UNIVERSITY OF GHANA

THE EFFECT OF MOBILE HEALTH SERVICE QUALITY ON USER SATISFACTION AND CONTINUAL USAGE

BY

ELIZABETH OPPONG

(10507861)

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DECLARATION

I do hereby declare that this thesis is the result of my own research towards the award of an MPhil degree in Marketing and that, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of this or any other University. All references used in my studies have been acknowledged accordingly.

…… ……

ELIZABETH OPPONG DATE

(10507861)

CERTIFICATION

I hereby certify that this thesis was supervised in accordance with procedures laid down by University of Ghana, Legon.

…… ……

PROF. ROBERT EBO HINSON DATE

(SUPERVISOR)

…… ……

DR. PRINCE KODUA DATE

(CO- SUPERVISOR)

DEDICATION

This work is dedicated to my husband, Mr. Moses Oppong and children, Gabrielle and Rolland Oppong.

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ABSTRACT

The increased use of mobile phones to access healthcare service by both health professionals and consumers has raised the need for more attention to be focused on mobile health (mHealth) service quality issues. The purpose of this study is to assess the level of mHealth technology service quality and its effect on user satisfaction and continual usage intentions among rural communities in Ghana. This study seeks to examine causal relationships between four variables, namely: mHealth service quality; user satisfaction; continual usage; and monetary cost. A purposive sampling method was used to select three hundred and five (305) respondents. The population of the study were women in rural communities in the Central Region of Ghana who have used mHealth technology services. The mHealth service quality model was adopted for the study. Results are presented using structural equation techniques. The study revealed that, among the three dimensions of mHealth service quality (system, interaction and information quality), only interaction quality is statistically related to user satisfaction. Secondly, all the three mHealth service quality dimensions were found to have a positive impact on continual usage with information quality having the strongest impact. Thirdly, satisfaction has a strong relationship with continual usage; and finally, low monetary cost has a positive influence on user satisfaction and continual usage of mHealth technological service for maternal healthcare. The findings suggest that policy makers and service providers must incorporate good customer care practices and periodic training of both health and information technology personnel on good customer relationship in the design and implementation of mHealth services.

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LIST OF ABBREVIATIONS

AIDS	-	Acquired Immune Deficiency
AVE	-	Average Variance Extracted
BDR	-	Birth and Death Registry
CFA	-	Confirmatory Factor Analysis
CHN	-	Community Health Nurse
CHW	-	Community Health Workers
CIA	-	Central Intelligence Agency
ECT	-	Expectation Confirmation Theory
E-S-QUAL	-	Electronic Service Quality
GFI	-	Goodness- of – Fit
GHS	-	Ghana Health Service
GoF	-	Global Fit Index
GSMA	-	Groupe Speciale Mobile Association
HIV	-	Human Immunodeficiency Virus
IBM	-	International Business Machines
ILO	-	International Labour Organization
IS	-	Information System
IT	-	Information Technology
ITU	-	International Telecommunication Union
JHS	-	Junior High School
MDS	-	Mobile Data Service
mHealth	-	Mobile Health Technology
MOH	-	Ministry of Health
MOTECH	-	Mobile Technology for Community Health

MVP	-	Millenium Village Project
NCA	-	National Communication Authority
NFSD	-	Novartis Foundation for Sustainable Development
NHIS	-	National Health Insurance Scheme
NIH	-	National Institute of Health
RMSEA	-	Root Mean Squared Error of Approximation
SEM	-	Structural Equation Modeling
SERVQUAL	-	Service Quality
SHS	-	Senior High School
SIM	-	Subscriber Identity Module
SPSS	-	Statistical Package for Social Science Software
TTF	-	Technology Task Fit
UNICEF	-	United Nations International Children's Emergency Fund
VPN	-	Virtual Private Network
WHO	-	World Health Organization
WOM	-	Word of Mouth

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The world has become a digital society (International Telecommunication Union (ITU), 2015). Statistical figures from ITU (2015) indicate that there are currently over 7 billion mobile cellular subscribers worldwide as compared with the year 2000 which was below 1 billion subscribers. Employment in the global mobile ecosystem is expected to rise from 13 million to over 15 million people by the year 2020 (Groupe Speciale Mobile Association (GSMA), 2015). The introduction of low cost mobile phones from China and pre-paid tariffs from telecommunications networks have contributed immensely to the spread of mobile technology in developing economies (Tobbin, 2012a; Awotwi, 2012).

The mobile phone is one of the technologies that has spread faster around the globe (Boateng, Hinson, Galadima & Olumide, 2014). Ghana, a West African country with population of more than 26 million (World Bank, 2014) can boast of having over 35 million mobile voice subscriptions (NCA, 2016). This could be generally attributed to the fact that there are subscribers owning more than one phone or SIM card in Africa (Hodge, 2005).

Mobile technology and services are creating a wide area of business opportunities (Boris, Marjan and Gregor, 2015). Scholarly research has been conducted on the role of mobile phones in rural settings (Boadi, Boateng, Hinson & Opoku, 2007); financial services (Duncombe & Boateng, 2009; Hinson, 2011; Tobbin, 2012b; Abor, 2005); micro trading

(Donner, 2006; Boateng et al., 2014); mobile payment (Tobbin & Kuwornu, 2011); academic institutions (Thornton & Houser, 2005); and economic development (Aker & Mbiti, 2010; Abraham, 2006). The findings from these studies confirm the economic, social, financial and academic benefits of the increased use of mobile phones.

In August, 2015 the National Institute of Health, USA in collaboration with the University of California, Los Angeles conducted a training programme for world leaders in mobile technology and behavioural science and urged current researchers to include mobile health (mHealth) application products in their research to strengthen and support on-going quality health campaigns globally (NIH, 2015). The increased use of mobile technology in the health sector is believed to have helped reduced healthcare cost (Meigounpoory, Sajadi & Danehzan, 2014); provide access to relevant health information (Nchise, Boateng, Shu & Mbarika, 2012a); improve efficiency in health delivery; advanced clinical care (Ahlan & Ahmad, 2014; Awotwi, 2012); as well as promote behavioural change in patients (Trevor, Synowiec, Lagomarsino, & Schweitzer, 2012).

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 to its citizens (Trevor et al., 2012). A global report on inequities in rural health protection compiled by the International Labour Organization (ILO) (2015) indicates that 56% of people living in rural areas across the globe are denied critical healthcare access as compared with those in the urban areas; especially in developing countries. The ILO report argued that, in spite of the fact that half of the world's population live in rural communities, only 23% of global healthcare personnel are deployed there.

Ghana can boast of 2,262 public and private healthcare facilities (Atinga, Abeka-Nkrumah & Domfeh, 2011; Ghana Health service, 2007). As at 2013, there were 2,615 doctors, 24,535 nurses, including Community Health Nurses (CHN) and 4,185 midwives in public healthcare (MOH, 2014). Despite this high intake of healthcare personnel, it is still inadequate by WHO standards taking into consideration the doctor and nurse per population ratios (MOH, 2014). More so, most highly skilled healthcare personnel are reluctant to work in rural communities due to unfavourable working and living conditions (Agyei-Baffour et al., 2011; Kruk et al., 2010; Johnson et al., 2011). As a result, rural communities who form about 46% of Ghana's population (CIA, 2015) are put in a disadvantaged position since they are denied access to universal health care.

In 2003, the government of Ghana, in an attempt to provide affordable and easy access to healthcare to all its citizens, introduced the National Health Insurance Scheme (NHIS) for both private and public healthcare centres in the country (Abuosi & Atinga, 2013; NHIS, 2012). Abuosi & Atinga (2013) hold that, although the introduction of NHIS scheme has resulted in an increment in health service usage, its impact on health service quality need to be further researched.

Ahlan & Ahmad (2014) opined that health information technology systems can be developed to serve people with limited healthcare access. Mobile health (mHealth) technology has been a tool in closing the gap in access to healthcare (Trevor et al., 2012). Donor agencies, programme implementers and policy makers are looking for innovative ways of finding lasting solutions to rural health challenges through the use of mobile technology (Trevor et al., 2012). There are over 600 mobile health projects in developing

countries (Dahdah, Lou & Meadel, 2015). Duncombe & Boateng (2009) and Hinson (2011) argue strongly that mobile phones could have a great impact on people living in rural communities. Also, mobile phones may have the ability to provide healthcare access to a larger portion of the targeted population (Nchise et al., 2012a).

Mobile health technology (mHealth), also called telemedicine is a component of electronic health (E-Health). E-health can be defined as "the use of information and communication technologies for health" (Trevor et al., 2012, p.1). E-health has benefited from more scholarly investigations than mHealth technology (Dahdah et al., 2015). Mobile health technology can broadly be defined as "the use of portable devices capable of creating, storing, retrieving, and transmitting of data in real time between end users for the purpose of improving patient safety and quality of care"(Akter & Ray, 2010a, p.75; Vital Wave Consult, 2009).

The focus of mHealth services in advanced and developing countries varies. In advanced countries, the emphasis is on seeking reductions in health care costs, optimizing efficient asset utilization, improving the patient experience and to deliver high quality care. In developing countries, the focus is on improving access to basic health care by remote diagnosis and monitoring, prevention, access to health related information, effective and quality service delivery and to reduce the shortage of highly educated health care personnel (Trevor et al., 2012). There are various types of mHealth services ranging from the very simple to the very complex.

Some of the areas of interest most frequently researched regarding mobile health technology around the globe include: self-care management support (Guo, Chang & Lin, 2015); disease prevention (Free et al, 2013); medication adherence (Ovbiagele et al., 2015); sexual and reproductive health (Nchise et al., 2012a); privacy and security (Lee & Kwon , 2015); mental health (Harrison et al., 2011); maternal care (Dahdah et al., 2015); as well as obesity and eating disorders (Gerber, Stolley, Thompson, Sharp and Fitzgibbon, 2009). All these studies attest to the fact that continual mHealth technology usage could help reduce, if not eliminate, preventable diseases in the world. It might be useful to ponder the question; are users satisfied with the quality of mHealth technology services they receive; and what factors account or could account for their satisfaction and continued usage of mHealth services?

Akter, D'Ambra, Ray & Hani (2013a) are of the view that mHealth service quality can predict customer satisfaction and willingness to continue usage of services. Customers or users' satisfaction is very essential in mobile commerce and technology (Amin, Rezaei & Abolghasemi, 2014), and as such, this study seeks to examine the level of mHealth technology service quality and its effect on user satisfaction and continual usage in rural communities in Ghana. Findings from this study would enable health regulatory bodies, healthcare institutions, mobile technology developers, mobile network providers and donor agencies to have appreciable knowledge of the motivational factors that help promote the adoption of mobile health technology by rural communities.

1.2 Problem Statements

Studies by Nchise et al. (2012a), Nchise, Boateng, Mbarika, Saiba & Johnson (2012b), Akter et al. (2013a), Betjeman, Samara, Soghoian, & Foran (2013), Meigounpoory et al. (2014) and Lee & Han (2015) have confirmed the capabilities of using an affordable information technology tool such as a mobile phone to help improve healthcare service delivery globally. However, empirical studies on mHealth technology services have focused predominantly on developed economy contexts, thus making the generalization of such findings in developing countries rather problematic (Betjeman et al., 2013). Consequently, O'Connor and O'Donoghue (2015), Dahdah et al. (2015) and Ahlan & Ahmad (2014) have called for further research on mHealth technology in developing countries.

Studies by Akter, D'Ambra & Ray (2013b) and Meigoungpoory et al. (2014) have raised concerns about service quality issues in mobile healthcare delivery and the need for a valid instrument to be used to determine factors that enhance service quality in mHealth technology. However, most consumer research studies on mobile health technology focus less on service quality issues, but more on mHealth technology acceptance and adoption. For instance, Ahlan & Ahmad (2014) and Holden & Karsh (2010) examined the acceptance of various health information technology for physicians; Fischer, David, Crotty, Dierks & Safran (2014) and Sun, Wang, Guo & Peng (2013) considered technology adoption by the elderly patients; Shareef, Kumar & Kumar, (2014) examined the adoption behaviour of diabetic patients; while Lee & Rho (2013) focused their attention on the acceptance of disease prevention monitoring applications.

Studies relating to customer satisfaction and customer loyalty in mobile technology services are not new but issues of customer satisfaction and continuance of mobile technology services are less researched (Gao, Waechter & Bai, 2015; Boakye, 2015). In measuring customer satisfaction, Akter et al. (2013a) argued that the mHealth service quality model, which is dynamic, multidimensional and context-dependent, is capable of determining customer satisfaction leading to continual usage. Sun et al. (2013) and Akter et al. (2013a: 2013b) recommended the use of an integrated model for further studies on mHealth technology.

Findings from the study of Nchise et al. (2012a) indicate that cost incentives play a major and influential role in consumers' access to health information through the use of mobile phones. Studies on mHealth technology services in relation to monetary cost predominantly focus more on infrastructure, human resource, information technology development, sustainability of mHealth intervention projects and healthcare delivery cost (Schweitzer & Synowiec, 2012). Less research on consumer's monetary costs and its implication on satisfaction and continual usage of mHealth services seem to have been done.

It can be argued that most of the existing literature on mHealth technology are foreign-based and has tended to focus less on service quality issues. This justifies the need for studies that focus on improving mHealth service quality and hence the current investigation is on the effect of service quality on user satisfaction and continual usage of mHealth technology in rural communities in Ghana, with a focus on the role of monetary cost on user satisfaction and continual usage. This study will answer the calls of O'Connor & Donoghue (2015) and Dahdah et al. (2015) for more studies on mHealth technology

from developing economy contexts and Akter et al. (2013a; 2013b) and Meigoungpoory et al. (2014) for more studies on mHealth service quality. It will extract themes from mHealth service quality model developed by Akter et al. (2013b) to assess mHealth service quality. The focus of the study will be on maternal healthcare delivery.

The outcome of this study would enable developers of mobile health applications, network providers and service providers in healthcare to consider critical factors that stimulate satisfaction and motivates users to continually use mHealth technology services; especially in developing countries.

1.3 Research Objectives

This study seeks to assess the level of mHealth technology service quality and its effect on user satisfaction and continual usage intentions among rural communities in Ghana. The specific objectives are as follows:

1. To examine the relationship between mHealth technology service quality dimensions and user satisfaction among rural communities in Ghana;
2. To examine the effect of mHealth technology service quality dimensions on continual usage among rural communities in Ghana; and
3. To examine the effect of monetary cost on the relationship between user satisfaction and continual usage of mHealth technology.

1.4 Research Question

The study aims to find answers to the following research questions:

1. What is the relationship between mHealth technology service quality dimensions and user satisfaction among rural communities in Ghana?

2. What is the effect of mHealth technology service quality dimensions on continual usage among rural communities in Ghana?
3. What is the effect of monetary cost on the relationship between user satisfaction and continual usage of mHealth technology?

1.5 Significance of the Study

Provision of quality health care in Ghana is a priority on the national health agenda (Atinga et al., 2011). Developing countries have been urged to use technology as one of the key tools to achieve quality health care (MOH, 2011). Studies have confirmed the capabilities of mobile technology adoption in the health sector in helping to improve maternal healthcare delivery as well as other preventable diseases like diabetes, hypertension, strokes, HIV and various forms of illness. As at 31st December, 2015, the total number of mobile voice subscribers in Ghana was 35,008,387 as compared to seven years ago, when it was only 11,570,430, thereby yielding a penetration rate of 127.63% (NCA, 2016; NCA, 2008). The growth of mobile penetration rate in the country enables rural communities to have access to information technology usage (Hinson, 2011; Boadi et al., 2007) as well as enhance healthcare delivery (Awotwi, 2012; Nchise et al., 2012b).

Some of the mHealth technology initiatives in the country are: the one for detecting the authenticity of medication called Mpedigree (Mpedigree, 2015); the one to facilitate communication among rural and urban doctors called MDNet (Foguem & Foguem, 2014); the one used by GHS for keeping track of anti-malarial supplies to prevent shortage called SMS for Life (Novartis Foundation, 2014); "NO Yawa" meaning no worries, a Grameen Foundation project funded by the Embassy of the Kingdom of the Netherlands with the aim of educating youth on sexual and reproductive health thorough SMS and voice

messages (Grameen Foundation, 2015); and the one for Community Healthcare Workers (CHW), maternal and child healthcare (Grameen Foundation, 2012; Norvatis Foundation, 2010; MOH, 2011).

