access health information, and 82% had gone online using a computer system. Some of the women reported using tablet devices (35%), mobile phones (33%) and iPad touch devices (21%) to access online health information. The authors argue that, since the use of the internet among women in the United States is high, it should be integrated with birth education classes.

Similarly, an evaluation of an ICT based project in Nigeria (Gombe State) indicated that 50% of the women involved in the project were happy to receive MCH information through mobile phones as over 24 000 calls were received within four months of the project initiation, and about 400 women provided positive feedback on the quality of information and support from the call centre (Obasola & Mabawonku, 2017). However, the study indicated that the use of ICT may be affected by the level of IT skills possessed by women. Likewise, a study by Balogun et al. (2012) involving 399 mothers, at a tertiary health clinic in Lagos, Nigeria, reported that mothers (77%) were positively disposed to use mobile phones for receiving appointment reminders. Brown, Oluwatosin and Ogundeji (2015) also observed a related trend in Oyo State, Nigeria, where 95.1% of the 614 mothers expressed willingness to use their cell phones to receive appointment reminders. Only 4% of the mothers were not willing to use their mobile phones to receive information on immunization.

The positive attitude observed in these studies differed from the findings of (Parkkola, 2006). The author reported a negative disposition to ICT by mothers in Finland because of limited knowledge on the use of ICT. A study in Kaduna State, Nigeria (Castle et al., 2011) also revealed a negative disposition owing to low ICT skills by mothers using mobile phones. As a result, most of the mothers lacked willingness to participate in the ICT based projects. These results further underscored the need to pay attention to mothers‟ views on the type of ICT tool and the need to train mothers on the use of ICT tools when promoting health messages, as perception may vary from one setting to the other.

In spite of the growing body of the literature (Balogun et al., 2012) on the acceptance of recent ICT channels as sources of MCH information, studies have shown that women still prefer health tips from radio and television (O'Mara, Babacan & Borland, 2010; Parmar, 2010). These studies have shown that the available ICT channel may not be the most preferred source of MCH information. Likewise, the more recent source may not be the most used, because women in the developing countries are positively disposed to use old ICT, such as the radio and television. Therefore, there is the need to be cautious in the deployment of technology for communicating MCH information. It is important to investigate the mothers‟ perceptions of ICT tools and the information being transmitted when evolving ICT based projects. The acceptance of the ICT can depend on the effectiveness of ICT based projects.

2.1.2 Mobile Phone Technology

Wise GEEK (2013) defines the mobile phones as “a wireless electronic device used for telephone and multimedia communications which is used to make and receive calls, send and receive text messages (p.29)”. Asfahaanulah, (2008) asserts that, the

evolution of mobile technology has made a huge impact in all sectors and has facilitated m-computing, m-communication, m-health and m-commerce (p.7)". Internet technologies are not fully accessible to rural communities; the mobile phone is the first Information, Communication and Technology tool that is widely adopted in rural communities (Royal Tropical Institute, 2012).

Royal Tropical Institute, (2012) states that, the mobile phone has become a part of everyday life and an important tool for communication. It provides functionalities such as emailing, messaging and chatting system. James and Veerstag (2007) states that its usage has also increased the Gross Domestic Product (GDP) growth rate in developing countries where laptops were increasingly being substituted with mobile phones. The increased use of mobile phones in today"s economy is enough evidence of how important mobile phones have become. In the past few years, there have been great developments in the usage of mobile phones in Africa (Aker & Mbiti, 2010). The gap between the rural and urban communities has been bridged through communication between individuals and businesses (Aker et al, 2010). Aker et al (2010) report that the mobile phone has greatly reduced communication costs by allowing individuals to send and obtain information quickly.

In a research conducted by Sife, Kiondo and Lyimo-Macha (2010), it was revealed that rural communities benefit from the use of mobile phone technology as farmers disseminate business related information. Sife et al (2010) argue that the mobile phone could help enhance the lives of rural communities through easy dissemination of information thus creating opportunities and reducing poverty levels in these rural communities. The study revealed that, 72% of the respondents believed that mobile phones improved their ability to deal with "emergency situations" by helping to alert

the appropriate crime control authorities as well as health professionals in emergencies. Some emergency situations cited include requesting for an ambulance service.

Food and Agriculture Organisation (2009) reports that mobile phones are relatively cheap to obtain and has the ability to create economic opportunities and strengthen social networks in rural areas. Tcheng (2007) examined the use of the mobile phone in terms of Information and Communication Technology (ICT) characteristics. In that regard, the study concluded that ICT development is increasingly considered a factor in economic growth rather than a consequence of it. As a result, three characteristics of ICT (i) ICT is omnipresent in most business sectors (ii) ICT improve continuously and therefore reduce costs for the users and (iii) ICT contributes to innovation and to the development of new products and processes became evident in the research findings.

2.1.3 Ownership and Use of Smart Phones in Health Delivery

In a research by Food and Agriculture Organisation (2009), it came to light that developing countries contribute 70 percent of the global mobile phone usage. Mobile phone usage in rural communities has increased over the years, which suggests that there are more mobile phones users in rural communities FAO (2009). According to James and Versteeg (2007), the method used to determine the penetration of mobile phones is often determined by data on the mobile phone usage. However, in Africa, mobile phone usage is not only dependent on the number of mobile phone subscribers. People in rural communities also share their mobile phones with non-mobile phone subscribers thereby making it difficult to determine the exact number of mobile phone users in Africa.

In a study by the National Institute of Statistics of Rwanda (2013), it was revealed that there has been a huge increase in the use of mobile phone technologies exceeding the number of telephone line subscription. The percentage of households with a mobile phone also increased in urban areas from 26.5% in 2005/2006 to 71.5% in 2010/2011 as well as in rural areas from 2.2% in 2005/2006 to 40.6% in 2010/2011.

Index Mundi (2018) further explains that the "mobile cellular per capita" for the African continent has reached 89.9 as compared to 2012. Countries such as Burundi, Ethiopia, Tanzania, Niger, Djibouti, Malawi and the Democratic Republic of Congo (DRC), Ghana, Liberia, Burkina Faso, Sudan, Zambia, Togo, Guinea, Uganda, Chad, Rwanda, Mozambique, Lesotho and Sierra Leone have all experienced a surge in the mobile cellular per capita.

According to a report by NCA (2016) Ghana is one of Africa‟s largest mobile markets with about 34.57 million subscribers with an estimated population of 28,000,000 and a penetration rate of 119%. This report buttresses the James and Versteeg‟s (2007) assertion that mobile phones are shared with non-owners within rural communities thereby making it difficult to match the number of phones in existence to an equal number of users.

In a cross-sectional study, Payne, Wharrad, and Watts (2012) explored the extent to which junior doctors and medical students own smart phones and use them to enhance their clinical activities in the United Kingdom (UK). It was found that 72.4% of junior doctors use medical apps during clinical activities. Smart phone apps that increased efficiency by saving time and allowed rapid „mobile‟ decision making were preferred by the study sample.

In the United States of America, a similar study was done to evaluate the use of smart phones and smart phone apps among Accreditation Council for Graduate Medical Education (ACGME) practitioners (Franko & Tirrell, 2012). Franko and Tirrell (2012) found that more than 85% of the respondents used a smart phone of which the i-Phone was the most popular (56%). Another 56% of the respondents reported using apps in their clinical practice. The most commonly used type of apps in the study were drug guides (79%), medical calculators (18%), coding and billing apps (4%) and pregnancy wheels (4%). Franko and Tirrell (2012) concluded that the clinical use of smart phones and apps was likely continue to increase. They also demonstrated an absence of high quality and popular apps despite a strong desire among physicians and trainees.

Chang et al (2012) posits that although very limited studies seem to have been done in Africa regarding the use of smart phone apps for clinical decision making, there was a study done in Botswana that evaluated a smart phone-based m-Learning (Mobile Learning) tool. It was found that smart phones loaded with point-of-care tools were effectively utilized by resident physicians in resource-limited settings both for accessing point-of-care medical information at the bedside and for self-directed learning at home (Chang et al., 2012). They also found that users required only a short period of time to learn how to use the smart phone and search for information.

Since Chang et al (2012) work evaluated only medical residents who had been trained and provided with smart phones for the sole purpose of testing the pre-loaded m-Learning tool, the results may not be generalized to medical practitioners who use personal mobile phones and apps for clinical decision making.

In a two-arm comparative study with crossover design conducted among resident physicians at the University of Botswana, the performance of resident physicians in answering eight multi-part clinical scenarios using PubMed abstracts accessed via the PubMed for Handhelds (PubMed4Hh) website versus medical/drug reference applications (Medical Apps) accessed via software on the mobile phone were compared (Goldbach et al., 2014). The study found that mobile apps with condensed content might be more appropriate for point-of-care information needs of physicians as compared to accessing point of care information from a website. While this study does show that physicians preferred the use of condensed material provided by smart phone apps, it did not explore the use of residents‟ personal smart phone.

In another study conducted in northern Ethiopia, twenty-eight health extension workers (HEWs) and twelve midwives were provided with smart phones installed with locally developed apps (Little, Medhanyie, & Blanco, 2014). Using an observational research design the participants were followed up for eighteen months. The study found that HEW and midwifes made good use of smart phones for maternal care. It also found that the mobile internet connection, although not fast, was found to be reliable, even in rural and quite remote areas (Little et al., 2014).

In Ghana, the Government of Ghana through the Ministry of Health and Ghana Health Service have since 2003 been promoting ICT use for solving health problems (Afagbedzi, Obuobi, Aryeetey, & Bosomprah, 2013). There are policy statements stating clearly the government‟s intention to explore the use of ICT in the health sector (Ministry of Health, 2011). However, besides few pilot projects, there is very limited information on the application of smart phone technology in medical practice in Ghana. In May 2013, Ghana Health Service launched the e-health project, a web

based application aimed at providing the public with an avenue through which they could seek health information and gain access to medical practitioner and specialist consultation by just logging in to the website. The e-health project however, in a recent evaluation has been found to be fraught with many challenges that hinder its success (Bedeley & Palvia, 2014). This study was conducted by using both qualitative and quantitative methods to collect data from multiple perspectives of both health service providers and consumers. The top five challenges identified included issues related to: lack of ICT infrastructure; lack of basic ICT knowledge/skills; internet (accessibility & reliability); financial and sustainability issues, and privacy and/or security of electronic record (Bedeley & Palvia, 2014). While some difference may exist, the results show great similarity between the views of providers and consumers of the new e-health system. As mentioned earlier, the use of smart phone technology by medical practitioners has the potential to overcome some of these challenges identified by Bedeley and Palvia (2014).

One situational analysis of mobile phone technology use in Ghana, suggests that the mobile phone could become as important as the stethoscope in the future (Ofosu, 2010). The study analyzed the various pilot projects being undertaken by various non-governmental organizations (NGOs), under the auspices of the Ghana Health Service as at 2010. The Mobile Technology for Community Health (MOTECH) pilot is one such project analyzed by Ofosu (2010). MOTECH is a Ghana Health Service supported programme consisting of two interrelated mobile health services: The first is a “Mobile Midwife” application, which is a service that enables pregnant women and their families to receive Short Message Service (SMS) or voice messages that give essential information about their pregnancy weekly in their own language. The second application termed “Nurses Application” helps Community Health Workers to

record and track the care delivered to women and newborns in their area (Wood et al., 2012). MOTECH is studying whether the use of mobile phone technology can help solve health service problems by significantly easing the utilization of information for health care providers, thus improving their efficiency and effectiveness. It seeks to test the promise of mobile phone use for transforming routine health information operations. The Initiative has piloted in the Kassena-Nankana and Kassena-Nankana West Districts of the Upper East Region of Ghana (Wood et al., 2012). The Builsa and the Bongo districts of the same region serve as control zones. Each rural health facility in the programme area is supplied with mobile phones on which the MOTECH Java application for health workers is installed. Nurses are required to input information about their clients‟ clinic visits into applications on the mobile phone and send this to servers at MOTECH head office. The MOTECH system analyses the data and sends a reminder message to patients who may have missed a scheduled appointment. The healthcare worker is also notified of patients who are overdue so they can follow up to reduce defaulter rates. The data is also used to generate some of the essential monthly reports that the facilities are required to submit to their district and regional health management teams. Wood et al (2012) observed that this has significantly reduced the health workers workload. The MOTECH Nurses‟ Application also enables staff check the database, and retrieve lists of patients overdue for care, those due to deliver soon and such similar details (Wood et al., 2012).

In another work by Andreatta, Debpuur, Danquah and Perosky (2011) ten birth attendants selected from the remote Sene District, in the Brong Ahafo region of Ghana participated in a study to evaluate the use of cell phones by birth attendants for reporting postpartum hemorrhage (PPH) data. The birth attendants were trained to

send SMS text messages over a 90-day period from cell phones using a simple numeric protocol to report data on PPH, such as maternal age; use of bimanual uterine compression; maternal and neonatal mortality; and prenatal care. The results showed that both professional and traditional birth attendants can be trained to use cell phones to report health-related information which may be a more accurate picture of what actually occurs since the reporting is in real time (Andreatta et al., 2011).

