HOW THE HEALTHCARE-SEEKING SOCIO-CULTURAL CONTEXT SHAPES MATERNAL HEALTH CLIENTS' MHEALTH UTILISATION IN A KENYAN CONTEXT

BY

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DECLARATION

I hereby declare that the thesis

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is my own work, and all sources have been acknowledged through referencing.

Signed by candidate

……..

Sowon, Karen Cheruto

DEDICATION

To my beloved husband, Saya. Thank you for being the wind beneath my wings.

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We all need that one person who believes in the beauty of our dreams even when these dreams may seem unattainable. I am lucky to have had that person as my husband; Jackson Saya. I had given up even before I began, because it didn't make sense how we would manage financially. But when I was ready to stash my admission to UCT in the stack of many other admissions, you had more faith to push me to get my visa and start school. Indeed, a journey of a thousand miles begins with one little step, and I am so grateful to have had your support every step of the way. Today, four and half years later, the dream has been fulfilled. My PhD experience has been a true test of resilience, tenacity, patience and humility. In this journey, many have asked me questions like 'Why are you doing this?' or 'When are you completing?' I asked myself similar questions many times. Though this period of study has been such a personal experience, I would not have made it without the support of all the people herein acknowledged.

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Karen Sowon

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ABSTRACT

Problem Statement: Many developing countries are still grappling with poor health as a result of strained healthcare systems. Top among health inequalities is maternal care with maternal mortality rates being almost 19 times higher in developing countries than in their developed counterparts. mHealth presents the potential for developing countries to overcome some of the traditional healthcare challenges. However, despite the compelling evidence for the potential of maternal mHealth from the plethora of effectiveness studies, why when and how interventions work/do not work in different contexts are not fully understood. Socio-cultural factors are one of the most cited reasons for variance in uptake and utilisation of such technologies. To date, research explaining how socio-cultural factors shape mHealth utilisation is sparse.

Purpose of the study: The main objective of the study was to explain how mHealth utilisation behaviour emerges within the healthcare-seeking socio-cultural context. To achieve the objective, the study identified the socio-cultural characteristics of the maternal healthcare-seeking context and analysed the user-technology interaction within this context.

Research methodology: Building on the foundation that human experiences are best understood in situ, the study adopted explanatory methods guided by an interpretivist paradigm. The study drew upon Activity Theory as a lens to understand the maternal mHealth utilisation phenomenon. Hence, we theorised healthcare-seeking as an activity whose cultural aspects were further understood using Hofstede typology of culture. The study used a Kenyan maternal mHealth intervention to elucidate the phenomenon. We employed semi-structured interviews, focus group discussions, observations, informal discussions and document review to gather data. The sample was purposively selected and comprised various maternal health stakeholders: maternal health clients, their partners, project implementers and healthcare professionals.

Key findings: The results of the study show that the healthcare-seeking socio-cultural context which is characterised by socio-cultural attributes such as high-power distance, high uncertainty avoidance, gendered relations, and collectivism shapes mHealth utilisation behaviour in a dialectical process. This process takes place as maternal health clients shape and are shaped by mHealth within their healthcare-seeking socio-cultural context through a process of internalisation and externalisation.

From an internalisation perspective, uncertainties and risks in the maternal healthcare-seeking context resulted in hesitated adoption. Contextual perceptions of usefulness of the intervention resulted in the use of mHealth to substitute other healthcare structures while having different perceptions of the role of mHealth created dissonance among the maternal health clients.

With regards to externalisation, maternal health clients adopted legitimisation strategies to reduce uncertainties and to develop trust required for initial and continued use of the intervention. They legitimised both the intervention artifact, and the information. Since the mHealth intervention presented appropriate social cues, being accompanied by the expected health provider's persona, maternal health clients readily humanised the intervention. The contextual social norms around pregnancy also presented a need for the maternal health clients to make their mHealth use an 'appropriate behaviour' by negotiating use with relevant stakeholders in the context. Finally, in response to mHealth technology paradoxes that challenged the very motive of healthcare-seeking, maternal health clients coped by abandoning mHealth, or otherwise accommodating it.

Originality/contribution: This study contributed to knowledge, theory and practice. First, the study suggests theoretical propositions that explain how mHealth utilisation behaviour emerges. These findings may be useful to similar developing-country contexts. A further contribution to theory emerges from the use of Activity Theory to understand the phenomenon. The study helps to operationalise Activity Theory concepts in Information Systems research. Second, the study provides recommendations to practise with regard to the design and implementation of mHealth interventions. These insights may be useful to mHealth designers and implementers in designing mHealth solutions that are contextually relevant. Here, we propose the consideration of mHealth intervention characteristics that will aid utilisation, involving healthcare professionals and other community stakeholders in mHealth implementation and integrating mHelath into existing healthcare structures.

Keywords: mHealth, utilisation behaviour, healthcare-seeking context, maternal health, Activity Theory, developing countries

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LIST OF ACRONYMS

ANC	Antenatal Care
AT	Activity Theory
CHIT	Consumer Health Information Technology
CHV	Community Health Volunteer
CHW	Community Health Worker
CoP	Community of Purpose
DoL	Division of Labour
eHealth	Electronic Health
FGD	Focus Group Discussion
HCP	Healthcare Professional/Provider
HIS	Health Information System
HIT	Health Information Technology
HIV/AIDS	Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome
ICT	Information and Communication Technologies
ICT4D	Information and Communication Technology for Development
IS	Information Systems
IT	Information Technology
ITU	International Telecommunication Union
KDHS	Kenyan Demographic Health Survey
LMIC	Low- and Middle-Income Countries
MDG	Millennium Development Goal
mHealth	Mobile Health
MMR	Maternal Mortality Ratio
M(N)CH	Maternal, (Neonatal) and Child Health
MoH	Ministry of Health
NGO	Non-Government Organisation
PDA	Personal Digital Assistant
PROMPTS	Promoting Mothers in Pregnancy and Postpartum Through SMS
RCT	Randomised Control Trial
SDG	Sustainable Development Goal
SIM	Subscriber Identity Module
SMS	Short Messaging Service
SSA	Sub-Saharan Africa
TBA	Traditional Birth Attendant
UN	United Nations
USSD	Unstructured Supplementary Service Data
WHO	World Health Organisation

GLOSSARY OF TERMS

Antenatal (Prenatal) care	Pregnancy-related care services provided to women between conception and the onset of labour
Birth order	Refers to whether a birth is a first, second or higher order
Early prenatal care	Prenatal care that is initiated within the first 12 weeks of pregnancy
eHealth	Healthcare practices and information delivered and enhanced by the internet and related technologies
Expected date of delivery	Is the estimated date when a woman is expected to deliver
fANC	A model/approach defined by World Health Organisation for delivering goal-oriented ANC services
First trimester	The first 14 weeks of pregnancy
Gestation age	Foetal age in weeks counted from the date of the mother's last menstrual period
Health information technology	Information technology applied in healthcare to store, share and analyse health information
Maternal death/mortality	The death of a woman while pregnant or within 42 days after giving birth, from any cause related to, or motivated by, the pregnancy and child birth, but not from accidental or incidental causes
Maternal health	Refers to the health of the women during pregnancy, childbirth and six weeks or 42 days postpartum
Maternal healthcare seeking behaviour	The utilisation of maternal healthcare services (antenatal, delivery and postnatal care)
Maternal mortality ratio	The number of maternal deaths per 100,000 live births
mHealth	The practice of medicine and public health that integrates the use of mobile and wireless devices to promote health by supporting healthcare practices
Mobile penetration rate	Number of mobile cellular subscriptions in every 100 people
Parity	The number of live births that a woman has had
Postnatal care	The care given to the mother and her new-born baby immediately after birth up to the first six weeks of life

Primigravida	Refers to a woman who is pregnant for the first time
Second trimester	The time from 14 weeks to 26 weeks of pregnancy
Significant other	Other interpersonal relationships (excluding healthcare providers) that play an important role in a woman's pregnancy
Traditional birth attendant	A traditional (mostly non-formally trained) midwife who gains her skills through apprenticeship and provides care, support and advice to women during pregnancy
Third trimester	The time from 26 weeks of pregnancy onwards
Utilisation bahaviour	A person's use of technology to accomplish a certain task as well as the activities related to adapting, changing or modifying the human-technology interaction context.

CHAPTER 1: INTRODUCTION

1.1 Introduction

> "There was at one time some debate as to whether information and communication technologies (ICTs) were relevant to the developing countries, but this debate is resolved with a clear 'yes' answer. The question has now become not whether, but how ICTs can benefit development…. The particular issue concerns the need to bridge the so-called digital divide between those people with the ability to access and use technologies effectively, and those without. The challenge remains to tackle such difficulties and to resolve them" (Walsham et al., 2007, p. 317).

The world has changed. ICTs have become pervasive and can be found in almost every sphere of life in all parts of the world (Walsham, 2012, 2017). This thesis embarks from the premise that the use of ICTs holds the potential to transform developing countries by helping them to address some of the pressing challenges in various sectors. Despite the tremendous proliferation of ICTs such as mobile technologies that have contributed to economic development (Walsham, 2017), developing countries still face challenges that most developed countries have been able to surmount. One such area where problems persist is in the health sector.

In this chapter we lay the foundation for the thesis. We provide a background that justifies the specific direction and focus that the study will take, the research problem and questions, and the research approach used to answer these questions. The chapter culminates by stating the motivation for the research and presenting the structure and organisation of the thesis.

1.2 Background

The Sustainable Development Goals (SDGs) re-affirm the centrality of health as a key contributor to sustainable development. In most developing countries, the burden of disease continues to plague many, consequently affecting the socio-economic development of these countries. Top among health inequalities are maternal, new-born and child health (MNCH) with maternal mortality rates being almost 19 times higher in developing than in developed countries (World Health Organisation [WHO] et al., 2015).

Though SDG 3 calls for a significant reduction of maternal mortality ratio by 2030 (United Nations [UN], 2019), developing countries are still lagging in meeting these targets. These countries account for a higher percentage of total worldwide deaths. In 2015 almost 830 women died every day due to pregnancy and childbirth complications and almost all the deaths occurred in low-resource settings (UN, 2019; WHO et al., 2015). Some barriers that contribute to these statistics include supply-side barriers such as limited infrastructure, scarce resources and barriers of access, as well as demand-side barriers such as socio-cultural factors (Gabrysch & Campbell, 2009; Kyei-Nimakoh et al., 2017; Moyer & Mustafa, 2013). These barriers influence how people seek and use healthcare services, also referred to as healthcare-seeking behaviour

While the health sector reports various challenges, developing countries are benefiting from the economic growth unlocked by the increased diffusion of mobile technology. Mobile technology has gained wide acceptance, penetration and usage in developing countries (Latif et al., 2017), unlike many other technologies in the past. Statistics show that 90 out of 100 people in developing countries have access to a mobile phone (World Bank, 2018). Their popularity has led to considerable interest in exploiting and leveraging them to overcome traditional healthcare challenges (Latif et al., 2017; Mechael et al., 2010). From its inception, a wide use of mobile technology that has supported a wide array of healthcare processes has been reported (Latif et al., 2017; UN Foundation & Vodafone, 2009). This application of mobile technology in healthcare has come to be known as mHealth. There continues to be increasing evidence of its usefulness in low-income countries (Colaci et al., 2016; Latif et al., 2017). The evidence indicates that innovative use of mobile technology in existing healthcare delivery systems has the potential to help reach the underserved while improving healthcare delivery and access (Akter & Ray, 2010; Chib et al., 2015; Tao et al., 2020).

1.2.1 What is healthcare-seeking behaviour?

Healthcare-seeking behaviour is often discussed when considering the utilisation of any health services. Some studies have defined it as "any action or inaction undertaken by individuals who perceive themselves to have a health problem or to be ill, for the purpose of finding an appropriate remedy" (Olenja, 2003, p. 61). Hence, the behaviour is linked to how people access and utilise healthcare services (O'Donnell, 2007). The decision to seek and use healthcare services is often complex (MacKian, 2003) because it is driven by many determinants which may vary, based on

social, economic or cultural circumstances that may enable or impede use (Andersen, 1995; O'Donnell, 2007). For example, socio-cultural factors may obscure the recognition of illness and the benefits of healthcare services and, while benefits may be recognised, financial limitations may restrict their use (Gabrysch & Campbell, 2009; O'Donnell, 2007). "Appropriate and timely care-seeking is essential for healthy outcomes for individuals and communities. Understanding health-seeking behaviour in a community is therefore necessary for the development of appropriate health policies, health systems and educational strategies to facilitate access." (Qureshi et al., 2016, p. 76).

We thus embark on this journey with the argument that healthcare-seeking provides the minimum context for understanding why, when and how health interventions are used. We use the term "healthcare-seeking behaviour" to refer to the people's conduct in seeking/accessing care as enabled or constrained by various social and cultural factors.

1.2.2 The role of context in health programmes

The importance of context in Information Systems (IS) has been established. Early researchers identified cultural barriers to be more critical than technological matters in the implementation of IS because they provide the social context within which IS artifacts are interpreted and assigned meaning (Robey et al., 1990 as cited in Walsham, 2017). A user's internal system combines with other structures to affect a person's choices on how they utilise the IT artifact (Al-Natour & Benbasat, 2009).

In health, it is known that patient outcomes are not the sole function of efficacious health interventions (Alexander & Hearld, 2012; Jacobs et al., 2012). The impact of these interventions on outcomes is mediated by context. Context is often used to capture all constitutive elements such as "when, and where information systems are developed, implemented and used" (Hayes & Westrup, 2012, p. 24). Among other elements, it includes human, socio-cultural and organisational factors (Alexander & Hearld, 2012) that may act as a barrier or facilitator to intervention implementation or its effects. Even when implementation does not vary, these factors may result in interventions having different effects in different contexts. Understanding context is therefore, critical in interpreting intervention use and generalising beyond its context (Moore et al., 2015).

1.3 Research Problem

Despite the progress shown by mHealth, and compelling anecdotal evidence on its benefits (Lee et al., 2016; Nurmatov et al., 2014; Watterson et al., 2015), evidence for the value of mHealth remains scarce, weak and ambivalent (Chib et al., 2015; Dick et al., 2020; Krah & de Kruijf, 2016; Manyati & Mutsau, 2020). The weak evidence may in part be attributed to the lack of rigorous evaluation methods (Dick et al., 2020). Most mHealth evaluations to assess the effectiveness of mHealth have relied on randomised control trials (RCTs). Though this method has been used as the ultimate standard for rigorous evaluations, its lack of qualitative analysis proves to be a weakness for mHealth studies (Dick et al., 2020). RCT evaluations focus on quantifiable health outcomes and rarely examine the interaction between interventions and the context (the sociotechnical aspects) in which they are implemented (Bonell et al., 2012; Dick et al., 2020).