One of the major health issues in Ghana is maternal healthcare (Abor, Abekah-Nkrumah, Sakyi, & Adjasi, Abor, 2011). Maternal mortality is an issue of great concern to many health institutions worldwide. Statistics from the WHO (2015) indicates that, in the year 2013, almost 800 women died globally from preventable pregnancy related issues, with an approximation of 99% coming from women living in rural areas in developing countries. The maternal mortality ratio in Ghana as at 2013 was 380 per 100,000 live births (World Bank, 2014). One of the key objectives of the Millennium Development Goals (MDGs) now called Sustainable Development Goals (SDGs) set by the United Nations was the reduction of maternal mortality rate by 75% by the end of the year 2015 (WHO, 2015).

As a result, the Grameen Foundation, an NGO in collaboration with the Ghana Health Service in 2010 launched a free mHealth technology pilot project in the Upper East, Central, Volta and some part of Greater Accra Regions to address some of the information-based drivers of high maternal and infant deaths especially in rural parts of the country (Grameen Foundation, 2012). The mHealth technology application services introduced by Grameen Foundation would be discussed further in chapter three. Records indicate that, as at April 2012, the total number of registrants was over 17,000 (Ghana Health Service, 2012). Grameen Foundation's free pilot project officially ended in August 2015, making it difficult for old customers and potential customers to have access to the mobile health care service (Grameen Foundation, 2015). System reliability and efficiency

are some of the major factors that affect mHealth service quality (Meigounpoory, Sajadi & Danehzan, 2014).

It could be argued that the continual usage of mHealth by rural communities in developing countries could have an enormous effect on reducing maternal mortality rates. A study to examine the factors that influences satisfaction and the use of mHealth technology by rural communities in Ghana could be an important academic and policy contribution. Findings from this study could make a contribution to the better understanding of the literature on mobile technology service for maternal health care by rural communities in developing economies.

1.6 Scope of the Study

This study focuses on mHealth technology service quality in rural communities in Ghana. Mobile technology promises to revolutionize healthcare delivery by shifting the focus of healthcare delivery from curative to preventive measures. It also aims at bridging healthcare access gaps between rural and urban communities in developing economies. The population of the study is limited to rural communities in the Central Region of Ghana due to proximity and convenience. Mobile health application programmes run by Grameen Foundation, Ghana in relation to maternal healthcare will be considered for the study.

1.7 Organization of the Study

This study is divided into six chapters. Chapter One is the introduction and provides background information on the area of research, problem statement and purpose of the research. Chapter Two reviews existing literature and develops a conceptual framework to underpin the study. Chapter Three highlights the contextual issues surrounding the study.

Chapter Four outlines the research methodology used to conduct the study. Chapter Five dwells on the presentation and discussion of findings. Chapter Six focuses on the conclusions of the study, makes recommendations and proposes future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

One of the key trends that will influence the delivery of great customer experiences and customer satisfaction in Africa over the next decade is the use of network technology (Hinson, 2015). This projection was made recently at the second Customer Service Management Africa Conference at the Institute of Public Administration in Windhoek, Namibia on the topic "The future of customer experience and customer-centric leadership in Africa". This calls for more attention to be given to service quality issues in information technology in Africa.

The focal point of this study is to examine the level of mHealth service quality and its effect on user satisfaction and continual usage as well as to examine the role of monetary cost on user satisfaction and continual usage of mHealth technology service. This chapter reviews the literature on the focal point of the study and has been grouped into eight main sections. The conceptual framework of the study and hypothesis are also considered.

2.2 Mobile Health Technology (mHealth) Service Quality

This section is further sub-grouped into seven sections. The first section examines the various mHealth technology services in developing countries: the second section highlights the definitions of service quality; whereas the third section discusses the theoretical background of mHealth service quality. Section four considers the conceptualization of mHealth service quality; section five examines service quality dimensions in mHealth; the sixth section dwells on the impact of service quality on service

providers; and the seventh section, which is the final part, considers the impact of service quality on consumers.

2.2.1 Mobile Health Technology Service in Developing Countries

Healthcare institutions, especially in developing economies continue to have public healthcare challenges such as HIV/AIDS, cholera, malnutrition, malaria and disease outbreaks; coupled with high maternal mortality rates, shortages of trained healthcare personnel in rural communities and uneasy access to quality healthcare facilities (Trevor et al., 2012; Sanner, Roland & Braa, 2012). 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). The target groups for mHealth technology services are healthy people, hospital patients and chronically ill individuals (Deng, Moa & Liu, 2014).

There are various classifications of mHealth technology services. Deng et al. (2014) outlines four types, namely: (i) mHealth service for healthcare research where data is collected with portable wireless device; (ii) mHealth for healthcare professionals, where mHealth is used for medical education and medical records keeping; (iii) mHealth for patient appointment, reminders and treatment; and finally, (iv) mHealth for the general population to promote health behaviour change and emergency care. All these services attest to the critical role mHealth technology can play towards enhancing healthcare delivery and hence the need for much attention to be given to the quality of mHealth technology services as well as to encourage continual usage.

Table 2.1: Mobile Health Technology Services in Developing Countries

AUTHOR(S)	M-HEALTH SERVICE	ACTIVITY	COUNTRY
Betjeman et al.(2013) Akter , Ray & D'Ambra (2012)	Medication adherence services for people being treated for HIV and Tuberculosis	This type of service is twofold: the first one enables SIM card to be slotted inside a specially designed pill bottle that sends an SMS message to a server each time the user takes out a pill; and the second one allows the user to dial a special number each time a pill is taken. This enables service providers to promptly alert users on missed pill time.	South Africa Uganda Kenya Zambia Botswana
Motamarri, Akter, Ray, & Tseng (2014) Grameen Foundation (2015)	Health education services	This type of service promotes health behavioural change through the use of SMS messages on reproductive health, prevention of sexually transmitted diseases and general health.	India Nigeria South Africa Uganda Ghana
Betjeman et al.(2013)	Service provider, consumer (patient) and healthcare worker communication services	The provision of a Virtual Private Network (VPN) to facilitate phone calls and text messages communication between healthcare providers and users', as well as communication among healthcare workers.	Malawi Uganda Guatemala

Source: Adopted from Literature review.

Table 2.2: Continuation of mHealth Technology Services in Developing Countries

AUTHOR(S)	M-HEALTH SERVICE	ACTIVITY	COUNTRY
Motamarri et al. (2014)	Emergency and disaster response services	This type of service identifies, tracks and monitors users in remote, disaster prone areas or to monitor the outbreak of diseases.	Peru India Uganda
Betjeman et al.(2013) Grameen Foundation (2015)	Rapid Voice and SMS services	Specially-designed software customized for monitoring pregnancy and facilitation of communication between pregnant women in rural communities and service providers, with an aim of encouraging early prenatal care as well as reduction of maternal mortality.	Rwanda Ghana Sierra Leone
Motamarri et al. (2014) West (2012)	Diagnostic and treatment support service	The use of voice and SMS to manage diseases such as diabetics, hypertension and eating disorders.	India Mexico

Source: Adopted from literature review

2.2.2 Definition of mHealth Service Quality

Service quality in mHealth can be defined as "consumer's judgment of, or impression about, an mHealth platform's overall excellence or superiority" (Akter et al., 2013a, p. 9), which is similar to Zeithaml (1988)'s definition, that is "consumer's judgment about the overall excellence or superiority of a service". There are various definitions of service quality, but all the definitions seem to share a common focus which is on the consumer's expectation. The customer or patient is the ultimate judge of service quality and hence

service providers must strive to exceed customer's expectations (Dagger, Sweeney & Johnson, 2007; Shen, Tan & Xie, 2000). Service quality can be defined as "a function of the differences between expectations and performance" (Parasuraman, Zeithaml & Berry, 1985; Gronroos, 1982).

Berry, Parasuraman & Zeithaml (1988) defined service quality as "conformance to customer specifications". Service quality can also be defined as the "consumer's overall impression of the relative inferiority or superiority of the organization and its services" (Bitner, Booms & Mohr, 1994). Consumers' perception of quality of services is higher when performance exceeds expectations and low when performance does not meet expectations (Oliver, 1980). This study adopts the definition Akter et al. (2013a).

2.2.3 Theoretical Background of mHealth Service Quality.

The following key generic service quality theories from various disciplines that formed the basis for the assessment of mHealth technology service quality is further assessed. They are: Information System (IS) success theory; SERVQUAL and E-S-QUAL model; Service Quality Model developed by Gronross (1984); and Health Service Quality Model developed by Donabedian (1992) (Akter et al., 2013b; Meigounpoory et al., 2014; Chatterjee, Chakraborty, Sarker, Sarker & Lau, 2009).

2.2.3.1 Information System (IS) Success Theory

DeLone & McLean (1992) developed an Information System (IS) model which has been adopted by several information system researchers over the past years to assess Information System (IS) success in various fields of study (Chatterjee et al., 2009; Lu, Zhang and Wang, 2009; Akter et al., 2013b). DeLone & McLean (1992) identified six key

IS success dimensions, namely, "information quality, system quality, use, individual impact, user satisfaction and organizational impact". System quality can be defined as the characteristics of information system such as process, flexibility and volumes of an information assessed by the device, information quality refers to content of information, use refers to adoption level, and user satisfaction refers to the satisfaction level of a user after the system experience. The IS model posits that all the six elements identified relate and affects each other.

Service quality was identified as one of the key determinant of use and user satisfaction of an information system due to the dynamic trends in technology. DeLone & McLean (2003) modified the original model by adding service quality to system and information quality and also merged individual and organizational impacts to become one unifying component and renamed them as net benefits which refer to "overall measures of the final result of the use of an information system"(DeLone & McLean, 2003, p. 17).

2.2.3.2 SERVQUAL and E-S-QUAL Model

The SERVQUAL model, developed by Parasuraman et al. (1988), is one of the most widely used models to assess service quality attributes across various fields of study (Huang, Lin & Fan, 2015; Saghier & Nathan, 2013; Xu, Benbasat & Cenfetelli, 2013; Shen, Tan & Xie. 2000; Kuo, Wu & Deng, 2009) despite various criticisms against the application of the model in some contexts. An exploratory study by Parasuraman et al. (1985) on the concept of service quality indicated that there is a gap between a consumer's expectation and actual performance of service. They proposed quality service delivery to meet consumer's expectations as a remedy for closing that gap and hence the development

of the SERVQUAL model (Parasuraman et al., 1988). Ten dimensions (10) of service quality were initially identified.

Three years later, these dimensions were revisited and further scaled down to only five dimensions, which are used to date to assess service quality. The five key SERVQUAL dimensions are: reliability ("the ability to perform the promised service dependably and accurately"); assurance ("courtesy of employees, their knowledge and their ability to inspire confidence and trust"); responsiveness ("the readiness to help customers and provide timely service"); empathy ("caring and personalized attention a firm gives to its customers") and tangibles (Parasuraman, Berry & Zeithamal, 1991).

The shift in service delivery in technological development compelled Parasuraman, Zeithaml & Malhotra (2005) to develop an electronic service quality scale, abbreviated "E-S-QUAL" to measure the technical and offline service quality aspect of a website or virtual platform for shopping of products and services. E-S-QUAL comprises of four key elements, namely: efficiency (in terms of speed and ease of website access); fulfillment (in terms of availability of items ordered and quick response of complaints); system availability and privacy (protection of consumers data). The E-S-QUAL model is widely acknowledged and used by most researchers to measure website platform quality (Boshoff, 2007; Akinci, Atilgan-Inan & Aksoy, 2010; Marimon, Vidgen, Barnes & Cristobal, 2010).

The SERVQUAL and E-S-QUAL model has come under intensive critiques from various researchers regarding the conceptual framework and measurement method. In the health sector, Dagger et al. (2007) emphasized the mixed results the SERVQUAL scale has

produced over the past years that makes the model multi-dimensional. Dagger et al. (2007) cited studies of Reidenbach & Smallwood (1990), Lytle & Mokwa (1992) and Headley & Miller (1993) all identifying additional dimensions to the original SERVQUAL scale. Reidenbach & Smallwood (1990) and Lytle & Mokwa (1992) identified seven dimensions in an emergency room setting and healthcare fertility clinic respectively, whereas Headley & Miller (1993) identified six dimensions in primary care.

Cronin & Taylor (1992) and Brady & Cronin (2001) both argue strongly that the performance-based measure of service quality may be an improved means of measuring the service quality construct and can produce better and more reliable results than the SERVQUAL model which measures only the gap between expectation and performance. Lu et al. (2009) and Huang et al. (2015) argue that neither SERVQUAL nor E-S-QUAL are strong instruments to measure service quality in mobile service due to unique characteristic of mobile service. Babakus & Boller (1992) are of the view that the measurement of consumer's perceptions provides more information than "the measurement of consumer's expectations" of service.

2.2.3.3 Gronross Service Quality Model

Gronroos (1984) developed the first service quality model to measure perceived service quality using qualitative methods. Key elements in the model are technical quality, functional quality, and corporate image. Technical quality can be defined as "the quality of what the consumer actually receives as a result of their interaction with the service provider"; functional quality refers to "how consumer gets the technical outcome or how services are delivered to the consumer"; and then corporate image is what is built in the minds of consumers as a result of technical and functional quality. Gronroos (1984)

emphasized the use of expectations as a standard of reference against which service performance can be measured.

2.2.3.4 Donabedian's Service Quality Model

Donabedian (1992) originally developed a service quality model for healthcare. Two key elements, namely technical quality and interpersonal quality, were identified. Technical quality is the use of medical science and technology in healthcare delivery, whereas interpersonal quality refers to the relationship between healthcare service provider and their consumers. Since its inception, Donabedian's model (1992) has been expanded to cover more technical and interpersonal quality dimension by other health researchers (Akter et al., 2013b; Zineldin, 2006; Dagger et al., 2007).

Zineldin (2006) identified five service quality attributes, namely, object, process, infrastructure, interaction and atmosphere quality; whereas Dagger et al. (2007) developed four main health service quality dimensions which were found to drive service quality perceptions. They are interpersonal, technical, environmental and administrative quality. Interpersonal reflects on the relationship developed between users and service providers. Technical quality is the outcome of the service process. Environmental quality looks at atmosphere and tangibles, whereas administrative quality considers the production of the core service while adding value to a customer's use of a service.

2.2.4 Conceptualization of mHealth Technology Service Quality

In the healthcare sector, most studies on perceived service quality attributes focuses on generic service quality models of Gronross (1984), Parasuraman et al.'s (1988) SERVQUAL model and Donabedian's (1992) model (Meigounpoory et al., 2014; Abuosi

and Atinga, 2013; Akter, D'Ambra & Ray, 2010b, 2013a; Yesilda & Direktor, 2010; Dagger et al., 2007; Reidenback & Smallwood, 1990).

However, some researchers have argued strongly that there is the need for a clear distinction to be made between mHealth service quality and other existing healthcare service quality due to the unique characteristics of mHealth technology such as virtual consultation, ubiquity, accessibility, personalized nature, immediacy, interactivity and mobility (Motamarri et al., 2014; Akter et al., 2013a, 2013b). Similarly, Huang et al. (2015) have also called for a clear distinction to be made between service quality attributes of wireless applications such as mobile and wired application such as computer due to the unique characteristics they both possess.

Mobile health technology implementation could be argued to still be at an infancy stage (Gurman, Rubin and Amira, 2012; Akter et al., 2013a; Deng et al., 2014; Chatterjee et al., 2009). Early scholarly writings on service quality of mHealth technology did not use any valid scale to directly measure key mHealth service quality attributes identified (Akter et al., 2013a, 2013b). Meigounpoory et al. (2014) shares a common view with Akter et al. (2013b) and emphasized that empirical studies on mHealth services quality are still not adequate to date.

Similarly, Lu, Zhang & Wang (2009) revealed that there are no existing scales that measure service quality specifically in m-commerce in general as researchers are always tempted to use a generic service quality scale of marketing and management. Studies on mobile technology usage have proven that one generic model might not be adequate to effectively assess the mobile technology performance and hence some researchers have

called for integration of generic models (Chen, Park & Putzer, 2010; Rao & Troshani, 2007; Akter et al., 2010b:2013b; Wu & Wang, 2005; Sun et al., 2013).

Service quality is multi-dimensional and hierarchical (Brady & Cronin, 2001; Akter et al., 2013b). Fassnacht & Koese (2006) argues that service quality must be viewed as a higher order construct that contains various sub-dimensions. An instrument to measure and predict mHealth service quality specifically for developing economy was recently developed by Akter et al. (2013b) using theories in marketing, information systems and health management as a guiding model, in addition to extracts from mHealth literature. Three key elements were identified to have a strong impact on mHealth service quality leading to satisfaction and continuance. They are system quality, interaction quality and information quality. These unique qualities are further discussed in the next section.