According to Oduro-Mensah et al (2013) "the advent of smart phones makes a future link between mobile phone ownership and internet access and use in supporting decision making a definite possibility". They also suggest that the universal ownership of mobile phones by healthcare workers in their study area makes the use of mobile phone technology to support point of care decision making very possible. But as discussed earlier, there is very little research work exploring this possibility of smart phone use among doctors in Ghana and sub-Saharan Africa.

2.1.4 Mobile Health (mHealth)

Ganapathy and Rivandra (2008) describe mHealth as mobile computing, medical sensor, and communications technology for healthcare (p.6). Cameron (2009) defines m-health as the delivery of healthcare services via mobile communication devices such as cell phones and applications of m-health range from targeted text messages to promote healthy behaviour to wide-scale alerts about disease outbreaks (p.23). Cameron (2009) regards m-health as the use of mobile networks and devices in supporting e-care with emphasizes on leveraging health-focused applications such as the use of smartphones and short message services (SMS) by consumers and clinicians.

Mobile technology services have the potential of providing solutions to many health-related problems globally (Kay, Santos & Takane, 2011; Garcia-Gomez et al., 2014). There are various classifications of mHealth technology services and Deng et al. (2014) outline four types, namely: mHealth service for healthcare research where data is collected with portable wireless device; mHealth for healthcare professionals, where it is used for medical education and medical records keeping, mHealth for patient appointments, reminders, and treatment; and m-Health for the promotion of health, behaviour change and emergency care. All these services attest to the critical role m-Health technology can play towards enhancing healthcare delivery. Majerowicz and Tracy (2010), asserts that the emergence of ICT in health care can improve the way health care delivery is administered to patients. Hence, the need to access the internet has become increasingly important. This is where the use of mobile phones provides easy access to timely information. However, rural communities still lack the appropriate infrastructure to provide these online facilities.

2.1.5 Mobile Health Delivery in Ghana

In Ghana, there has been a surge in mobile phone use and mobile data subscription. According to the GSMA, (2014) mobile phone dispersion and use is paramount in Ghana‟s digital revolution. As developments in the health field increases, traditional ways of providing health care cannot be over emphasized. Ghana has made strides in applying m-Health to healthcare delivery. There are various reports of mHealth pilot interventions, particularly for telemedicine and mHealth (Grameen Foundation, 2015; GSMA, 2014; Novartis Foundation, 2014). However, there is a dearth of peer-reviewed literature on these projects. A review by Afarikumah (2014) identified 22 mHealth projects at various levels of implementation in Ghana. Twelve of these were mHealth projects designed for teleconsultation; data collection; and logistics and

supply chain management. The Mobile Technology for Community Health (MOTECH) project, a successful pilot in the Kassena-Nankana District, has been introduced in six districts in Ghana in order for an average of reaching 71,000 community members and 1,100 health staff (Grameen Foundation, 2015) to have access. Another mHealth project that has proven successful is the telemedicine project implemented as part of the Millennium Villages Project (MVP) (Novartis Foundation). This improved access to healthcare and developed capacity of community health extension workers has become an accessible human resource for health delivery.

Similar to Mobile Technology for Health (MOTECH) and other m-Health projects in the country, there is very little peer-reviewed literature on how technology could be used to provide healthcare. A few studies have focused on the data quality issues such as accuracy and completeness of data as well as the benefits accrued from the implementation of mHealth (Adokiya, Awoonor-Williams, Barau, Beiersmann, & Mueller, 2015).

The implementation of mHealth projects has been made possible through the enabling policy environment created by the Ministry of Health and the Ghana Health Service. In 2005, the Health Sector ICT Policy and Strategy was launched as a roadmap to achieve the vision and goals of the Information Communication Technology for Accelerated Development (ICT4AD) policy (Ministry of Health, 2011). Subsequently, in 2012, a National eHealth Strategy was also launched to guide the use of ICT in bridging the human resource and infrastructure inequities in Ghana‟s health sector (Ministry of Health, 2011). These express the need to improve data collection, especially at the local level, using relevant ICT tools. There is also the emergent need

to introduce mHealth as a means of increasing access to healthcare delivery in remote communities (Adokiya et al., 2015).

As telecommunication markets become of age, mobile phones in Africa are moving from simple communication gadgets into electronic platforms that support and enhance the delivery of services. This has tilted the development pattern regarding mobile phones from a communication and coordination cost reduction tool to a life changing one (Aker et al., 2010). The increasing acceptance of mobile phones has spurred a considerable level of enthusiasm about its effect on the socio-economic development potentials of Africa.

According to Madon, Amaguru, Malecela and Michael (2014), the ability of countries and regions to be part of the digital media landscape is gradually being assumed to be a measure of economic development. Although mobile phone penetration has been phenomenal, its use has been low Majority of the people are stuck to the basic function of the mobile phone that is for that is making and receiving calls (Coleman, 2010).

Social scientists have attested that health information is not intermediated by technologies in a simple and straight forward way but always mediated in intricate and unpredictable ways (Bruno, 2015). The peculiarities of the African continent in terms of health technology diffusion is saddled with obstacles and hampering effective healthcare delivery including poor infrastructure and lack of health care professionals. Several needs are competing for less resources and this invariably limits the amount of resources available for investing in the health sector, and for the development of mHealth systems. Adoption and use of mHealth strategies in Africa

are largely directed at resource constrained areas and may not necessarily be on health.

The Korle Bu Teaching Hospital in Ghana has a daily outpatient attendance in excess of 1,500. Although it is a referral facility, most patients use it as their primary healthcare facility putting pressure on the already strained facility (Ghana Health Service, 2018). To address this challenge, a mobile medical expert system (mMES) that employs cloud computing and text messages was instituted. This required healthcare seekers to first register as users through the system, and interact with a medical doctor through the cloud by means of a mobile technology device. The medical doctor can then respond to the patient through the same means (GHS, 2018).

A study by Sambira (2013) also revealed that the use of text messages has also revolutionized the fight against counterfeit drugs. A Ghanaian technology company mPedigree which partners governments in Africa and drug manufacturers; empowers final consumers of drugs to check the authenticity of drugs. It was put in place as a system that allows genuine drug producing companies to put unique codes on their packaging. Consumers simply text these unique codes to a company that maintains the system for free. Consumers are then informed instantly whether the drug is genuine or not. These are some of the e-health means and strategies to solve the numerous health challenges facing Ghana, even in the urban areas.

2.1.6 Mobile Health in Africa

There are a number of public health challenges affecting healthcare institutions, especially in developing economies. These include the spread of HIV/AIDS, cholera, inability to avoid malnutrition, malaria and outbreak of epidemics; high maternal mortality rate, inadequate trained healthcare personnel in rural communities; and

uneasy access to quality healthcare facilities (Trevor et al., 2012). However, mobile technology services have the potential of providing solutions to many health-related challenges globally (Kay, Santos & Takane, 2011; Akter & Ray, 2010a; West, 2012 & Garcia-Gomez et al., 2014) including decreasing maternal mortality and morbidity. More than three-quarters of the world‟s 5.3 billion mobile phones are found in the developing world (USAID, 2012). This provides an increasingly powerful opportunity for mobile phones to be used in the public health of developing countries. M-health capitalizes on the mobile phone‟s core utility of voice and SMS as well as more complex functionalities and applications including General Packet Radio Service (GPRS), third and fourth generation mobile telecommunications (3G and 4G systems), Global Positioning System (GPS), and Bluetooth technology to improve public health outcomes (Marshall, Lewis, & Whittaker, 2013).

A number of countries have embraced the global phenomenon of using mHealth interventions (Marshall, Lewis, & Whittaker, 2013). The United States Agency for International Development (USAID, 2012) reported in their mHealth Compendium, that while South East Asia reported a massive use in mHealth initiatives, Africa reported the fewest initiatives (Marshall, Lewis, & Whittaker, 2013). However, it is important to note that though fewer Africa countries reported m-health initiatives, it is possible that there could be smaller implementations by non-governmental organizations and individuals that have not yet received global recognition.

Due to the pervasiveness of mobile phones, a number of studies have tested and determined the feasibility of their use as tools to educate health workers on guidelines and protocols certain diseases and medical conditions such as the prevention of malaria and HIV/AIDS. The education has mostly been on mobile health applications

on voice and text messages (SMS) and data access which are unidirectional, bidirectional or omnidirectional (Kallander et al., 2013b). Text messaging or SMS was noted to have been the most predominant m-Health application in use (Kallander et al., 2013b). This is mostly because every mobile phone has text messaging capability and this makes it a relatively cheap tool for data collection or disseminating health information with little expertise. Text messages have been used to send reminders for medication) in some parts of Kenya (Otieno et al., 2014). Zurovac et al (2011) studied the effect of mobile phone text-message reminders by health workers for malaria treatment in Kenya and conclude that the application help patients in following their drug regiment which led to high improvement in the treatment. Otieno et al (2014) also conducted a study on the feasibility, patterns of use and acceptability of mobile phone text-messaging to improve the treatment of children with complicated malaria cases in western Kenya. The study showed that, text messaging was very helpful to mothers in administering the medication which prevented the children from relapsing. It is clear that all above the mentioned studies focused on the texting feature in mobile phones application to patient‟s health at various levels and study sites.

Other studies have also considered the feasibility of mobile phones as data collection tools for health professionals and low-cadre health workers. Vélez, Okyere, Kanter, and Bakken (2013) studied rural midwives and use of mHealth prototypes, and user-centered design methods for patient care and concluded that, it helps both rural midwives and users in minimising complications associated birth deliveries. Other studies have reported on the feasibility of SMS for reporting routine and non-routine health information. For instance, Stanton et al (2015) examined how community health volunteers (CHVs) and health surveillance assistants (HSA), used mobile

phone to report cases of hydrocele and lymphoedema in different communities in Ghana and Malawi. It concluded that CHVs and HSAs were able to submit reports on cases of hydrocele and lymphedema successfully with minimal errors.

Different cadres of health workers have been engaged in m-Health studies with most of them being formal health workers with professional training (Rajput et al., 2012). However, minimal studies have engaged non-professionally trained health workers such as community health volunteers in Kenya. CHV play a mediating role between the health system and their communities, providing maternal and child health services, mass drug distribution, health promotion activities and others (Alam, Khan, & Walker, 2012; Gallo et al., 2013). They usually have varied levels of literacy with most of them having a minimum of primary school education (Acharya, Singh, Adhikari, & Jain (2016). Madon, Amaguru, Malecela, and Michael (2014) engaged VHWs to collect data during the annual NTD MDA in Tanzania while Stanton et al (2015) also worked with CHVs to submit data on lymphoedema and hydrocele cases from the community. Perosky et al (2015) engaged certified midwives and traditional midwives to collect data on pregnancies in rural Liberia. There were differences in data submitted by the two groups, with formally trained highly literate health workers producing better output. Since these volunteer health workers generate the data at the community level, most studies look to them as the key actors in improving data capture at the community level with mHealth tools.

Six initiatives were found to be used in remote data collection in Africa. These initiatives included the Dokoza system which uses SMS to fast-track and improve critical services to HIV/AIDS and Tuberculosis patients through efficient data collection systems in South Africa (Lagerwerf & Boer, 2009). The rest are the

EpiHandy initiative which is used to collect epidemiologic data in Uganda, Mozambique and Burkina Faso. Outcomes of the EpiHandy initiative revealed significant reduction in data entry errors, broad user acceptance, and cost effectiveness relative to traditional paper-based data collection techniques (Engebretsen, 2005). Integrated Healthcare Information Service through Mobile Telephony (IHISM) is an initiative implemented in Botswana which remotely collect data and also provides useful health information on HIV/AIDs via SMS (Anderson et al., 2007) while the TRACnet initiative in Rwanda is a comprehensive data entry, storage, access, and sharing system used to manage critical information on HIV/AIDS patients and monitoring anti-retroviral treatment (ART) programs nationally (Binagwaho et al., 2013). The rest of the initiatives reported are the Pocket Digital Assistant (PDAs) for Malaria Monitoring initiative in Mozambique; and EpiSurveyor used in Kenya, Uganda and Zambia (Smertnik, 2012).

Three initiatives were found in this category. Therapeutic and Public Health use by Front Line Healthcare Workers was implemented in Mozambique to provide Mozambican health workers with diagnostic and analytical tools including reference material in the mobile phone‟s memory, a calculator for determining drug dosage, and a program for analyzing inputs from medical sensors (e.g., low-cost pulse oximeter probes or a simple electrocardiogram). Finally, Mobile E-IMCI was implemented in Tanzania to provide guide to health workers through the IMCI process with step-by-step instructions (DeRenzi et al., 2008; Swendeman & Rotheram-Borus, 2010).

It is however important to state that even though mobile health comes with enormous benefits, but it is without challenges. The implementation of healthcare technology is not so easy to implement. Clearly, if technology has reached its full latent in this

arena, there must be some obstacles to its deployment. Perhaps the largest current barrier is a lack of standards. Hospitals are afraid to commit to investing in specific technologies for fear that they may someday grow old-fashioned and not be interoperable with what is in use by the majority of hospitals.