Researchers have continually identified the need for more data on the effectiveness of mHealth interventions, especially in light of context-based sociological determinants (Chib et al., 2015; Dick et al., 2020; Lee et al., 2016). This type of research is necessary because quantifiable indicators in themselves do not provide clear evidence of meaningful development (Chib et al., 2015; Dick et al., 2020). Why, when and how interventions work, as assisted or constrained by various socio-cultural factors, will offer a more meaningful understanding to implementers (Swanson et al., 2015; Tamrat & Kachnowski, 2012) and complement existing efficacy and effectiveness studies. Approached qualitatively, it has been argued that this approach will help in elucidating “health-related meanings, beliefs and behaviours” (Ward et al., 1997, p. 25) among healthcare consumers that may influence utilisation.

Our further interest in the socio-cultural context is also attributed to the fact that pregnancy, though regarded as a universal human phenomenon, is intricately situated within a culture (Ottani, 2002). Consequently, socio-cultural factors are likely to play an essential role in the local adaptability and utilisation of maternal mHealth interventions. Individuals’ adoption and usage decisions happen within these rich contexts. Hence we use the term utilisation behaviour to refer to a person’s activities to adapt, change or modify the human-technology interaction context (Barki et al., 2007). It is against this backdrop that this study proposes the need to explicate the role of the healthcare-seeking socio-cultural context in the utilisation of maternal mHealth interventions.

1.4 Research Question and Objectives

The main interest for this research is to contribute to explaining mHealth utilisation. The question we seek to answer is: **How does the maternal healthcare-seeking socio-cultural context shape maternal health clients' mHealth utilisation behaviour?** Since health interventions are essentially programmes embedded in a social context (Walugembe et al., 2019), we propose that the achievement of our objective requires us to study technology within its context of use: in this case, the healthcare-seeking context. Hence understanding mHealth utilisation requires us to consider the complex relationship between technology and the context. This relationship is often dialectical rather than one way. Consequently, our objectives and sub-questions (Table 1.1) reflect this perspective.

Following the above argument, the first sub-question is: *What are the socio-cultural characteristics of the maternal healthcare-seeking context?* With healthcare-seeking being the main context in which we examine the use of mHealth, this question seeks to describe the socio-cultural context to provide a foundation for answering subsequent questions. The second question is: *How does mHealth mediate maternal healthcare-seeking*? By theorising healthcare-seeking as the context of use, we assume that mHealth and its agency may modify this context. This question is interested in the mHealth intervention as a social actor and examines how it changes the maternal healthcare-seeking context. The third and fourth questions deal with the dialectical nature between the technology and the context. The third question is: *How does mHealth shape maternal health clients' mHealth utilisation behaviour?* This question addresses how mHealth and its agency shape the maternal health clients' interaction with it and the subsequent emerging utilisation behaviour. The last question: *How does the maternal healthcare-seeking socio-cultural context shape maternal health clients' mHealth utilisation behaviour?* addresses how the maternal health clients and their socio-cultural context influence how they use/interact with the mHealth intervention. Though this last question is similar to the main question, we considered it reasonable to address it separately since it deals with one part of the bi-directionality of the interaction between the technology and the context. Thus, sub-questions three and four put together complete the analysis of the dialectical relationship stated earlier. Only in understanding this relationship can we more conclusively provide a succinct answer to the main question of the study.

Table 1.1: Summary of research objectives and their related sub-questions

OBJECTIVES	SUB-QUESTIONS
To identify the socio-cultural characteristics of the healthcare-seeking context	What are the socio-cultural characteristics of maternal healthcare-seeking context?
To understand how mHealth mediates maternal healthcare-seeking	How does mHealth mediate maternal healthcare-seeking?
To explain how mHealth shapes maternal mHealth utilisation behaviour	How does mHealth shape maternal health clients' mHealth utilisation behaviour?
To explain how mHealth utilisation is shaped by the maternal healthcare-seeking socio-cultural context	How does maternal healthcare-seeking socio-cultural context shape maternal health clients' mHealth utilisation behaviour?

The research questions allow us to align with the purpose of IS studies to provide an "understanding of the context of the information system, and the process whereby the information system influences and is influenced by its context" (Walsham 1993 in Goldkuhl, 2012, p. 138).

1.5 Research Context

The study was conducted in Kenya. Kenya is one of the leading countries in sub-Saharan Africa (SSA) with a high number of implemented mHealth programs (Deglise et al., 2012; Lee et al., 2017). As in most other developing countries, the application of mHealth has been seen in the persistent health priorities that the country faces (Njoroge et al., 2017). These include Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome (HIV/AIDS) and malaria where mHealth has been used for treatment adherence (Lester et al., 2010; Pop-Eleches et al., 2011; Zurovac et al., 2011); maternal and child health where implementations range from Short Message Service (SMS) reminders and education support to mothers (Fedha, 2014; Mushamiri et al., 2015; Odeny et al., 2014); community health workers' support (Bakibinga et al., 2017; Jones et al., 2012); timely disease reporting and surveillance (Toda et al., 2016), among many more.

The increase of mHealth projects in Kenya may be attributed to the growth in mobile technology that the country has achieved, coupled with the persisting healthcare challenges that it faces. Kenya has a high mobile phone ownership, estimated at 86% in 2018 (Pew Research Center, 2019). At the same time, one of the pressing healthcare challenges that it faces is the high maternal mortality rates (Gitobu et al., 2018). The maternal mortality ratio (MMR) in Kenya stands at 510 in 100,000

(World Economic Forum, 2015). The statistics marked a decrease of 26% for the period 1990 – 2015, which was way below the global decline estimated at 44% for the same period (Dennis et al., 2019). The challenges in the Kenyan health sector are in many ways, similar to the challenges faced by most developing countries. These include a strained healthcare system, high costs of care, inequalities among populations, accessibility issues, among others (Kahn et al., 2010; Mannava et al., 2015; Nyakang'o & Booth, 2018). In light of these factors, Kenya presented a suitable context for the study.

To study the utilisation phenomenon, we deemed it necessary that the woman herself directly interact with the mHealth intervention, rather than interacting through an intermediary. Hence, we considered it preferable that the maternal health client has access to a personal phone, so that she was not dependent on others for accessing mHealth information. In aiming to control the availability and ownership of mobile phones and barriers related to mobile infrastructure, a developing country with high mobile growth was considered suitable. We considered Kenya a fitting context for the study because of the high mobile penetration rates, coupled with the pressing maternal mortality challenges. Though we have used a Kenyan context to guide the study, we believe that the insights are theoretically generalisable to other similar developing country contexts. Chapter 6 describes the Kenyan context further.

1.6 Research Approach

The study employed an interpretivist paradigm. The paradigm offered us a sensible way to understand the utilisation phenomenon from the experiences and meanings assigned by participants based on their cultural and historical contexts (Orlikowski & Baroudi, 1991). In conjunction with this, we used qualitative methods guided by a single case study approach. This combination allowed us to "…investigate a contemporary phenomenon within its natural context…" (Yin, 2009, p. 14), hence yielding richer insights in answering the *'how*' questions that have been posed in the study. The case study method also allows for theoretical and analytical generalisability in areas of concept development, theory building and extension, generation of rich insights and drawing of specific implications.

Study participants were drawn from the Promoting Mothers in Pregnancy and Postpartum Through SMS (PROMPTS) – a maternal mHealth intervention in Kenya. We invited a total of 38 maternal mHealth stakeholders, who were purposively sampled, to participate in the study. This sample comprised of 30 maternal health clients, five significant others and three key informants. The key informants were PROMPTS staff members who were involved in the project implementation. We also engaged some health practitioners in informal discussions. The study employed multiple methods of data collection to ensure a rich data set. The methods used included semi-structured interviews, focus group discussions, observations and field notes, document reviews and informal discussions. Data was collected between January and May 2019.

We drew upon Engeström's Cultural-Historical Activity Theory (Engeström, 2014), simply referred to as Activity Theory. The theory served as a sensitising device to provide orienting concepts to explore mHealth utilisation. While there have been calls to raise awareness of context among IS investigations (Davison & Martinsons, 2016), IS researchers have also been cautioned against neglecting the IT artifact (Orlikowski & Iacono, 2001). Thus, starting on the premise that IT artifacts are part of a social system whose characteristics are manifested within its context of interaction (Al-Natour & Benbasat, 2009), Activity Theory provided a suitable approach to examine the interrelationship between technology and context. In addition, by using the theory, we were able to draw on the concept of contradictions, and the principles of internalisation and externalisation, to better explain the dialectical interrelationship. By analysing the healthcare-seeking activity, we believe that mHealth utilisation can be described, explained and understood. This study therefore fits well with the socio-technical view of Information Systems which emphasises the interrelatedness of technological and social systems (Cecez-Kecmanovic et al., 2014).

1.7 Importance of the Study

From a practice perspective, the insights gained from this research may be useful, since understanding how interventions work in their respective contexts is a prerequisite to improving them for more consistent results across contexts (Pawson et al., 1997). In addition, studying 'technology-in-use' allows us to elucidate insights for engineering purposes so that design processes produce solutions that are effective and appropriate (Bannon & Bødker, 1989; Benson et al., 2008). We argue that in understanding how maternal clients interact with maternal mHealth

interventions in their healthcare-seeking context, it is possible to reflect on the design and implementation of mHealth innovations. Consequently, the findings from this study may offer insights to the policymakers, mHealth developers and implementers on factors that may influence design and implementation for local adaptability. The need for contextually-fit innovations has been motivated by Avgerou (2008).

This study is also important on a theoretical level. The theoretical contribution emerges from operationalising Activity Theory to study the utilisation phenomenon. Furthermore, we formulate theoretical propositions that explain how utilisation behaviour emerges in a healthcare-seeking socio-cultural context.

1.8 Structure and Organisation of the Thesis

This thesis is organised into nine chapters. This chapter outlines the research problem. We indicate that mHealth offers developing countries the opportunity to deliver more accessible health services. In our brief discussion of the existing research, we argue that one of the problems is that current research has focused on effectiveness of mHealth, using quantifiable health outcomes. There is a scarcity of utilisation studies that enhance our understanding of how context shapes utilisation of these interventions. This understanding is what we intend to offer through the remaining chapters of this thesis. This chapter also gives the rationale for why the study is important and provides a summary of the research approach that was employed to answer the research question.

mHealth presents a nexus between health and technology. Hence the thesis presents a review of the literature in two chapters. **Chapter 2** provides a background that explicates the domain of maternal health, presenting the statistics, challenges and the barriers to the uptake of these maternal healthcare services. Consequently, **Chapter 3** anchors the study in its technological background by looking at the growth of mobile technology that has facilitated the advancement of mHealth. We show the gaps in mHealth studies to date and justify the need for this study to help address some of these gaps. We also elucidate some of the constructs such as culture and utilisation being used in the study that help us operationalise them effectively.

Chapter 4 positions the study theoretically. The chapter justifies the choice of Activity Theory, operationalises the theory for our study and reviews the use of Activity Theory in IS-related

research. We restate the research questions in light of the theoretical concepts. **Chapter 5** is devoted to the philosophical assumptions and other methodological decisions that guide the study. This includes justifications for the case selection, explanations on research methods and instruments, sampling, analysis and ethical considerations and procedures. **Chapter 6** offers a detailed description of the study context. We present the factors that make Kenya ideal for the research and describes the PROMPTS mHealth intervention which is the case study.

The findings are detailed in **Chapter 7,** based on the concepts and principles of Activity Theory, as well as on major themes that emerged from the inductive analysis of data. The penultimate **Chapter 8** discusses the findings in detail and identifies major propositions based on the analysis of data. In this chapter, we demonstrate that each research question has been answered. Finally, **Chapter 9**, reflects on the research, presents the theoretical, methodological and practical contributions of the study, as well as implications to research and practice. This chapter also addresses the limitations and recommendations for future research.

CHAPTER 2: HEALTHCARE-SEEKING BEHAVIOUR IN MATERNAL HEALTH

2.1 Introduction

Healthcare-seeking behaviour is linked to how people access and utilise services (Recall Chapter 1). This chapter situates the study in the wider body of maternal and healthcare-seeking literature. The aim of the review is to elucidate what has been done and highlight existing gaps.

Section 2.2 expounds on the burden of maternal health in developing countries and discusses trends and challenges that these countries face. Because healthcare-seeking does not happen in a vacuum, Section 2.3 goes on to highlight some of the demand- and supply-side factors that have been barriers to utilisation of maternal healthcare services. Since culture is broad and complex, Section 2.4 operationalises the concept of culture in relation to this study. Sections 2.5 and 2.6 address culture in healthcare-seeking behaviour and in pregnancy respectively. Section 2.7 offers a summary of the chapter.

2.2 Maternal Health

Good health is critical to the well-being of a society, which in turn contributes to socioeconomic development. Maternal mortality which gauges maternal health in a country is one of the indicators of international development. While maternal health refers to the health of women during pregnancy, childbirth and the postnatal period, maternal mortality is defined as the death of women during pregnancy, childbirth, or in the 42 days after delivery by causes related to or aggravated by pregnancy (Hogan et al., 2010). Of all health indicators, maternal mortality exhibits the greatest disparity between developed and developing countries (Ziraba et al., 2009). High MMR is a major challenge that is yet to be solved in developing countries. Lower-income countries account for 99% of all maternal deaths, with SSA alone contributing to more than half of these statistics (WHO et al., 2015). For this reason, the global community has endorsed the reduction of MMR as a critical development goal. SDG number 3.1 calls for a reduction of the current global MMR to less than 70 in 100,000 by the year 2030.

Maternal mortality is generally highest among women in the third trimester (UNICEF, 2009). WHO also records that perinatal deaths, which include pregnancy losses of at least seven months gestation and within the first seven days of life, are high (WHO et al., 2015). The perinatal deaths stand at close to 4 in 100 women and vary with demographics such as rural or urban living, level

of education and economic status. These statistics tell the story of the risks that pregnant women face in developing countries while giving life.

2.2.1 Understanding pregnancy stages

A typical pregnancy gestation period is 40 weeks. This period is divided into three stages called trimesters (WHO, 2018b). The first trimester is marked by the period between conception and the 12th week (Figure 2.1). The second trimester is weeks 13 to 27, while the third is from the 28th week and lasts up to birth. This third phase, extending through to the first seven days of a child's birth, is also referred to as the perinatal phase. Generally, women experience pregnancy sickness symptoms, and a high risk of miscarriage within the first trimester,. As they enter the second trimester, the 'baby bump' will begin to show, following the growth of the baby. This second trimester also marks the period that women will feel their baby moving for the first time. Finally, all factors held constant, the third trimester climaxes in the birth of the baby. The woman then enters into the postpartum phase.