2.2.5 Service Quality Dimension in mHealth Technology Service

Consumers' are increasingly coming into contact with a diverse range of mobile technology services (Huang et al., 2015), and hence their expectation of service quality would vary from one mobile service to the other. The interactive nature of service process between service provider and consumer results in the consumer's immediate evaluation of quality of service after service experience (Yesilada & Direktor, 2010).

One of the major organizational challenges in most healthcare institutions is the provision of quality service to an increasing number of people at a minimal cost (Varshney, 2005). Poor quality of service in the health sector leads to complications that calls for additional care and cost to the consumer (Akter et al., 2010a). Akter et al. (2013b) developed the mHealth service quality model, believing that it better explained and measured overall

mHealth service quality performance. Three key dimensions were identified. They are system, interaction and information quality.

- **System Quality**

System quality measures technical success and can be defined as "users' perceptions regarding the technical level of communication" (Delone and McLean, 2003; Lee, Shin & Lee, 2009). Chatterjee et al. (2009) argues that, the data processing capability of a system, in terms of the ability of a system to integrate data from different places, can effectively influence high use and increase satisfaction among users. A system is said to be of quality when it is useful, available, reliable, adaptable and gives a timely response (Delone & McLean, 2003). Akter et al. (2013b) posits that there are three key elements that can have a positive impact on system quality. These are system reliability, privacy and system efficiency.

System reliability: this is the degree to which the system is available on a regular basis. System reliability can be defined as "the ability to perform the promised service dependably and accurately" (Parasuraman et al., 2005, p. 4). A user's ability to depend on the "system to complete the task without system problems and system frequent breakdowns" (Chatterjee et al., 2009, p. 622).Yang & Fang (2004) opined that system reliability involves service providers keeping to their promises and ensuring that billings and records keeping are done accurately. Reliability is considered the vital core of service quality (Berry et al., 1988).

Constantinides (2002) points to the fact that a system is said to be reliable when the technical and service personnel are readily available to resolve technical problems and

system failures around the clock with minimal disruption of services. A poor network signal might pose a greater challenge to the reliability of mobile technology services (Norris, Stockdale & Sharma, 2009). System reliability is perceived to have a strong influence on usage and user satisfaction of an information system (Nelson, Todd & Wixom, 2005).

System privacy: privacy and security issues are complex to handle by numerous information technology service providers (Kotz, 2011; Norris et al., 2009). Personal privacy, data privacy and risk free environment are some of the challenging issues facing the usage of mobile services (Wu & Wang, 2005). Parasuraman et al. (2005) defines security or privacy as the degree to which the customer believes the system is safe and can be trusted.

Three key mHealth information security and privacy threat issues were outlined by Kotz (2011).They are identity threats (this is where a patient loses or share an identity, or the identity is misused for medical fraud by health personnel); access threats (this is unauthorized persons having access to health records deliberately or mistakenly); and disclosure threats (this is unauthorized disclosure of health such as decrypting of data store on previous, current or future communications between the user and the service provider for profit or reward).

Kotz (2011) and Kotz, Avancha & Baxi (2009) strongly believe that privacy issues must be considered in the design and implementation of mHealth applications; and more authentication mechanisms, access control and encrypting of all communications with strong encrypting key must be ensured by mHealth service developers and providers.

System efficiency: this can be defined as "the degree to which a system is simple to use, properly structured and able to meet various needs of the user" (Parasuraman et al., 2005, p. 7). Sun et al. (2013) are of the view that consumers with little or no knowledge in the use of technology might not be willing to use technology perceived to be complicated. Delivering of the right information to the right customers is essential in promoting service quality.

- **Interaction Quality**

Human interaction is a key tool in influencing customer satisfaction due to the intangible nature of services (Hinson, Owusu-Frimpong & Dasah, 2011; Bowen, 1986; Zeithaml, Berry & Parasuraman, 1996). Interaction is "the period of time during which a consumer directly interacts with a service provider" (Chowdhury, Patro, Venugopal & Israel, 2014, p.2). Interpersonal process is essential to the customer's overall perception of the service provider's performance (Dagger et al., 2007; Wu, Tsai & Chen, 2015). Wu et al. (2015) hold that frontline personnel levels of interpersonal competence has a strong influence on service quality.

The attitude of an employee towards customers can also influence their satisfaction level. Brady & Cronin (2001) identified attitude, behaviour and expertise of the service provider's personnel as some of the interaction quality attributes that influences consumers' perceptions of the functional quality. Studies by Lu et al. (2009) identified interaction attributes such as attitude, expertise, problem solving and information to have a strong influence on service quality of mobile service. Akter et al. (2013b) also identified three key elements that define interaction quality and these include cooperation, confidence and care.

Cooperation: this is the readiness of the service provider to deliver and provide prompt service to users (Parasuraman et al., 1988). Cooperation can be expressed in the form of prompt response to phone calls and services, and the professional way of handling and resolving complaints (Yang & Fang, 2004).

Confidence: this is the degree to which a system is considered safe to use (Akter et al., 2013b; Parasuraman et al., 2005). Consumers must have confidence in the service provider to render services safe for use without complications. Consumer trust in the service provider can also increase consumer satisfaction and continual usage of the service (Deng, Lu, Wei & Zhang, 2010).

Care: this is customized attention from service providers to consumers (Parasuraman et al., 1988). Training of employees on good customer relations and business ethics is an essential tool towards customer satisfaction (Hinson, Mohammed & Mensah, 2006; Gronross, 1984). Motamarri et al. (2014) emphasized the fact that, in most developing economies, excessive demand for healthcare services and shortage of trained medical personnel affects how healthcare service providers respond promptly and show empathy to consumers. Mobile health technology creates the assurance of quality care and hence qualified health personnel must handle customer service requests (Motamarri et al., 2014).

- **Information Quality**

Information quality can be defined as the degree to which a service is helpful in completing a particular task (Motamarri et al., 2014; Nelson et al., 2005); the benefit consumers receive from the service provider as a result of interaction with the service provider (Gronross, 1984); and "the extent to which complete, accurate, and timely

information is provided to the customer during the interaction process with the user interface" (Fassnacht and Koese, 2006, p. 26; Lee et al., 2009).

Chae et al. (2001) identified four key elements in information quality namely; connection quality (access to stable mobile service with less interruption of connection); content quality (value and usefulness of information provided); interaction quality (which is the service provider's easy and efficient way of interacting with consumers); and contextual quality (that is the timeliness with which customers can have unrestricted access to information irrespective of time and location).

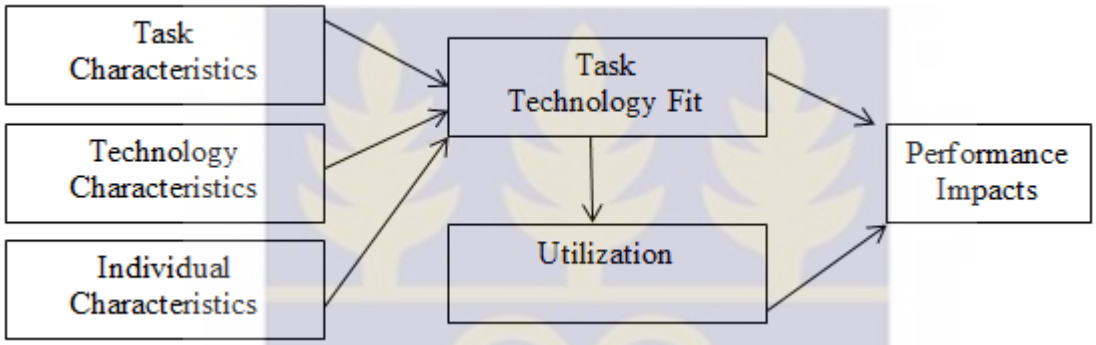
Content of information should be personalized, complete, relevant, easy to understand, and secured (DeLone & McLean, 2003). Frequent reviewing and updating of information content to reflect current consumers' changing needs is essential (Constantinides, 2002). Information quality can be classified as a utilitarian benefit or a hedonic benefit (Akter et al., 2010b:2013b; Fassnacht & Koese, 2006).

Utilitarian: this is the degree to which service received serves its purpose. Users' perceive services to be of quality when it serves its purpose. Consumers might not be willing to continue to use products or services that do not fulfill the very purpose for which it was purchased, regardless of the unique product or service attributes (Zhou, Lu & Wang, 2010; Goodhue and Thompson, 1995; Gatara & Cohen, 2014).

Goodhue & Thompson (1995) developed a model called "Technology Task Fit (TTF)". This model holds the view that consumers will be willing to use information technology services on the condition that it enables them to perform tasks at hand or improve

performance. Three key elements were identified, namely: task characteristics (activities that compel users to rely heavily on information technology service); technology characteristics (a tool or system used by the consumer to perform a task); and individual performance in terms of experience and self-efficacy (Zhou et al., 2010).

Fig 2.1: The Task Technology Fit Model



Source: Goodhue & Thompson (1995)

Hedonic: this can be defined as "the degree to which information service arouses positive feelings" (Akter et al., 2013b, p. 185). Consumers perceive services to be of quality where service attributes enables them to feel good about themselves after the service experience. Hedonic customers use services or products for luxury purposes, for pleasure, fun, and enjoyment (Venkatesh, Morns, Davis & Davis, 2003). Traditionally, a patient goes to hospital for health treatment and advice, the enjoyment of using mHealth technology for the same services might encourage continual usage of mHealth services (Dwivedi, Shareef, Simintiras, Lal & Weerakody, 2015).

This study adopts Akter et al.'s (2013b) mHealth service quality model. This model was developed in the context of mobile health technology for a developing economy. Other

studies have cited and acknowledged Akter et al. (2013b)'s mHealth service quality model leading to user satisfaction and continual usage in their studies (Ha, Kim, Libaque-Saenz, Chang & Park, 2015; Sun et al., 2013; Meigounpoory et al., 2014; Hossain & Quaddus, 2015; Huang et al., 2015).

2.2.6 The Impact of Service Quality on Service Providers.

Service quality has a great impact on organizational performance in terms of increased market share and profit margin (Anderson, Fornell & Lehmann, 1994); cooperate image-enhancing as well as customer loyalty (Cudjoe, Anim & Nyanyofio, 2015). In the health sector, service quality has the potential to reduce healthcare costs and waiting time periods; increase patients' satisfaction and compliance to physician advice; and request as well as improve effective and efficient management of the healthcare delivery system (Atinga et al., 2011; Choi, Cho, Lee, Lee & Kim, 2004). Service quality attracts new customers (Deng et al., 2010).

2.2.7 The Impact of Service Quality on Consumers

Service quality leads to satisfaction (Parasuraman et al., 1988; Woodside, Frey & Daly, 1989). Hinson et al. (2006) outlined some of the key satisfaction attributes consumers exhibit when satisfied with services. A strong bond is developed between service providers and consumers in such a way that a consumer develops high service failure tolerance. The tendency to spread positive word of mouth (WOM) advertising about the service provider to friends and relatives is high. The consumer will continue to use service and shows some level of commitment. Hinson et al. (2006) concluded in their study that, although the measuring of service quality is important, much effort should be channeled

towards the management and improving of service quality by service providers in order to maintain and keep consumers satisfied.

2.3 User Satisfaction

User satisfaction continues to remain an issue of great concern since it depicts the success of information technology services (Wixom & Todd, 2005). Similarly, in the health sector, service quality delivery is used as a tool to enhance user satisfaction (Akter et al., 2010b). Maintaining and providing customer satisfaction is one of the major challenges faced by many service industries (Parasuraman, et al., 1988). This section will review literature on the meaning of satisfaction; consider satisfaction theory and user satisfaction in mobile technology service; highlight the impact of user satisfaction on the service provider; and then discuss the relationship between service quality and satisfaction.

2.3.1 Meaning of User Satisfaction

Satisfaction emerged from the Latin word called "satis" which means "enough" (Gungor, 2007, p.13). Researchers frequently use customer and consumer satisfaction interchangeably in their studies, which can result in ineffective comparative analysis of empirical results (Giese & Cote, 2000). Yi (1990) and Giese & Cote (2000) argue strongly that a uniform definition of satisfaction would be essential in order to ensure its correct usage in different contextual settings. Giese & Cote (2000) proposed a framework for consumer satisfaction based on compilations from literature, commonalities in the definition of satisfaction over the past 30 years, supporting it with group and personal interviews of consumers.

Findings from Giese & Cote (2000) study indicates that consumer satisfaction comprises of three key components, namely; response (which could be emotional or cognitive); focus on a particular object (that is expectations, products or consumption experience); and it occurs at a particular time (that is after consumption, after choice or based on accumulated experience). Kotler, Keller & Lu's (2006) definition of satisfaction conforms with the findings of Giese and Cote (2000). According to Kotler et al. (2006), "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".

Churchill & Surprenant (1982) define satisfaction as twofold: conceptually and operationally. Conceptually, "satisfaction is as a result of the purchase and use of products where consumers compares cost of purchase and rewards in relation to anticipated consequences". Operationally, it is the "sum of satisfaction with various attributes of products or service". Satisfaction is defined by Johnson & Fornell (1991) as "an overall evaluation based on the total purchase and consumption experience with goods or service over time". The consumer's fulfillment response to mean "a judgment that a product or service produces a pleasant level of consumption–related fulfillment" (Oliver, 1997: Zeithaml et al., 2009).

User satisfaction is "an attitude-like judgment following the consumption experience" (Lovelock & Wirtz, 2011, p. 74). This study will adopt the definition of Kotler et al. (2006) since it conforms with the findings of Giese & Cote (2000), which have been cited regularly in the literature (Wang & Liao, 2007).

2.3.2 Satisfaction Theory

The disconfirmation paradigm theory developed by Oliver (1977) is one of the most frequently used and cited theories in various scientific research, especially on consumer and information research (Spreng, Mackenzie & Olshavsky, 1996; Churchill & Surprenant, 1982; Parasuraman et al., 1988). Most theories explaining the nature and the development of consumer's satisfaction from various perspectives were derived from the Disconfirmation Paradigm Theory (Isac & Rusu, 2014; Bhattacherjee, 2001a). Spreng & Page (2003) define disconfirmation as "the discrepancy between two concepts that is; expectations or desires and actual performance".

This theory posits that, under normal circumstances, consumers have a mind-set standard and expectation, which they compare new service experiences with. This mind-set standard according to Oliver (1980), is strongly influenced by their attitude, expectation and intention. Their satisfaction level is determined by how well new services meet up to their set up standard. When actual performance of the product or services falls below expectations or standard set, satisfaction is negatively disconfirmed. It only becomes positively disconfirmed when a product or service performs beyond the customer's expectation. When products or a service performs to meet the consumer's expectation, disconfirmation is said to be confirmed.

Four key components play major a role in this theory. They are consumer expectation; perceived performance of the service or product; disconfirmation; and satisfaction. Expectations are attributes that the consumer anticipates to be associated with a product or service; perceived performance is the consumers' perception of the actual performance of a product or service; disconfirmation refers to the judgments or evaluations that the

consumer makes regarding products or services and satisfaction is the extent to which the consumer is pleased with a product or service experience after consumption.

However, Bhattacherjee (2001a) and Spreng et al. (1996) have criticized Oliver's (1977) expectation confirmation theory (ECT). A revised version believed to better explain consumers' post adoption or continuance of information technology services was developed by Bhattacherjee (2001a). The revised ECT theory posits that consumers' initial product or service expectations are based on information received from general mass media and other users and that, consumers' real expectation develops after actual usage or experience. Hence, initial expectation might not be appropriate to be used to assess post adoption satisfaction. User satisfaction leading to continual usage can be attributed to two key elements, namely: expectation (in terms of perceived usefulness); and confirmation of expectation following actual use.

Spreng et al. (1996) also found Oliver's (1977) ECT model to be inadequate and hence proposed a more comprehensive model that gives a better understanding of consumer satisfaction determinant. Four key determinants of satisfaction were identified: expectation; desire congruency (that is a user's assessment of the degree to which a product or service is perceived to have met or exceeded their desire); information satisfaction; and performance.

2.3.3 User Satisfaction of mHealth Technology Service

Consumer or user satisfaction is dynamic and evolves with time; and, as a result can be influenced by several factors that could be personal or situational (Zeithaml, Bitner &

Gremler, 2009). Satisfaction can be assessed based on a specific transaction or overall general service experience (Yi, 1990; Deng et al., 2010). In the healthcare sector, Akter et al. (2013a: 2013b) argues that works on user satisfaction of mHealth technology services are inadequate. An mHealth service quality model believed to be more effective in predicting user satisfaction and continual usage outlined three key attributes, namely: system quality (that is the technical aspect of service); interaction quality (that is the relationship between the service provider and the consumer); and information quality (that is the content and value of information).