The ubiquitous nature of mobile phones has made them sought-after tools in developing countries. However, poor network signals have been the bane of a number of mHealth studies conducted in the rural areas. This means data packets can be dropped in transmission or data submitters would have to wait till signals with reasonable strength are received before attempting a submission.

It was also noted that the size of the phone, its screen size and keyboard are challenges for some study participants. The small form factor of phones used in the MVP project in Ghana affected data entry by the midwives (Vélez et al., 2013). They complained that the size of the phone made it difficult to press the right buttons read the keypad and select numbers using the function keys and so this study used both a QWERTY phone and touchscreen phone and midwives had better ease of use with the touchscreen phones.

2.1.7 Over View of Maternal Health and Healthcare Delivery in Ghana

Maternal health is the health of women during pregnancy, childbirth and the postpartum period. Maternal health care services include antenatal care (ANC), delivery care and postnatal care (PNC) services (WHO, 2016). Maternal mortality is defined as deaths occurring in women, while pregnant or within 42 days of termination of pregnancy irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (WHO, 2016). Maternal healthcare has been a global

concern so that the lives of millions of women in their reproductive age can be saved through maternal health care services. Despite efforts that have been made to strengthen maternal health care services, maternal mortality is still high in most of the developing countries (Gyimah, Takyi & Addai, 2006). Every day, approximately 800 women die from preventable causes related to pregnancy and childbirth and 99% of all maternal deaths occur in developing countries (WHO, 2016). Though the causes of maternal deaths are numerous and vary from place to place depending on various factors, the major ones are hemorrhage (mainly postpartum hemorrhage), hypertension and sepsis (WHO, 2016). The large number of maternal mortalities, especially in developing countries has been due to low level of maternal health care seeking behaviour. The low proportion of antenatal care compounded by the extremely low skilled person attended delivery might be some of the major reasons for the high maternal mortality persisting during the last decade (Berhan, 2014). Maternal health is a major challenge in most developing countries, including Ghana.

Maternal health care service has been among the most important interventions to decrease maternal morbidity and mortality. Because of this fact, Ghana has given a special consideration to it in the last two decades. Maternal health is among the six priority areas in the reproductive health strategy of the country. Studies conducted in Ghana shows the increment of women who are getting maternal health care services from time to time. However, the maternal health care seeking behaviour of women is still low. In Ghana, one explanation for poor health outcomes among women is the non-availability of health personnel and proximity in accessing health facilities and health care service by a great proportion of women in the country and therefore only 13% of women in Ghana receive antenatal, delivery care from health professionals and postnatal care, respectively (Gyimah et al, 2006).

Maternal mortality remains a challenge in providing quality maternal and other reproductive healthcare services in Ghana. Maternal mortality continues to be a great concern with almost (99%) all maternal deaths occurring in developing countries with more than half in sub-Saharan Africa. 1 in 180 pregnant women die during childbirth when compared to 1 in 4,900 in developed countries. 75% of maternal deaths occur as a result of complications due to pregnancy and childbirth (WHO, 2016).

Ghana‟s maternal mortality ratio declined from 760 per 100,000 live births in 1990 to 319 per 100,000 live births in 2015 (WHO, 2016). The pace of decline in maternal mortality has been slow and this led to Ghana‟s inability to achieve the millennium development goal target of 190 per 100,000 live births in 2015. The maternal mortality ratio remains high and requires strenuous efforts if Ghana has to achieve the sustainable development goal target of 70 per 100,000 live births in 2030. Most maternal deaths occur in the rural areas as compared to urban areas. This has largely been attributed to the high prevalence of skilled birth attendance of 74% in urban areas as compared to 43% in the rural areas (Say et al., 2014). Several other factors have been implicated as major contributory factors to maternal deaths in Ghana. Low antenatal coverage, socio-cultural factors, lack of logistics, equipment, and blood at healthcare facilities has been largely blamed as reasons for high maternal mortality in Ghana (Oladapo et al., 2005; Say et al., 2014). It was observed that maternal deaths are usually directly related to causes, such as hemorrhage, unsafe abortion, hypertensive disorders, infections, and obstructed labor while indirect causes, include malaria, HIV/AIDS, and anemia (Oladapo et al., 2005; Say et al., 2014). Other factors, including poverty, lack of skilled health personnel, and poor transport system have contributed to the high maternal mortality ratio in Ghana (Adjei, 2016). This argument seems to be supported by the Thaddeus and Maine‟s framework which posit

that factors of this nature often result into one of the three delays; delay in making a decision to go to hospital, delay in arriving at the hospital, and a delay in getting treatment at a health facility which often lead to maternal mortality (Abor et al., 2011).

It is evident from the above discussion that, maternal health is one of the key components as far as Ghana‟s socio-economic development is concern and also a key indicator of the level of development in global ratings. Therefore, there is the urgent need to put in place the needed mechanisms such as the appropriation of mobile technology which is less expensive but can assist in reaching the ordinary Ghanaian in the remotest part of country in terms of accessing medical health care in meeting the health care needs of the people particularly the mothers.

2.1.8 Influence of CHPS on Accessing Maternal Healthcare

The healthcare system in Ghana is structured in five levels. The tertiary hospitals which are also teaching hospitals are at the apex of the healthcare delivery ladder. T1is is followed by the regional hospitals which provide specialist care for patients and also serve as referral points for district hospitals (Awoonor-Williams et al., 2013). The district hospital provides care at the district level and also serves as referral points for the sub-district facilities (facilities at the community level). The lowest facilities in the healthcare delivery ladder are the community clinics or community-based health planning and services (CHPS) (Awoonor-Williams et al., 2015). Although maternal mortality has been high in Ghana, several interventions have been implemented toward addressing the issue. The free maternal healthcare policy introduced has helped to reduce maternal mortality in the country; however, poverty prevented some women from accessing the free maternal healthcare (Asamoah et al., 2011). These

women were unable to access the free maternal healthcare because they could not afford the cost of transport to the nearest health facility (GSS, 2012). Other interventions, such as the Ghana Essential Health Intervention Program has contributed in reducing maternal deaths by strengthening the CHPS, which makes healthcare more accessible to the people especially in rural communities (Awoonor-Williams et al., 2015). Although many other interventions have been implemented at national, regional, and community levels to reduce maternal mortality, its high ratio still remains a major concern in Ghana (Lambon-Quayefio, 2014).

The objective of the CHPS initiative in Ghana is to ensure access to quality healthcare for all especially mothers and children who form the vulnerable part of many rural communities. To access means the ability to make use of the services rendered by the health facilities in times of need. The question that comes to mind is whether maternal and child health services are access to all mothers after the introduction of the CHPS in Ghana. Those who need health services most that is, women and children tend, to be the least able to gain the benefits and are frequently more harmed or ignored by the actual operations of the CHPS services as they are delivered (Awoonor-Williams et al., 2015).

Access to healthcare varies across space because of lack of healthcare providers and consumers (spatial factors); it also varies among population groups because of their different socio-economic and demographic characteristics (non-spatial factors). Accordingly, spatial access emphasizes the importance of geographic barriers (distance or time) between consumer and provider, whereas non-spatial access stresses non-geographic barriers or facilitators such as social class, income, ethnicity, age, sex, among others (Joseph & Phillips, 2004).

Since the 1960s, health policy makers have attempted to improve maternal healthcare by considering aspects of both spatial and non-spatial factors (Meade and Erickson, 2000). Such efforts are exemplified in designations of Health Professional Shortage Areas (HPSA) and Medically Underserved Areas or Populations (MUA/P) by the US Department of Health and Human Services (DHHS). In Ghana, these medically underserved areas are the places where CHPS facilities are located to help improve the access and quality of maternal healthcare (Alhassan et al., 2013).

2.2 Theoretical Framework

Littlejohn and Foss (2009) define theory as a unified or coherent body of propositions that provide a philosophically consistent picture of a subject. They argue that theories reduce complex experience into a manageable set of concepts and propositions in order to make for easy understanding. Deo-Silas (2013) sees the relationship between theory and research as a transaction where the theory determines the data to be collected on one hand and how the research findings or data support or challenge the theory on the other. Thus, theories provide a framework or model to explain and make sense of data collected.

The current study seeks to examine how mobile phones are appropriated in the maternal health delivery processes at two CHPS compounds in the Effutu Municipality. Since the study is about mobile technology appropriation in the maternal health delivery process, the Technology Appropriation Model (TaM) has been used to explain and contextualize findings arising out of the research.

2.2.1 Technology Appropriation Model (TaM)

The analysis of the study is underpinned by the Technology Appropriation Model (TaM) by Carroll et al.,2001; Bar, Pisani & Weber, 2007). The model posits that, appropriation refers to cultural learning or the application of cultural tools for specific purposes. The Appropriation of technology is a subjective social activity where people not merely be seen as malleable subjects who can be dictated to by technology (Overdijk, & Diggelen, 2006). This indicates that people may reject technology, redefine their functional purposes, and customize or invest symbolic meanings to it. Appropriation does not specifically relate to the features of the technology but the structures a technology brings or alters as they engage with it. Wertsch (1998) describes appropriation as the act of taking something that belong another or purpose and making it your own. In this sense, the mobile technology which is designed to perform the function of making and receiving calls is appropriated by health experts as essential for promoting healthcare at all levels. Health professionals therefore go beyond their traditional usage of using the mobile phone technology, create WhatsApp platforms to engage clients, send voice messages, make video calls, share health information and other useful applications such as pregnancy tracking devices to clients.

This model was birthed from the socio-cultural theory. In the socio-cultural field, appropriation refers to cultural learning, or the application of cultural tools (Overdijk & van Diggelen, 2006). Wertsch (1998) describes appropriation as the act of taking something that belongs to another and making it your own. In the field of technology, MacKay and Gillespie (1992, p.698) posit that appropriation of technology is a subjective social activity because “people are not merely malleable subjects who submit to the dictates of a technology, they are active, creative and expressive –albeit

socially situated – subjects". The scholars note that innovations are not always a linear process, since people may reject technologies, redefine their functional purpose, customize or even invest symbolic meanings to them. In their view, appropriation does not specifically relate to the features of a technology, but the structures a technology brings or alters as individuals engage with it.

Overdijk and Diggelen (2006) argue that appropriation of a technology simultaneously transforms the user and technology. It does not only cause change in the knowledge and skill of the user, but it also causes change in the properties of the technology. Thus, central to the concept of appropriation is a mutual shaping. Overdijk and Diggelen (2006) contend that the concept implies a process of social construction in which the actions and thoughts of the technology users are shaped through the use of the technology, while at the same time the meaning and effects of the technology are shaped through the users" actions.

Sey (2011) gives quite a broad definition of appropriation when she contends that the user appropriation of technology may not only lead to dramatic or mild deviations from the original purpose of the technology and bring about significant structural change to the technology itself but may also change the way the organisation or the individual operates. Thus, technology appropriation, in her view, is a two-way affair.

Bar, Pisani and Weber (2007) also argue that technology appropriation occurs when users take full advantage of features provided by technology designers. They argue that technology embodies two components: structural features and spirit. Structural features are the types of rules, resources, and capabilities the system offers such as how restrictive, sophisticated, or comprehensive it is. The spirit of a technology refers

to the values and goals underlying the structural features, such as what types of uses are considered proper or not (DeSanctis & Poole, 1994 cited in Sey, 2011).

DeSanctis and Poole (1994) identify four aspects of technology appropriation. Appropriation moves refers to the particular ways in which a group chooses to appropriate a structural feature; for example, to use it directly or in relation to other structures. Faithfulness or unfaithfulness reflects whether the user adheres to or deviates from the structural features and spirit of the technology. Instrumentality of use describes the purpose for which the technology is used, for example, to manage communications or to exercise power. Attitudes, on the other hand, refer to the users‟ approach to the technology. This includes users‟ confidence level in technology, perception of its value, and willingness to excel at using it.

2.2.2 Relevance of TaM to Current Study

The Technology Appropriation Model (TaM) has been used in various studies to explain how the mobile phone can use to solving maternal health issues in the quest to reduce maternal mortality. In his study, West examined how mobile technology could be used to improve maternal health and fight Ebola. West (2015) explained and conceptualise how mobile technology are used in improving maternal health and fight Ebola in Nigeria.

West (2015) argues that, there are a number of ways in advanced mobile technologies can help improve maternal care and aid in reducing infant mortality. They can strengthen training of medical workers by providing access to accurate and current information regarding health conditions and treatment as well as the latest ideas on treating particular problems. Having this access allows frontline health workers to

handle various illnesses and understand where to go when they require additional health care information.

Further to the above, he indicated that mobile devices can empower patients. Individual will no longer need to visit doctors‟ offices to be reminded to take their medication. Instead, mobile devices allow patients to receive personal reminders via an automated phone calls or text messages (West, 2015 p.3).