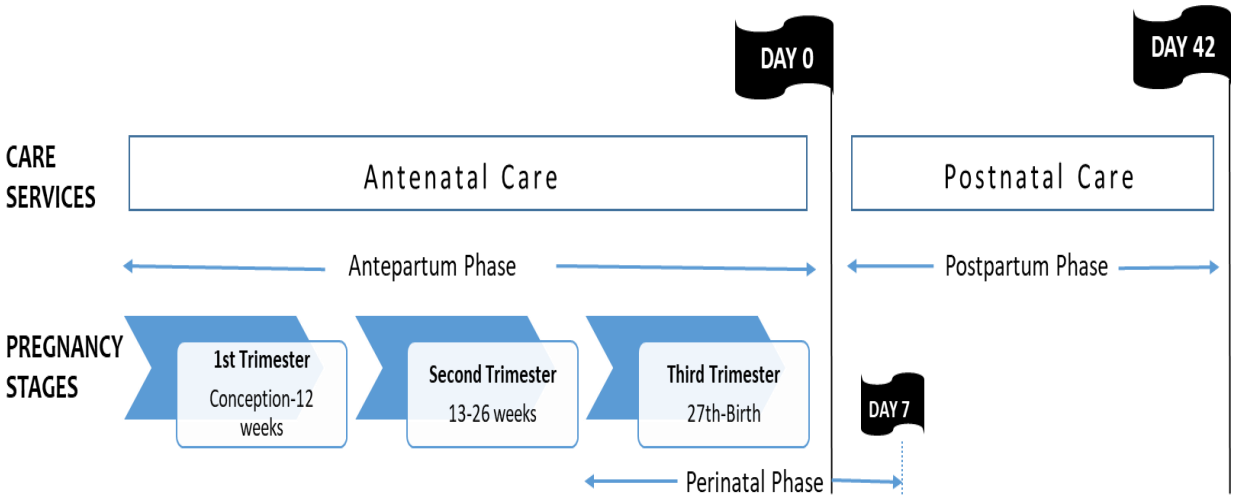


Figure 2.1: Stages of pregnancy (Source: Author)

Antenatal care (ANC) is the care offered by a skilled healthcare professional (HCP) to pregnant women during the antepartum phase. ANC aims to ensure the best health conditions during pregnancy (WHO, 2018b). Critical components of ANC include identifying potential risks, prevention and management of pregnancy-related or pre-existing conditions that may put the pregnancy at risk, and health education (WHO, 2018b). Care offered for preventable pregnancy-

related deaths includes tetanus immunisations, iron/folate supplements, malaria prophylaxis, blood pressure measurements, among others. Recognising the challenges in developing countries, WHO proposed an antenatal care model, known as focused ANC, that incorporated all these treatments. The aim of this model was to deliver four goal-oriented antenatal visits during pregnancy (WHO, 2002, 2018b). However, a newer model for care proposes that eight or more ANC contacts will dramatically reduce maternal mortality (WHO, 2016b). The ANC care should be sought immediately a woman knows she is pregnant. Immediately after birth, postpartum care is critical for preventing maternal and neonatal mortality, both of which decline exponentially with increasing postpartum time (Benova et al., 2019).

2.2.2 Maternal health trends and statistics in developing countries

The risk of a woman dying due to pregnancy or childbirth in her lifetime is much higher in developing countries. This risk is estimated at 1 in 6 in poorer economies compared to 1 in 10,000 in most developed countries, or even 1 in 30,000 in places like Northern Europe (Katusiime & Pinkwart, 2016). The World Economic Forum suggests that the mortality rate is 14 times higher in developing than in developed nations (World Economic Forum, 2015). This makes childbearing in developing countries a risky process that many women dread (Katusiime & Pinkwart, 2016). It is because of these devastatingly high statistics that the global Safe Motherhood Campaign was established in 1987 to reduce maternal mortality by half by the year 2000. After missing this mark, the global community reaffirmed its commitment to the fifth development goal (MDG-5) to reduce MMR by 75% by 2015 (Nour, 2008).

Progress in achieving developmental targets related to maternal health has been slow. By 2015, there was only a 45% reduction (World Economic Forum, 2015) from about 523,000 deaths to 289,000 deaths (WHO et al., 2015). Developing countries accounted for almost all maternal deaths (WHO, 2016a). A majority of these maternal deaths are concentrated in Southern Asia and SSA (Figure 2.2). These two regions account for almost 86% of all maternal deaths worldwide (World Economic Forum, 2015), with SSA carrying the bigger portion. It is therefore clear that maternal mortality as a health indicator still shows wide gaps between affluent and less affluent women and between urban and rural areas, both within countries and between them (WHO, 2016a).

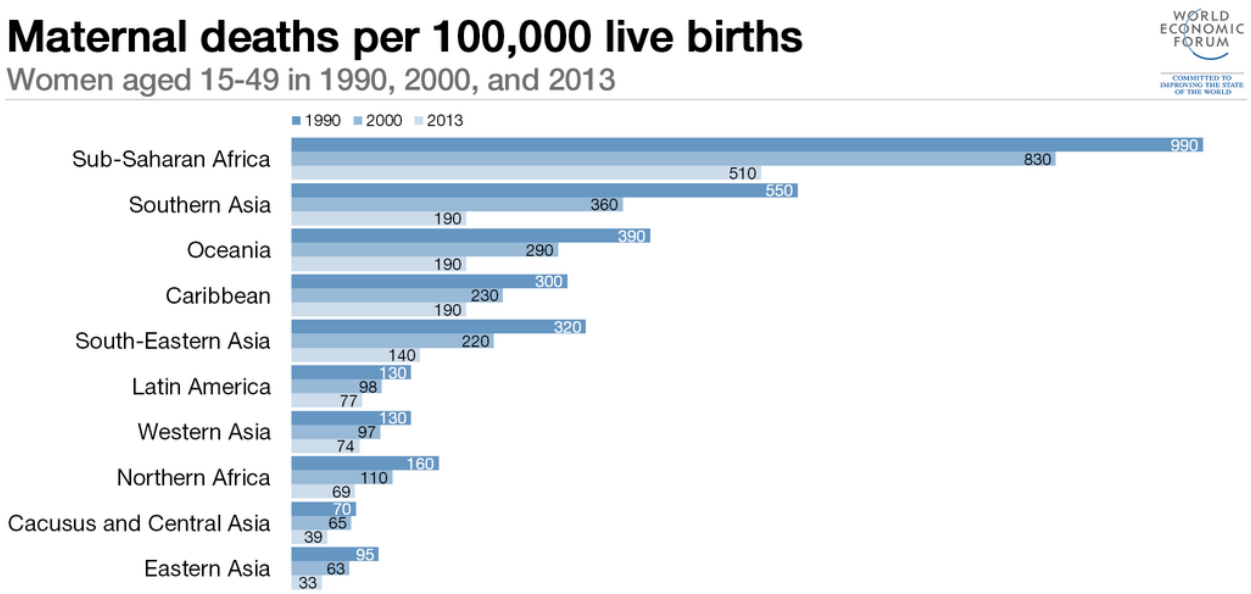


Figure 2.2: 1990-2013 Maternal mortality ratio around the world (from World Economic Forum, 2015)

2.2.3 Causes of maternal deaths in developing countries

Preventable pregnancy complications affecting women in developing countries have remained the same over the years (Figure 2.3). Of the large proportion of maternal deaths are women who develop or arrive at the health facility with complications that could have been resolved if they had received timely care and effective interventions (Ronsmans et al., 2006; WHO, 2016a).

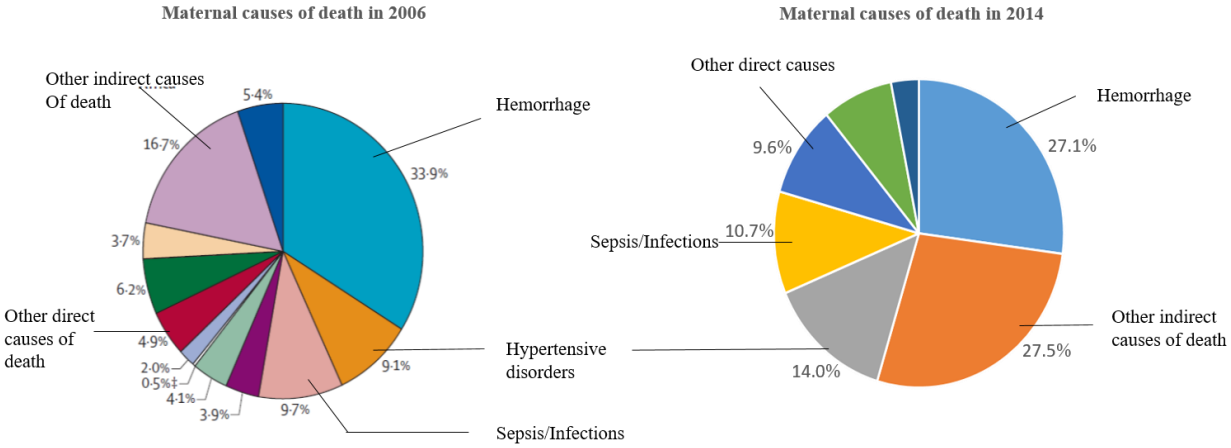


Figure 2.3: Main causes of maternal deaths in developing countries in 2006 and 2014 (from Khan et al., 2006; Say et al., 2014)

The complications include haemorrhage (severe bleeding), infections and obstructed labour (Katusiime & Pinkwart, 2016; Khan et al., 2006; Osubor et al., 2006). Other contributors include hypertensive disorders (pre-eclampsia and eclampsia) and unsafe abortions (Say et al., 2014). These are direct contributors and account for four-fifths of maternal deaths in developing countries (Osubor et al., 2006). The complications could be prevented through the provision of quality antepartum, delivery and postpartum care (Say et al., 2014). Indirect factors include diseases like HIV/AIDS and malaria, and factors such as limited information on maternal health, anaemia and heart disease (Cross et al., 2010; Katusiime & Pinkwart, 2016).

2.2.4 Challenges facing the use of maternal health services in developing countries

Though the use of ANC has increased in many parts of the world, 54% of women in low-income countries still do not benefit from skilled delivery either by a midwife, doctor or a trained nurse (WHO, 2016a). WHO recommends at least four antenatal visits during pregnancy to allow enough time for diagnosis and treatment of potential problems (Wang et al., 2011), but this ideal is yet to be a reality in many developing countries. In fact, in many rural areas in developing countries, most women avoid seeking ANC in their first trimester because of the cultural beliefs surrounding such actions (Simkhada et al., 2008). Many women, especially in SSA, only start ANC in the second and third trimesters (Dennis et al., 2019; Wang et al., 2011). This delay means that possible pregnancy complications that could have been detected and avoided go un-cared for. When sought early and continued until birth, regular ANC is useful in identifying and preventing adverse pregnancy outcomes (WHO, 2018b). Consequently, the lack of utilisation and delay in starting ANC among maternal health clients are identified as some of the leading causes of high mortality rates.

Three possible delays contribute to maternal deaths.

1) Women's delay in recognising the need to seek care contributes directly to maternal deaths (Ronsmans et al., 2006). Such delay could be on the part of the woman, family or community (Nour, 2008) and generally contribute to women's utilisation of healthcare services (Noordam et al., 2011);
2) The delay in reaching the health facility which may be exacerbated by poor infrastructure and socioeconomic factors;
3) The delay in receiving adequate treatment once a woman arrives at a health facility.

The three delays, commonly referred to as the three-delays model (Figure 2.4), originate in the work of Thaddeus and Maine (1994).

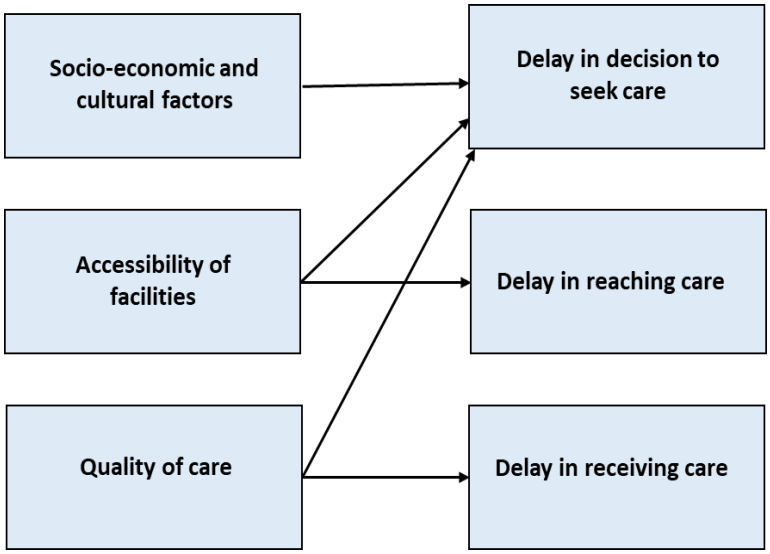


Figure 2.4: Illustration of three-delays model (Thaddeus & Maine, 1994)

In addition to the maternal health inequalities that exist between developed and developing countries, mortality rates are often glaring, even within a country. Some of these gaps are seen in the differences between poorer and more affluent women, as well as inequities between women living in urban and rural areas (Doctor et al., 2019; Ronsmans et al., 2006; Say & Raine, 2007). For example, in Mandera, a drought-prone area in Kenya, considered the worst place to give birth in the country, the MMR stands at 3,795 deaths per 100,000 live births (UNFPA Kenya, 2015), despite a lower national MMR of 510 in 100,000. The gaps that exist between rural and urban areas might be attributed to the scarce healthcare resources, as well as the low doctor-patient ratio, barriers in cost, poor proximity to health facilities and under-resourced facilities, as well as to a range of socio-cultural challenges (Doctor et al., 2019; Gabrysch & Campbell, 2009; Simkhada et al., 2008; WHO, 2016a). In other areas, poor quality of service in cases where maternal health clients are ill-treated by the health practitioners, have also been reported as contributing to low use of maternal health services by women (Harvey, 2012; Mannava et al., 2015; Say & Raine, 2007). In Malawi and Uganda, maternal health clients indicated that being treated with respect was an important factor for maternal mHealth use (Atukunda et al., 2020; Watkins et al., 2013).

Gender also plays a role in health equity. There continues to be a gender-related health gap between men and women. Women are more vulnerable to ill-health, have lower access to health resources

and health services and are generally underprivileged within the overall healthcare system (Shaikh & Hatcher, 2004). These and other factors are further elaborated in subsequent sections.

2.3 Factors Affecting Access to Healthcare Services

Barriers to access and use of health services may be viewed from the availability of good quality healthcare services (supply factors) or from the perspective of health consumers not utilising services from which they could benefit (demand factors) (O'Donnell, 2007). Most of the supply and demand-side factors incorpoate aspects of availability, accessibility, affordability and acceptability (O'Donnell, 2007) that define how accessible health services are. Solving the healthcare access problem therefore requires resolving both the supply and demand-side issues. We discuss supply and demand side factors in the following sub-sections. Table 2.1 offers a summary of the factors.

2.3.1 Supply-side factors

Supply-side factors are those elements that are inherent within the healthcare system (Jacobs et al., 2012). When good quality and effective care is not offered, the public will have no interest in healthcare services (Ensor & Cooper, 2004; O'Donnell, 2007). Providing good quality care is often dependent on existing resources (O'Donnell, 2007). In this section, we expound on supply-side barriers by focusing on the attitude of HCPs and the quality of care.