Chae et al. (2001) in their study on elderly patients' satisfaction with mHealth technology services indicated that patient location (in terms of where the patient uses the facility, which could be either private home, care home or hospital); educational level; and quality of verbal communication has the greatest influence on user satisfaction. The quality of verbal communication was identified to be the key indicator of user satisfaction of mHealth technology. Similarly, Zhao, Lu, Zhang & Chau (2012) indicated that interaction among service providers and customers leads to satisfaction in mobile data services. Wang and Liao (2008) also posit that information quality leads to user satisfaction in an electronic service.

Mahmood, Burn, Gemoetes & Jacquez (2000) hold that, convenience; user background; and the organization's attitude and support constitute three essential elements that enhance user satisfaction in information technology service. However, Boadi et al. (2007) also hold that customer satisfaction with mobile technology services could be enhanced, when three key elements (abbreviated, the "3C's"- convenience, cost and communication) are given considerable attention by service providers.

- **Convenience**

This can be defined as the degree to which the service is available anytime and anywhere (Akter et al., 2010b; Makarem, Mudambi & Podoshen, 2009). Mobile health technology is seen to be one of the pervasive healthcare applications, where pervasive healthcare means "healthcare to anyone, delivered without any time restrictions and is available everywhere" (Varshney, 2005, p.2). Makarem et al. (2009) argues that service convenience is one of the key elements that has a strong impact on customer satisfaction in technology-enabled services.

- **Cost**

Cost is one of the key factors consumers consider when making a decision on information technology usage (Schweitzer & Synowiec, 2012; Wu & Wang, 2005; Constantinides, 2002; Boadi et al., 2007). Zhou (2011) argues that users expect to receive quality services at low cost and hence their satisfaction level would be greatly influenced by the monetary cost of usage. Three key monetary costs on mobile technology services adoption were identified from the literature by Wu & Wang (2005) and Boadi et al. (2007). They are equipment cost (cost of mobile phone and maintenance); transaction fees (cost incurred each time services are used); and access cost (initial monetary cost of locating or subscribing to the service).

These costs of using mobile technology can be classified as "non-negligible" which literally means unavoidable. Users must be in a good financial position to access and continually use the mobile service (Wu & Wang. 2005; Zhou, Lu & Wang, 2010). For instance, a slightly used simple mobile phone in Ghana cost between Ghs 30 to Ghs 40, whereas a simple brand new one of high quality sells from Ghs 100 and above. Starter

pack of various networks SIM is Ghs 3.50 including the registration fee charged unofficially by phone card vendors; a mobile phone charger sells from Ghs 15 and above; and mobile phone replacement battery is from Ghs 15 and above. Charging of mobile phones at designated mobile phone charger shops for people with no access to electricity cost around Ghs 1 daily; and then finally, users must make provision for extra money to buy scratch rechargeable cards to upload onto the network periodically in order to keep the phone lines from being disconnected by network providers.

- **Communication**

This refers to improving information quality and relationships (Boadi et al., 2007). Information quality has a great influence on user satisfaction and continual usage (Chatterjee et al., 2009; Chae et al., 2001). The quality of information and a good relationship between medical staff and patients (customers) leads to satisfaction and continuance of mHealth services (Akter et al., 2012). Information is said to be of quality when it is useful, clearly understood and current (Wang & Liao, 2007). The relationship between service provider and consumers also enhances customer satisfaction (Makarem et al., 2009; Hinson et al., 2011). In addition, studies by Wang and Liao (2007) indicates that content quality (that is useful, current and clear); appearance (that is colours, font and layout); service quality and ease of use are some of the key factors that influence user satisfaction in mobile technology.

2.3.4 The Impact of User Satisfaction on the Service Provider

Consumer or user satisfaction plays a major role in the business market as profits are generated as a result of satisfying consumer's needs and want effectively (Churchill & Suprenant, 1982). It also promotes repeat sales, encourages positive word of mouth as well

as builds customer loyalty (Bearden and Teel, 1983: Zeithaml, 2000). In the healthcare services, a satisfied patient complies with the physician's advice and requests therefore promoting speedy recovery (Calnan, 1988; Pascoe, 1983). Anderson et al. (1994) outline six salient benefits to a firm when customers are highly satisfied: increased loyalty from current customers; reduction in price elasticity as satisfied customers will be willing to pay for services and will tolerate price increment; protection of current customer from competitive efforts; lower cost of attracting new customers; enhanced reputation for the firm; and reduction in failure cost.

Hinson et al. (2006) emphasized the findings of other researchers confirming the fact that satisfying customers might not be enough to retain them as even highly satisfied customers still defect to competitors due to current growing changes in consumers' taste and preferences of services. There is an argument suggesting that customer satisfaction comes with a cost to the service providers as they put in more effort to improve perceived service attributes, or the overall service delivery design (Terpstra & Verbeeten, 2014). This calls for frequent consumer satisfaction surveys in order to identify changing trends, which would be very beneficial to result-oriented service providers' while at the same time ensuring an effective allocation of costs and resources.

2.3.5 The Relationship Between Service Quality and User Satisfaction

Service literature has left a degree of confusion regarding the relationship between service quality and consumer satisfaction (Cronin & Taylor, 1992). Three issues that typically characterize the relationship between service quality and satisfaction are that "satisfaction is an antecedent of service quality, service quality is a predictor of satisfaction, and service quality and satisfaction are interchangeable" (Kassim & Abdullah, 2008, p.4). Early

scholarly writing on service management holds an argument that "customer satisfaction depends on the customer's perception of the value received in a transaction, where value is the same as perceived service quality" (Hallowell, 1996, p. 2). Satisfaction, in general, is a broader concept that captures service quality as one of its components (Zeithmal et al., 2009).

In the healthcare sector, service quality and patient satisfaction continue to remain a critical issue for health service providers (Choi et al., 2004; Atinga et al., 2011). A study by Atinga et al. (2011) found that communication and the patient-provider relationship to be key indicators of health service quality leading to patient satisfaction. Satisfaction is considered to lead to behavioural intentions and hence is mediated between service quality and continual usage (Akter et al., 2013; Dagger et al., 2007; Cronin & Taylor, 1992). Studies by Dagger et al. (2007) confirm that overall health service quality has a significant positive impact on health service satisfaction and behavioural intentions.

Cronin & Taylor (1992) cited the empirical studies of Bitner et al. (1994) and Bolton & Drew (1991a: 1991b) also suggesting that satisfaction is an antecedent of service quality. Cronin & Taylor (1992), using a sample size of 660 from four industries, found the causal order of the relationship between service quality and customer satisfaction proved otherwise; rather, perceived service quality leads to satisfaction. Similarly, Agyapong (2011), using a multiple regression analysis on a sample size of 460 found the effect of service quality on customer satisfaction in the telecommunication industry found service quality to be a good predictor of satisfaction. Other researchers have opined that service quality and customer satisfaction can be determined using the same attributes identified by Parasuraman et al. (1998) namely: responsiveness; assurance; tangibility; empathy; and

reliability (Krishnamurthy, Sivakumar & Sellamuthu, 2010; Bowers, Swan & Koehler, 1994).

However, some researchers have a different opinion on how service quality and customer satisfaction relates. Makarem et al. (2009) and Parasuraman et al. (1988) argue that, service quality focuses mainly on the dimension of the quality of service and considers the overall service experience, whereas customer satisfaction looks at specific transaction or encounter. Anderson et al. (1994) argues that customer satisfaction depends on price, whereas service quality does not. Service quality depends on the user's current perception of service whereas satisfaction depends on both current, past, future or anticipated experience (Anderson et al., 1994). From the analysis above, it can be said that service quality plays an important role in customer satisfaction.

2.4 Continual Usage of Mobile Technology Services

Providers of services stand the chance of failing and not making profit unless consumers' continue to use their services (Hong, Thong, Moon & Tam, 2008; Zhou, 2011; Bhattacherjee, 2001a: 2001b). Continual usage, also called post-adoption, is the behavioural pattern reflecting continued use of products or services (Zhou, 2011; Akter et al., 2012; Limayem, Cheung and Chan, 2003; Hernandez, Jimenez & Martin, 2009). It can be viewed as an extension of acceptance, which means the use of a product or service that transcends conscious behaviour and becomes part of normal routine activities of a user (Bhattacherjee, 2001a).

Zhou (2011) and Hernandez et al. (2009) argue that, after an initial encounter with service, consumers then take a firm decision as to whether to continue or discontinue with service

usage. Hernandez et al. (2009) discovered internal motivation attributes such as perceived self-efficacy (the belief that one is capable of handling or behaving in a certain way) and attitude to have a strong influence on continual usage. Positive attitude towards technology would encourage continual usage (Henandez et al., 2009). Hong et al. (2008), on understanding the behaviour of mobile data service of consumers indicated that users' passion to continue to use mobile data services (MDS) can be attributed to factors such as attitude, social and media influence, perceived mobility and monetary value.

Similarly, in an explorative study, Lee et al. (2009) identified information quality such as content richness and quality to be key determinants for continual usage of mobile technology services. Shin, Lee, Sin & Lee (2010) identified monetary cost as a key determinant of continual usage, whereas Boakye (2015) identified, service quality, mobility and customer experience as key determinants of continual usage of mobile technology services. User satisfaction is an essential factor for continual usage (Alawneh, Refai & Batiha, 2013; Woodside et al., 1989). User satisfaction literature perceives satisfaction as an object-based attitude that according to Wixom & Todd (2005), might not be adequate enough to guarantee system usage. Behaviour-based belief and attitude attributes such as ease of use and usefulness also play a key role in the continual usage of information technology services (Wixom & Todd, 2005).

Findings from Bhattacherjee's (2001b) study on the antecedents of electronic commerce service continuance, indicated that satisfaction was the strongest predictor of continuance intention (β 0.76) with perceived usefulness following up (β 0.44). In building on the works of Bhattachhere (2001b), Akter et al. (2012) conducted studies on continuance of mHealth technology services and concluded that, service quality and trust (that is

confidence in a service provider's reliability and integrity) result in positive behavioural intentions and hence play a pivotal role in promoting continuance of mHealth services. In summary, it can be argued that service quality, positive attitude, satisfaction, monetary cost, social and media have influence on continual usage of mobile technology services.

2.5 The Effect of Service Quality on User Satisfaction and Continual Usage

Several works have established that the delivery of quality services leads to consumer satisfaction (Nartey, 2015: Yesilda & Direktor, 2010; Parasuraman et al., 1988: Rust and Oliver, 1994: Hallowell, 1996: Zeithaml et al, 1996: Akter et al., 2010b: 2013b). More so, customer satisfaction of the quality of services leads to continual usage (Boakye, 2015; Gao et al., 2015; Deng et al., 2010; Bhattacherjee, 2001b; Alawneh et al., 2013; Woodside et al., 1989), which gradually develops into customer loyalty (Evanschitzky, Iyer, Plassmann, Niessing and Meffert, 2006). Studies have shown the tremendous role customer loyalty can play in firm performance (Anabila, Narteh, & Tweneboah-Koduah, 2012; Boohene & Agyapong, 2011; Hallowell, 1996; Innis & Londe, 1994).

Akter et al. (2010b) argues that consumers would continue to use mHealth technology services especially where service quality is high. Hence, overall service quality leads to satisfaction and has both a direct and indirect impact on continuance. Similarly, studies by Kuo et al. (2009) indicate that service quality has a strong influence on satisfaction and also has a positive influence on continual usage of mobile technology services.

2.6 Impact of Monetary Cost on Satisfaction and Continual Usage

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). Deng et al. (2010) initially argue that, when a consumer finds true value for money in accessing services, they would be generally satisfied and continue to use the service. However, findings from their studies on customer satisfaction and loyalty on mobile instant messages in China, using SEM indicated otherwise: monetary value has a direct effect on satisfaction, but the effect was not significant as compared with other variables such as functional (the practical or technical benefits that users can derive from using the service) and emotional values (users' mental or psychological need of the service). The authors concluded in their study that monetary value might not significantly predict customer satisfaction, especially when cost of service is low and it is very affordable to users.

However, studies by Zhou (2011) and Boadi et al. (2007) reveals that the satisfaction level and desire to continue to use or adopt a service by consumers would be greatly influenced by the monetary costs involved. Consumers must have the financial means to use mobile technology services (Wu & Wang, 2005; Zhou & Wang, 2010). The monetary cost of mobile service involves equipment, access and transaction costs (Boadi et al., 2007; Wu & Wang, 2005).

2.7.0 Empirical Studies on mHealth Technology Service

A quantitative study by Akter et al. (2013b) using confirmatory factor analysis (CFA) and the SEM with a sample size of 283 confirmed that mHealth service quality has a strong association with system quality ($\beta = 0.88$), interaction quality ($\beta = 0.94$) and information

quality (β= 0.93). However, under system quality, system efficiency emerged as the highest variance (β= 0.86) followed by system reliability (β= 0.77) and privacy (β= 0.66). All components were found to be statistically significant (p< 0.01). The study confirmed the Global fit index (GoF); that is, the geometric mean of the average communality and average R^2 for all endogenous constructs to be 0.775 for the overall mHealth service quality scale, which adequately validates the research model globally. Findings from the study attest to the fact that service quality is a critical predictor of user satisfaction and continual usage.

The qualitative study on mHealth service quality by Meigounpoory et al. (2014), using a sample size of 12 professionals and experts of health information technology in Iran, confirms that system quality, interaction quality and information quality are the three main factors affecting mHealth service quality leading to user satisfaction.

Empirical studies by Chartterjee et al. (2009), using a deductive approach to assess the validity of propositions related to mobile work in the healthcare context confirms that technological characteristics such as system quality, content quality or nature of work and service quality are very significant to the success of an information system. System quality characteristics include data processing; information access; communicability and portability; content quality or nature of work including task structure; urgency; extent of mobility and information complexity; and service quality attributes entails system reliability and system support. Findings from the study indicated that system reliability is one of the key conditions to enhance the service quality of mHealth technology services. DeLone & McLean's (2003) model of an Information System (IS) was used as a guiding model and 70 articles between year 2005 to 2008 were reviewed for the study.

Studies by Varshney (2005) on pervasive healthcare applications, challenges and wireless solutions indicated that the overall quality of the mHealth service for patients in both cities and rural areas can be improved through information system quality, technological characteristics and effective management of medical information. Information system quality entails reliability of service; the capability of the system to store significant amounts of information; privacy and security of patients' information as well as updating of patients' records; technological issues involves accessibility and updating of software as well as restriction barriers for unauthorized persons from having access to or making of adjustment to patients' health records; managerial issues which include training of healthcare personnel and management of cost; and finally, medical issues such as how specific contents of medical information are presented or communicated to patients.

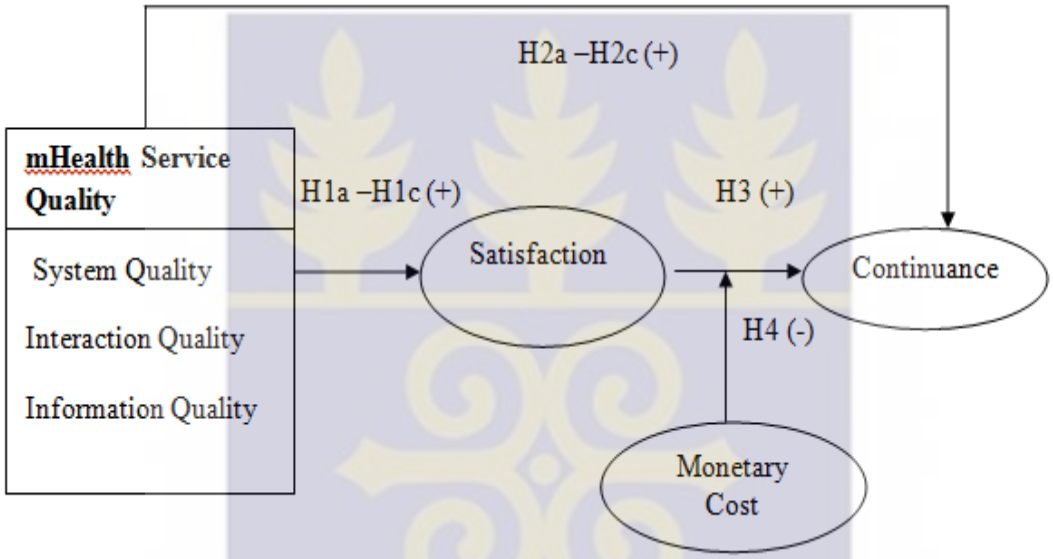
In summary, system reliability, privacy and interaction quality issues seem to be the key dimensionality of mHealth service quality as these variables were seen to have significant impact on mHealth service quality. Secondly, the fact that no valid scale was used in the previous studies to directly measure key service quality attributes of mHealth identified calls for more empirical studies to be done using a valid mHealth service quality scale for confirmation or otherwise of previous findings.