Following from West‟s (2015) study, it is important to examine how mobile technology is appropriated in maternal health delivery process. Based on the attributes of the technology appropriation model, they study will investigate the extent to which CHPS compounds utilize the structural features of mobile phones. The rationale is to help provide a conceptual grounding for the application and use of mobile phone technology in improving maternal health care delivery in the evolving technological age.

2.3 Summary of Chapter

This chapter has reviewed related works on technology appropriation and maternal health care delivery with much of the literature coming from the other parts of the world. From the available literature, there appears to be a number of policies and programmes regarding the appropriation of mobile phone in the general health delivery process. However, the debate has been as to whether the appropriation of mobile technology in the maternal health delivery can improve maternal health or not, outcomes thereby reducing maternal deaths. Thus, meeting the target set under the SDGs in less and middle income economies particularly in Ghana. The next chapter discusses the data collection methodology and analysis plan.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter discusses the methodology of this study. It highlights discussions on the research approach, research design, population, sampling and sample size data collection procedures, and the data analysis plan. The chapter also presents ethical considerations of the data of the data collected as well as the criteria to check the trustworthiness of the data.

3.1 Research Approach

The approach to this research incorporates philosophical assumptions as well as specific methods and procedures which translate the specific approach used into practice (Creswell, 2014). The study is thus, qualitative and draws cues from the interpretivist inductive school of thought and thereby positions it within the interpretive paradigm. This is to enable the researcher to reflect upon the broader epistemological and philosophical consequences from the participants‟ perspective (Patton, 2002).

Qualitative research is generally characterized by inductive approaches to knowledge building, which is aimed at generating meaning (Leavy, 2014). This approach thus, help to explore, investigate, and learn about social phenomenon with the view to unpacking meanings ascribe to activities, situations, events, or artifacts and to build a depth of understanding about some dimensions of social life (Leavy, 2014). In essence, the primary aim of the study and purpose is to explore, describe, and explain the phenomenon of technology appropriation in the delivery of healthcare in some selected deprived communities in the central region of Ghana.

3.2 Research Design

Research design is described as a strategy, plan or structure of conducting a research project (Creswell 2014). Creswell argues that the selection of a research design is mostly dependent on the nature of the research problem, the researcher‟s personal experiences and the participants of the study. Hence, the choice and adoption of the case study design. With this knowledge, the design for this study is a case study. This is an enquiry which the researcher develops an in-depth analysis of a case, often a programme, event, activity, process. It also explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time (Creswell, 2014). It involves a detailed, in-depth data collection from multiple sources of information (observations, interviews, audiovisual materials, documents and reports) and reports on case themes (Creswell, 2014 p. 97). A case study is one of the several ways of doing qualitative research because its enables researchers to understand humans in social context by interpreting their actions as either a group, community or event (Creswell, 2014).

Yin (2009) also indicates that, a case study facilitates thorough investigation in a real-life contemporary phenomenon in its natural context. In consonance with Yin‟s (2009) assertion, adopting the case study became the most relevant option for this study on the use of technology in the contemporary era. Moreover, the issue of maternal health and mortality although has been in existence for many years, it is prevalent and global leaders concerned with health are effortlessly looking at innovative ways to surmount this unfortunate phenomenon, especially in Africa, Asia and Ghana. A case study, again, according to Rowley (2002), is feasible when the focus of the study is to elicit data on the “why” and “how” a phenomenon is manifested in a particular setting. On the bases of Rowley‟s (2002) declaration, a

case study ideally suits the study because the intention is to investigate not only what midwives, expectant and postpartum mothers do to prevent maternal mortality but also why and how they appropriate technology to access healthcare.

Yin (2009) asserts that there are different types of cases that can be studied - single cases, single cases with embedded units, and multiple case studies. For the purpose of this research, the multiple case study will be used. Yin (2009) defines multiple case study as examining cases across multiple sites. A multiple case study allows the researcher to analyse within each setting and across settings. In a multiple case study, the researcher examines several cases to understand the similarities and differences between them (Yin, 2009). This study employed the multiple case study design because it examines the case of maternal health and how mobile phone are appropriated among midwives, expectant and postpartum mothers in two CHPS compounds within the Winneba municipality. It is important to state, that this study is a multiple case study because attention was paid to specificities and the variances within each case (CHPS compounds) in order to bring out the relevant issues peculiar to each of them. This involves the selection of several events or situations to show different perspectives of the issue. The current study, thus, examines the appropriation of mobile phones among health personnel, expectant and postpartum mothers in the promotion of maternal health in two different CHPS compounds with different health personnel with varied work experiences across the two settings.

3.3 Population

Creswell (2013) define population as all the elements that meet the criteria for inclusion in a study. Creswell asserts that the eligibility criteria should include "a list of characteristics that are required for the membership in the target population" (p.35). The issue of eligibility criteria appears to dovetail into the study"s target population as postulated by Nworgu (2006). The target population includes all the members of a group whom the research is targeting or related to. This is to gain in-depth understanding of the phenomenon as posit by Yin (2012). Thus, the members of the population are required to meet certain eligibility criteria in order to be considered for the study. Based on this, the population for the current study comprises all heads of the two CHPS compounds (Health Personnel/midwife), all expectant and postpartum mothers, who own and use smart phones, who also visit these facilities in the Effutu Municipality and were willing to take part in the study.

3.4 The Site

Community-Based Health Planning and Services (CHPS) is a Ghana Health Service national strategy to deliver essential community-based health services involving health planning and service delivery within the communities. Its primary focus is to provide healthcare support services to communities in deprived sub-districts and thereby, bring healthcare services closer to such communities (GHS, 2012). Within the Effutu municipality are a number of CHPS compounds. However, the Ansaful and Gyangyandze CHPS compounds were selected for this study due to their proximity to the researcher and usefulness to the municipality. The Ansaful CHPS compound is approximately 5 kilometres to the Winneba Municipal hospital and about 3 kilometres to the Trauma Specialist Hospital (Central Regional Hospital). The Ansaful CHPS

compound serves communities such as Ansaful, Asebu, Pomadze and New Winneba. The population of this community is about 1000 (Ghana Statistical Service, 2012). The Gyangyandze CHPS compound is approximately 8 kilometres to the Winneba Municipal Hospital and about 10 kilometers to the Trauma Specialist Hospital (Central Regional Hospital) with a population of about 700 (GSS, 2012). It serves people within communities such as Gyangyandze, Nsuoakyir, Gyahadze, and Woara Beba.

3.5 Sampling and Sample Size

Daymon and Holloway (2011) describe sampling strategy as a decision on what data to access and the particular place or site the data could be accessed in order to achieve some targeted objectives for a study. They purport that, qualitative research sampling is often purposeful. Thus, any data to be sampled for a qualitative study is directly based on their direct relationship to the purpose of the work. Therefore, in order to achieve set objectives for this study, the purposive sampling strategy was employed. Patton (2002) describes the purposive sampling as a process where participants, settings and other sampling units are selected on the basis of some criteria of interest to the researcher. The purposive sampling allowed the selection of the participants, the site and sampling units in relation to the participants‟ knowledge on the subject of discussion, as well as their experiences on the phenomenon under investigation.

The overriding interest and motivation for investigating the appropriation of mobile phones by expectant and postpartum mothers and health officers was key to the selection process because these people have used and experienced the technology and therefore could give in-depth and rich information on their experiences. This is in line with Lindlof and Taylor (2002), that “an intelligent sampling strategy enables

researchers to make systematic contact with communicative phenomena with a minimum wasted effort" (p.120).

Daymon and Holloway (2011) indicate that with qualitative studies the sample size does not necessarily determine the quality of the study and could be determined by the researcher but to have an in-depth coverage of the phenomena being studied. Creswell (2013) argue that it is better to retain depth of a data collection rather than breadth in terms of sample size.

A sample size of 10 participants was selected for the study. This number agreed to participate after completing the recruitment membership form. The sample consist of two (2) health personnel of the CHPS compounds (head), one each from the two CHPS compound, four (4) expectant mothers, two (2) each from the two CHPS compound and four (4) postpartum mothers, two (2) each from the two CHPS compound. A recruitment form was given to the nurses at the out-patient unit to explain to mothers the rationale behind the study so they could indicate their interest. It also provided an opportunity for participants to indicate the place which is more convenient for the interview to be carried out. This sample size provided an opportunity to easily record participants" responses to the phenomena. It also helped to gather in-depth knowledge on the phenomenon under study for the purposes of rich thick descriptions and interpretations.

3.6 Instrument

The researcher used interview as the instrument for the collection of data. According to Brinkmann (2013), humans are naturally conversational, and an informal interview allows participants to be forth coming with information in a conversational non-formal setting. Just as Lindlof and Taylor (2002) indicated, interviews are key

features of qualitative research because they help to understand the social actors‟ experiences and perspectives through stories, accounts and explanations they present. Fetterman (2010) views interviews as the most important data-gathering method. This instrument was used basically to gather responses for my research questions which focused on how mobile phone technology is appropriated for providing maternal healthcare delivery at two CHPS compounds in the Effutu Municipality. Most importantly, the interviews gave the opportunity to ascertain the rationale behind the appropriation of mobile phone in the maternal healthcare delivery process.

Creswell (2014) defines interviews as conversations held face-to-face or telephone mediated between a researcher and a participant. Daymon and Holloway (2011) posit that interviews are a major source of data in qualitative research and also enable the researcher explore participants‟ perspectives and perceptions. Interviews are described as means to collaboratively extract information about people‟s feelings, intentions, experiences and ideas (Daymon & Holloway, 2011). Braun and Clarke (2013) further espouse that interviews are means of encouraging others to willingly articulate their interest and experiences.

Qualitative interviews are mostly categorized into three: structured, semi-structured and unstructured (Braun & Clarke, 2013; Daymon & Holloway, 2011). In this study, I used semi-structured interviews. According to Braun and Clarke (2013), this type of interview involves the use of prepared step-by-step questions. However, it is important to state that the researcher does not adhere to it dogmatically. In instances where it becomes extremely necessary, other questions were introduced. Accordingly, I chose to use the semi-structured interview because I sought to gain diverse opinions during the course of the interview and to provide an opportunity to follow-up on

interesting developments and to elaborate on various issues. Daymon and Holloway (2011) postulate that, structured interviews tend to be rigorous and therefore impede the flexibility that qualitative interviews seek. For that reason, I resorted to the use of semi-structure interviews so as to encourage different perspectives in the processes of all the interview sessions. As argued by Gubruim and Holstein (2002), semi-structured interviews with open ended questions allow for greater flexibility and freedom on the part of both interviewer and interviewees in terms of planning, implementing and organizing the interview content and questions. The interviews were unstructured and generally open-ended to elicit diverse viewpoints of the participants.

Also, the interview elicited narrative data that allowed me to investigate the view of the participants. This was to affirm Daymon and Holloway (2011) assertion that interviews conversations between partners that aim at having „in-depth information" about a certain topic or subject in order to subject it to varied interpretations and meanings. In view of these assertions, through the interview, I got to understand at first-hand how and why the participants appropriated mobile phone technology to access maternal healthcare services at the two CHPS compounds in the Effutu Municipality.

3.7 Procedure

Braun and Clarke (2013) opine that, the researcher must create a good rapport with the interviewee by way of introduction. I introduced myself and the reason behind the interview. I also briefed them on the form the interview was going to take and urged them to feel free to respond to the questions. Employing such rapport techniques created a favourable platform for health personnel of the CHPS facilities (midwives),

the expectant mothers and the postpartum mothers to articulate their opinions to aid the data collection. During the interview session, I professionally investigated the issue of technology appropriation and therefore, asked questions which would elicit the kind of data being sought.

The researcher began the interview by introducing himself to the participants to create a good rapport and also seeking their further consent. Reponses from these interviews were recorded with the researcher‟s palm sized note pad recorder and also took field notes. The interviews took place at the health facilities and sometimes outside of the facility depending on where the participants decided. The face-to-face format was adopted for all the interviews. Each of the interviews lasted between twenty-five (25) to thirty (30) minutes. The socio-demographic characteristics of the interviewees such as age, ethnic background, religion, educational background, and profession were all taken into accounts since they could influence their decision to appropriate technology. For instance, whereas the senior secondary graduates in the sample were tech savvy and adept as using the mobile phone for different purposes, the uneducated were tutored to use the WhatsApp application.

For flexibility and openness, all the interviews were conducted in English, Fante and Effutu. For those who were not proficient in English, they were interviewed in Fante and Effutu. These three languages were used because they are the languages spoken and well understood by the interviewees. The language enabled interviewees to speak in their dialect and also express their own thoughts and feelings. The questions asked were free from ambiguities since they were proofread by my supervisor. To ensure the anonymity of the interviewees, their identities were protected. Participants had the opportunity to freely seek clarifications on questions that were not properly

understood and further explanations were given. Sometimes, I paused where necessary in the event that the interviewee had to attend to some important matters and then continue. Again, participants were given the opportunity to bring on board new ideas useful to the discussion which were not necessarily in the interview guide.