2.3.1.1 Attitudes and behaviour of healthcare professionals

The role of the patient-provider interaction in healthcare is well studied (e.g. Entwistle et al., 2010; Harris et al., 2011). Most of the findings show that the attitudes and behaviours of HCPs influence maternal healthcare-seeking (Gabrysch & Campbell, 2009; Mannava et al., 2015). Low utilisation rates have often been observed where women perceive health service providers as unfriendly and rude (Atukunda et al., 2020; Simkhada et al., 2008; Uldbjerg et al., 2020). In such circumstances, women would often prefer the services of, say, a traditional birth attendant (TBA) (Atukunda et al., 2020; Uldbjerg et al., 2020). Providers' attitudes therefore positively or negatively affect how women perceive maternal healthcare (Mannava et al., 2015). Though not specific to maternal healthcare, Entwistle et al. (2010) noted that patients found it easier to be active participants in their healthcare when providers gave the impression of being caring and

having time for them. These relationships also affect the patient's perception of the quality of care (Mannava et al., 2015). Sprague and Simon (2014) demonstrate how negative provider-patient experience resulted in delayed HIV services for pregnant women in South Africa.

2.3.1.2 Quality of care

Quality of care is a multifaceted variable. WHO defines it as "the extent to which healthcare services provided to individuals and patient populations improve desired health outcomes" (2018a, para. 4). Six dimensions of quality are offered. These are that they should be effective, efficient, accessible (timely), acceptable/patient-centred, equitable and safe (Organization, 2006). Regarding family planning, Bruce (1990) defined the quality of care as including: having choices, access to information, technical competence of the HCPs, care follow-up and continuity mechanisms, and appropriately designed services. Talking about maternal health, Hulton et al. (2000) presented ten elements of quality of care including human and physical resources, good practice, management of emergencies and good patient-provider relationships, as already discussed.

Judgement on quality is made by the user based on their experience in seeking care as well as the experiences of people they know (Thaddeus & Maine, 1994). Healthcare-seeking is negatively impacted when care is believed to be poor (Mannava et al., 2015). Tumlinson et al. (2019) explored how provider absenteeism negatively affected the quality of care and subsequently utilisation in Kenyan health facilities. Singh (2016) noted that the lack of resources such as beds and equipment in health facilities affected health service utilisation in rural India.

> "The two mechanisms through which quality of care affects the decision to seek care are satisfaction or dissatisfaction with the outcome (e.g. effectiveness of the treatment and remedies prescribed), and the satisfaction or dissatisfaction with the service received (e.g. hospital procedures, efficiency)" (Thaddeus & Maine, 1994, p. 1095).

Some studies (Atukunda et al., 2020; Simkhada et al., 2008) have noted that lack of satisfaction with the quality of care is a potential demotivating factor in the use of maternal care services which may delay the decision to seek care. When care is finally sought, the other systemic and infrastructural barriers such as providers' absenteeism may delay the receipt of care.

2.3.2 Demand-side factors

Demand-side barriers refer to factors not related to services delivery or price of the services that impede access to health services (Ensor & Cooper, 2004). These factors influence utilisation at an individual, household or community level (Jacobs et al., 2012). The differences in the impact of demand-side factors tend to be substantial between income groups, favouring the richer, and may also favour urban rather than rural dwellers (Ensor & Cooper, 2004; O'Donnell, 2007). Demand-side factors include all factors that obscure the recognition of illness or suppress utilisation even when benefits are recognised (O'Donnell, 2007). We focus on demographics, inadequate knowledge, economic and opportunity costs, the urban challenge and socio-cultural factors.

2.3.2.1 Demographics

Factors such as age, education, parity and marital status are some of the most common personal factors known to affect the uptake of healthcare services (Ensor & Cooper, 2004; Magadi et al., 2000; McNamee et al., 2009; Tanou & Kamiya, 2019). Often, age is used as a proxy in the use of health services. It is often associated with wantedness of a pregnancy, decision-making power and socioeconomic status (Gabrysch & Campbell, 2009). The wantedness of pregnancy may be a reflection of the cultural perceptions associated with the 'properness' of pregnancy. For example, in Mathole et al. (2004), women who were over 40 years did not seek ANC because they felt ashamed of being pregnant at that age. On the other hand, younger women often delay the initiation of care (Gabrysch & Campbell, 2009; Magadi et al., 2000), because they are hiding their pregnancy to avoid potential social implications such as stigmatisation, school expulsion or natal abandonment (Pell et al., 2013).

Education is one of the most consistently discussed factors that determines maternal service utilisation (Simkhada et al., 2008; Stephenson et al., 2006; Tanou & Kamiya, 2019). Women with higher education tend to utilise more maternal services (Doctor et al., 2019; Tanou & Kamiya, 2019). As far as being a determinant of healthcare utilisation is, education is a complex variable, as it often moderates other variables (Ensor & Cooper, 2004). For example, it may influence a consumer's evaluation of whether they or a dependent requires treatment, or their ability to assimilate health information or appreciate the importance of care (Simkhada et al., 2008). Shahabuddin et al. (2017) posit that education may contribute to the major reason why people maintain certain cultural beliefs and practices. Mechanisms through which education might play a

role in the decision to seek care are not adequately understood (McNamee et al., 2009; Thaddeus & Maine, 1994). However, Thaddeus and Maine suggest two possibilities:

- education breaks the barriers of culture influencing perceptions and beliefs of health services and
- that it increases self-confidence and imparts respect and influence over control on household resources and decision-making resources (McNamee et al., 2009).

Other studies also argue that higher education levels may reduce power differentials between maternal health clients and HCPs; thus placing the clients in a vantage position to demand adequate services (Gabrysch & Campbell, 2009).

Multiparous women, i.e those with a higher parity (the number of live births that a woman) and birth order (whether a birth is a first, second or higher order) often draw on their experience and may see no need for seeking healthcare services (Doctor et al., 2019). This is often the case when their previous births were without any complications (Gabrysch & Campbell, 2009). Marital status may influence women's autonomy, as later discussed.

2.3.2.2 Inadequate knowledge

The lack of knowledge about the need for seeking healthcare is a common barrier to the uptake of maternal health services (Mumtaz & Salway, 2007). For women with obstetric complications, obtaining medical care begins with the recognition of warning signs and symptoms (Thorsen & Sundby, 2012). However, since landmark studies on maternal health service utilisation such as that of Thaddeus and Maine (1994), perceptions on pregnancy have remained consistent. In many African contexts, pregnancy is still considered a natural process that does not need medical care or intervention (Atukunda et al., 2020; Zamawe, 2013). This perception plays a role in the utilisation of services as it affects the recognition of symptoms and the assessment that the symptoms are serious enough to warrant medical care (Thaddeus & Maine, 1994; Thorsen & Sundby, 2012). Women are likely to dismiss certain pregnancy-related signs and symptoms as being a normal part of the journey to motherhood (Sharma & Vong-Ek, 2012; Thorsen & Sundby, 2012; Zamawe, 2013). Studies have shown that information about pregnancy and childbirth risks could increase the use of services and interventions (Gabrysch & Campbell, 2009).

2.3.2.3 Economic factors and opportunity costs

Healthcare consumers are often faced with direct and indirect costs of healthcare-seeking and ability to pay for these costs has remained a barrier to the use of maternal services (Dennis et al., 2019). While direct costs are those linked to actual treatment and medication, indirect costs include distance to the health facility and the corresponding costs in access, and opportunity costs in terms of time spent reaching and seeking care (Ensor & Cooper, 2004; Wong et al., 2017).

Longer distances imply higher costs for maternal healthcare consumers. Cost remains pertinent because many developing countries still rely on the health consumer's 'out of pocket' payments to contribute to financing health services (Harris et al., 2011; Ilinca et al., 2019; McNamee et al., 2009). Cost of healthcare-seeking is a greater deterrent among women of lower socioeconomic status. Compared to more affluent women, poor women are less likely to use maternal healthcare services (Dennis et al., 2019; Doctor et al., 2019). This might explain why mortality rates have generally been higher in lower income countries and among women from low socioeconomic status (Thaddeus & Maine, 1994). Other studies (Amin et al., 2010; Doctor et al., 2019) have demonstrated the link between economic status and use of services. However, even where health services are offered free, or at low costs, indirect costs may still affect health services utilisation by delaying access to the health facility (Harris et al., 2011; McNamee et al., 2009; Munguambe et al., 2016). Poor road and telecommunication infrastructure or lack of transport altogether exacerbate this delay, especially in rural contexts (Nour, 2008; Wong et al., 2017). Hence, distance and transport-related barriers are associated with the first delay of healthcare-seeking (Recall the three-delays model).

Women are often responsible for the vast majority of household chores. As a result, the time spent getting to, waiting and receiving care is often considered time lost from other productive activities that require their attention (Ensor & Cooper, 2004; Gabrysch & Campbell, 2009). This is complicated by the fact that more often than not, women have to make arrangements for the care of their dependents before they can seek care (Nyakang'o & Booth, 2018). Cost and distance therefore influence the choice of services among maternal health clients, e.g. delivering at home rather than at a health facility (Doctor et al., 2019; Ensor & Cooper, 2004).

2.3.2.4 The urban challenge to healthcare-seeking

Though there have been many discussions around challenges that rural dwellers face, literature indicates that urban dwellers may face the urban penalty rather than the urban advantage. In many African countries, the speed of urbanisation has outstripped resources, making it difficult for the relevant bodies to provide housing, services (including health) and employment to the growing population (Fotso et al., 2009; Saghir & Santoro, 2018). The strain from urbanisation manifests itself in a significant heterogeneity of socioeconomic conditions and resources among urban populations (Diez Roux et al., 2007; Fotso et al., 2009). Consequently, evidence suggests that intra-urban disparities in health are much higher than intra-rural (Fotso, 2007).

Though barriers to the use of health services in rural areas include distance to health facilities and poor infrastructure, the situation in urban areas is often more complicated. In urban contexts, the mere proximity of health services does not always translate to increased utilisation among the urban poor. The paradox may be attributed to competing needs on available economic resources that include basic survival needs (Escamilla et al., 2018; Fotso et al., 2008). With regard to factors such as the opportunity cost of healthcare-seeking among poor urban maternal healthcare consumers, the lack of steady and regular sources of income adds another layer of complexity. This lack of income, combined with scarce employment opportunities, result in women engaging in ad hoc jobs that require them to trade at the times when most facilities are operating (Fotso et al., 2008). Thus, a visit to the health facility may translate to a loss of income.

Due to these complexities of urbanisation, researchers have suggested that the urban advantage on health has narrowed drastically in comparison to rural health consumers (Fotso, 2007; Gould, 1998). Some studies have shown that there is no significant difference in rural and urban women on receiving ANC (Tanou & Kamiya, 2019). Fotso et al. (2008) substantiates this by showing that rural women in Kenya had better maternal health outcomes compared to their urban-poor counterparts. Considering the urban poor thus remains a critical component of any efforts to meet SDG health-related targets (Fotso et al., 2008).

2.3.2.5 Sociocultural factors

While there have been strategies to address the aforementioned economic, social and physical barriers that have had a deleterious effect on maternal health outcomes, further challenges

lie in the socio-cultural factors that influence women's use of maternal healthcare services (Kyei-Nimakoh et al., 2017; Lubbock & Stephenson, 2008). These factors operate at the community, household and individual level. Generally, low demand for health interventions can be traced back to deep-rooted attitudes that reveal social and cultural norms (O'Donnell, 2007). In maternal health, there has been a consistent consensus that socio-cultural factors play a critical role in how women interact with maternal healthcare services (Farnes et al., 2011; Munguambe et al., 2016; Serizawa et al., 2014; Simkhada et al., 2008; Thaddeus & Maine, 1994). These factors shape healthcare-seeking behaviour in that community beliefs and norms often reflect in an individual's health decisions (Stephenson et al., 2006). The norms influence if, when and where women seek care (Ensor & Cooper, 2004).

The decision-making status of women is one such socio-cultural factor which has its foundations in the socio-cultural structures. These structures define who does what. This decision-making status shapes female autonomy and, consequently, how they interact with healthcare services (Atukunda et al., 2020; Chol et al., 2019; Fotso et al., 2009; Shahabuddin et al., 2017). Women do not always make healthcare-seeking decisions on their own. Literature (Chol et al., 2019; Ensor & Cooper, 2004; Gabrysch & Campbell, 2009; Kaiser et al., 2019) shows that more often than not, women have to seek permission from their husbands, mother-in-laws or another close relative.

In addition to decision-making power, other dimensions of a woman's autonomy include her position in the household as well as financial independence. This dimension of autonomy is often modified by other factors such as age, socioeconomic status, marital status and parity (Gabrysch & Campbell, 2009; Shahabuddin et al., 2017) and may influence how and when women seek care when they need it. Most health technologies, therefore, seek to empower patients and increase autonomy (Diamantidis & Becker, 2014) by providing access to health-related information, as much as they increase the reach of healthcare services. Female empowerment may improve maternal health outcomes such as increased use of family-planning services (Prata et al., 2017) and use of ANC services (Kawaguchi et al., 2014).

In some African settings, childlessness is seen as grounds for divorce and may threaten a woman's economic security by not being accepted into the family where she is married (Mboho et al., 2013). Particularly in cases where the woman is uneducated, an important part of her identity may be

dependent on motherhood, as her husband could go on to take a new wife (Farré, 2013). Subsequently childbirth may be a symbol of status for women and may be seen as a means for women to demonstrate strength and courage (Atukunda et al., 2020). Securing this status may play a role in pregnancy perceptions. In such situations, a woman's efforts to gain esteem and enhance her status may play a role in recognition of complications and subsequent delays in the decision to seek care (Atukunda et al., 2020; Thaddeus & Maine, 1994).

The construction of masculinity in patriarchal culture often limits male involvement in pregnancy and child-rearing (Farré, 2013; Manda-Taylor et al., 2017). These norms may exacerbate the impact of factors such as opportunity costs that may require women to leave some of their children behind while they go to seek care.

2.3.3 Summary of factors affecting the utilisation of healthcare

In a systematic review of factors affecting the utilisation of ANC in developing countries (Simkhada et al., 2008), the majority of the 28 studies that were reviewed used quantitative techniques. Most studies used bivariate analysis with a focus on demographic variables. Fewer studies addressed socio-cultural factors which, as we have discussed, equally influence the use of maternal services. Table 2.1 summarises some of the most common factors that we have discussed in this section.

Table 2.1: A summary of supply- and demand-side barriers that affect maternal healthcare-seeking behaviour

BARRIER	FACTORS	
Supply-side (Factors inherent within the healthcare system that may diminish the interest of healthcare consumers in the services)	Relationship with HCPs	Poor patient-provider relationship negatively impacts the utilisation of maternal healthcare services
	Quality of care	Health system barriers that include strained infrastructure and human resources. These translate to poor quality of care that leads health consumers to forgo the use of health services and seek other alternatives

Table 2.1 (continued).