2.8.0 The Conceptual Framework of the Study

Drawing on the literature reviewed earlier, the conceptual framework for this study centres on the impact of mHealth service quality on user satisfaction and continual usage, as well as the effect of monetary cost on user satisfaction and continuance. There are three key dimensions in mHealth service quality, namely: system quality; interaction quality; and information quality. All these service quality dimensions have a great impact on user

satisfaction leading to continual usage of mHealth technology services (Akter et al., 2013b). The monetary cost of acquisition and usage of mobile services are non- negligible and have an influence on user satisfaction and desire to continue to use the service (Zhou, 2011; Boadi et al., 2007).

Fig 2.2: The Conceptual Framework



Source: Adopted from (Akter et al., 2013b; Boadi et al., 2007; Wu & Wang et al., 2005).

2.8.1 Development of Hypothesis

Service Quality and Satisfaction: service quality and satisfaction are important concepts in the health sector (Atinga et al., 2011; Donabedian, 1992). Woodside et al. (1989) concluded in their studies on service quality and customer satisfaction that consumer satisfaction of health services is as a result of overall service quality of the service experience which indirectly influences on behavioural intention. Akter et al. (2013) identified system, interaction and information quality as key service quality attributes in

mobile health. However, Caruana, Money & Berthon (2000) posit that, although consumers might perceive a service firm to produce quality service that does not necessarily mean that consumers would be satisfied with the service. This study, therefore posits that:

H_{1a}: There is a positive relationship between system quality and user satisfaction of mHealth technology services.

H_{1b}: There is a positive relationship between interaction quality and user satisfaction of mHealth technology services.

H_{1c}: There is a positive relationship between information quality and user satisfaction of mHealth technology services.

Service Quality, Satisfaction and Continuance: service quality is acknowledged as a key indicator of success in information technology as well as a good predictor of user satisfaction (Boakye, 2015, DeLone & McLean, 2003). However, Bhattachhere (2001b) and Akter et al. (2013b) argue strongly that service quality dimensions lead to satisfaction and continual usage. This study, therefore posits that:

$H_{2a:}$ There is a positive relationship between system quality and continual usage of mHealth technology services.

$H_{2b:}$ There is a positive relationship between interaction quality and continual usage of mHealth technology services.

H_{2c}: There is a positive relationship between information quality and continual usage of mHealth technology services.

H_3: There is a positive relationship between user satisfaction and continual usage of mHealth technology services.

Monetary Cost, Satisfaction and Continuance: most mHealth services in developing countries are sponsored pilot projects (Dahdah et al., 2015; Tamrat & Kachnowski, 2012) that are delivered to users in rural communities at no fee at the initial stages. Users might pay for mHealth services after the pilot stage. However, to have access to mHealth services and enjoy full benefit of the service, users must own a mobile phone and be in good financial position to replace worn out batteries and chargers, subscribe to a particular network and frequently upload top up credits in order to maintain a mobile phone contact line. The monetary cost has been identified as one of the key influences of consumer satisfaction (Boadi et al., 2007; Zhou, 2011) as well as continual usage (Deng et al., 2010; Zhou, 2011). However, taking into consideration the convenience and the health benefits of the usage of mHealth technology services, the possibility of monetary cost not having any influence on user's satisfaction and desire to continue to use mHealth service is likely. This study, therefore posits that:

H_4 : The higher the monetary cost, the lower the effect on satisfaction and continual usage of mHealth technology services.

CHAPTER THREE

CONTEXT OF STUDY

3.1 Introduction

This chapter focuses on mHealth technology services in rural communities in Ghana and has been grouped into five main sections. The first section provides the outline of issues to be discussed; the second section considers mHealth technology services in Ghana; the third section highlights the background history of Grameen Foundation, Ghana, and how mHealth technology services are delivered; the fourth section deals with studies on mHealth technology in Ghana; the fifth section which is the final part looks at geographical and demographic characteristics of the district under study.

3.2 Mobile Health Technology Services in Ghana

The need to improve public healthcare interventions and the empowerment of the population to seek for early treatment and a healthy lifestyle through the use of information technology has become necessary in Ghana (MOH, 2012) due to the tremendous impact of technology usage in other sectors globally. However, the awareness and the use of mobile technology specifically designed and programmed for healthcare intervention services, especially in developing countries are still at the infancy stage (Awotwi, 2012; Hampshire et al., 2015). A Study by Hampshire et al. (2015) on the informal use of mHealth services, using a sample size of over 4,500 young people in Ghana, Malawi and South Africa indicated that the youth were informally using mobile technology on health related issues. They use their mobile phones to call on friends, relatives and health centres for emergency health care assistance, to seek for further

clarification regarding correct medicine usage as well as to book for hospital appointments.

Most of the mHealth technology initiatives in the developing countries are pilot projects from donor agencies that have ended or are about to end (Mars, 2013; Tamrat & Kachnowski, 2012; Oerther, Manjrekar & Oerther, 2014; Dahdah et al., 2015; Noordam, Kuepper, Stekelenburg; Milen, 2011). Ghana is in a similar situation as most of the mHealth technology services in rural communities were pilot projects funded by foreign donors and rendered to customers at no fee. Some of the mHealth technology initiatives in the country have been discussed earlier in section 1.5 of chapter one. An mHealth application designed by Grameen Foundation for maternal healthcare delivery in the rural communities in Ghana was selected for the study and hence, the next section would highlight more on Grameen Foundation, Ghana and how their mHealth technology application operates.

3.3 Mobile Health Technology by Grameen Foundation, Ghana

Grammen Foundation is a non- governmental organization founded in 1997 by Alex Counts after working with Professor Muhammad Yunus at the Grameen Bank in Bangladesh for six years. The headquarters of the Grameen Foundation is in Washington, D.C and can boast of branches in the United States, Africa, Asia and Latin America. The vision and mission of the foundation is to "strengthen the world's poor to address their own unique needs" (Grameen Foundation, 2015).

Grameen Foundation works together with private institutions, government and other non-governmental agencies to provide access to financial information on agriculture and mobile healthcare services. Some of the institutions that have funded Grameen Foundation projects over the past years are Bill & Melinda Gates Foundation, Johnson & Johnson, the government of Norway and USAID. Other institutions that have also worked and impacted their rich information technology experience with Grameen Foundation are Dimagi, InSTEDD and University of Southern Maine, all forming the Mobile Technology for Community Health (MOTECH) suite consortium (Grameen Foundation, 2015).

Grameen Foundation, Ghana branch, and Mailman School of Public Health, Columbia University in partnership with the Ghana Health Service launched Mobile Technology for Community Health (MOTECH initiative in 2010. The pilot project was funded by Bill & Melinda Gates Foundation and aimed at addressing some of the information-based drivers of high maternal and infant deaths in rural communities in Ghana through the use of mobile phones (Grameen Foundation, 2012). The MOTECH project was initiated at Kassena-Nankana District in the Northern Region in July, 2010 and then extended to three other regions, namely; Awutu Senya District in the Central Region, Volta Region and some parts of the Greater Accra region. The MOTECH services will be discussed in detail next.

3.3.1 MOTECH Services in Rural Communities in Ghana

MOTECH was programmed to have two interrelated applications; one for consumers or patients called “mobile midwife application”; and then one for healthcare personnel called “nurse’s application”. The mobile midwife application enabled pregnant women to receive

SMS or voice messages in local languages through their personal, shared or public phones whereas nurse's application were used to track and record healthcare delivered to women and new-borns. The nurse application communicates patient's data to the MOTECH server. This server was programmed to generate monthly reports to various district and regional offices as well as to give alerts on overdue patient treatment appointments to enable healthcare personnel to follow up on the patient.

Women accessed MOTECH services by registering either in person through specially trained Community Health Worker (CHW) or through MOTECH customer care line. After the registration, they were given ID numbers to access the service through their mobile phones. The mHealth services delivered were personalized weekly health messages on diet during and after pregnancy, pregnancy related issues, breastfeeding, caring for new-born, phone call appointment reminders and alerts and customer service centre that handled customers and healthcare personnel's inquires (Grameen Foundation, 2012).

3.4 Studies on mHealth Technology in Ghana

In December, 2009, a 90 day pilot project funded by the Bill and Melinda Gates Foundation was implemented at Sene District in the Brong Ahafo Region (Andreatta, Debpuur, Danquah & Perosky, 2011). The main purpose of the project was to ascertain the possibility of using mobile phones to report health-related outcomes by professional and traditional birth attendance in rural communities in Ghana. Within the 90 day period, two nurses and eight traditional birth attendants were given 2 days training on how to report postpartum hemorrhage (excessive bleeding following the birth of a baby) to a designated number for assistance using mobile phones.

Findings of Andreatta et al. (2011) studies on the 90 days pilot project indicated that all the 10 participants were able to use the mobile phone for the intended purpose, thereby confirming the possibilities of training community-based healthcare providers with low level of education to use mobile phones to report health-related outcome to designate health institutions.

Similarly, studies of Coates, Kvedar & Granstein (2015) reports on another pilot study that was done in 2010 to examine the use of a mobile phone platform to provide dermatologic care in Ghana. Mobile phones were used by Ghanaian dermatologist to capture images of 34 patients from Accra and Kumasi with skin diseases. The images were sent through the internet for critical diagnosis by a dermatologist in the United State. The mobile phone application programme was called "ClickDiagnostic" and was developed by International Development Activist from Harvard University and Massachusetts Institute of Technology with the purpose of addressing the lack of access to doctors, medical and financial resource (Coates et al., 2015). The findings from the study confirmed the capabilities of the usage of mobile phones in delivering timely reports on dermatologic diagnosis.

In July, 2011, a qualitative study was conducted by Grameen Foundation at Kassana Nankana District in the Upper East Region using a focus group survey with the aim of gathering feedback on the mobile midwife application. The issues considered in the study were users' ease of accessing messages; ways of improving access to messages; willingness of users to pay for messages, and clarity and credibility of messages.

Findings from the study indicated that the majority of the respondents using their personal phone had no problem accessing the service, but rather those accessing services through relatives or public phones had challenges such as frequent absents of the owners of the phone hence hindering message accessibility. The report indicated that there mixed result regarding willingness of users to pay for messages.

Recently, Asgary et al. (2016) conducted a study on the use of smart phones to train Community Health Nurses (CHN) in visual inspection with acetic acid for cervical cancer screening in urban communities in Ghana. The findings from their study indicated that expert feedback on their diagnoses was obtained within 24 hours, therefore confirming the efficacy of mHealth technology in improving cervical cancer screening in Ghana. Similarly, Vroom et al. (2015) conducted a study on the use of mobile phones by community health volunteers for reporting on lymphatic filariasis mass drug administration activities in Nzema East and Ahanta West District in the Western Region of Ghana. Findings from the studies indicated low numerical skills and lack of motivation for community health volunteers resulting in delays and inaccuracy of reports submitted by the community health volunteers.

3.5 Geographic and Demographic Characteristics of the Study Area

Awutu Senya District in the Central Region is the area for this study. As at 2012, total mobile midwife registrant in that district was more than 11,000 (GHS, 2012). Awutu Senya has two districts namely, East and West district. The total population of the East district is 108,422 and that of the West, 86, 884 totaling 195,306. The female population formed more than 50% of the population in both districts. The fertility rate in both districts

is at 3% with women giving birth between the ages of 15 to 49 years. The main languages spoken in both districts are Awutu and Akan.

More than 80 % of the populations in the East district are literate whereas that of the West, 75%. More than 40% of the population in both districts can read and write English and Ghanaian language. Approximately, more than 60% of the populations in both districts are into active economic activities such as agriculture, forestry, fishery, craft and related trade, service and sales whiles others are technicians and professionals holding managerial positions in other firms. The percentage of phone ownership in the East district is 68.7% and that of the West district, less than 40%. Both districts have access to electricity (Ghana Statistical Service, 2014).

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter outlines and discusses the various steps used to conduct this study. It entails the research approach, research design and strategy, sampling design, source of data, data collection method and data analysis. Ethical issues and limitations of the study are also discussed.

4.2 Research Approach

There are several factors that influence the researcher's choice of a particular research approach (Creswell, 2003; Leedy & Ormrod, 2005). Some of the factors pointed out by Creswell (2003) include the type of audience targeted with the report; the nature of the research problem identified; as well as researchers' personal experience in terms of computer literacy and statistical data handling. The research approach can be classified as qualitative approach, quantitative approach and mixed methods approach.

Quantitative studies best fit the research problem identified in this study. Positivist paradigm were considered since it generalizes and predicts the causes and effects (Newman & Benz, 1998). A similar research approach was adapted in studies on mHealth technology adoption (Dwivedi et al., 2015; Hoque, Karim & Amin, 2015); acceptance (Sun et al., 2013; Chen et al., 2010); and service quality (Akter et al., 2013b).

4.3 Research Design

Research design can be defined as "the general strategy for solving an identified research problem" (Leedy & Ormrod, 2005, p. 85). It outlines the research plan which entails methods used to collect measure and analyze data in order to achieve research objectives (Cresswell, 2003). Research design can be classified as being exploratory, descriptive and explanatory or a causal research design (Zikmud & Babin, 2010; Yin, 1994).

This study is primarily an explanatory research. It intends to examine the relationship between mHealth service quality and user satisfaction as well as examine the effect of monetary cost on satisfaction and continual usage. In order to achieve this objective, hypothesis were developed from the conceptual framework for the study, which was adopted from Akter et al. (2013b), Boadi et al. (2007) and Wu & Wang (2005).

4.4 Research Strategy

Research strategy is a systematic way of finding answers to research questions (Saunders et al., 2007). The most frequently used research strategy are the survey and experimental (Creswell & Clark, 2007; Zikmud, 2000). The research objectives, research questions, extent of existing knowledge and philosophical view of the researcher influence the type of strategy to adopt (Saunders et al., 2009). Survey is a system for collecting data for assessing opinions and trends (Creswell, 2009). It can be cross-sectional or longitudinal (Zikmund & Babin, 2010). Experimental strategy, on the other hand, is used to test and determine whether treatment, invention or programme of study has an effect on the targeted or selected population (Creswell, 2003).

This study adopts a cross sectional field study using a structured questionnaire survey method to obtain data from respondents.

4.5 Sampling Design

Sampling is the statistical method of selecting a representative data or group in order to obtain data to address a research problem (Boateng, 2014). It entails target population, sample frame, sampling technique and sample size (Malhotra & Dash, 2011).

4.5.1 Population

Population refers to "the entire set of individuals or other entities to which study findings are to be generalized" (Leedy & Ormrod, 2005, p.198). The targeted population for the study was rural women who were active users of mobile midwife service at Awutu Senya District in the Central Region of Ghana, precisely Papaase, Opeikuma, Ofaakor, Okwampa, Bawjiase and Ofadaa communities. Mobile midwife is one of the mHealth technology services developed and implemented by the Grameen Foundation, one of the leading mHealth service providers in developing economies.

Women in rural communities were selected because MOTECH services were designed purposely with the aim of improving pre-natal and neo-natal care in rural communities in Ghana (Grameen Foundation, 2012). Six communities in the Awutu Senya District were selected due to proximity and familiarity.

4.5.2. Sampling Technique

Probability and non-probability sampling are the two main types of sampling technique (Creswell, 2003; Saunders et al., 2009). The probability sampling technique gives an equal

chance for all elements to be selected from the population. Examples include stratified random sampling; systematic sampling; and simple random sampling (Saunders et al., 2009). Regarding non-probability sampling, not all elements have the opportunity to be included in the sample. Examples include purposive sampling procedure, convenience, quota and snowball sampling (Saunders et al., 2009; Mbokane, 2009). Saunders et al. (2009) are of the opinion that, non-probability sampling is appropriate where there is no sampling frame or there are challenges in obtaining lists of target population.

The non-probability sampling technique was used for the study as this sampling approach has been used by other researcher in studies in mHealth technology (Deng et al., 2014; Amin et al., 2014; Chen et al., 2010. Purposive sampling also called judgmental sampling, was used to sample the targeted population. Purposive sampling enables a researcher to select cases that require knowledge on specific activity in order to have the appropriate answers to research questions (Saunders et al., 2011).