3.8 Data Analysis Plan

According to Creswell (2013), data analysis could be both inductive and deductive to establish patterns or themes. Patton (2002) posits that qualitative analysis should transform data into findings. The data collected on the research questions were put into themes. I then adopted the thematic analysis method for developing the themes generated. According to Braun and Clarke (2013), thematic analysis is "a method for identifying, analysing, and reporting patterns (themes) within data. It minimally organises and describes your data set in (rich) detail" (p. 6). The inductive type of thematic data analysis where the researcher does not try to fit the data into any form of preconceived analysis or pre-existing coding frame (Braun & Clarke, 2013) was used for this study. I further interpreted the findings using concepts and theories to draw meanings from responses from the participants. Direct quotations were used to support the interpretations and discussions. In line with these assertions, the data analysis was done in order to draw patterns and themes from the data collected. The data from the interviews were analysed based on the research questions which emphasized; how the mobile phone technology was appropriated for providing maternal healthcare delivery at two CHPS compounds in the Effutu Municipality, and the perspectives of the users of the technology on maternal healthcare delivery at two CHPS compounds in the Effutu Municipality. Data collected were assembled and prepared, with the aim to have a clear view, description and understanding of what had been collected as argued by Flick (2013). Flick argues that qualitative data

analysis aims at describing issues in the field or a phenomenon into greater detail. Therefore, the data were read thoroughly, severally and repeatedly transcribed to identify descriptive issues. The data captured through the recordings on my Infinix Note 6 phone were transcribed to get the interview transcripts. This was achieved by continuously playing the tapes back and forth to familiarise with the data and immerse myself in the contents of the data to get the exact responses that were given by the interviewees during the interview session (Clarke & Braun, 2018). In a detailed manner, I described the identified issues and also ensured that in-depth and direct quotations or excerpts were used to support the detailed descriptions and discussions of the research questions. The analysis was done based on Sunday"s (n.d.) assertion of data analysis which states that the researcher moves away from the data that have been collected, into some form of explanation, understanding or interpretation of the people and situation under investigation. For easy analysis and interpretation, the data derived were simplified into several thematic units after a step-by-step process of analysing data as suggested by Clarke and Braun (2018).

First, the recorded interview data were transcribed verbatim into written text through a rigorous and thorough „orthographic" transcript. This activity seemed time-consuming, frustrating and sometimes boring but it provided another excellent opportunity for me to familiarize myself with the data (Creswell, 2014). In fact, according to Berg (2007), this should be considered as a key phase of data analysis within interpretative qualitative methodology and recognised as an interpretative act, where meanings are created, rather than seen as a mechanical way of putting.

I systematically worked through the entire data set, giving full and equal attention to each data item, and identified interesting aspects of the data items that may form the basis of repeated patterns (themes) across the data set. I initially identified the codes,

and then matched them with data extracts that demonstrated the codes. Consequently, all the data extracts were coded and collated together within each code by copying extracts of data from the individual transcripts.

Second, I familiarized myself with the data through iterative readings guided by some prior knowledge and analytic interests and thoughts. Through this, I engaged in immersion by repeated readings of the transcripts by searching for meanings, patterns and I subsequently commenced the process and coding processes and since my ideas and identification of possible patterns had been shaped from the readings. Again, aiming for a detailed analysis, I searched for the latent or semantic themes, and theoretically-driven information. Whilst doing this, I took notes and marked ideas for coding before attempting any further formal coding process.

3.9 Ethical Issues

Creswell (2014) asserts that in research it is unethical to enter into an organisation or social group to collect data without permission from the gate-keepers of the organisation. Permission was sought from the Municipal Health Directorate before conducting the interviews with the sampled staff of the facility. Kumar, (2005) posits that people make decisions to participate in a study depending on the quality of information they receive about the kind of information being sought. So, the rationale and objectives of the study were thoroughly explained to participants; how the research would be carried out; the nature of their participation; the time required; the kind of data to be collected; and how the data would be used and reported.

The right to privacy is crucial and important in research this according to Cohen et al. (2007) "the right to privacy" means that a everybody has the right to take part or not to take in the research, to answer questions or not to answer questions, to be

interviewed or not be interviewed, to have their home intruded or not to allow their homes to be intruded into, to answer telephone calls or emails or not, and to engage in private behaviour in their own private place without fear of being observed. Also, participants were informed that participation in the study was voluntary and may choose to opt out at any point if they so wish. Where consent was denied, the researcher did not insist but substitute with another health personnel or mother appropriately. Halai (2006) posits that a good research is a moral and ethical task and the researcher should be very knowledgeable in making sure that the interest of the study participants is not taking for granted in any way. This is because the protection of participants in any research is imperative (Cohen, 2007).

To ensure confidentiality and anonymity, all data, including tape-recordings, discussions were stored out of the reach of unauthorised persons. According to Kumar (2005) the researcher must ensure that no unauthorised persons have access to them. Identifiers such as participants‟ names, address and year of birth which could publicly disclose the identity were deleted from the report (Creswell, 2014). As suggested by Cohen et al., (2007, p. 64) the names and addresses of participants were not indicated in the report but replaced with codes to ensure anonymity.

3.10 Trustworthiness of Data

Lynham and Guba (2011) proclaimed that one of the most popular criteria for judging the quality of a study located within the interpretive-qualitative framework is trustworthiness criteria. Creswell (2014) also indicated that it is a means to determine whether the process to a finding is accurate from the standpoint of the researcher, the participant or the readers account.

Again, Anney (2014) contend, that trustworthiness of a research study is very important for ensuring the credibility of the study. Therefore, Anney (2014) recommends that qualitative researchers in their method of inquiry should employ the trustworthiness criteria of credibility, transferability, dependability and confirmability provided by Lincoln and Guba (2000). Bryman (2008) employs trustworthiness criteria to judge the quality of the studies, this, according to him enhances the researchers‟ ability to assess the accuracy of the findings as well as convince readers.

To ensure validity and reliability of data collected, data was collected from different sources which in this case were data from different participants for credibility and confirmability. This is referred to as participant triangulation or within triangulation (Bush 2002). In accordance with this, the study adopted the participant triangulation as a data collection method for triangulation purpose as argument for increasing the validity and trustworthiness of the findings.

3.11 Summary of Chapter

The chapter focused on the procedures and processes that would be employed to collect data for the research. The research adopted a qualitative approach anchored on a multiple case study design to elicit the views of midwives, expectant and postpartum mothers and how mobile phones are appropriated for maternal healthcare delivery services. Interviews were used in the collection of data from the field. Again, rationalization was given for each of the method used. Moreover, the research work was built on confidentiality, anonymity, beneficence and reciprocity, informed and voluntary consent. In sum, the chapter explicates research approach, research design, sampling technique and size, data collection method, data collection process, method of data analysis, ethical issues, the data site and trustworthiness.

CHAPTER FOUR

RESULTS/FINDINGS

4.0 Introduction

This chapter presents the discussions of findings from the data collected through interviews on technology appropriation and maternal healthcare delivery services in two CHPS compounds in the Effutu municipality. This chapter presents the findings of how the mobile phone technology has been appropriated to provide maternal healthcare from the point of view of expectant mothers, postpartum mothers and health personnel.

Table 1: Showing the type of respondent, the number of facilities and number of participant

S/N	Types of Respondent	Number of Participants from Facility 1	Number of Participants from Facility 2	Sub-Total
1	Health Personnel	1	1	2
2	Pregnant mothers	2	2	4
3	Postpartum mothers	2	2	4
	Grand Total			**10**

For the purposes of anonymity and confidentiality, the participants were represented with alphanumeric codes. The following were generated codes for each participant involved in the study. For example the CHPS compounds had F1P1HP (Facility 1, Participant 1, Health Personnel); F2P1HP (Facility 2, Participant 1, Health Personnel); F1P1PM (Facility 1, Participant 1, Pregnant mother); F1P2PM (Facility

1, Participant 2, Pregnant mother); F1P1PPM (Facility 1, Participant 1, Postpartum mother); F1P2PPM (Facility 1, Participant 2, Postpartum mother); F2P1PM (Facility 2, Participant 1, Pregnant mother); F2P2PM (Facility 1, Participant 2, pregnant mother) and F2P1PPM (Facility 2, Participant 1, Postpartum mother)and F2P2PPM (Facility 2, Participant 2, Postpartum mother). From the data, each research question was analysed accordingly.

4.2 RQ 1. How is mobile phone technology appropriated at two CHPS compounds in the Effutu municipality?

This research question sought to investigate how mobile phone technology is appropriated to provide maternal healthcare services. The world is dynamically changing due to the advancement in mobile technology. These days, it is almost impossible to avoid the presence of mobile applications or Mobile Apps (Asfahaanulah, 2008).

Asfahaanulah, (2008) internet technologies have shaped the way people form and share content through communication in so much so that social networks, which are very popular among the youth, are becoming prevalent by virtue of the ability of the technology to meet their needs. The numbers of people who join social networks, often defined as programs for interaction that provides opportunities for social feedback and support (Smertnik, 2012). The mobile technology has been integrated in the healthcare delivery processes especially in areas where accessibility is a problem and health facilities are far away as well as shortage in trained healthcare personnel (Vélez et al, 2013). The data collected therefore generated the following themes; use of WhatApp, use of voice messaging and use of video calls on how mobile phone technology is appropriated.

4.2.1 Use of WhatsApp

WhatsApp is a popular mobile application for providing instant messaging service on smartphones. It uses internet services to communicate different type of text and multimedia messages between users or groups. WhatsApp was founded by Jan Koum and Brian Acton who had previously spent 20 years at Yahoo. WhatsApp joined Facebook in 2014, but continues to operate as a separate app with a focus on building a messaging service that works fast and reliably anywhere in the world (Church & De Oliveira, 2013). Although there are a number of instant messaging applications on the mobile devices such as yahoo messenger, messenger lite on Facebook, the WhatsApp application is one of the most favoured mobile based applications. Church and de Oliveira (2013) emphasize that, WhatsApp has grown in popularity due to benefits such as, ability to send real-time messages to individuals or groups simultaneously, and privacy to information. More than two billion people in over 180 countries use WhatsApp to stay in touch. WhatsApp is free and offers simple, secure, reliable way of chatting in routine conversation among users (Church and de Oliveira, 2013). This was declared by one of the participant who claimed to prefer using the WhatsApp to access healthcare.

> *I must say that it is easy to download the App and very easy to use and moreover, it is free!! So as for me, I use WhatsApp a lot especially chatting with health personnel at the CHPS compound and among ourselves on our group platform. (F1P1PPM).*

From the excerpt, it shows that the health personnel, expectant mothers and postpartum mothers at the Ansaful CHPS compound use WhatsApp in the provision of maternal health care delivery in the municipality. From the interviews, it was

identified that WhatsApp is one of the commonest Apps used by respondents to interactions on health related matters. It was revealed that a group WhatsApp platform had been created for some of the patrons of the facility particularly, those with smart phones to interact among themselves especially and with the health personnel on regular basis. A respondent explicitly showed evidence of a conversation between herself and some health workers shown in Figure 3.

Figure 3: Engagements between a Health personnel and Client through WhatsApp

Source: Researcher"s field note (2020)

Figure 3 shows excerpts of one-on-one interactions on WhatsApp between an expectant mother and health personnel. The interaction shows an expectant mother reporting of some discomfort at night and the health personnel in turn, provide the

needed support to the expectant mother. This is a clear indication of how technology had been appropriated to benefit both the expectant mother and health personnel outside the regular hospital visit or doctor-patient in-person consultation.

This is what a respondent had to say about how she is able to reach the health personnel at the Ansaful CHPS compound at any time:

> *Yes, I use WhatsApp and not any other instant messaging app to interact with the widwife because it is easy to download and its current too, that is what everybody is using these days.*

Al Dahdah et al., (2015); Meigounpoory, Sajadi, and Danehzan, (2014) attest that, the use of mobile technology in healthcare delivery is a contemporary phenomenon but has contributed enormously towards healthcare delivery. This is in line with Bar, Pisani and Weber (2007) who postulated under the Technology Appropriation Model (TaM) which states that, technology appropriation occurs when users take full advantage of the features provided by a particular technology for their daily activities because of its flexibility and efficiency.