Demand-side (Obscure the recognition of illness or suppress utilisation of healthcare services even when benefits are recognised)	Demographics	Factors such as age, education, parity and marital status that influence the perceptions and attitudes towards maternal healthcare seeking
	Inadequate knowledge	Lack of knowledge to recognise warning signs and symptoms and to perceive severity of complications that may delay the decision to seek care
	Economic factors	Lower socioeconomic groups may avoid seeking care because of the direct and indirect costs related to maternal healthcare seeking. Women may be dependent on other family members for financial support, which may affect healthcare-seeking behaviour.
	Sociocultural factors	These include pregnancy-related cultural beliefs and practices that influence behaviour during pregnancy (Further discussed in Section 2.6). Women's relative autonomy in the household and community may also limit her decisions on when to seek care.

2.4 Defining Culture

Though many definitions of culture exist as summarised in Straub et al. (2002), we opted for the definition of culture from the perspective of shared values. Values provide the basis for one mode of conduct being preferable over another (Straub et al., 2002), are acquired early in life, and reinforced through different institutions in society. Choosing to refer to culture as mental programming or software of the mind, Hofstede and Hofstede elaborate this as "patterns of thinking, feeling and potential acting that were learned throughout [a person's] lifetime" (2005, p. 4). These patterns of thinking that are based on values affect a person's behaviour (Straub et al., 2002). We take the stance of values not as personal preferences but rather as the 'desirable' that people 'should' or 'ought' to strive for as influenced by culture and societal expectations on an individual to conform, hence being shared values that regulate the behaviour in a collective life (Vauclair, 2009). This cultural-level, value-based view allows us to better investigate culture by looking into the perceptions, attitudes and beliefs of the empirical context regarding pregnancy and maternal healthcare-seeking accessed through the individuals.

Accessing culture through the individual is critical because while culture is collective and shared in nature, it is revealed in individual behaviour (Srite & Karahanna, 2006). Viewed this way,

culture ceases to be a difficult amorphous construct. Seen as patterns of thinking based on cultural values, Hofstede and Hofstede (2005) identify five cultural dimensions, as summarised in Table 2.2.

Table 2.2: A summary of Hofstede and Hofstede's (2005) cultural dimensions

DIMENSION	DEFINITION
Collectivism/Individualism	The way people prioritise the needs of the group over their own. In collectivism, the interest of the group prevails over the interest of the individual, the opposite of which would be individualism.
Power Distance	Specifies the extent to which there is a disparity in power that may result in inequality between the more powerful and the less powerful members
Uncertainty Avoidance	The extent to which members of a group feel uncomfortable by uncertain, ambiguous or unstructured situations. This involves the degree to which a society tries to control the uncontrollable.
Masculinity/Femininity	This entails the distribution of roles between genders. A society is more masculine when gender roles are distinct and feminine when roles overlap. Western cultures may display more masculine traits of assertiveness and competition, whereas Eastern cultures may value the quality of life and interpersonal relationships (Kaur & Noman, 2015).
Long- and Short-term Orientation	The extent to which culture fosters values oriented towards future rewards or delayed gratification of the material, social and emotional needs (Van Bossuyt, 2008).

Hofstede and Hofstede (2005) further differentiate the manifestations of culture by using an 'onion' model, as represented in Figure 2.5. To understand culture, one would need to work their way through each layer to get to the core. The layers consist of symbols (like words, gestures, objects and pictures) which carry meanings that are recognised only by those who share the culture. New symbols easily develop as old ones disappear, and this is often seen in the development of language. Heroes represent human actors, alive or dead, real or imaginary (e.g. Batman) who possess characteristics that people who belong to a cultural group value. These persons are respected and serve as models of behaviour. Rituals are activities within the culture (such as ways of greetings or social and religious ceremonies) that are valued. At the core of culture, values elevate certain courses of action over others. This may, for example, determine what is considered evil/good, dirty/clean, dangerous/safe, amongst others.

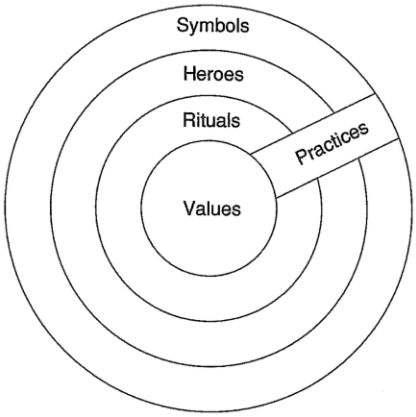


Figure 2.5: Hofstede's cultural model (from Hofstede & Hofstede, 2005)

Values sit at the core of the cultural fabric and seldom change. However, symbols, heroes and rituals can be seen, heard and observed in the practices of a culture and may change from time to time and from generation to generation, but they still change in a way that reflects the values of that particular group. Since values may not always be directly observable, researchers may access them by engaging with the other three layers of culture: symbols, heroes and rituals (Hofstede & Hofstede, 2005). For example, in this study, the concept of rituals may be accessed from the healthcare-seeking practices, norms and beliefs during pregnancy.

Culture is complex and multi-layered (Straub et al., 2002). It may vary according to divisions such as social class, gender, generation and occupation (Hofstede & Hofstede, 2005). Hence, it would be misleading to aggregate individuals cultural values at a macro-level as people are "influenced by a complexion of cultures and sub-cultures" (Huang et al., 2003, p. 94) based on membership to other groups. Hofstede and Hofstede (2005) give some examples of layers of culture that could influence an individual's behaviour:

- National level of culture according to one's country
- Regional culture which may be ethnic, religious or linguistically affiliated
- Gender-related such as if one was born as a girl or a boy
- Generation-related which separates grandparents from parents and children
- Social-class-related which may be a factor of educational opportunities and one's profession
- Organisational culture for employees defining the way people are socialised by their work organisation

Given the complexity of culture, an instantiation is often useful (Straub et al., 2002). When viewed from the perspective of individual values, culture has to be seen as dynamic rather than immutable (Straub et al., 2002), which implies that depending on circumstances, different sub-cultures may be more critical to an individual, who may adopt a different sub-culture when circumstances and conditions change. To generalise cultural-level characteristics such as individualism or collectivism across individuals and entire groups of people would therefore be dangerous, leading to ecological fallacy (Straub et al., 2002; Vauclair, 2009). However, the perspective of values at an individual level is useful when the objectives of a study entail examining individual differences. Since this study seeks to operationalise the cultural context, a culture-level perspective of values was deemed adequate. Because the dimensions produced by Hofstede apply to a cultural level, we instantiated our cultural perspective to focus on healthcare-seeking during pregnancy as a sub-culture. The implication of this is that rather than generalising the cultural characteristics to individuals thus making false inferences, we use Hofstede's cultural constructs to characterise the maternal healthcare-seeking context as the social entity within the context of this study.

While Hofstede's typology of culture is popular among researchers, some studies (Irani et al., 2010; Merritt & Stolterman, 2012) have accused this dimensional perspective as being too rigid and limited. This critique is based on the argument that culture encompasses facets beyond the five dimensions proposed by Hofstede (Recall Table 2.2). However, Hofstede does not in any way claim that these dimensions are conclusive (Hofstede, 2002). Contrary to this, he emphasises that the dimensions are only constructs, which can only be deemed useful by their ability to explain behavior. Acknowledging that culture can change in terms of practices, the perspective of values which reflect deep seated assumptions in a society that seldom change (Figure 2.5) allows us to derive some usefulness from the dimensions to offer explanations to our empirical context of culture. This choice inherently assumes that the observed behaviour in light of maternal healthcare-seeking practices reflects a 'sharedness' of culture. Thus, we use Hofstede's dimensions as the attributes of culture, not as a predictive device or as a way to generalise to other groups of people; but rather as a sensitizing device.

2.5 Culture in Healthcare-seeking Behaviour

Culture has been identified as one of the key contributors to health-seeking behaviour (Shaikh & Hatcher, 2004). A person's delay in seeking care might entail their view of their health, how they experience symptoms of illness and pain, and their judgement on the magnitude of their problem to warrant professional help (Andersen, 1995; Montague & Perchonok, 2012). These beliefs are often rooted in culture (Shahabuddin et al., 2017) and are perhaps more important in healthcare decision-making than a person's perceived need only. Culture influences beliefs, values and preferences of the health consumer by creating a unique set of health beliefs and perceptions about the meanings of 'illness' and 'health' and perceived severity of illness (Anderson et al., 2003; Montague & Perchonok, 2012). These perceptions may lead to decisions of self-care, home remedies, traditional healers or professional healthcare (Delgado et al., 1994; Shaikh & Hatcher, 2004).

The African culture is mostly collectivistic with a strong emphasis on sharing, family bonding and a strong authority structure (Straub et al., 2002). These relationships can serve as an enabling resource to facilitate or delay the use of health services (Andersen, 1995). For example, women may consult elderly women in the family before seeking formal care for themselves and their children's treatment (Delgado et al., 1994). In Bangladesh, mHealth adoption decisions by the elderly were influenced by their relationships with other family members (Hoque & Sorwar, 2017). We further explore the role of relationships in maternal healthcare-seeking in section 2.6.2.

In light of the acknowledged role of culture on care-seeking, it is considered an important dimension when thinking about the contextualisation of information technologies for healthcare. Contextualisation in terms of language suitability used in communicating healthcare messages is a popular view (Deglise et al., 2012; Gurman et al., 2012). However, culture is more than just language.

2.6 Pregnancy and Culture

Even when maternal services are available and accessible, their utilisation may still be low. Increasing availability does not always result in increased utilisation because of the interplay of other reasons that include socio-cultural factors (Escamilla et al., 2018; Fotso et al., 2008; Thaddeus & Maine, 1994). Pregnancy and childbirth, though a universal human phenomenon, is

highly defined by culture (Ottani, 2002) which influences health-seeking behaviours of pregnant women (Farnes et al., 2011). Subsequently, aspects of care that may be influenced by culture, such as the first delay (Recall the three-delays model) influence if, when, how and why women use health services. Cultural factors therefore, may affect both the utilisation and also the outcomes of health interventions in maternal care (Coast et al., 2016; Thaddeus & Maine, 1994).

Pregnancy-related beliefs and preferences are a reflection of maternal healthcare culture (Say & Raine, 2007). Besides, other factors that influence maternal healthcare-seeking, such as women's autonomy relative to their relationships and social networks, are embedded in socio-cultural structures and affect maternal healthcare-seeking behaviour (Atukunda et al., 2020; Say & Raine, 2007). In the following subsections, we look at these two topics, namely cultural beliefs in pregnancy and relationships in pregnancy.

2.6.1 Cultural beliefs during pregnancy

Socio-cultural perceptions about pregnancy threats shape how maternal health clients seek pregnancy-related healthcare services (Dako-Gyeke et al., 2013). Beliefs such as when to disclose pregnancy and the implications of untimely sharing of this news such as witchcraft are common in Africa and are grounded in cultural beliefs in these societies (Nyemba-Mudenda & Chigona, 2018; Roberts et al., 2016; Serizawa et al., 2014; Simkhada et al., 2008). In such cultural settings, it is believed that the early periods of pregnancy are particularly susceptible to witchcraft and thus a woman is better off keeping the pregnancy secret to safeguard herself from people who could 'harm' the pregnancy (Dako-Gyeke et al., 2013; Mathole et al., 2004).

Openly disclosing one's pregnancy may also be associated with boastfulness (Pell et al., 2013). Hence, by choosing to keep their pregnancy secret, women ward off any gossip and potential embarrassment should one not carry the pregnancy to term (Pell et al., 2013). Since pregnancy is also evidence of sexual activity, women, especially younger ones, may be shy to disclose their pregnancy (Finlayson & Downe, 2013). These perceptions related to the timing of pregnancy disclosure result in women in developing countries seeking ANC late in the third trimester only when the pregnancy is evident/showing (Simkhada et al., 2008; Uldbjerg et al., 2020; Wang et al., 2011). Thus, the beliefs may contribute to health disparities by influencing a patient's values, preferences and behaviours on when to seek care (Montague & Perchonok, 2012).

Pregnancy-related complications are also accompanied by cultural beliefs. Obstructed labour has been associated with extramarital affairs and may be a contributor to low utilisation of delivery services among maternal health clients (Mrisho et al., 2007). Complications may also be evidence of spiritual attacks (Dako-Gyeke et al., 2013). Subsequently, definitions of what is considered a proper or normal pregnancy experience is often socially constructed. In Kang (2014), the concept of a good birth was socially constructed as one that was natural rather than through a caesarean section.

Another reason for such constructions is based on the perceptions of the gravity of the illness that individuals in communities have. Many African communities view pregnancy as a normal life event rather than a condition that requires professional medical supervision and care (Atukunda et al., 2020; Finlayson & Downe, 2013; Mumtaz & Salway, 2007). Consequently, most women will seek care only when they experience a complication during the pregnancy (Finlayson & Downe, 2013; Uldbjerg et al., 2020). In addition, because pregnancy is considered normal, women may be keen to avoid interventions such as induced labour, caesarean sections and ultrasounds and see them as being unnecessary (Carolan & Cassar, 2010).

Other studies (Dako-Gyeke et al., 2013; Riang'a et al., 2017) have shown that where pregnancy complications are associated with prohibited actions such as going out at night or eating certain foods, compliance to the cultural norms on the part of the women is necessary to safeguard herself and her unborn baby from any of the undesired outcomes. Some of the reported consequences include having too big a baby or a deformed baby.

2.6.2 Relationships in pregnancy

How people interact in a society is determined by the culture embodied such as individualism or collectivism. Berscheid (1995) posits that behaviour in relationships is culturally prescribed. Expressions of culture are continually replayed in an individual's daily interactions, shaping one's internal representation of self (Lalonde et al., 2004). They shape individual autonomy as well as define appropriate behaviour. In this section, we explore two types of relationships:

- relationships between maternal health clients and HCPs and
- between maternal health clients and their significant kin.

As alluded to earlier, the attitudes and behaviour of HCPs influence use of maternal health services (Mannava et al., 2015). Kang (2014) noted that immigrant women would not ask questions or demand explanations from health practitioners. Their behaviour was influenced by their perceptions of the authority of health professionals. This power structure may be attributed to the fact that physicians are regarded as the gatekeepers to medical information and treatment (Ainsworth-Vaughn, 1992). The one-sided ownership of information translates to unequal power distribution between the doctor and the patient. Hitherto, physician power status has been found to be an important variable affecting consumer healthcare-seeking behaviour. Patients may also fear to engage HCPs and feel compelled to conform to clinician's decisions for fear of being labelled 'difficult' (Entwistle et al., 2010; Frosch et al., 2012). The similar results in these two studies despite the diverse populations, namely urban affluent and rural deprived, may be indicative that physician-patient interaction is an important factor across groups.