4.5.3. Sample Size

Sample size determines how many people to select. Saunders et al. (2009) outline some of the factors that determine the choice of sample size such as, the level of certainty that data collected will be a true representation of the characteristics of the total population, the size of the population from which the sample would be drawn from as well as the type of statistical analysis to be done.

Sample size for this study was selected based on the choice of statistical analysis. SEM is a large sample size technique (Schreiber, Nora, Stage, Barlow & King, 2006). SEM enables the measurement of several variables and their interrelationships simultaneously

(Hoe, 2008). As recommended by Hair, Black, Babin, Anderson & Tatham (2006), the sample size should not be less than 200. Total sample size of 350 was initially selected for the study and out of which 305 were valid after the screening process. 45 were rejected on grounds of double ticking and providing an incomplete questionnaire. Similar quantitative studies on mHealth technology using SEM have used a sample size above 200 (Shareef et al., 2014; Deng et al., 2014; Akter et al., 2012) and even less (Hoque et al., 2015; Sun et al., 2013).

The sample size was apportioned based on communities with the highest registrant. Records indicate that, as at 2012, registrants in communities in Ofaakor were 2,303; Papaase recorded 1,494; Opeikuma recorded 880; Okwampa were 599; Ofaadaa were 522; and that of Bawjiase were more than 200 (Grameen Foundation, 2012). Table 4.1 outlines a summary of how the sample size was apportioned to each community.

Table 4.1: Sample Size of the Population for the Study

Community	Targeted Sample Size	Actual Sample Size	% Percentage of Respondents
1. Ofaakor	100	83	27
2. Papaase	70	58	19
3. Opeikuma	60	60	20
4. Okwampa	55	45	15
5. Ofaadaa	45	50	16
6. Bawjiase	20	9	3
Total	350	305	100

Source: Field Data, 2016

4.6 Data Source

There are two sources of data, namely, primary and secondary (Hair et al., 2006; Saunders et al., 2007). The choice of the source of data is influenced by availability of existing data as well as the purpose for which that data is to be collected (Hair et al., 2006).

4.6.1 Secondary Source of Data

These are data collected already for other purpose (Saunders et al., 2009; Webb, 2000). Saunders et al. (2009) grouped secondary data under three types, namely: documentary; survey-based; and one compiled from multiple source. Examples of documentary data are notices, correspondence, minutes of meetings, reports, books, newspapers, magazine, video recordings, organization database and electronically stored data.

The survey-based data are data collected, usually through the use of a questionnaire, which have been analyses for its intended purpose already. Multiple sources of data are usually a combination of different data to form another data set. Examples are financial times country report, government publication and industry statistical report.

4.6.2 Primary Source of Data

These are data collected directly at source to address current research problems identified (Saunders et al., 2007). Primary data source is the most valid and truthful representation (Leedy & Ormrod, 2005). Examples are observation, and interviews. Interviews are discussions between two or more people, which can be classified as semi-structured, in-depth and group interviews (Saunders et al., 2009). Semi-structured interviews are thematic and are called qualitative interviews. The structured interview also called a quantitative interview is the administration of a questionnaire which can be open-ended or

closed-ended. The in-depth interview is a one on one interview and that of a group interview; people are deliberately grouped to respond to a moderator's questions in turns.

Primary data were the major source of data for the study. Closed-ended structured interview were used to collect data. Other sources of information were obtained from marketing books, electronic journals and articles from the internet and the university library.

4.7 Data Collection Method

The process of gathering information is called data collection. In quantitative studies, the data collection method is through the filling out of questionnaire by the targeted respondent. This section dwells on how the data collection instrument was designed and pre-tested and then finally outlines how questionnaires were administered to the target population.

4.7.1 Research Instrument Design

Research instruments are measuring tool designed to obtain data on a topic of interest from research subjects (Creswell, 2009). A questionnaire was used to collect the data. The questionnaire was divided into five (5) sections and contained a total number of 50 questions (items) drawn from the four key elements in the conceptual framework, namely, mHealth service quality; user satisfaction; monetary cost; and continual usage of mHealth technology. The questionnaire contained a brief introduction stating the nature and purpose of the research, as well what was required of respondents. Responses to all questions apart from the one in section one and three were measured on a five-point Likert scale ranging from 1(strongly disagree) to 5 (strongly agree).

The first part focused on demographic characteristic of respondents such as gender; age; level of education; occupation; average monthly income; duration of usage of mHealth technology service; mobile phone ownership status; frequency of service usage; and frequency at which customer care line was used by the respondents. It is a prerequisite by researchers to include demographic characteristics of the respondents as it enables readers to easily determine whose research findings are to be generalized for comparative studies as well as to enable the identification of gaps in research (Hammer, 2011).

The second section comprised of thirty (30) measurable items which concentrated on mHealth service quality attributes. Three main variables were identified as determinant of mHealth service quality. They are system quality; information quality; and interaction quality. System quality was measured using three independent variables, namely: system reliability; system efficiency; and system privacy (Parasuraman et al., 2005; Akter et al., 2013b). Interaction quality was also determined using three independent variables, namely: cooperation (Dagger et al., 2007; Parasuraman et al., 2005 and Akter et al., 2013b); confidence; and care (Akter et al., 2013b; Parasuraman et al., 1988). Information quality were measured with two independent variables extracted from Akter et al. (2013b) and Fassnacht & Koese. (2006). They are utilitarian and hedonic.

The third phase contained four (4) measurable items which focused on overall mHealth service user satisfaction which was adopted from Akter et al. (2013b) and Bhattacherjee (2001a). A five- point Likert scale adopted from Vagias (2006) was used. It ranged from1 (not at all satisfied) to 5 (extremely satisfied). The fourth section also contained four (4) items that dwelt on monetary cost attributes such as equipment cost, access cost, transaction cost and user willingness to pay for the service (Wu & Wang, 2005; Chae et

al., 2001). The fifth section entailed 3 items and focused on the continual usage of mHealth technology service (Bhattacherjee , 2001a; Akter et al., 2013).

4.7.2 Pre-testing of Questionnaire

A pilot study was launched among ten (10) past users of mobile midwife services in the Awutu Senya District upon approval from the District Health office. This was done to gain a better insight on the level of understanding of questionnaire content by respondents as well as time each respondent might use to fill out the questionnaire completely.

During the pre-testing stage, the researcher realized that, although respondents could read and write, they were reluctant to fill out the questionnaire themselves and hence requested some form of assistance after spending about 10 minutes on the first section. This compelled the researcher to take a decision to engage the services of two additional research assistants to assist in the administration of the questionnaires. This ensured better understanding, encouraged a high response rate, and ensured accuracy of recording as well as to reducing the amount of time respondents (who are mothers) have to spend. A few grammatical and numbering errors were detected and corrections were made to that effect prior to the main data collection.

In order to ensure reliability and validity of research instruments used for the study, Cronbach's Alpha values for scales extracted directly from other researchers were checked for consistency. The acceptable range is 0.70 and above (Nunnally & Bernstein, 1994). The questionnaire was also verified by 3 graduate students with a marketing background for content validity. The final questionnaire is shown in Appendix A hereto.

4.7.3 Administration of the Questionnaire

Ethical issues regarding the data collection exercise were addressed in writing and verbally to the health management authority and to respondents, thereby giving respondents the voluntary will to participate. The administration of the questionnaire lasted over a period of two weeks after permission was granted at the district office.

Saunders et al. (2009) outlined two types of questionnaire administration. They are self-administered (this is where respondents fill out the questionnaire themselves and submit through agreed or approved means); and interviewer-administered (this is where questionnaires are filled out for respondents based on respondents' answers provided). Saunders et al. (2009) indicates that factors that influence choice of questionnaire administration are population characteristics; confidence that right person has responded; sample size; response rate; length of the questionnaire; as well as financial resources.

An interviewer-administered questionnaire was used for the study. Questionnaires were administered on different days with the help of two research assistants who were undergraduate marketing students. Past users of mobile midwife services attending antenatal checkup or sending their wards for medical care at selected community health clinics and those met on the streets were considered. Their opinion on the level of mHealth service quality, user satisfaction, monetary cost and continual usage as outlined in the questionnaire was solicited and recorded. In all, 350 questionnaires were administered out of which 305 were valid after screening therefore yielding a response rate of 87%.

4.8 Data Analysis Technique

Data analysis considers how data were organized and processed to make meaning. It entailed data entry and checking; conducting of demographic analysis; descriptive statistics of measurement of items; confirmatory factor analysis; structural analysis; and testing of the hypothesis.

The starting point of every data analysis is editing and coding (Saunders et al., 2009; Zikmud & Babin, 2010). Questionnaires were double checked and those filled completely and correctly were selected and coded before it was keyed into the computer for analysis. Data was run using Statistical Package for Social Science (SPSS) software version 22, with SEM which is the most widely used statistical package. The frequency command was used to check for missing data and wrong coding. Re-coding was made to that effect. Demographic analysis was done to ascertain characteristics of the respondent in terms of highest and lowest age range, education and income level, occupation, phone ownership status as well as duration of mHealth service usage.

Descriptive statistical measurement of items was done to compare means and standard deviation of the variables in order to identify the highest and the lowest variables. Measurement scales were extracted directly from other researchers and hence a confirmatory factor analysis (CFA) was done to test construct reliability and validity of the study. Reliability ("the degree of consistency between multiple of measurement of variable") was tested using Cronbach's alpha. Nunnally & Bernstein (1994) recommend a Cronbach's alpha coefficient value to be 0.70 and above. Regarding validity, loadings that were less than the threshold value of 0.50 were dropped from further analysis (Fornell and Larker, 1981; Hair, Anderson, Tatham & Black, 1998). The type of indicators used to test

the goodness-of-fit of the model included the chi-square, degree of freedom (df), goodness-fit-index (GFI), comparative fit index (CFI) and root mean squared error of approximation (RMSEA).

Average variances extracted (AVE) were calculated for each factor in order to assess discriminant validity of the construct. Fornell & Larker (1981) recommends each factor not to be less than 0.50. SEM with AMOS version 22 was used to test the causal relationship between four variables, namely: service quality; user satisfaction; monetary cost; and continual usage as well as to test the hypotheses.

4.9 Ethical Consideration

The involvement of human subjects in research calls for a closer look at ethical issues (Leedy & Ormrod, 2005). Leedy & Ormrod (2005) out lined four key ethical issue in research elements namely: protection from harm (not exposing respondents to physical or psychological harm); informed consent (the need to brief respondents about the nature and purpose of the research as well their role in order to enable them to take a firm decision as to whether to participate or not); right to privacy (the need for confidentiality of respondent's performance or data); and honesty (reporting of findings to be complete and honest and not misleading).

An introductory letter from the University of Ghana stating the purpose of the research, and a copy of the proposal and questionnaire was submitted to the Awutu Senya District Health office for approval. Prior to the administration of questionnaires, respondents' consent was sought. The data collected was double checked for accuracy. A copy of the

approval letter issued from the Awutu Senya District Health Office is shown as Appendix B hereto.

4.10 Limitations of the study

Every research is believed to have some limitations. The researcher believes the effect on the validation of the conclusion drawn would be minimal because they have been factored into the research design. Some of the limitations have to do with the sample size and sampling method used for the study. The sample size of the population (that is 305) used to analyze data is not representative of the entire view of all users of mHealth technology services. All previous users of mobile midwife services in the Awutu Senya district should have been given an equal chance of being selected for the study in order to generalize findings of the study. Secondly, this study was gender, location and hospital biased as only rural women who assessed mHealth technology services in government healthcare centers were considered. Another issue has to do with the reluctance of respondents to give honest and verifiable answers. A detailed limitation of the study can be found at page 94 and 95 of chapter six, which is the final chapter.

CHAPTER FIVE

DATA ANALYSIS AND DISCUSSION

5.1 Introduction

The focal point of this study is to examine the level of mHealth service quality and its effect on user satisfaction and continual usage of mHealth technology service. This chapter focuses on analysis, interpretation of data and discussions of findings. The chapter has been divided into six sections. The first section cover demographic characteristics of respondents; the second section considers descriptive statistics of measurement items; and the third section is on confirmatory factor analysis. The fourth section is on testing of hypothesis; the fifth is on the moderating effect of monetary cost on user satisfaction and continual usage; and the final section is on discussions of findings.

5.2 Demographic Characteristics of Respondents

The targeted population for the study were rural women at Awutu Senya District in the Central Region of Ghana who were users of "mobile midwife service", an mHealth application programme developed and implemented by Grameen Fondation in collaboration with the Ghana Health Service. In all, 350 questionnaires were administered out of which 305 were valid after screening therefore yielding a response rate of 87%.

All respondents were female since "mobile midwife" services were designed for women. The highest percentage of women who used mHealth technology services were between the ages of 15 and 24 years, forming 38.40%. The next were those between the ages of 25 and 29 years (36.10 %) with the least being those above the age of 40 years. All respondents had some form of basic education. Junior High School (JHS) leavers formed

the majority with 55%, followed by Senior Higher School (SHS) leavers with 21.3%. The majority of respondents were self-employed, engaged in peasant farming (40.30%) and micro-trading activities (34.80%). There were a few housewives (8.9%) and health workers (6%). The rest were into other entrepreneurial activities such as hairdressing, dressmaking and food selling.

Close to half (44.90%) of respondents' average monthly income was between an amount of GH 50 to 199 which was the highest percentage, followed by those earning between GH 200 and 499 (34.1%). Those earning above GH 500 were the smallest group forming 9.50%. A large proportion of respondents (43.9%) had more than one year of experience using mHealth service which was the highest grouping. The second highest group formed 35.40% of the respondents with mHealth service experience of less than a year. The remaining 20.7% of the respondent used mHealth service for a year.

A little over half of the respondents (59%) used mobile phones belonging to relatives and friends to access mHealth technology services, the rest used their personal phones (41%). Close to half (45.20%) assessed mHealth service weekly with only 4.9% using the service occasionally. An overwhelming number of respondents (99.3%) have never called the customer care line service for assistance. Probably, they preferred face to face interaction with healthcare personnel for assistance. Table 5.1 and Table 5.2 outline a summary of the demographic profile of the respondents.

Table 5.1: Demographic Characteristics of Respondents

ITEMS	CATEGORIES	FREQUENCY	STATISTICS %
Age			
	15-24	117	38.4
	25-29	110	36.1
	30-34	47	15.4
	35-39	23	7.5
	40 >	8	2.6
	Total	305	100
Education			
	Primary	54	17.7
	JHS	168	55.1
	SHS	65	21.3
	Vocational	18	5.9
	Total	305	100
Occupation			
	Traders	106	34.8
	Housewives	27	8.9
	Health Workers	6	2
	Farmers	123	40.3
	Hairdresser	20	6.6
	Others	23	7.5
	Total	305	100
Average Monthly Income			
	< than GH 50	35	11.5
	GH 50-199	137	44.9
	GH 200-499	104	34.1
	GH 500 >	29	9.5
	Total	305	100

Source: Field data, 2016

Table 5.2: Continuation of Demographic Characteristics of Respondents

ITEMS	CATEGORIES	FREQUENCY	STATISTICS %
Service Usage Period			
	< than one year	108	35.4
	One year	63	20.7
	One Year and >	134	43.9
		305	100
Phone Ownership Status			
	Personal	125	41
	Shared	180	59
	Total	305	100
Frequency of Usage			
	Daily	97	31.8
	Weekly	138	45.2
	Monthly	55	18
	Occasionally	15	4.9
	Total	305	100
Calls to Customer Service			
	Never	303	99.3
	Rarely	2	0.7
	Total	305	100

Source: Field data, 2016

5.3 Descriptive Statistics of Measurement Items

Table 5.3 and Table 5.4 below display components of the measurement items. Response to questions on mHealth service quality, mHealth monetary cost and mHealth service continual usage was measured on a five-point Likert scale ranging from 1(strongly disagree) to 5 (strongly agree) with 3 being a neutral point. Regarding mHealth user satisfaction, a five- point Likert scale adopted from Vagias (2006) which ranged from1 (not at all satisfied) to 5 (extremely satisfied) was used. The results were based on the

mean and standard deviation of the scale measurements. The mean values indicated the extent to which respondents disagree or agreed with the statements in the questionnaire.