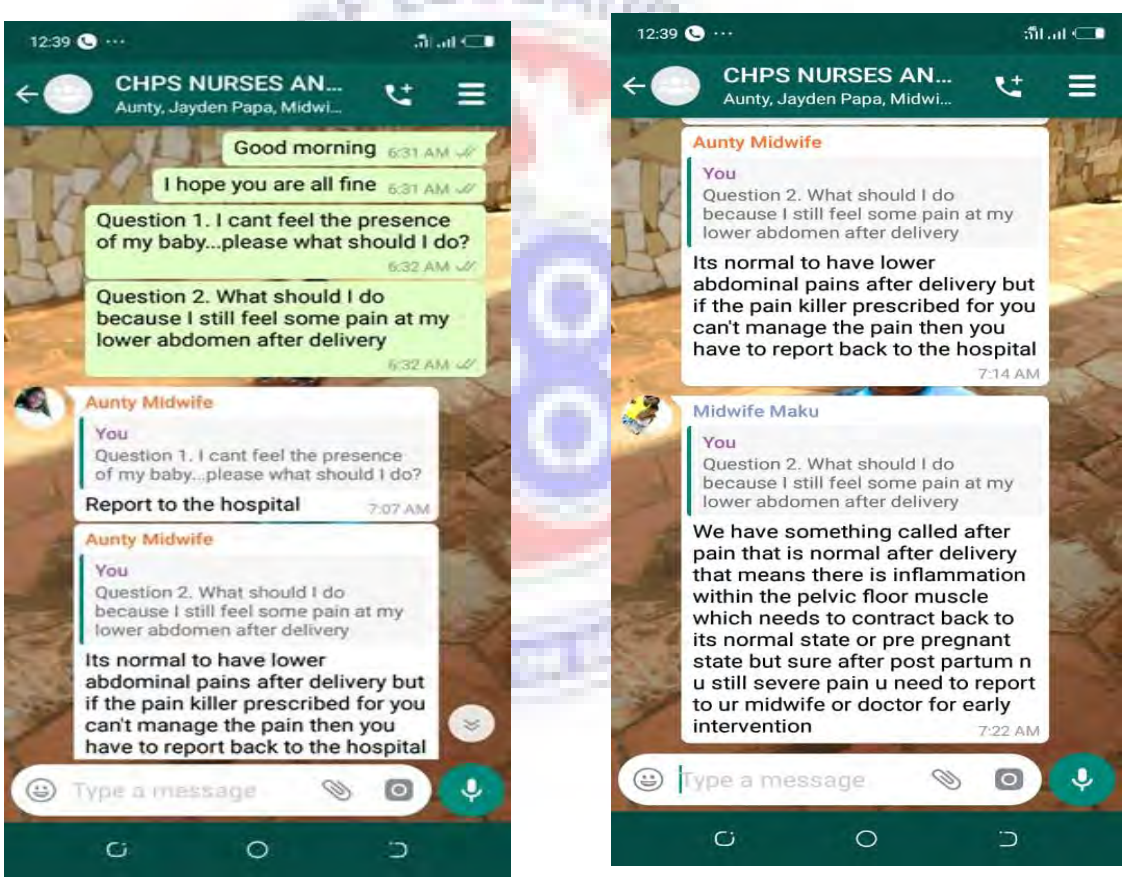
Apart from individual chats, it was also observed that there was a group platform called "CHPS Nurses and mothers" where health personnel, expectant mothers and postpartum mothers interact among themselves on maternal health issues. This was confirmed by a participant at the Gyangyandze CHPS compound and this is what she had to say:

> *We use WhatsApp to interact with our patients especially those that have smart phone and are IT savvy through our WhatsApp platform…*

we discuss, give useful information and solutions to issues on reproductive health and makes my work easier. (F1P1HP).

The assertion by the respondent above confirms what Payne et al. (2012) found among junior doctors and medical students owning smart phones in UK. It was found that 72.4% of junior doctors use apps during clinical activities. Smart phone apps increased their efficiency by saving time and allowed rapid „mobile" decision making.

Figure 4: WhatsApp Group platform for Health personnel and Clients



4a **4b**

Source: Researcher's field notes (2020)

Figure 4a and 4b show a discussion between a health personnel and a client on a WhatsApp platform called „CHPS nurses and mothers" at the Gyangyandze CHPS compound. It is evident from figure 4a that, the client was complaining of an unusual

abdominal pain and the health personnel provided the needed support. This shows how mobile phone technology has been appropriated so that health personnel attend to urgent maternal health needs of their client outside the health facility. This is in line with the declaration from another participant who indicated that:

> *Even after delivery at the facility, we interact with the nurses on our WhatsApp platform, there am able to report any unusual feeling and also receive reminders on my next post-natal visit. This helps some of us a lot because sometimes the pressure is serious and I sometimes forget mpo (F1P1PPM).*

4.2.2 Use of Voice Messaging

Voice messaging is a feature on WhatsApp that can be used to communicate either with a group or with just a single contact. Voice messaging have been used in handling other health issues and so can be used in the provision of maternal health care services such as to increase access to family planning information (Corker, 2010), tackle emergencies and complications during pregnancy (Ivatury, More & Block, 2009) and improve prenatal and postnatal care (Cormick et al., 2012).

Voice messaging is an instant communication technology in which messages are transmitted via voice media. Voice messaging is an alternative to voice calls or text messages. It stores voice messages in a voice mail, which can be accessed via a smart device or even a landline phone (Asfaque, Tharewal, Shaikh, Banu & Hannan, 2014). Some of the salient features of voice messaging include Web and phone service platforms, message tracking, simple message record or upload, automatic re-dialing and online list management. For businesses, voice messaging can offer considerable advantages and can be used for appointment reminders, recalls and dissemination of

information. It can also be used to improve customer service, to reach out to customers or provide them with customized information, or to reach a larger segment of the market (Asfaque et al., 2014).

The reason for the use of voice messaging at the Ansaful and Gyangyandze CHPS compounds was not different from the assertion of Rice and Shook (1990) that, voice messaging is clear and concise. Health personnel use voice messages to communicate with their clients‟ particularly expectant mothers and postpartum mothers and vice versa. This, according to the users, provides clearer description of whatever information is being sought. Voice messages are sent to expectant mothers and postpartum mothers as reminders to prenatal and postnatal care services respectively.

Below is a voice message discussion between a health personnel and a client.

Figure 5: Voice note between health personnel and Clients

Source: Researcher's field notes (2020)

Figure 5 shows a voice message explaining a WhatsApp message sent by health personnel at the Ansaful CHPS compound explaining the concept of a post-pregnancy abdominal pain or "after-pain" to a postpartum mother.

Mobile voice messaging is a less complex mobile facility which does not require any specialized technical knowledge to use (Asfaque et al., 2014). Moreover, the sender is able to articulate his or her views, suggestions or whatever information is needed to put across in a clear and concise manner which is also clearly received and well comprehended by the recipients. Further to the above, the messages are instantly received and the recipient is also able to give instant feedback where necessary. This is in tandem with what a participant also stated:

I like the use of voice message a lot because am able to express myself very well compared to the WhatsApp…I use WhatsApp though but I enjoy using the voice message, the mothers get exactly what I am communicating to them. (F2P1HP)

A feature of voice messaging, where messages are automatically recorded and played back as and when needed was also identified as useful for providing maternal healthcare services as espoused by Jover (2013). This was revealed by a respondent at the Ansaful CHPS compound where she indicated:

I like the voice messaging, especially when it is used during discussion on the group platform. I'm able to play back the issues discussed when I am not active on the platform. Also, for clarification purposes am able to play back over and over to listen and understand the issues very well and make meaningful contribution to the group (F2P2PPM).

4.2. 3. Use of Video Calls

This is also been appropriated through the use of the mobile phone in the healthcare delivery process because of its enormous benefits. It provides an opportunity for patient and clinicians at long distances to reach each other and provide care, advice, reminders, education, intervention, and monitoring. It allows immediate use of full two-way communication of content, verbal, and pictorial objects.

Video calls is a method of communicating between two or more locations in which sound, vision and data signals are conveyed electronically to enable simultaneous interactive communication (Denstadli, & Julsrud, 2012). This medium allows parties

involved to see the facial expressions and body language of the communicators (Denstadli, & Julsrud, 2012). The use of video is being hailed as advancement in electronic communication. Many companies are developing systems to support concepts such as virtual teams, telecommuting, and remote conferencing as communication and technology becomes deeply interrelated (Haynes, 2010). This is because it comes with a lot of benefits such as allowing for greater access to experts/specialists at the national and international level; more productive use of time by eliminating wasted travel time and significant travel cost savings; reduce environmental impact through less travel and reduce pressure, stress and fatigue from travel; facilitating short notice meetings between individuals in distant locations thus decisions can be made more quickly; increase meeting attendance by participants who would otherwise be unable to join in; greater accessibility and allows geographical reach even to rural or remote locations (Haynes, 2010).

Companies have seen the need to incorporate this medium of communication in their operations why not the healthcare delivery system. This is especially necessary for us a developing economy where there are inadequate health facilities, inadequate trained staff particularly in rural areas, where specialist medical help may not be available on hand (Alhassan et al, 2013). Therefore, linking-up on video call to a regional centre, cottage hospitals and clinics to receive help in diagnosing patients disorders is very relevant. This is what is known as telemedicine in medical circles Spiby et al., (2018). This is exactly in line with what one of the participant said:

> *Yes! we called it telemedicine, it's usually necessary to use video calls sometimes because CHPS have certain protocols within which we can operate, implying that there are certain medical conditions that are*

beyond us and would have to refer to a bigger facility for further investigation. However, sometimes there are some situations which are within the jurisdiction of our operations but may encounter a challenge in the process, then telemedicine becomes necessary. For instances, in situations like obstructed labour, the midwife calls for support or expert advice from the central regional hospital (Trauma and Specialist Hospital) through a video call is used (*F2P1HP).*

The respondent was however, quick to add that though the video call is very useful, but it is not without challenges and she said:

Sometimes, we are faced with the problem of poor network connectivity and with unclear video or blur video but in general it is not totally bad (F2P2HP).

This was in line with a study by Spiby, De Benedictis, Johnson, & Roberts (2018), both midwives and women admitted the usefulness of video call but indicated how frustrating it could be especially when there is poor signal which causes delays. Sey (2011) further asserts that, appropriation may change the way individuals or organizations operate. This is also true with the healthcare delivery process because normally for some medical conditions, the only solution would have been a referral; however, with the integration of technology in the healthcare delivery process, it has changed certain dynamics. This is how a respondent recounted such an instance:

Video audio recordings have been of immense help to us. Ordinarily, we would have prepared the patience for referral to a big facility especially when we are confronted with some complications during

delivery. But now we are able to make a video call for a doctor to see and then direct us. We have saved many lives through this medium. (F1P1HP).

Another participant said:

Had it not been the video call made by the nurses when I came to deliver, I'm sure I would have been dead by now. When I went to the clinic I had a complication. I saw the nurses contacting a doctor through a video call and explaining my situation. He observed my tummy and asked them questions. He directed them as to what to do. The doctor even spoke with me and encourages me to remain calm (F1P2PM).

Further to the above, this finding is also in line with the assertion of Bar, Pisani and Weber"s (2007) that Technology Appropriation Model (TaM) which stipulates that technology appropriation occurs when users take full advantage of features provided by technology designers. What this implies is that both health personnel and clients are making optimum use of mobile phone technology in the provision of healthcare services.

4.3 RQ 2. What are the perspectives of users of the appropriated mobile phone technology on maternal healthcare at the two CHPS compounds in the Effutu Municipality?

4.3.1 Introduction

Mobile phones have over a few decades revolutionalised how we communicate, interact, search for information, and even work (Jover, 2013). The development of smartphones with multitude of functions, increase memory capacity, speed and

constant connectedness to the internet has increased the time spent using the phone, implying a near ubiquitous usage (Jover, 2013). The use of phones to work has sprung to different facets of our economy and the health sector is not left out, specifically maternal health. This research question two of this study seeks to identify the perspectives of users of mobile technology on maternal healthcare delivery. The data therefore generated these themes: reduction in maternal mortality rates, user satisfaction, ease of payment, access to sharing of information, access to credible, poor connectivity and knowledge gap.

4.3.2 Reduction in Maternal Mortality Rates

The delay in accessing proper healthcare contributes to a high level of maternal mortality in Sub Saharan African countries since most health facilities are far away and therefore, making access to them a difficulty (WHO, 2015). Again, the delay in clinical decisions and the indifferent attitude of health personnel towards emergencies is noted to contribute to high maternal mortality figures in Ghana (Abor et al., 2011). According to the World Health Organisation (2013), one of the major causes of maternal deaths is the delay in accessing medical care for an obstetric emergency which is the third phase of delay. Hence, the appropriation of mobile technology which is perceived to have these benefits made it easier to contact patients, midwives and supervisors on time, increase efficiency due to the ability to coordinate visits, and if complications occurred assistance was only a call away.