Other than the relationship with providers, culture and its corresponding cultural perspectives also guide how social relationships are structured and influence decision-making roles. Research shows a reliance on older family members for treatment advice as a common practice in developing countries (Delgado et al., 1994; Kaiser et al., 2019). In pregnancy, female kin are particularly crucial because pregnancy-related authority and decision-making responsibility may be socially defined to belong in the female domain (Ensor & Cooper, 2004; Mumtaz & Salway, 2007). Hence, other than offering care and support, one of the key responsibilities of female relatives is to impart maternal-related traditions (Kaiser et al., 2019). Serizawa et al. (2014) noted that among Sudanese women, female relatives were a critical driving force in their decision-making for maternal care. On the other hand, Malawian women were influenced by their female significant others in the decision to seek ANC (Roberts et al., 2016) while, among African-American women, social/family support of other women was central to the pregnancy experience (Savage et al., 2007).

In addition to older female relatives, partners/husbands are also important to the pregnancy experience. Serizawa et al. (2014), noted that Muslim women needed to obtain permission from their husbands to receive healthcare. Being the decision-makers and often the main controllers of household resources, men play a critical role in women's healthcare-seeking behaviour (Kaiser et al., 2019; Shaikh & Hatcher, 2004). Elsewhere, it has already been noted that decision-making in the context of roles and responsibilities assigned to women can affect the adoption of ICT (Chib, 2010).

It is therefore clear that relationships are core to the culture of pregnancy and are often seen at greater play in patriarchal societies. The undeniable link between relationships in pregnancy, be it between the family members or the health practitioners and the women, affect health outcomes and health-seeking behaviour. In light of the role that relationships play on power distribution in pregnancy, Simkhada et al. (2008) reiterated the need for qualitative studies that explore such factors in maternal healthcare. There is a dearth of literature that theoretically explains how such aspects of culture affect a woman's utilisation of maternal healthcare services such as mHealth.

2.7 Chapter Summary

This study is founded on the argument that technology must be contextually-fit, which is referred to by Avgerou (2008) as 'local-embeddedness'. The chapter provided some of the contextual factors that play different roles in maternal healthcare-seeking behaviour. From the review of literature in this section, it is clear that maternal health is a persisting challenge in developing countries. Both supply-side and demand-side barriers influence the uptake of maternal health services. However, the majority of these barriers have been discussed from the view of the utilisation of traditional healthcare services. There is a need for a better understanding of how these factors may shape mHealth utilisation when offered as a healthcare service. Specifically, it is widely acknowledged that socio-cultural aspects play a vital role in maternal service utilisation, but fewer studies show how this comes to be. The chapter demonstrated that the healthcare-seeking environment is characterised by a plethora of cultural beliefs and norms, as well as culturally-rooted social structures that shape if, when, why and how women seek care during pregnancy. The insights gained from this chapter will be useful in elucidating how maternal health clients may use mHealth interventions within their local contextual realities.

We also showed that we adopted Hofstede and Hofstede's (2005) definition of culture as shared values. Based on need to avoid ecological fallacy, we explained the choice to instantiate culture at the maternal healthcare-seeking level based on the cultural-level view of values and explained the rationale of accessing culture at an individual level.

CHAPTER 3: ICTS IN SOCIOECONOMIC DEVELOPMENT AND HEALTHCARE

3.1 Introduction

The aim of this chapter is to situate mHealth as an innovation that has had a developmental impact in healthcare in its technological and information systems background. Sections 3.2 through 3.4 discuss the role of ICTs and specifically mobile technology in social economic development in low-income countries. Section 3.5 demonstrates how mHealth has been used in addressing maternal healthcare challenges in these countries and also identifies some of the gaps in mHealth research that are relevant to this study. The concepts of acceptance and success of such ICTs as used in healthcare are addressed in Section 3.6. In this section, we also define the concept of utilisation as used in the thesis. Thereafter, Section 3.7 discusses some of the factors that may affect the utilisation of such health-related ICTs in the contexts of use. A summary of the chapter is offered in Section 3.8.

3.2 The role of ICT for Development (ICT4D)

The concept of development in ICT4D is still contested with regard to what development means and what the use of 'for' implies (Chipidza & Leidner, 2019; Sein et al., 2019; Zheng et al., 2018). This debate in terminology is not one we engage with at this point and in this study. Rather, we choose to employ the term as used to describe the premise that ICTs do contribute to the socioeconomic improvement, not only in developing countries (Avgerou, 2010), but also in other societies (Zheng et al., 2018).

In early years, there had been a debate on the role of ICT in development. The debate has since ended with the resounding confirmation that ICTs do, and will continue to, play a significant role in development (Walsham, 2017). Heeks (2010) presented a synthesis of the literature in ICT4D, showing that the role of ICT in development includes increased livelihoods and economic growth, empowerment and the development of freedom. With this debate out of the way, the more recent question has been *how* ICTs benefit development (Chipidza & Leidner, 2019). One major concern that has arisen is the disconnect between ICTs and their local context. Researchers have suggested that ICTs need to be designed in a way that they are aligned to local realities (Hayes & Westrup, 2012; Heeks, 2010). Some of these local realities include socio-cultural issues which have been

less investigated in ICT4D studies (Thapa & Sæbø, 2014) and whose understanding may help to explain why ICT4D projects fail or succeed.

In healthcare, it has been noted that ICTs, reinforced by an enabling environment, can lead to improved health services (Avgerou, 2008). The health sector has always relied on modern technologies (Chetley et al., 2006) to help address healthcare challenges and deliver better services to the health consumers. Technological developments keep pushing the frontiers of what is possible in health. Technologies such as the internet and computers have existed and have revolutionised healthcare in the past by helping health practitioners in rural places to access current medical information, foster communication among colleagues, and to diagnose and treat patients (Bukachi & Pakenham-Walsh, 2007). However, their impact has been limited because of the divide that existed in terms of access to these technologies (Bukachi & Pakenham-Walsh, 2007). Though ICTs at large have transformed the health sector, the application of mobile technologies has arguably been the most significant in transforming healthcare delivery by making it accessible, affordable and cost effective (Akter et al., 2010; Silva et al., 2015).

3.3 Mobile Technologies: Trends and Statistics in Developing Countries

Unlike pre-existing technologies such as the internet and computers, mobile phones have achieved wider use and penetration across socioeconomic and demographic groups (Porter, 2012). Its unprecedented growth in developing countries (Figure 3.1) has led to developmental outcomes in various sectors of the economy, as well as for individuals. These developments include the creation of new employment opportunities as well as improving sectoral service delivery (Aker & Mbiti, 2010). In SSA, mobile subscriber penetration was estimated at 44% in 2016 and was predicted to reach 50% by the year 2020 (GSMA, 2017). At least 9 out of 10 people have some access to a mobile phone, whether shared or individually owned (World Bank, 2018). It is also estimated that with developed countries nearing subscriber saturation, developing countries will account for 9 out of 10 new subscribers from 2016 to 2020. In countries like Kenya, mobile penetration in terms of SIM connections has already exceeded 100% (Communications Authority of Kenya, 2018). With the increasingly low cost of smartphone devices, smartphone adoption is expected to reach 55% in 2020 from only 28% in 2016.

Such growth rates have increased the potential for consumer-focused mobile phone innovations to reach the under-served. Already, transforming mobile innovations have had an indelible impact on development, with benefits being reaped in health, education, agriculture and crisis management (Zambrano & Seward, 2012). Some of the renown applications include Uber and Airbnb (GSMA, 2017), Kenya's mobile money service that has transformed the banking sector (Aker & Mbiti, 2010; GSMA, 2017) and Ushahidi, the crisis management crowdsourcing application with its origins in Kenya (Aker & Mbiti, 2010). Thus, some studies posit that mobiles are becoming the fastest vehicles for economic development (Rotondi et al., 2020).

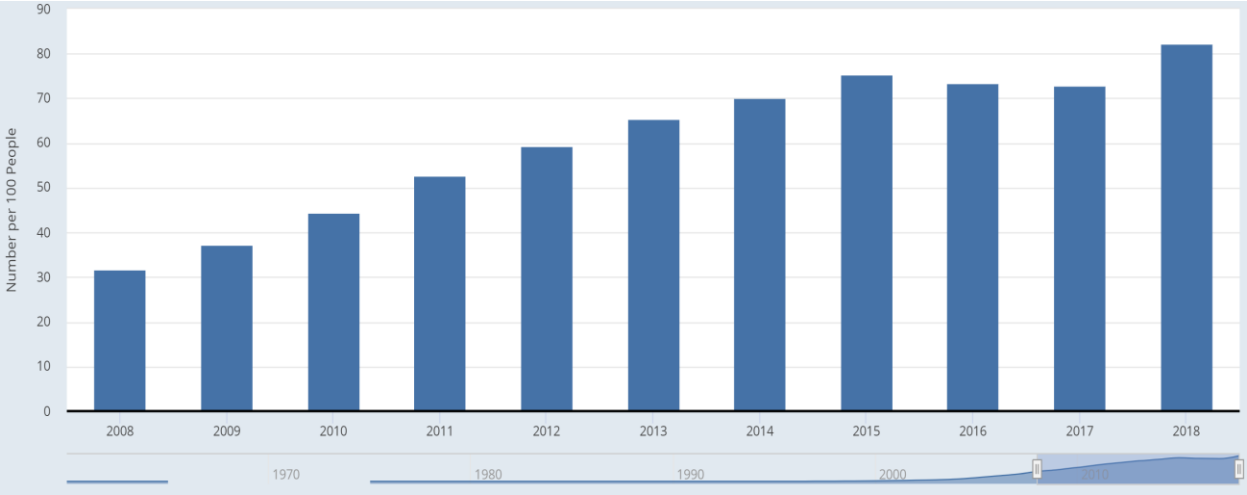


Figure 3.1: Mobile Cellular Subscriptions for Developing Countries in SSA (World Bank, 2018)

Some of the characteristics of mobile phones that may have contributed to these developments include mobility, affordability, the suitability of use in remote areas with poor infrastructure and usability even with low literacy levels (Scott et al., 2004; Wagg et al., 2019). These factors have made entry barriers much lower compared with other modern ICTs (GSMA, 2017; Zambrano & Seward, 2012). Besides, low prepaid airtime denominations with pay-as-you-use 'contracts' as well as lower costs on infrastructure, have led to SMS gaining wider adoption. This service is often used by consumers as an inexpensive option to maintain communication with significant others (Scott et al., 2004; Sylvester, 2016). The wide use of SMS has inspired innovations that take advantage of this mobile function. The ever increasing mobile technology penetration rates, prompted by lower hardware and usage costs, have seen consumers in developing countries adopting the technology and have presented unique opportunities to engage the underserved (Martin, 2012).

3.4 Women and Mobile Technologies

Women are among those that have benefited the most from developments in mobile technology. For a long time, a gendered digital divide has existed between men and women. Main users of ICTs (computers and the internet) have been men and young males, with women only reporting marginal use (Kvasny et al., 2008). It has been suggested that ICTs contribute to women empowerment by increasing participation in economic and social development, facilitating decision-making and enabling digital inclusion (Buskens & Webb, 2009; Porter et al., 2020; Rotondi et al., 2020; Wagg et al., 2019). Mobiles can help women "feel more connected, safer, and make it easy to access life-enhancing opportunities, such as health information, educational opportunities and financial services" (GSMA, 2017).

Mobile technology has been unique in that there has been wider adoption among women, even though gender disparity still exists in phone ownership, especially in lower economic populations (GSMA, 2010; Sylvester, 2016). Unlike past technologies, mobile phones, offering the benefits of ubiquity and mobility with good infrastructure, even in hard to reach places, has gained more favour among women. One of the most frequently reported uses of mobile phones among women is keeping in touch with family and friends, hence strengthening family links and support networks (Aker & Mbiti, 2010; Macueve et al., 2009; Sylvester, 2016). In poorer places where personal ownership of mobile phones is not guaranteed, sharing of phones among family members and friends is common (Buskens & Webb, 2009; Macueve et al., 2009; Marler, 2018). This behaviour in phone sharing makes accessibility of mobile phones high, even in rural communities (Kaplan, 2006; Steenson & Donner, 2009).

In previous technologies, illiteracy among women may have been a barrier that excluded them from benefiting from the use of ICTs (Buskens & Webb, 2009). However, mobile phones do not require high literacy levels, and this has led to increased adoption among the literate and illiterate women alike. As a result of these capabilities made possible by the mobile phone, more women are socially and economically empowered and independent (GSMA, 2017; Noordam et al., 2011). In services like mHealth, the health information capabilities offered by mobile phones have been reported to increase confidence among women, thereby improving their agency and autonomy (Noordam et al., 2011; Nyemba-Mudenda & Chigona, 2018).

3.5 ICTs in Healthcare: mHealth

mHealth describes the use of mobile technologies as used in healthcare delivery systems (Agarwal et al., 2016; Istepanian et al., 2004). The 'mobile' in mHealth covers a wide array of mobile devices, including wearable devices, tablets, Personal Digital Assistants (PDAs) and mobile phones, amongst others. In this study, we focus on the use of mobile phones to deliver healthcare. mHealth is offering developing countries a more plausible way to reach their health-related goals and targets. The statistics indicate a higher ratio of mobile phones than doctors among the populations. Whereas there is one doctor for every 10,000 Kenyans the mobile penetration statistics (Pew Research Center, 2019; World Bank, 2018) suggest that there are approximately 9,000 mobile phone subscriptions per 10,000 people. This mobile to people ratio is expected to be higher since there has continued to be an increased proliferation of mobile phones.

Evidence on the successful, effective and sustainable use of mobiles for healthcare delivery in developing countries is steadily growing (Chib et al., 2015; Marcolino et al., 2018). Though there is much evidence from developed countries to test the success of mobile health interventions for health consumers (Free et al., 2013), the differences in infrastructure and the context of how mobile phones are used make it difficult to directly apply the findings to problems faced by developing countries (Katusiime & Pinkwart, 2016; Oak, 2007). For example, of the vast array of mHealth uses, as documented by Vital Wave Consulting (2009), the most promising applications of mHealth in developing countries have been those that use text messaging (Chen et al., 2018), rather than multimedia which may be more successful in developed countries. This reality informed the choice of a case for this study (Chapter 5).

With the high burden of disease in most developing countries, existing evidence of such mHealth innovations suggests benefits for both the health system itself as well as for consumers. mHealth reviews show that mobile phones in developing countries have been used to successfully support behaviour change such as smoking cessation, increased physical activity (Free et al., 2013), increased utilisation of maternal services (Poorman et al., 2015) and increase in child immunisation services (Gibson et al., 2017). There has also been success in their use for the management of diseases such as hypertension and asthma (Free et al., 2013; Strandbygaard et al., 2010). These have improved the adherence of health workers to treatment guidelines (Zurovac et al., 2011), as well as supporting disease prevention and control (e.g. Deglise et al., 2012). Patients in Kenya and

Uganda received SMS reminders targeted at improving patient adherence to antiretroviral treatment (Lester et al., 2010; Pop-Eleches et al., 2011), while others received messages to improve clinic attendance (Kunutsor et al., 2011). Other reviews (Lee et al., 2016; Sondaal et al., 2016; Watterson et al., 2015) have shown the utilisation of SMS to increase the uptake of prenatal and postnatal care services in developing countries. It can therefore be said that mHealth interventions facilitate care at a distance to improve health outcomes, by providing opportunities such as patient reminders, health education and aiding communication between patients and clinicians (Piette et al., 2012).