The highest mean under reliability was 4.10 (it doesn't have long waiting time) and the lowest was 3.15 (mHealth platform was always available). This means unavailability of the network to access mHealth service did not influence most respondent's perception of service quality probably due to frequent network challenges in the rural communities but however, waiting time period to access mHealth platform had a great influence on a respondent's perception of mHealth service quality.

Under efficiency, the highest mean was 4.58 (information on this platform was well organized) and the second was 4.50 (the system was flexible to meet a variety of needs). This means timely delivery of information on the platform to meet a variety of needs plays a key role in mHealth service quality. All items under privacy recorded a mean score above 4.0 indicating the extent to which privacy influences respondents' perception of quality of mHealth service. Willingness of health service personnel to help customers received the highest mean of 4.35 under cooperation. The least was 3.26 (they provided the service by a certain time). This means respondents might perceive mHealth service to be of quality when health service personnel shows much willingness to attend to their needs, even when occasionally services are not delivered by a certain time.

All items under confidence recorded a mean score over 4.0 with safety of mHealth information quality receiving the highest mean of 4.39. Similarly, all items under care, utilitarian and hedonic recorded a mean score above 4.0 with "information provided has been worthwhile" having the highest mean score of 4.81 of all variables under mHealth

service quality. This means that the majority of the respondents were utilitarian users who perceive health information service to be of high quality when it is safe to rely upon it and it enables peculiar task at hand to be performed with much ease or promotes a change of behaviour.

In all, respondents were satisfied with mHealth service quality and overall experience of mHealth usage at a mean value of 4.04 and 4.45 respectively. They were moderately satisfied with the mHealth monetary cost (3.50) as most of the respondents used shared phones (59%) probably due to high equipment cost which had a mean value of 3.72. Some of the respondents were not willing to pay for mHealth services (2.84) which recorded the least of all means for the measurement items, probably due to free NHIS from the government which covers maternal healthcare in Ghana, financial challenges or due to the long trial period. However, they showed much interest to continue to use mHealth service (4.58) and more also encourage friends to use the service at a mean of 4.68. This means that respondents might perceive mHealth service to be of quality and be willing to continue to use the service when they are satisfied with the overall service experience which includes the monetary cost involve.

Table 5.3: Descriptive Statistics of Measurement Items

Measurements Items	CODE	Mean	SD
Reliability			
mHealth platform was always available	SQR1	3.15	1.223
I could access system whenever I needed	SQR2	3.97	1.085
I could receive service right away.	SQR3	3.98	1.21
It doesn't have long waiting time	SQR4	4.1	0.925
Efficiency			
This system was simple to use	SQE1	4.08	1.041
It was easy to get service from this system.	SQE2	4.1	1.047
The system was flexible to meet variety of needs	SQE3	4.5	0.58
Information on this platform was well organized	SQE4	4.58	0.508
Privacy			
M-health platform protected my personal information	SQP1	4.23	0.766
It does not share information with others	SQP2	4.22	0.788
It offered me a meaningful guarantee not to share my information	SQP3	4.22	0.813
Cooperation			
M-health service personnel were always willing to help me.	SQC1	4.35	0.794
They showed interest to solve my problems.	SQC2	4.29	0.836
They provided service right the first time.	SQC3	3.51	1.331
They provided the service by a certain time	SQC4	3.26	1.432
Confidence			
Behaviour of mHealth personnel on platform instilled confidence in me	SQCO1	4.35	0.696
I felt safe while consulting them on the platform	SQCO2	4.39	0.534
They were competent in providing service on the platform	SQCO3	4.38	0.526
They have knowledge to answer my question	SQCO4	4.37	0.589
Care			
M-health service personnel understood my specific needs.	SQCA1	4.25	0.817
They gave me personal attention	SQCA2	4.28	0.728
They had my best interests at heart	SQCA3	4.37	0.541
They gave me individual care.	SQCA4	4.42	0.539

Source: Field Data, 2016

Table 5.4: Descriptive Statistics of Measurement Items cont…

Measurements Items	CODE	Mean	SD
Utilitarian			
mHealth information services served its purpose very well	SQI1	4.75	0.431
Overall, this information service has been useful to me.	SQI2	4.8	0.409
Information provided has been worthwhile	SQI3	4.81	0.393
I enjoyed using this information service	SQI4	4.75	0.483
Hedonic			
I feel hopeful as a result of having information.	SQH1	4.39	0.558
I feel encouraged having this information.	SQH2	4.47	0.574
mHealth technology has increased my chances of improving my health	SQH3	4.54	0.584
User Satisfaction			
How satisfied were you with mHealth service quality	USAT1	4.04	0.775
How satisfied were you with mHealth personnel attitude and performance	USAT2	3.75	0.891
How satisfied were you with overall mHealth monetary cost	USAT3	3.5	0.753
How do you feel about your overall experience of mHealth usage	USAT4	4.45	0.617
Monetary Cost			
I think mHealth service equipment cost was not expensive.	MC1	3.72	1.014
I think service access cost was not expensive.	MC2	4.28	0.583
I think service transaction fee was not expensive.	MC3	4.43	0.587
I am willing to pay for using mHealth service	MC4	2.84	1.288
Continual Usage			
I intend to continue using mHealth service to get medical information	CU1	4.58	0.586
My intentions are to continue using mHealth service than use any alternative means (such as traditional health system).	CU2	4.11	1.006
I will encourage friends and others to use this service	CU3	4.68	0.469

Source: Field data, 2016

5.4 Confirmatory Factor Analysis

Measurement scales were extracted directly from other researchers and hence a confirmatory factor analysis (CFA) was done to test construct reliability and validity of the study. Six variables (SQC1, SQC2, USAT3, USAT4, MC2 and MC4) were dropped during the CFA because their loadings were less than the threshold value of 0.50. Barring these, all other variable indicators had significant standardized loadings of $\rho \leq 0.001$. Additionally, the t-values of the individual indicators ranged from 1.915 to 36.293 (Anderson & Gerbing, 1988). The validity and reliability of the measures enabled effective assessment of the psychometric properties of the scaled measures (Fornell & Larcker, 1981).

All eleven constructs were tested for their goodness of fit and validation of scales of the measurement of the constructs by the CFA. The model fit indices in the measurement model exhibited good fit on the data (X^2 = 1695.015, df = 715, GFI = .897, CFI = .916, RMSEA = .067, PCLOSE = .056). These indices meet the acceptable criteria for the overall model fit of the sample group as recommended by Kline (2005). Table 5.5 and Table 5.6 represent the standard loadings and the t-values of each variable indicator.

Table 5.5: Measurement Model Result

Constructs	Items	Loading	t-value
Reliability	SQR1	0.523	7.947
	SQR2	0.759	10.832
	SQR3	0.718	10.624
	SQR4	0.679	Fixed
Efficiency	SQE1	0.688	8.136
	SQE2	0.594	7.423
	SQE3	0.588	10.691
	SQE4	0.547	Fixed
Privacy	SQP1	0.947	31.353
	SQP2	0.990	36.293
	SQP3	0.917	Fixed
Cooperation	SQC1	0.324	5.338
	SQC2	0.273	4.626
	SQC3	0.834	14.565
	SQC4	0.819	Fixed
Confidence	SQCO1	0.569	9.975
	SQCO2	0.825	15.655
	SQCO3	0.924	17.073
	SQCO4	0.772	Fixed
Care	SQCA1	0.745	12.024
	SQCA2	0.963	13.387
	SQCA3	0.733	15.586
	SQCA4	0.670	Fixed
Utilitarian	SQI1	0.807	12.095
	SQI2	0.965	13.723
	SQI3	0.962	13.705
	SQI4	0.622	Fixed
Hedonic	SQH1	0.627	Fixed
	SQH2	0.837	9.366
	SQH3	0.606	8.338

Source :Field data, 2016

Table 5.6: Measurement Model Result cont..

Constructs	Items	Loading	t-value
User satisfaction	USAT1	0.552	Fixed
	USAT2	0.865	8.402
	USAT3	0.479	6.564
	USAT4	0.122	1.913
Monetary cost	MC1	0.639	Fixed
	MC2	0.489	7.303
	MC3	0.680	9.299
	MC4	0.484	7.075
Continual Usage	CU1	0.600	Fixed
	CU2	0.706	7.854
	CU3	0.669	7.746

X^2 = 1695.015, df = 715, GFI = .897, CFI = .916, RMSEA = .067

Source: Field data, 2016

5.4.1 Confirmatory Factor Analysis of Second –Order Variables

From the conceptual framework of the study, there were three second order constructs, namely: system quality; interaction quality; and information quality which were made up of eight first-order constructs. System quality was further computed from variables making up reliability, efficiency and privacy. Interaction quality was obtained from cooperation, confidence, and care. Information quality was also composed of utilitarian and hedonic factors. All variable indicators had significant standardized loadings of $\rho \leq 0.001$ with t-values of the individual indicators ranging from 6.533 to 8.411.

The composite reliabilities gave an indication of the internal consistency, meaning that the measures consistently represent the same latent construct. The composite construct reliability of each construct ranged from 0.711 (information quality) to 0.830 (user

satisfaction), which falls within the required criteria (Hair et al., 2006; Fornell & Larcker, 1981).

The average variance extracted (AVE) estimate measures the amount of variance captured by a construct in relation to the variance due to random measurement error. The AVE scores of the constructs ranged from 0.501 (information quality) to 0.714 (user satisfaction), which indicates adequate convergent validity (Fornell & Larcker, 1981; Bagozzi & Yi, 1988). Confirmatory factor analysis was done for all the six constructs in order to test for the goodness of fit and validation of scales of the measurement. The model fit indices in the measurement model exhibited a good fit on the data (X^2 = 240.600, df = 115, GFI = .931, CFI = .963, RMSEA = .052, PCLOSE = 0.201). Table 5.7 below summarizes the CFA results.

Table 5.7 Confirmatory Factor Analysis Results

Constructs and Alphas	Items	Loading	t-value	AVE	Composite reliability
System Quality (α = 0.726)	RELI	.660	8.170	.511	.727
	EFF	.781	8.411		
	PRIV	.612	Fixed		
Interaction quality (α = 0.713)	COOP	.765	7.169	.506	.720
	CONF	.587	6.533		
	CARE	.681	Fixed		
Information quality (α = 0.698)	UTIL	.539	6.820	.501	.711
	HEDO	.651	Fixed		
User satisfaction (α = 0.896)	USAT1	.693	7.293	.714	.830
	USAT2	.974	Fixed		
Monetary cost (α = 0.710)	MC1	.647	8.912	.502	.718
	MC3	.580	Fixed		
Continual Usage (α = 0.741)	CU1	.615	7.738	.516	.746
	CU2	.683	8.034		
	CU3	.681	Fixed		

X^2 = 240.600, df = 115, GFI = .931, CFI = .963, RMSEA = .052

Source: Field data, 2016

5.5 Structural Analysis and Testing of Hypothesis

The Structural Equation Modeling (SEM) approach was used to evaluate the various hypotheses made earlier in Chapter Two of the study. SEM is the most considered modeling approach by researchers (Bagozzi & Yi, 2012) because it enables the control of the measurement of error to be done, tests multiple relationships and also provides information on the degree of fit of the tested model (Byrne, 2013). The structural paths were estimated to test the hypotheses between the constructs. The AMOS output provided some measures which enable effective assessment of the absolute and incremental fit of the proposed model.

In the study model results, there were a chi-square of 39.533 (df = 17, p < .01) indicating a normed chi- square fit value of 2.32. The root-mean-square-error of approximation (RMSEA) value is 0.070; goodness-of-fit index (GFI) is 0.94. Regarding the incremental fit measures, the comparative fit index (CFI) value was 0.95. These results from the structural model assessment statistics reveal that the model appears to have established an acceptable fit and thus accomplished a satisfactory level of nomological validity.

5.5.1 Mobile Health Technology Service Quality Dimensions and User Satisfaction

The relationship between mHealth service quality dimensions (system quality, interaction quality and information quality) and user satisfaction was tested using the SEM approach. Findings from the result indicates that only interaction quality had a positive and statistically significant relationship (β=0.519, t-value= 10.318, p<.001) as shown in table 5.10. The associations between system quality (β= -0.043) and information quality (β= 0.041) on user satisfaction were statistically not significant. Hence, hypothesis 1a and hypothesis 1c were not supported by the model, but rather hypothesis 1b was supported. This implies that interaction quality is the key mHealth service quality dimensions that have a great influence on user satisfaction of mHealth services for maternal healthcare among rural communities in Ghana.

5.5.2 The Effect of mHealth Service Quality Dimensions and Continual Usage.

The effect of mHealth service quality dimensions on continual usage was examined. Findings from the results indicate that all the three dimensions were positive and statistically significant, therefore supporting hypothesis 2a, 2b and 2c. On the individual items, information quality (β=0.227, t-value= 3.913, p<.001) was found to be the highest

contributor towards continual usage. This was followed by interaction quality (β=0.168, t-value= 2.659, p< .05) and then system quality (β=0.116, t-value= 2.011, p<.05) as shown in table 5.10 below. This result implies that, for users to be willing to continue to use mobile phone for healthcare services, priority must be attached to all the three mHealth service quality dimensions by service providers.

5.5.3 Mobile Health Technology Service User Satisfaction and Continual Usage

The relationship between mHealth user satisfaction and continual usage was tested. Results indicate that there was a statistically significant relationship between user satisfaction and continual usage based on the structural results (β=0.366, t-value= 13.065, p<.001) as shown in table 5.10 Thus, hypothesis 3 was supported. This implies that, when users are satisfied with mHealth services quality, they will be willing to continue to use the services.

5.5.4 Controlled Variables Analyses

Demographic characteristics such as frequency of usage, level of education and income were controlled. None of them were found to be statistically significant. This implies that frequency of usage (β= - 0.065), level of education (β= 0.035) and income (β= 0.040) as shown at table 5.8 have no significant influence on continual usage of mHealth technology services among rural communities.

Table 5.8 Structural Model Assessment Result

Ho	Effects	β Estimate	t-Value	P-Value	Remarks
H1a	System Quality -----> Satisfaction	-0.043	-0.796	0.426	Rejected
H1b	Interaction Quality ---> Satisfaction	0.519	10.318	0	Supported
H1c	Information Quality---> Satisfaction	0.041	0.755	0.45	Rejected
H2a	System Quality-----> Continual usage	0.116	2.011	0.044	Supported
H2b	Interaction Quality --> Continual usage	0.168	2.659	0.008	Supported
H2c	Information Quality---> Continual usage	0.227	3.913	0	Supported
H3	Satisfaction --> Continual usage	0.366	13.065	0	Supported
	Frequency of usage---> Continual usage	-0.065	-1.22	0.223	Rejected
	Education ---> Continual usage	0.035	0.644	0.519	Rejected
	Income ---> Continual usage	0.04	0.731	0.465	Rejected

Source: Field data, 2016

5.6 Moderating Effect of Monetary Cost

To examine the effect of monetary cost on the relationship between user satisfaction and continual usage of mHealth technology, a multi-group moderation was conducted. The responses used for the general model were split into two subgroups (expensive and affordable) based on their responses on the monetary cost. Consequently, out of 305 respondents, 132 respondents considered mHealth monetary cost as expensive representing 43%, while 173 considered it affordable, representing 57% of the total respondents.

The multi-group analysis indicated differences in the relationship between user satisfaction and continual usage. More specifically, from the relationship between user satisfaction and continual usage, the coefficient estimates were higher in the affordable group (β=0.688) than in the expensive group (β=0.154). This suggests that respondents

who considered the mHealth service costs (in terms of equipment, service access, and transaction fee) as affordable have a greater tendency to be satisfied and continue the system usage than those who considered it expensive. Hence hypothesis 4 that proposed that "the higher the monetary cost, the lower the effect on satisfaction and continual usage of mHealth technology service" was not supported. The multi-group effects test results are displayed in table 5.9 below.

Table 5.9 Multi-group Effect of Monetary Cost

Relationship			Expensive		Affordable		
			Estimate	P	Estimate	P	z-score
Continual	<---	Satisfaction	0.154	0.310	0.688	0.000	2.081**

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Source: Field data, 2016

5.6 Discussion of Results

This chapter reports on the findings of the study. The discussions of the results were specifically based on the research objectives which have been covered in detail in Chapter One.

5.6.1 Mobile Health Technology Service Quality Dimensions and User Satisfaction

Among the three dimensions of mHealth service quality, the study found interaction quality to have a positive and statistically significant relationship with user satisfaction. The rest showed no significant effect. This finding contradict previous findings by Akter et al. (2013b: 2010) and Meigounpoory et al. (2014) who found all the three mHealth service quality dimensions (system, interaction and information quality) to have a positive relationship with satisfaction. Similarly, previous work by Wang & Liao (2008) also found

information quality and system quality to be good predictors of user satisfaction in electronic services.