From the data, it was observed that virtual consultation, ubiquity, accessibility, personalised nature, immediacy, interactivity and mobility nature of the mobile phone made it easier for patients to access healthcare. For instance, the selected CHPS compounds are equipped with basic tools to assist patient during critical situations. WhatsApp, voice messages or video calls are sent to emergency service providers

such as ambulance services and immediately they respond. Adequate and vivid description of the condition of the patient is given to the referral facility through a voice note or video call before the patient is transported. This allows for the health personnel to prepare mentally and materially awaiting the patient. Hence, work is efficiently and effectively delivered. A participant affirmed this observation and stated:

> *Indeed, it is helping us save lots of lives, technological advancement in the form of mobile phones has helped a lot. Undue delays have been minimized, with the use of mobile phone, action is taken in a quick manner with just the touch of a screen and instant feedback received. Again, experts are contacted to provide technical advice where necessary (F2P1HP.)*

This assertion by the participant was affirmed by Chib et al (2015) who stated that mobile phones improve the capacity of lesser trained health workers by connecting to better trained medical staff. It was further observed that the appropriation of mobile technology also aids in the arrangement and in the acquisition of drugs during emergency situations as well as in normal times. This affirms what a participant said:

> *We use the mobile to make request for drugs that are not in stock in our pharmacy by either sending WhatsApp message or voice message to our main pharmacy. We normally don't have all the drugs here. Again, in emergency situations, we send message to request for infusion and other drugs even before we get to our main pharmacy and this has helped in attending to patients as quickly as possible thereby reducing maternal death cases here. (F2P1HP)*

4.3.3 Ease of Payment

From the interview, it was clear that, mobile technology has been appropriated to perform online payments in these CHPS compounds. Mobile payment (MP) can be defined as „„payments for goods, services, and bills with a mobile device such as mobile phone etc. by taking advantage of wireless and other communication technologies (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008). A similar definition by Pousttchi (2008) highlights the initiation, authorization, or completion processes of payment via mobile communication techniques and devices. Mobile payment is considered as an important alternative method of payment to credit cards and cash. Mobile payment systems are expected to be a major tool in various transactions owing to the increasing popularity of mobile devices and rapidly emerging mobile commerce activities (Ondrus & Pigneur, 2006).

The use of mobile devices for buying products and services is becoming very common. According to Global Findex Database (2019), mobile devices accounted for 31% of e-commerce transactions in the U.S.A and 15% in Japan and South Korea. In the past few years, Africa has unprecedented growth of mobile financial services. In Ghana, the service has increase from 26%-51% from 2017-2019 (GFD, 2019). With the phone being handy, all that is needed is to have money on the mobile wallet. A participant alluded to this fact and stated that:

> *Ooh hmmm had it not been the mobile online registration and renewal of NHIS cards some mothers would have probably been denied access to healthcare or even pay for health services and purchased of drugs*

so it's good…some come without realising that their cards have expired but with this technological innovation we are able to renew instantly for them and then help them to access their drugs and its very simple. (F2P1HP)

Nchise et al. (2012) also assert that cost-incentive plays a major and influential role in consumers‟ access to health information through the use of mobile phones. The cheap and convenient nature of the service encourages many people to use it. This is confirmed by a participant and she declared that:

The online mobile transaction has helped a lot. It is cheap, when I was going to deliver; I didn't have any physical cash on me but with mobile phone I was able to pay for my drugs and it saved my life. (F2P2PM)

In a study by Health Finance and Governance (2015) which is in line with the above assertion by a participant, a not-for-profit, D-tree and Zantel‟s partnership in Zanzibar ensured that over 10,000 births occurred at a hospital instead of home. This was done by transferring money into the mobile wallets of pregnant women to attend hospitals. Through this health insurance premium, workers are paid through mobile money and medicines are easily purchased through the same medium.

4.3.4 User Satisfaction

Maintaining and providing customer satisfaction is one of the major challenges faced by many service industries (Parasuraman, Zeithaml, & Berry, 1988). Satisfaction is a person‟s „feeling of pleasure or disappointment resulting from comparing a product‟s perceived performance or outcome in relation to his or her expectations‟ (Kotler & Keller, 2012, p.10). Mahmood et al (2000) suggest that convenience, user background

and an organization‟s attitude and support constitute three elements that enhance user satisfaction in information technology and access. Again, Boadi et al (2007) also hold the view that, convenience, cost and communication also play a role in customer usage and satisfaction with mobile technology services.

The tendency for users to discontinue usage, complain and pass negative comments on mobile services is high, especially when monetary cost of usage is high (Zhou, 2011). Monetary cost is any transactions either direct or indirect with a monetary value implemented via a wireless telecommunication network (Wu & Wang, 2005, p. 2). Kim, Chan, & Gupta (2007) found that monetary cost such as user perceived fee to be a major hindrance to mobile service adoption. Similarly, Zhou (2011) and Boadi et al (2007) reveal that the satisfaction level and the desire to continue to using a particular service by consumers would be greatly enhanced. According to Sherri et al (2013), public health systems rely heavily on cash for payments for medical services; for salaries of healthcare workers, purchase of drugs at pharmacies etc. It is increasingly becoming evident that digital payments in rural, remote settings are safer, quicker and easier.

However, Deng, Lu, Wei, and Zhang (2010) hold the view that when a consumer finds true value for money in accessing services, they would be generally satisfied and continue to use the service. The participants consider the appropriation of mobile phone technology in the maternal healthcare delivery as less expensive and ease of use. This was declared in a statement by a participant:

> *The use of WhatsApp, voice or video call is very cheap and convenient… sometimes when I see any unusual signs on me or my baby I do a voice message to the midwife. She will then send me feedback. This is because my baby was born premature and I was*

advised to tie him to my belly but I didn't know how long I should do it. I sent a voice message to the nurse without going there and she assisted me. So, you can see that the ability to make the call saved the time of commuting from my home to the facility. I think it is inexpensive and easy to use (F2P1PPM)

This assertion from the participant affirms Aker and Mbiti (2010) assertions that the mobile phone has greatly reduced communication cost by allowing individual to send and obtain information quickly. Narteh (2015) argues that service convenience is one of the key elements with a strong impact on customer satisfaction in technology-enabled services. The assertion by Narteh (2015) on convenience of a technology which eventually leads to some satisfaction in its usage was affirmed by a participant when she said:

With my mobile phone, it is very convenient and easy to use. Irrespective of the time, am able to call and discuss any health issue concerning me with the midwife at any time of the day through WhatsApp (F2P2PPM).

Another participant also said:

With any of these WhatsApp, voice messaging or video call I'm able to interact with the midwife at any time of the day on whatever is bothering me on the pregnancy. At least am able to greet her every morning…you know…. my time will be due soon… she smiled said participant (F1P1PM).

Another element which contributes to the appropriation of mobile technology is its service quality and low cost. Health personnel, pregnant mothers and postpartum

mothers prefer to appropriate mobile technology because of its low-cost visa vie the satisfaction derived. They seem to have a higher satisfaction compared to the cost involved. Zhou (2011) asserts that users of a technology expect to receive quality services at low cost and otherwise their satisfaction level would be greatly influenced by the monetary cost of usage. This was in conformity with what a participant said:

> *I'm satisfied with the use of the appropriation of mobile technology in accessing health because it is very easy to use and cheap as well. With just one Ghana cedi bundle of data, I'm able to either send a WhatsApp message, voice note or even do a video call to the midwife on any issue bothering on my pregnancy compared to commuting to the facility (F2P1PM).*

The element of satisfaction was also reiterated by participant from the Ansaful CHPS compound and she said:

> *The satisfaction derived as health personnel, pregnant women and postpartum mothers with the use of WhatsApp, voice messaging or video calls are a lot. The reason for embracing the appropriation of mobile technology in the maternal healthcare delivery process in our facility (F2P1HP).*

4.3.5 Access to Information

Access to information on issue of maternal health was another crucial theme identified and relevant to promoting maternal health. O'Mara, Babacan, and Borland, (2010) assert that information sharing is a universal method of information acquisition which improves the general wellbeing of the individual. The WhatsApp platforms

created at the two selected CHPS compounds provide an opportunity for the sharing of information leading to education, awareness creation and the avoidance of unwanted behaviours. Health personnel, expectant and postpartum mothers who share health information among themselves through the appropriation of the mobile phone technology has contributed immensely to the general maternal well-being of mothers who patronized the Ansaful and Gyangyandze CHPS compounds. For instance, some participants were able to share their experiences on how they managed sleeplessness, pain and loss of weight on the WhatsApp group platforms of the participants. This was aptly affirmed by a participant who declared that:

> *Initially, I thought I was in this alone until someone on the platform talked about how she managed sleeplessness. She said, she used a pillow to support the tummy so that she could catch some sleep. This, to me, was useful information which was shared. I guess I could easily access this information because I am on the same platform (F2P2PM).*

Some participants also shared some useful information on nutrition and breastfeeding for members to access easily. These are usually sent in text, voice notes and its serve as a good source of information. This is how a participant had to describe this novel initiate:

> *We post a lot of things on the platform especially, pictures, videos or even texts on nutrition, diet, breastfeeding and others. We also receive feedback in the form of thumbs up or questions and we take advantage of it to educate ourselves. For instance, I shared some information on exclusive breastfeeding and to my surprise it generated a lot of questions and I took my time to explain (FIPIHP).*

This was also buttressed by a participant who said:

> *I have always believed that eating snails when pregnant could cause my baby to have watery mouth; I never knew it was a good source of protein that could be added to the number of foods recommended for pregnant women. Some information on snails which was posted on our platform changed my perspective (F2P2PM).*

This is in conformity with a study by Oyeyemi and Wyn (2014) that, the use of mobile phone provide users a platform to interact and broaden their knowledge, especially on culture-related issues on pregnancy and diet. The access, to information also enhances their confidence, self-esteem as well as the adoption of maternal best practices.

Communications through instant messaging based on modern platforms such as the Internet and cell phones has gained more and more ground in recent years (Ramirez et al., 2008). Communication through modern real-time devices showed that online deliberations via the internet-based messaging services are not necessarily inferior to face-to-face or over-the-phone deliberations (Min, 2007). Empirical studies (Min, 2007; Rice, 1993) comparing face-to-face and Internet-based instant messaging suggested that both online and face-to-face deliberations can increase participants' knowledge, efficacy, and willingness to participate in politics as well as social activities. It is perceived to be effective, easy to use and real. Using cell phone networks as the platform, is characterized as instant (almost real time in message delivery), cost-effective (very cheap in sending SMS locally and overseas), and ubiquitous communication tool (Markett et al., 2006). Most respondents view these as

the reason for appropriating mobile phone technology. Spot-on-information here according to the Merriam Webster means exactly correct, accurate, and precise. All the above mentioned ways of appropriating mobile phone technology such as WhatsApp, voice messaging and video call possess these characteristics. This was attested by a participant who said:

> *You see… the reason why I personally like using WhatsApp, voice call or video call is that I'm able to send the exact information either through pictures, voice note or even through a video call to our clients or to our big hospital. When we are sending the information to our big facility, the information is sent and received in the precise or exact manner (F2P1HP).*

Another participant stated that:

> *I send messages through WhatsApp, voice note or video to my midwife, when I want to discuss an issue with the midwife. She receives the message in a precise manner and so she is able to assist me (F2P2PM).*

This is in tandem with TaM which proposes that individuals or groups will develop interest in the appropriation of a particular technology when they have the confidence, perceptions, and willingness to use it and excel at using it. Again, when it is easy to use and give them the needed result at a cheap, convenient and reliable manner.

4.3.7 Poor Connectivity

A major challenge that was identified with the appropriation of mobile technology in the process of providing maternal healthcare services was poor connectivity for some of the users. The widespread ownership of cellular phones and corresponding wireless network infrastructure enable public health programs to leverage mobile health (mHealth) technologies, with a goal of improving healthcare monitoring and delivery in resource-limited settings via real-time communication across large catchment areas. Consequently, there has been an international effort to coordinate the design, testing, and implementation of novel health devices in low and middle-income countries (WHO, 2010 & 2011). Early successes from these technologies have included drug adherence monitoring (Haberer et al., 2010), strengthening of patient provider communication (Lester et al., 2010), and improved healthcare quality control (Pop-Eleches et al., 2011).

Notwithstanding some successful examples, few successful mHealth interventions have been described in the developing world. Gurman, Rubin, and Roess (2012); Cole-Lewis and Kershaw (2010) posit that a defining feature of mobile applications is reliance on cellular phone networks for transfer of information. A fluctuation in network availability in rural areas is a frequently reported challenge (Blaschke et al. (2009) and especially, limits the functionality of real-time monitoring systems (Ofomata & Groves 2009); Deglis, Suggs & Odermatt, 2012). A participant recounted an incident regarding poor connectivity and stated:

> *I recall one of the days when we were attending to an emergency, and receiving expert advice with a video call and suddenly the connectivity went off, it was really a difficult moment for us… but we managed to sail through*

with the little experience we have acquired but those are some of the challenges that come with technology (F2P2HP).

A regular patron of one of the CHPS compounds also asserted:

I like visiting the midwives than calling them for emergency services because of where I am staying now has poor connectivity making it difficult to reach the health personnel. For two days I was in so much pain that I kept getting in touch with the midwife but was unable to reach her. On the third day, I was rushed to the CHPS compound and immediately I gave birth, so you see sometimes the mobile phone can never really replace the face-to-face consultation and diagnosis because with that at least the midwives can see you and understand the problem (F2P2PP).

Poor telecommunication infrastructure is a major barrier, hindering the mothers especially from accessing healthcare and health information through their mobiles phones. The network within the municipality has improved over the years but there are still pockets of areas with challenges of accessing good network. Some women have shown their displeasure over the poor telecommunication infrastructure in some parts of the municipality. This was what a participant also indicated:

The network coverage is very poor, last month a mother lost her unborn baby because the network was so bad and they couldn't contact the doctor (F2P2PM).