3.5.1 mHealth in maternal care

There is growing evidence showing the potential of mobile phones for maternal care, both in developed and developing countries (Lee et al., 2016). Existing literature is replete with many examples of such projects in different places. An analysis of various reviews (e.g. Chen et al., 2018; Poorman et al., 2015; Tamrat & Kachnowski, 2012) shows that mHealth in maternal care has mainly been used for point of care, data collection, health information delivery and appointment reminders. The landscape is filled with pilot projects and studies to demonstrate these various applications. For example, in Senegal, a community health network based on mobile phones helped community workers to call the nearest health centre in the case of an emergency. In response to such a call, an ambulance or motorbike was dispatched to deliver the mother to the nearest health facility (WAHA, 2011).

Another project in Kenya helped health service providers to register pregnant mothers and thereafter follow-up on their pregnancy progress, using SMS and mobile voice calls (Harvey, 2012). The intervention also allowed the women to contact health providers instead of delivering at home using TBAs. Taking advantage of skilled delivery ensured that any pregnancy-related complications arising during this process were professionally addressed.

The MomConnect project in South Africa is another example seeking to improve the overall healthcare system and deliver relevant information to pregnant women (Peter et al., 2016). Using Unstructured Supplementary Service Data (USSD), this intervention allowed pregnant women who suspected they were pregnant to self-register into the national pregnancy register. Thereafter, the confirmed pregnant mother received weekly text messages with information on healthy pregnancy or new-born care, depending on the stage of pregnancy.

In Tanzania, the Mobile Alliance for Maternal Action (MAMA) initiated a mobile health service aimed at delivering clinic appointment reminders to pregnant women, mothers with new-borns and caregivers. The antenatal messages targeting pregnancy nutrition and pregnancy health-related complications were disseminated during pregnancy and sixteen weeks after delivery (GSMA, 2017; Nyamawe & Seif, 2014). Other similar programs, such as Aponjon in Bangladesh (Philbrick, 2013) and 'Chipatala Cha Pa Foni' meaning 'Health Center by Phone' in Malawi (Peter et al., 2016; Watkins et al., 2013), have used regular SMS and/or voice-based messages to support the adoption of healthy behaviours among pregnant women. The messages address barriers to maternal, new-born and child health (MNCH) and provide information aimed at increasing the uptake of health services (Peter et al., 2016; Watkins et al., 2013).

In some maternal mHealth interventions, messages have not only been targeted at pregnant women, but to the community of pregnancy stakeholders as well. In addition to sending messages to the pregnant woman, the Mobile Midwife program in Ghana sent weekly messages to the family of the pregnant woman (Gurman et al., 2012). These, among other projects in developing countries, provide the anecdotal evidence of the potential of mHealth to address maternal health challenges in developing countries. Outcomes have included better awareness and compliance of matters such as exclusive breastfeeding, facility-based deliveries and attendance of ANC.

3.5.2 Evaluating the effectiveness of mHealth interventions

Despite the growing evidence base, literature continues to record gaps in understanding the effectiveness of mHealth (Table 3.1). When Tamrat and Kachnowski (2012) conducted their study, they called for more quantitative studies to corroborate the findings on the impact of mHealth. Since then, there has been a growth in such studies (Lee et al., 2016; Sondaal et al., 2016). However, there remains a persisting call for studies to strengthen the evidence base and help solve the inconsistencies of evidence in mHealth (Chen et al., 2018; Dick et al., 2020; Lee et al., 2016). Though Lee et al. (2016) call for more studies with quantifiable health outcomes, they also noted a paucity of studies that employ more methodological rigour to explain users' experiences of the mHealth interventions. Another study (Chib et al., 2015) identified the need for research that offers theoretically sound explanations as to why, and how, mHealth interventions are successful when they are successful.

Table 3.1: A summary of mHealth literature reviewing the effectiveness of mHealth in maternal care in Low- and Middle-Income Countries (LMICs)

Study	Title	Summary of included studies	Summary of findings	Author(s) proposed future research	Comments
Sondaal et al. 2016	Assessing the effect of mhealth interventions in improving maternal and neonatal care in low- and middle-income countries: a systematic review	27 studies; 6 randomised, 6 non-randomised and 15 descriptive studies	Effectiveness of mHealth interventions reported based on indicators such as increased antenatal care attendance, facility-service utilisation, skilled attendance at birth and vaccination rates. However, there were no consistent effects on other health outcomes	Need for rigorous studies	Evidence of mHealth effectiveness from the studies were mostly based on health outcomes that were quantitative in nature. Other studies that adopted qualitative approaches did not explain how and why interventions work. Such inconclusive results in the literature may be addressed by studies that consider the context of the interventions
Watterson et al. 2015	Using mhealth to improve usage of antenatal care, postnatal care and immunisation: a systematic review of the literature	10 articles; 2 RCTs and 8 observational studies	Evidence of effectiveness of mHealth on behaviour change to improve uptake of ANC and postnatal care (PNC) and increase immunisation rates	Call for further randomised trials to evaluate the effectiveness of mHealth	All the 10 studies used statistical analysis to present the effectiveness of mHealth innovations
(Amoakoh-Coleman et al., 2016)	Effectiveness of mhealth interventions targeting health care workers to improve pregnancy outcomes in low- and middle-income countries: a systematic review	19 articles; 10 intervention studies (one RCT) and 9 descriptive studies	Effectiveness of mHealth in supporting health care workers communication, educational needs and acting as tools for monitoring and tracking of pregnant women to improve uptake of maternal and neonatal health services	Call for studies to evaluate the effectiveness based on maternal and neonatal health outcomes	Review was targeted at studying mHealth among healthcare workers and may not be relevant to the current study

Table 3.1 (continued).

Colaci et al. 2016	mHealth interventions in low-income countries to address maternal health: a systematic review	19 articles with 5 RCTs, 9 before and after comparisons and 5 other types of studies	Demonstrates promises for mHealth in LMICs in improving maternal health outcomes and supporting health workers	Though mHealth has the potential to address maternal health problems in LMICs, high-quality studies are needed to solidify the evidence base. There is also a need for research to address issues of scalability and sustainability.	This study only reviewed quantitative studies. These do not tell us why or how the outcomes come to be.
Lee et al. 2016	Effectiveness of mhealth interventions for maternal, new-born and child health in low- and middle-income countries: systematic review and meta–analysis	15 studies: 10 being some form of RCTs, 2 controlled and uncontrolled trials and three other forms of study designs	Evidence for mHealth to improve MNCH but overall weak evidence and inconsistent conclusions about impacts on patient health outcomes	Calls for research with methodological rigour and more trials with quantifiable health outcomes and studies showing mechanisms of impact	No evidence of literature to explain mechanisms of impact or that consider the context

A quick analysis of the mHealth literature indicates that many mHealth effectiveness studies have taken the form of RCTs and mostly use quantitative indicators on health outcomes to report on the effectiveness (Colaci et al., 2016; Poorman et al., 2015; Sondaal et al., 2016). Whereas such studies will continue to have a place in research, RCTs "do not examine how complex interventions interact with the context in which they are implemented and received" (Bonell et al., 2012, p. 2301). In their Medical Research Council guidance, Bonell et al. emphasise the fact that being complex systems, health interventions intrinsically interact with their context and are thus dependent on contextual factors. This thinking is corroborated by the mHealth Alliance, reporting the need to study contextual factors. Such factors are likely to influence the use of interventions, regardless of whether they are delivered with high quality or not (mHealth Alliance, 2012). Thus, though RCTs will remain useful in assessing the effectiveness of mHealth (Hatcher & Bonell,

2016), they need to be complemented by other studies that will examine how mHealth innovations are accessed and used in the light of their varied contexts (Chib et al., 2015; Dick et al., 2020; Hatcher & Bonell, 2016). This kind of understanding on how interventions are accessed and used will increase the replicability of mHealth innovations (Lee et al., 2016).

3.5.3 mHealth critical success factors in developing countries

mHealth interventions, especially those targeted at women, should be designed and implemented with gendered relations in mind. The perception of pregnancy as a woman's domain influences male involvement in maternal healthcare-seeking activities (Aarnio et al., 2018; Manda-Taylor et al., 2017). mHealth interventions have the potential to influence men's and women's interactions in positive or negative ways. For example, the interventions may empower women or exacerbate the gender divide that already exists between men and women. Jennings and Gagliardi (2013) conducted a systematic review whose findings indicate that mHealth programs can be meaningful, by providing avenues for men to participate in areas that would normally be targeted at women, such as family planning. On the other hand, programmatic design may reinforce the digital divide and perpetuate gender-based power inequalities (Jennings & Gagliardi, 2013). Such inequalities may arise if, for example, the woman has to receive health information through her husband's phone. Therefore, though gender-integrated health interventions may not change gender norms, relationships and inequalities, they should be designed to limit harmful impacts on health outcomes (Mandal et al., 2017).

mHealth can address most of the healthcare delivery barriers (Recall Chapter 2) that include time, cost of delivering information, distance and limited human resources that characterise health systems in many developing countries (Beratarrechea et al., 2014; Mechael et al., 2010; World Economic Forum, 2011). Subsequently, mHealth may contribute to more effective health systems, where health consumers can access care and knowledge (Littman-Quinn et al., 2013) and are empowered by the greater sense of control and autonomy from having access to information (Vo et al., 2019). Other studies indicate that mHealth systems contribute to improved clinical/health outcomes, adherence and communication between patients and healthcare providers (Hall et al., 2014; Hurt et al., 2016; Oyeyemi & Wynn, 2014; Tamrat & Kachnowski, 2012).

mHealth interventions that have been developed within the local context and where the content is relatable in terms of language choices, level of language use and relevance stand higher chances of acceptance (Lund et al., 2014; Ross et al., 2013; Sondaal et al., 2016).

Technology used in mHealth also plays an important role. The SMS-based interventions in LMICs have been reported as being more prominent (Marcolino et al., 2018). SMS offers more convenience to health consumers in choosing when to access the information given, as well as being easy to use because they require a low level of technical skill (Lau et al., 2014; Lund et al., 2014).

In terms of implementation architecture, combining text messaging and two-way communication for emergencies is seen to be beneficial in areas such as maternal health (Sondaal et al., 2016). Such services may contribute to the judgments that mHealth users make regarding the quality of care received from these interventions. Akter et al. (2010) posit that mHealth users measure quality of mHealth services by the quality of interaction. This in turn is measured by constructs such as responsiveness, assurance and empathy; quality of the platform including reliability, efficiency and availability; and outcome quality which includes functional and emotional benefits that the user derives from using the intervention. Perceptions of quality of care are critical for satisfaction which is necessary for ensuring continued use (Akter et al., 2010; Akter, Ray, et al., 2013). mHealth systems that do not meet a threshold of quality may be underutilised, bypassed, or used as a last resort (Akter et al., 2010).

Sondaal et al. (2016) presented an extensive analysis of mHealth in LMICs. Some of the limitations of mHealth in developing countries pointed out in this study include lack of mobile phone ownership, cost and illiteracy. These barriers were more prominent among those of low socioeconomic status and those who were marginalised. Consequently, opportunities for mHealth include toll-free communication to address cost especially for those at the bottom of the pyramid, voice options to address illiteracy and using community volunteers to access women with no mobile phones (Sondaal et al., 2016). Though phone sharing among family members is a common solution to mobile phone ownership (Buskens & Webb, 2009), privacy may become an issue and pregnant women may end up being dependent on others for accessing information (Ross et al., 2013; Sondaal et al., 2016). These challenges could affect the success of such interventions. Other threats to mHealth are those that are infrastructural in nature. These include electricity and reliable

telecommunications network (Lund et al., 2014; Sondaal et al., 2016). Table 3.2 summarises the discussed critical success factors.

Table 3.2: Some mHealth success factors and potential considerations

SUCCESS FACTOR	CONSIDERATION EXAMPLES
Programmatic design	Think about the impact of mHealth on gendered relations. mHealth may contribute to increasing women's decision-making, social status and access to resources, or may exacerbate existing gender divide. Consider access to phones, security and privacy
Contextuality	Consider language of users
mHealth delivery technology	Consider skills of users, types of devices and general mobile infrastructure
mHealth implementation	Implementation architecture: One-way versus two-way communication Quality of mHealth services Free versus paid-for mHealth services
Infrastructure	Electricity, mobile penetration, network coverage

3.6 Acceptance and Success of ICTs in Healthcare

Health Information Technologies (HIT) empower patients and lead to better health outcomes, as empowered patients engage more actively in their own healthcare (Diamantidis & Becker, 2014; Tao et al., 2020). For this reason, acceptance of HITs among healthcare consumers remains of important concern. Though a large number of such technologies are available for health, their impact is inhibited by their underuse and low acceptance (Tao et al., 2020). Utilisation of such technologies is often used as a measure of their acceptance and success (Or & Karsh, 2009). However, utilisation is broad and is often defined differently by various studies. The subsequent sections therefore address the role of acceptance of HITs and the concept of utilisation as an IT construct as used in the thesis.

3.6.1 Acceptance of Health Information Technologies

Acceptance of consumer-oriented HITs is crucial to their success in achieving their desired positive impact in health (Tao et al., 2020). The healthcare sector has consistently relied on ICTs. This field takes the name of HIT. In the past, HIT was defined with a focus on healthcare-related information processing facilitated by computers. Thompson and Brailer (2004) defined HIT as the "application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of healthcare information, data, and knowledge for communication and decision-making" (p. 38). Later on, Goldschmidt's (2005) definition included electronic health records, decision support tools and telemedicine. Montague and Perchonok (2012) defined HIT as a variety of electronic methods used to manage information about people's health and healthcare, on both an individual and a group level. Chaudhry et al.'s (2006) definition included mobile computing and telemedicine, among others. Since mHealth involves leveraging of mobile computing to extend the reach of healthcare services as well as capturing, processing and facilitating the exchange of information (Odendaal et al., 2015), mHealth can accurately be categorised as HIT. When HITs are used by health consumers, the term used is Consumer Health Information Technology (CHIT).

As noted in the review by Or and Karsh (2009) and seen in other studies (e.g. Dou et al., 2017; Or et al., 2011; Phichitchaisopa & Naenna, 2013; Tao et al., 2020), most studies have used established theories of technology acceptance such as Unified Theory of Acceptance and Use of Technology (UTAUT) and Technology Adoption Model (TAM), to understand consumers' acceptance of HIT. The attributes used in the theories such as usefulness and ease of use are often considered as being inherent in technology. However, some researchers have suggested that these attributes are social constructs and that their definition is dependent on the socio-cultural context (Nocera et al., 2007). Such newer conceptualisations of use make the existing HIT studies that adopt a narrower conceptualisation of the variable limiting.

Or and Karsh (2009) noted that though social factors such as culture were critical in technology acceptance studies, they were rarely examined in the HIT acceptance studies. Where examined, they were operationalised using narrow attributes such as gender and race. This weakness may be attributed to the theories' minimalistic nature that necessitates the socio-cultural factors to be accounted for in the *Social Influence* variable of the model. Such narrow operationalisations of

factors in the sociocultural context may not be adequate because they ignore all other ways in which these factors may influence HIT utilisation (Holden & Karsh, 2010).