However, studies by Lu et al. (2009), Hinson et al. (2011), and Zeithaml et al. (1996) indicate that human interaction is a key tool in influencing customer satisfaction due to the intangible nature of services. Akter et al. (2013b) outlined interaction quality attributes such as cooperation among health personnel and customers, the confidence customers have in health personnel to deliver safe service without any complications as well as health personnel showing a caring attitude towards customers to have great influence on satisfaction. This has been confirmed in this study.

In addition, Zhao et al. (2012) also found the interaction quality to be a key attribute of satisfaction in mobile technology services. Kim, Park and Jeong (2004) emphasized the fact that interpersonal relationship between service provider and customers is very important in the mobile phone service industry. Dagger et al. (2007) and Zineldin (2006) share a common view with Kim et al. (2004). Chowdhury et al. (2014) argues strongly that quality of human to human interaction in technology-facilitated services are key determinates of adoption of services that are not self-service technology based.

A conclusion from these findings can be drawn that, although system quality and information quality together have been found in other mHealth studies to enhance service quality leading to user satisfaction, however, regarding mHealth technology services for maternal healthcare in rural communities Ghana, interaction quality is the strongest determinant of mHealth service quality and user satisfaction.

5.6.2 The Effect of mHealth Service Quality Dimension and Continual Usage

The study found that all the three mHealth service quality dimensions were positively related to continual usage, which is consistent with the findings of Akter et al.'s (2013b) mHealth service quality studies on diabetic patients. Findings from this study collaborates with previous work by Lee et al. (2009) who also found information quality to be a key determinant of continual usage of mobile technology service. Similarly, Boakye (2015) identified service quality to have great influence on continual usage of the mobile data services. In addition, Kuo (2003) and Kuo, Wu & Deng (2009) also attest to the fact that service quality has a positive relationship with continual usage of service by consumers.

5.6.3 Mobile Health Technology Service User Satisfaction and Continual Usage

The test of hypothesis 3 shows that there is a positive relationship between user satisfaction and continual usage, which is consistent with the finding of previous work of Bhattacherjee's (2001b) study on electronic commerce and Zhao et al.'s (2012) study on mobile value-added service respectively. Bhattacherjee (2001b, 2001a) perceives continual usage as an extension of acceptance behaviour.

Deng et al. (2010) strongly opine that understanding of customer characteristics such as age, gender, usage time and usage experience by service providers in mobile service would increase the consumer's satisfaction level which in turn could lead to continual usage of information technology service. However, Cocosila & Archer (2010) and Rai, Chen, Pye & Baird (2013) opined that people who are more vulnerable to health related challenges might show much interest in health innovation such as mHealth technology and might be more willing to continue to use services than those who are healthy.

5.6.4 Effect of mHealth Monetary Cost on User Satisfaction and Continual Usage

The test result of hypothesis 4 indicated that respondents who considered the mHealth service costs to be affordable have a greater tendency to be satisfied and continue with the system usage than those who considered it expensive. This finding contradicts previous findings of Deng et al. (2010) who concluded in their study on mobile instant messages that monetary value might not significantly predict customer satisfaction, especially when cost of service is low and it is very affordable for users. Moreover, previous studies by Boadi et al. (2007) indicates that the monetary cost involved in mobile technology service has had a great influence on user satisfaction and adoption. Caruana et al. (2000) argues that, although services rendered by a firm to customers might not be of high quality, an affordable price could have a good influence on a consumer's satisfaction of service.

The free mHealth services rendered to users might have also influenced their satisfaction level. 59% of respondents could not afford a mobile phone and hence used that of relatives and friends (see table 5.2). Respondents who used shared phones formed more than half of the population of respondents. This means that the introduction of mHealth service fees might discourage more rural women from using the service.

CHAPTER SIX

SUMMARY OF RESULTS, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter, which is the final one, summarizes the major findings and implications of the study. It provides conclusions and recommendations of the study. It has been sub-divided into five sections. The first section dwells on summary of the study. The next section is a summary of findings; the subsequent sections focus on the conclusion, implication of the study, the limitations of the study and future research direction.

6.2 Summary of the Study

The focus of the study was to examine the level of mHealth service quality and its effect on user satisfaction and continual usage intentions. The theoretical framework indicates that mHealth service quality is multi-dimensional and hierarchical and hence consist of information system, marketing and health theories. A review of literature indicates that studies on mHealth service quality are few and more so, service quality and monetary cost have a great influence on user satisfaction and continual usage. A quantitative approach was adopted for the study. In all, three hundred and five (305) past users of the mHealth technology service were purposively sampled from Awutu- Senya District in the Central Region for the study. The research instrument used to collect data was a questionnaire. Data was analyzed using Statistical Package for Social Science (SPSS) software and the SEM with AMOS version 22 were used to test the causal relationship among four variables, namely, mHealth service quality, user satisfaction, monetary cost and continual

usage as well as to test the hypotheses. All other hypotheses proposed for the study were supported apart from H1a, H1c and H4. Hypotheses H1a and H1c found system and information quality not to be statistically significant to user satisfaction but rather to continual usage. Hypothesis 4, found high monetary cost to have a negative effect on user satisfaction and continual usage of mHealth technology for maternal healthcare.

6.3 Summary of Findings

This section provides a summary of key findings on the objectives of the study. It focuses on the relationship between mHealth service quality dimensions and user satisfaction; the effect of mHealth service quality dimensions on continual usage; relationship between user satisfaction; and continual usage of mHealth services; and finally, the effect of mHealth monetary cost on user satisfaction and continual usage.

6.3.1 mHealth Service Quality Dimensions and User Satisfaction

The results indicated that only interaction quality had a positive and statistically significant relationship with user satisfaction. That suggests that good human relationships among healthcare personnel and customers are essential when considering enhancing mHealth service quality delivery and user satisfaction among rural women.

6.3.2 Effect of mHealth service quality dimensions on continual usage

The result supports the hypotheses that all the three mHealth service quality dimensions (system quality, interaction quality and information quality) have a positive relationship on continual usage of the mHealth technology service with information quality having the

strongest impact. This implies that continual usage depends on the quality of the mHealth service consumers receives from service providers.

6.3.3 Mobile Health Technology Service User satisfaction and continual usage

Findings from the study indicate that there is a strong relationship between user satisfaction and continual usage of mHealth services. This means when users are satisfied with the quality of service, they would continue to use the service.

6.3.4 Effect of mHealth monetary cost on user satisfaction and continual usage.

The findings did not support the hypothesis that the higher the monetary cost, the lower the effect on satisfaction and continual usage of mHealth technology service. The result suggests that respondents who considered mHealth monetary cost to be affordable have a greater tendency to be satisfied and continue the service usage than those who perceived the services to be expensive. Surprisingly, close to half of the population of the respondents (43%) perceived monetary cost to be expensive, indicating that those respondents might not be satisfied and continue to use the mHealth service when additional cost such as service fees are introduced.

6.4 Conclusions

In summary, four (4) key findings can be drawn from the study. First, a comparison study between all the three dimensions of mHealth service quality (system quality, interaction quality and information quality) on user satisfaction of mHealth technology service found only interaction quality to have a positive and statistically significant relationship with user satisfaction.

Secondly, the study revealed that all the three dimensions of mHealth service quality have a significant impact on continual usage, with information quality having the strongest impact. Thirdly, the result shows that user satisfaction have a positive influence on continual usage and finally, the study indicates that low monetary cost has a positive impact on user satisfaction and continual usage of mHealth technology services for maternal healthcare in rural communities.

Customers would perceive the mHealth services to be of quality when service providers are able to identify and satisfy their health needs efficiently and effectively. Moreover, when consumers perceive mHealth service to be of quality, they would continue to use the service and even recommend the service to relatives and friends. An affordable mHealth services would enhance customer satisfaction and desire to continue to use mHealth service.

6.5 Implications of Findings

Beyond medical gains or benefits of mHealth technology services, factors that positively influence mHealth service quality, user satisfaction and continual usage need not to be ignored or given little attention. Interaction quality is found to be a key indicator of mHealth service quality for maternal healthcare leading to satisfaction and continual usage. Service, by the nature of its characteristics, is inseparable. Both the service users and the service providers have roles to play which indirectly affects the outcome of the service.

This makes the human side of information technology service very essential. Attitude and behaviour of both frontline and key health personnel might change customer's perception of mHealth service quality positively or negatively. There is therefore a need for service providers to empower their personnel through the provision of periodic training of both health and Information Technology (IT) personnel on good customer relations and incorporate customer relationship management practices in the design and implementation of mHealth services. Constant monitoring and rewarding of both senior and junior personnel who demonstrate outstanding customer care would encourage and motivate other personnel to follow suit.

System quality, information quality and interaction quality have a positive influence on continual usage of mHealth service. A simple information service application that is reliable, efficient and easy to use would encourage continual usage among rural women. Regular updating of customer databases would also enable health needs of customers to be anticipated in order to deliver customized mHealth services. An affordable mHealth service would encourage continual usage hence, different pricing levels and flexible payment plan need to be considered by service providers, software developers and policy makers in order to make mHealth services for maternal healthcare in rural communities more affordable.

A conclusion can be drawn from this study that, interaction quality is the key mHealth service quality dimension that influences rural women to be satisfied with the use of mHealth services for maternal healthcare, although all the three dimensions of mHealth service quality have a positive influence on continual usage, monetary cost of mHealth

service is the key determinant of respondents' willingness to continue to use the mHealth service for maternal healthcare. It can be argued that any additional cost such as a mHealth service fee might not encourage more rural women to use mHealth technology. Hence, policy makers and service providers might have to look for alternative means of funding the mHealth service for maternal healthcare in rural communities in order to encourage continual usage.

6.6 Limitations of the Study and Future Research Directions

This study encountered some amount of limitations. The first was gender, location and focus of the study group. Only rural women who assessed mHealth technology services for maternal healthcare in government healthcare centers were selected. This was because "mobile midwife" services was designed for rural women and was accessible at the government approved healthcare centers. Respondents were selected from the Awutu Senya East and West only. Hence generalization of the findings of this study for all mHealth service users may not be appropriate. This calls for the need for service providers to consider introducing "mobile midwife" application programme at urban centers for an effective comparative study.

The second issue was the data collection method used for the study. The non-probability sampling method was used. All users were not given an equal chance of being selected for their opinions to be solicited for. Another issue was the sample size of the study. Considering the total number of mHealth registrants in the Central Region, the sample size of 305 used for the study was inadequate. Another challenge was the reluctance of respondents to give honest and verifiable answers. The researcher believes the effect on

the validation of the conclusion drawn would be minimal because they have been factored into the research design.

Future studies should focus on mHealth service quality and user satisfaction from the perspective of health workers. Further studies on impact of culture on mHealth user satisfaction would be essential. More studies on mobile technology-facilitated services from other sectors can be considered.

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APPENDIX A

QUESTIONNAIRE

UG BS
University of Ghana Business School

Dear sir/ Madam,

FILLING OF QUESTIONNAIRE

I am a Master of Philosophy candidate of the above university conducting a research in partial fulfillment of my academic requirement. I am conducting a study on "**The effect of Mobile Health Service Quality on User Satisfaction and Continual Usage".** The objective of the study is to identify the level of service quality and to examine the effect of monetary cost on user satisfaction and continual usage intentions of mHealth technology. I would be very grateful if you could assist me by filling this questionnaire. This study is strictly for academic purpose. No information shall be disclosed to third parties or put in to any other use.

Should you need further enquiries or clarification on this data collection exercise, please do not hesitate to contact me on telephone number 024-6704807 or the Head of Department, Marketing and Customer Management, University of Ghana Business School, P.O. Box LG 78, Legon.

Thank You

SECTION A

DEMOGRAPHIC CHARACTERISTICS

Kindly answer the following questions by ticking (√) the appropriate box ☐

1. Gender Male ☐ Female ☐

2. Which of the age range below applies to you?

   15-24 ☐ 25-29 ☐ 30-34 ☐ 35-39 ☐ 40 > ☐

3. What is your level of education?

   No education ☐ Primary ☐ JHS ☐ SHS ☐ vocational ☐ Tertiary ☐

4. What is your occupation?

   Trader ☐ House wife ☐ Health worker ☐ Others ☐

* Please specify if others……

5. What is your average monthly income range?

Less than GH 50 ☐ GH 50 – 199 ☐ GH 200 - 499 ☐ GH 500 > ☐

6. How long did you use mHealth technology services?

Less than one year ☐ One year ☐ More than one year ☐

7. What was your status regarding phone ownership?

Personal ☐ Shared ☐ Public phone ☐

8. How frequent did you use mHealth technology service?

Daily ☐ Weekly ☐ Monthly ☐ Occasionally ☐

9. How frequent did you call customer care line for assistance?

Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always ☐

SECTION B

MOBILE HEALTH SERVICE QUALITY

This section measures service quality in mHealth technology. Please indication your level of agreement by ticking (√) the appropriate Colum. (1 is Strongly disagree (SD); 2 is Disagree (D); 3 is neutral (N); 4 is Agree (A) and 5 is Strongly agree (SA).

	System Quality	**1 S D**	**2 D**	**3 N**	**4 A**	**5 S A**
	Reliability					
10	mHealth platform was always available					
11	I could access system whenever I needed					
12	I could receive service right away.					
13	It doesn't have long waiting time					
	Efficiency					
14	This system was simple to use					
15	It was easy to get service from this system.					
16	The system was flexible to meet variety of needs					
17	Information on this platform was well organized					
	Privacy	**1 S D**	**2 D**	**3 N**	**4 A**	**5 S A**
18	M-health platform protected my personal information					
19	It does not share information with others					
20	It offered me a meaningful guarantee not to share my information					
	Interaction quality					

	Cooperation					
21	M-health service personnel were always willing to help me.					
22	They showed interest to solve my problems.					
23	They provided service right the first time.					
24	They provided the service by a certain time					
	Confidence					
25	Behaviour of mHealth personnel on platform instilled confidence in me.					
26	I felt safe while consulting them on the platform					
27	They were competent in providing service on the platform					
28	They have knowledge to answer my question					
	Care					
29	M-health service personnel understood my specific needs.					
30	They gave me personal attention					
31	They had my best interests at heart					
32	They gave me individual care.					
	Information quality					
	Utilitarian					
33	mHealth information services served its purpose very well					
34	Overall, this information service has been useful to me.					
35	Information provided has been worthwhile					
36	I enjoyed using this information service					
	Hedonic					
37	I feel hopeful as a result of having information.					
38	I feel encouraged having this information.					
39	Using mHealth technology has increased my chances of improving my health					

SECTION C

MOBILE HEALTH SERVICE USER SATISFACTION

Please indication your level of satisfaction by ticking (√) the appropriate Colum. (1 is Not at all satisfied (NA); 2 is slightly satisfied (SS); 3 is moderately satisfied (MS); 4 is very satisfied (VS) and 5 is extremely satisfied (ES).

	User satisfaction	**1 NS**	**2 SS**	**3 MS**	**4 VS**	**5 ES**
40	How satisfied were you with mHealth service quality					
41	How satisfied were you with mHealth service personnel attitude and performance					
42	How satisfied were you with overall mHealth monetary cost					
43	How do you feel about your overall experience of mHealth usage					

Section D

MOBILE HEALTH SERVICE MONETARY COST

This section measures monetary cost of mHealth technology. Please indication your level of agreement by ticking (√) the appropriate Colum. (1 is Strongly disagree (SD); 2 is Disagree (D); 3 is neutral (N); 4 is Agree (A) and 5 is Strongly agree (SA).

	Monetary cost	**1 SD**	**2 D**	**3 N**	**4 A**	**5 SA**
44	I think mHealth service equipment cost was not expensive.					
45	I think service access cost was not expensive.					
46	I think service transaction fee was not expensive.					
47	I am willing to pay for using mHealth service					

Section E

MOBILE HEALTH SERVICE CONTINUAL USAGE

This section measures continual usage of mHealth technology. Please indication your level of agreement by ticking (√) the appropriate Colum. (1 is Strongly disagree (SD); 2 is Disagree (D); 3 is neutral (N); 4 is Agree (A) and 5 is Strongly agree (SA).

	Continual usage	**1 SD**	**2 D**	**3 N**	**4 A**	**5 SA**
48	I intended to continue using mHealth service to get medical information services.					
49	My intentions were to continue using mHealth service than use any alternative means (such as traditional health systems)					
50	I will encourage friends and others to use this service					

THANK YOU