This confirms study by Little et al (2014) found that poor mobile internet connection hampered the delivery of work of Health Extension Workers (HEWs) in Ethiopia..

4.3.8 Knowledge Gap

Another challenge identified with the appropriation of mobile phone appropriation in maternal healthcare services is the inability of some users to appropriate some of the features provided in the mobile phone. This was what a participant had to say in connect with the usage of some features:

> *It is easy to make or receive voice or video from the health personnel but my problem is with regard to the WhatsApp texting services. I cannot read and write so whenever they send a message to my phone in English and my children are not at home to read and translate it for me, then I find it hard to understand the messages ... I missed an appointment once because I did not understand the message on the phone informing me of a change in time until my children came back home to inform me (F2P2PP).*

Another participant aptly indicated:

> *This sometimes is a problem, there have been instances where important messages were sent to the women but only a few responded to it only to realize some could not operate from their phones and so couldn't access it (F2P2HP).*

This is affirmed by a study by Castle et al (2011) also revealed a negative disposition owing to low ICT skills by mothers using mobile phones. Similar revelations were made by Coleman et al (2015) which stated that, although mobile phone penetration has been phenomenal, its use has been low. Majority of the people are stuck to the basic function of the mobile phone that is for making and receiving calls.

4.4 Summary of Chapter

This chapter presented the findings and discussions of the research questions. The study sought to examine how mobile phone technology has been appropriated in two selected CHPS compounds as well as the perspectives of the end users which includes health personnel, expectant mothers and postpartum mothers in the maternal health care delivery service in the Effutu municipality.

The study found that mobile phone technology has been appropriated in several ways such as the use of WhatsApp, use of voice messages and use of video calls which are useful in enhancing the professional tasks of providing maternal healthcare services to clients who patronize the Ansaful and Gyangyandze CHPS compounds thereby tremendously assisting in reducing maternal mortality figures within the municipality. This finding is in line with Bar, Pisani and Weber‟s (2007) postulation under the Technology Appropriation Model (TaM) which stipulates that technology appropriation occurs when users take full advantage of the features provided by a particular technology for their daily or professional activities. It is important to state that even though the two facilities are located in different areas, there seem to be some similarities in the way they appropriate the mobile phone technology probably due to the fact that they operate under strict protocols provided by the Ghana Health Service which clearly spells out the limits within which they can operate.

It was further observed that the end users had their own perspectives on the appropriation of the mobile phone technology in the maternal healthcare delivery process. The following were some of the perspectives the user‟s on the appropriation of mobile phones reduction in maternal mortality rates, user satisfaction, ease of payment, access to sharing of information, access to credible information, poor

connectivity and knowledge gap. A clear indication that the appropriation of mobile phone technology could be one of the useful additional strategies to improving maternal health and a remedy to reducing maternal mortality figures, particularly in Ghana if fully utilised and the few challenges properly addressed. This intend will help in meeting the Sustainable Development Goal 3 of improving maternal health by reducing maternal mortality ratio to less than 70 per 100,000 by 2030.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter provides a recap of all the important issues that were raised in the study, draw conclusions and makes recommendations on how mobile phone technology has been appropriated in the maternal healthcare delivery services. The chapter captures the limitations of the study and also provides suggestions for further research.

5.1 Summary

This current research set out to investigate how mobile phone technology is appropriated in the maternal healthcare services specifically at two CHPS compounds in the Effutu municipality. The study was built around two main objectives which included how mobile phone technology has been appropriated in the maternal healthcare services, the perspectives of the end users of the mobile phone technology in providing maternal healthcare delivery service. The importance of the study was outlined as it will add up to the scant literature on mobile phone appropriation in the maternal healthcare delivery process and will serve as a stepping stone to future researchers who would delve more into the use of mobile phone in the healthcare delivery process in general.

The study was limited to only two CHPS compounds within the Effutu municipality which included the Ansaful CHPS compound and the Gyangyandze CHPS compound. The study further reviewed relevant literature health information, information sharing, mobile health in Africa, mobile health in Ghana, health and the use of mobile phone and global maternal healthcare. It also explains the theory of technology appropriation by Carroll et al, (2001); Bar, Pisani and Weber (2007).

A qualitative case study design was used and participants of the study were selected using the purposive sampling technique (Bernard, 2002). A semi-structured interview with open ended questions was carried out for 10 respondents to find out the perspectives on the phenomenon understudy. Basically, the research seeks to find out how technology in the form of mobile phone has been appropriated in the maternal health delivery process at some selected CHPS compounds in the Effutu municipality. The data collection method and instrument gave me the opportunity to delve deeper into the phenomenon in a natural setting. I thematically analysed the data (Clarke & Baurn, 2018). This allowed me to minimally organise and describe my data set in rich detail.

5.2 Conclusion

The study found that mobile phone technology has been appropriated in several ways such as WhatsApp, voice call and video call which are useful in enhancing the professional tasks of providing maternal healthcare services to clients who patronize the Ansaful and Gyangyandze CHPS compounds thereby tremendously assisting in reducing maternal mortality figures within the municipality. It is important to state that even though the two facilities are located in different areas, there seem to be some similarities in the way they appropriate the mobile phone technology probably due to the fact that they operate under strict protocols provided by the Ghana Health Service which clearly spells out the limits within which they can operate.

It was again observed that the end user had their perspectives on the appropriation of the mobile phone technology in the maternal healthcare delivery process. The following were some of the perspectives of the users on the appropriation of the mobile phone technology; reduction in maternal mortality rate, user satisfaction, easy

of payment, access to information and access to credible information as well as some few challenges such poor connectivity and knowledge gap.

A clear indication that the appropriation of mobile phone technology could be one of the useful additional strategies to improving maternal healthcare and a remedy to reducing maternal mortality figures, particularly in Ghana if fully utilised.

5.3 Limitations

The study set out to identify how mobile phone technology has been appropriated in the maternal healthcare delivery services and also the perspectives of the end users of the appropriated technology. Constraints such as distance and time was a challenge, because the CHPS facilities under study are at the outskirts of the municipality and had to commute severally within the period of study to collect data such as pictures and selecting the informants for the data collection.

Further to the above, there was a lot of difficulty in securing permit to enter any of health facility of the Ghana Health Service in the Effutu municipality. I wrote to the Municipal Health Directorate and they also forwarded the letter to the Regional Health Directorate in Cape coast where I had to follow up severally yet was unable to secure the permit and so therefore, I had to arrange with the mothers and health personnel (informants) to meet them at their own place which is convenient to them. So, I had to go to them one-by-one, some as far as Swedru to collect my data.

Getting the participants for the study was little challenging, sometimes, I arrange with them, fix a date and time only for me to go and meet their absence. Again, the idea of they even being recorded drew them back, even though I had made my made it known to them. I therefore, had 10 respondents for my interviews.

Also, the environment for the data collection was most of the time not too conducive for interaction. In that, usually the respondent will be engaged in her own house chaos or other things and so at some point we had to pulse for them to attend to whatever they may be doing before coming back to continue. This sometimes slows down the process and does not allow for the free flow of the discussion. Nevertheless, these limitations did not take away the credibility of the study as it has critical implications for further studies as well as recommendations.

5.4 Recommendations

From the data analyses and the discussions, the following recommendations are made. Health workers at CHPS facilities should be provided with mobile phone by the Ghana health service to improve their work. It was identified that most of the phones used at the various facilities were personal phones of staff and therefore can give room for excuses in very critical situations. To avoid this unpleasant situation, the ministry in collaboration with Ghana Health Service should make available such gadgets since it aids in the provision of good maternal healthcare services in the Effutu municipality.

Community members should be educated more on the need to deploy mobile phone technology as way of improving maternal health and therefore the need to embrace this new phenomenon and use it to their benefit thus helping to reduce maternal deaths in the municipality and the nation at large by improving timeliness in providing emergency patients service or referral to bigger health facilities to access emergency healthcare.

Efforts should be made to improve the quality of connectivity by service providers so as to be able to fully appropriation phone technology in the provision of maternal healthcare services.

The District Health Administration could lobby with the District Assembly to train more midwives and post them to the CHPS facilities to facilitate quality maternal healthcare delivery within the CHPS facilities. More experienced midwives should also be posted to the CHPS facilities because the current situation where most of the staff had only 1-5 years working experience could affect quality of maternal healthcare.

It is important to state that, to fully utilize electronic health through mobile phone, a lot needs to be done in terms of policy strengthening, education on the part of healthcare providers, general populace and investment in order to achieve the full potential of mHealth as its been effectively practiced in some advance countries.

In conclusion, the CHPS in the Effutu municipality have been identified as the first point of call to these communities in which they operate and majority of the community members are enjoying culturally acceptable and friendly services that are affordable. This has helped improved access to maternal healthcare services in the municipality especially with the appropriation of mobile technology in their service delivery.

Challenges associated with accessing quality maternal healthcare services in CHPS facilities within the municipality such as delays in commuting from home to the facilities, quick access health information, request for medicines and arrangement to referral facilities, all has been improved. It is therefore, incumbent on the Ministry of

Health and the Ghana Health Service to put in place measures to strengthen our health systems particularly maternal health through the use of mobile technology especially in remote communities since it is cheap, convenient and quick way of accessing health in communities in dire need of maternal health in order to meet the SDG 3 by 2030.

5.5 Suggestions for Further Studies

In view of the opportunities and challenges I had while reviewing literature and collecting data for the study, I make the following suggestions for future researchers.

A similar work can be done by taking a larger number of the CHPS facilities since this study was limited to only two CHPS compounds and extending the period of study in order to get enough time to reach out to a number of the end users of the mobile technology.

Again, studies could be carried out on technology appropriation, taking into consideration maternal and child health since there is a direct relationship between the mother‟s health and child health.

Mobile phone technology appropriation on maternal health can be extended to other levels of the health service hierarchy in public facilities such as clinics, hospitals. Also a comparative study could be conducted between private and public health facilities to identify the differences and similarities since they operate under different protocols though it is expected that they all adhere to the Ministry of Health and Ghana Health Service arrangement.

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UNIVERSITY OF EDUCATION, WINNEBA

DEPARTMENT OF COMMUNICATION AND MEDIA STUDIES

In-Depth Interview Guide

Health Officer (Midwife) appropriation of mobile phone for maternal healthcare

1. How do you appropriate mobile phone to provide healthcare services to the mothers?
2. What are some of the healthcare service that you provide through the use of the mobile phone?
3. How do the mothers respond to the use of the phones in the healthcare delivery process?
4. How often do the mothers appropriate mobile phone to request for health care services?
5. How has the appropriation of mobile phones contributed to the improvement of maternal health in your facility?
6. What are some of the issues that you consider to be challenges associated with the appropriation of the mobile phone providing healthcare to these mothers?

Expectant mothers appropriation of mobile phone technology for maternal healthcare

1. How do you appropriate mobile technology in accessing maternal healthcare?

   WhatsApp [ ] Video Calls [ ] Voice note [ ] Facebook [ ] Health information [ ]
2. How do you interact among yourselves and the health personnel through mobile appropriation?

3. How often do you seek healthcare from healthcare provider through the appropriation of mobile phone?
4. How fast do healthcare providers respond to your request when you engage them the mobile phone?
5. How often do health officers respond to your healthcare needs when you request for any health care or health care information?
6. How helpful has it been since you started engaging healthcare officers through the appropriation of mobile phone?
7. What do you consider to be some of the challenges associated with the use of mobile phone in accessing healthcare services from these healthcare officers?

Postpartum mothers appropriation of mobile phone technology for maternal healthcare

1. How do you appropriate mobile technology in accessing maternal healthcare? WhatsApp [ ] Video Calls [ ] Voice note [ ] Facebook [ ] Health information [ ]
3. How do you interact among yourselves and the health personnel through mobile appropriation?
4. How often do you seek health from healthcare provider through the appropriation of mobile phone?
5. How fast do healthcare providers respond to your request when you engage them the mobile phone?
6. How often do health officers respond to your healthcare needs when you request for any health care or health care information?
7. How helpful and has it been ever since you started engaging healthcare officers through the appropriation of mobile phone?

8. What do you consider to be some of the challenges associated with the appropriation of mobile phone in accessing healthcare services from these healthcare officers?

UNIVERSITY OF EDUCATION, WINNEBA

DEPARTMENT OF COMMUNICATION AND MEDIA STUDIES

RECRUITMENT FORM FOR RESEARCH PARTICIPANTS

This letter is to officially invite you as a participant in my research study titled "Technology Appropriation and Maternal Healthcare: A Case study of two CHPS compound in the Effutu Municipality".

Please be informed that participation in this research is entirely voluntary and you have the right to agree or to decline your participation. The study will comply with the general guidelines of confidentiality and non-disclosure of information obtained during the data collection sessions. The data collected will be used solely for academic purposes of this research. All the responses provided in this protocol will be anonymous and non-identifiable. The School of Research and Graduate Studies, University of Education, Winneba and my supervisor have consented to this.

Please tick appropriately your consent Yes [ ] No [ ]

Thank you

Enoch Mensah Andoh