Jimison et al. (2008) also make an important observation: successful use of CHIT among patients could be better achieved if care is delivered within a technology that they use from day to day for other purposes. The extant literature on CHIT acceptance has focused on technologies that health consumers in developing countries do not interact with from day to day such as the internet. Hence there is a need for studies to study acceptance of technologies such as mHealth that have recently proliferated the healthcare field. Most importantly, "mHealth adoption is not only a technology acceptance behaviour but also a health-related behaviour" (Guo et al., 2015, p. 661). This makes our approach of studying utilisation-related behaviour within the healthcare-seeking socio-cultural context more relevant.

3.6.2 Definining and situating technology utilisation

In the IS acceptance domain, utilisation (use) is almost always treated as a dependent variable to measure technology adoption (Burton-Jones & Straub Jr, 2006; Delone & McLean, 2003). Adoption and use are two processes that are intricately related (Al-Natour & Benbasat, 2009). However, despite being an important construct in the IS field, utilisation is seldom defined or its operationalisation is too simplistic (Burton-Jones & Straub Jr, 2006). Utilisation is more complex than the frequency of technology use, and duration or variety of system functions used (Barki et al., 2007). It is sometimes used as a proxy for other system measures such as usefulness and ease of use, and at times used instead of adoption (Delone & McLean, 2003). The ambiguity in its definition hinders the adequate study of the concept and misconstrues IS findings on the concept of utilisation (Burton-Jones & Straub Jr, 2006).

A common definition of use is one that involves three elements: a user, an object being used (system) and a task (what is being performed) (Burton-Jones & Straub Jr, 2006). Though useful, this definition ignores the multidimensional nature of use and overlooks the richness of context in shaping use (Barki et al., 2007). Individuals' adoption and usage decisions happen within rich social contexts which must be considered in understanding user behaviour towards such technologies (Lewis et al., 2003).

In light of the shortcomings of prior conceptualisations, some researchers have explored various other conceptualisations to address some of the aforementioned limitations (Bagayogo et al., 2014; Barki et al., 2007; Burton-Jones & Volkoff, 2017). The common denominator of these new conceptualisations is on their definition of use beyond the initial adoption phase. Of specific interest to this study is the conceptualisation of use by Barki et al. (2007) who coined a new term: IS use-related activity (ISURA). ISURA encompasses a person's interaction with technology where a user employs IT to accomplish a certain task, as well as the person's activities to adapt, change or modify the human-technology interaction context. Resonating with this definition, we choose to adopt it in the study. The expanded view of the construct of use may better explain salient technology acceptance outcomes without precluding IS utilisation behaviours included in the traditional view of the construct (Barki et al., 2007). It also helps us to move beyond adoption to understanding the user-technology relationship (Al-Natour et al., 2008), a view that is useful to this study.

3.7 Factors that may Affect Utilisation of ICTs in Healthcare

This section addresses factors that may affect the utilisation of ICTs in healthcare through the lens of IS. This approach is reasonable since HITs are essentially ISs. Trust is known to play a significant role in technology acceptance (Benbasat & Wang, 2005; Zhang et al., 2019) and influences how they are used (Geitner et al., 2017). As expected, trust is also critical to the use of HITs by consumers (Palanisamy et al., 2017; Tao et al., 2020). Other studies have demonstrated that there is a positive correlation between trust and continued use of mHealth interventions (Akter et al., 2011; Kaium et al., 2020). This may mainly be attributed to the fact that these interventions replace face-to-face interactions between HCPs and healthcare consumers (Fox & Connolly, 2018). Tao et al. (2020) further posit that CHITs need to earn trust from their users by eliminating uncertainty. We therefore find it useful to address the concepts of trust and legitimisation in how they influence uncertainty. We also discuss perceptions of technology from the lens of technology frames. As demonstrated by Nocera et al. (2007), perceptions of technology may be dependent on users' context which may subsequently influence how technology is used.

3.7.1 Trust in Information Systems

Understanding trust in relation to HITs is important. We assume that cultural factors, such as uncertainty, may influence trust. Trust affects the uptake of health-related technologies (Jimison et al., 2008; Song & Zahedi, 2007). Some studies have shown the role of trust in mHealth use (e.g. Akter et al., 2011). To further understand the concept of trust, we turn to exploring trust in IS. The influence of trust on perceptions and use of technology is not new to IS. A quick search on Google Scholar indicates that trust has been extensively studied in IS areas that involve internet services like e(m)-commerce, e-banking and e-government (Carter & Liu, 2018; Fang et al., 2014; Sarkar et al., 2020; Zhou, 2011). Trust reduces uncertainty and enhances desirable behaviour with regard to the use of technology (Gefen et al., 2003; Guo et al., 2016). More studies in this field (Mcknight et al., 2011; Söllner et al., 2012; Vance et al., 2008) have noted that past studies focused on examining how trust in the human aspect of technology affects IT acceptance. Only recently has the concept of trusting in technology piqued among researchers (Carter & Liu, 2018; Lankton et al., 2015; Mcknight et al., 2011; Talwar et al., 2020). Mcknight et al. (2011) note that over and above consumer interpersonal and institutional trust in understanding user behaviour, users' trust of the technology itself shapes their IT-related beliefs and behaviour.

Trust beliefs are one way in which we can understand how users trust technology. The beliefs refer to one's conviction that the trustee has favourable attributes to induce trust (McKnight et al., 1998). Two different categories of trust beliefs are employed in current trust in technology literature (Lankton et al., 2015). Human-like trust constructs such as integrity, competence and benevolence may be used in trust in technology (Benbasat & Wang, 2005; Lankton et al., 2015), since it is observed that people often respond to technology as social actors, and attribute human characteristics to them (Al-Natour & Benbasat, 2009). Alternatively, system-like constructs that parallel the interpersonal beliefs may be adopted when technical artifacts (e.g. Excel) do not possess interpersonal characteristics. These technology-trusting beliefs include functionality, reliability and helpfulness (Lankton et al., 2015). Table 3.3 summarises how these two categories map to each other.

Table 3.3: Summary of interpersonal and technology trust beliefs

Interpersonal trust beliefs	Technology trust beliefs
Competence: Trustee has the ability, skills and expertise to perform effectively	*Functionality*: The degree to which the technology has the necessary functions and features required to accomplish one's task
Integrity: The trustee adheres to a set of principles that the individual finds acceptable	*Reliability*: The degree to which the technology will continue to operate appropriately and flawlessly
Benevolence: The belief that the trustee cares about the individual's interests	*Helpfulness*: The degree to which the technology will provide adequate and responsive help

Because a user's propensity to trust is strongly related to the risk-related beliefs (Benbasat & Wang, 2005; Song & Zahedi, 2007), context can influence trust behaviour. For example, the cultural dimension of uncertainty avoidance might influence when and how people trust. Landmark studies such as Leidner and Kayworth (2006) have shown that national culture can influence implementation, adoption and usage of IS. Therefore, we consider trust to be an important construct in this study, especially since there is evidence of its role in mHealth use (Akter, Ray, et al., 2013; Kaium et al., 2020).

3.7.2 The concept of trust and legitimisation

Closely linked to trust is the concept of legitimisation. Rooted in social science, the concept of legitimisation has gained much traction in the field of organisational studies. Legitimacy connotes the congruence between an entity and its cultural environment (Deephouse & Suchman, 2008). As a multidimensional concept, Suchman (1995) defines three types of legitimacy: pragmatic legitimacy, moral legitimacy and cognitive legitimacy. Pragmatic legitimacy rests on judgements about whether a given activity/innovation benefits the evaluator. The evaluator focuses on direct benefits to be gained. Unlike pragmatic legitimacy, moral legitimacy has to do with whether an action is the right thing to do based on a socially constructed value system, though this does not imply that the latter is totally 'interest-free'. Finally, cognitive legitimacy is achieved when there is compliance with taken-for-granted and subconscious routines and cultural beliefs.

Legitimisation has been discussed in light of how organisations approach legitimacy or how they seek it. As a result, legitimacy in IT is also often looked at from the point of the technology

implementer engaging in actions and/or processes that will build legitimacy. For example, Kaganer et al. (2010) presented a taxonomy for building IT innovation legitimacy in the case of computerised physician order entry systems. Flynn and Du (2012) showed how IT management improved their influence in an IT implementation process by gaining legitimacy from other stakeholders. Since at the very core of legitimisation is trust, and since there is evidence that users can trust technology, it would be useful to explore how these concepts of trust and legitimisation manifest in the utilisation of mHealth.

3.7.3 Technology frames and technology personification

Originating in the work of Bijker (1997) and first applied in IS research by Orlikowski and Gash (1994), the concept of technological frames helps to understand how people make sense of ITs and how these constructions influence their interaction with technology (Davidson, 2006). People may attribute diverse meanings to the role of technology which is dependent on the context, practices and perceptions of those involved (Nocera et al., 2007).

What contributes to the technological frames that people adopt? One concept that seems to be linked to people's construction of technology is that of metaphorical personification, also known as anthropomorhism (Marakas et al., 2000). Anthropomorhism has to do with people attributing human characteristics to technology. For example, female health extension workers described in Aamir et al. (2018) felt that the mHealth application was their *personal helper that gave them the confidence* to perform their duties more efficiently; this perception arose because of the skills and knowledge they gained through the use of the phone. Speaking about computers, Marakas et al. (2000) suggested that how people anthropomorphise technology may lead to unreasonable expectations concerning the capabilities of a device. This behaviour may be influenced by an individual's lack of experience on the role of technology (Winograd et al., 1986), their self-evaluations in relation to technology and their belief about the social role of technology (Johnson et al., 2006). The social cues that the technology exemplifies may also influence these perceptions (Johnson et al., 2008; Marakas et al., 2000). Other studies (e.g. Geitner et al., 2017) have confirmed that people often respond to technology socially.

3.7.4 Culture and utilisation of Information Systems

Some authors have posited that a majority of ISs are not adopted because of socio-cultural factors (Srite & Karahanna, 2006). This notion has been corroborated by other studies which have suggested that one's cultural background plays a role in technology acceptance (Al-Gahtani et al., 2007; Bandyopadhyay & Fraccastoro, 2007), thus necessitating the need to study such user behaviour from a socio-cultural perspective.

In addition to being characterised by certain values that may influence uptake of technology, societies also have social structures that define them. One aspect of social structures is social capital which partly determines the relative social positioning of individuals in these contexts (Coleman, 1994). We assume that a consideration of social capital is relevant to our study, since social ties and relationships are core to the culture of maternal healthcare-seeking in most African countries (Recall Chapter 2). In this section, we review how culture has been studied in IS and explore the social capital dimension of social structures.

3.7.4.1 Culture in Information Systems studies

Differences in culture are likely to result in differences in the use of IT (Leidner & Kayworth, 2006). For example, in Vance (2008), French people from a high uncertainty avoidance context were more hesitant to adopt technology compared to American people from a low uncertainty context. Another research by Chau et al. (2002) found that consumer attitudes and use of the internet varied considerably between Hong Kong subjects (value for social relationships and shared loyalty) and American participants (value for personal competence and loyalty to oneself). Hong Kong participants used the internet for social communication, while American participants used it for information searching to allow them to perform tasks in a timely manner.

Leidner and Kayworth (2006) presented a summary of the study of culture in the IS field within six themes. Of interest in this study are the themes on culture in relation to adoption and use of technology, and IT use and outcomes. We limit the discussion here to studies that adopted Hofstede's taxonomy of culture. Several researchers (Al-Gahtani et al., 2007; Huang et al., 2003; Srite & Karahanna, 2006; Straub, 1994; Vance et al., 2008; Venkatesh & Zhang, 2010) have used different dimensions of this taxonomy to explain differences in diffusion, acceptance and utilisation of technology in various societies.

One of the most cited cultural dimensions related to adoption and use of IT is uncertainty avoidance. This is associated with the fact that IT is considered risky and thus high uncertainty cultures are less likely to adopt the technology (Leidner & Kayworth, 2006). The response towards technology may also be influenced by the characteristics that the technology itself presents. In Straub (1994), United States workers demonstrated a stronger proclivity towards e-mail compared to their Chinese counterparts who preferred fax because of its perceived information richness when compared to e-mail. Srite and Karahanna (2006) confirmed that uncertainty avoidance influences technology acceptance. Users from high uncertainty avoidance cultures look to their social environment for cues to determine the appropriateness of technology acceptance.

Another cultural dimension, according to Hofstede, is power distance. In high power distance societies, people may show deference to authority by using technology if conforming to its use is what the authority requires (Al-Gahtani et al., 2007). In traditional technology adoption models like UTAUT, the use that results from conforming to authority/relevant others' expectations is explained by the concept of subjective norm. Subjective norm is used to measure an individual's use of technology because they believe that a relevant other would want them to use it (Venkatesh et al., 2003). Thus, power distance often positively moderates the influence of subjective norm on perceived use. However, in Huang et al. (2003), rather than power distance reinforcing the effect of subjective norm on perceived use, power distance was found to have a negative moderating effect on perceived use in the use of e-mail communication. E-mail communication was considered to have a 'levelling/equalising effect', and hence participants shunned using it because it did not maintain hierarchical social order. Technology may therefore be used by more powerful members to reinforce control (Hasan & Ditsa, 1999). However, technology may also change the power structures in organisations by empowering those in lower power levels (Hasan & Ditsa, 1999). The impact of power distance on use of technology may vary depending on whether a culture is collectivist or individualist (Hasan & Ditsa, 1999). In collectivist cultures, the role of power distance may be observed more because conforming to social norms is considered important.

3.7.4.2 Social capital as a feature of social structures

Social capital refers to the features of social structure that facilitate individuals' actions (Coleman, 1994). Like any other capital, social capital is productive and enables the achievement of both personal and collective goals (Coleman, 1994). Social capital is often discussed in

technology acceptance studies since it can have an effect on technology adoption, diffusion and use (Yang et al., 2009). Technology can either substitute, complement or modify existing structures (Weltevreden, 2007). For example, it has been noted that technology-mediated interactions, like the use of social network sites, may afford users the opportunity to create new forms of social capital (virtual social capital) that may oppose or complement the social capital that exists offline (Alessandrini, 2006).

Social structures on the other hand could be formal or informal, such as communities of practice, where a group of people who share a craft or profession, and interact and learn from each other (Dennen, 2014; Li et al., 2009). The definition of a community of practice is founded on the concepts of a shared domain of interest/competence, a community of membership and relationships, and an activity/practice that entails a shared repertoire of experience (Candlin & Candlin, 2007). In healthcare-seeking, the shared interest entails a shared purpose among stakeholders. Purpose is the ultimate reason (or the why) of a practice (Manley et al., 2014). Hence, a shared purpose "results when a group of individuals aligns their belief systems or values with a common challenge, vision or goal" (Finney, 2013 p. 5 as cited in Manley et al., 2014). Thus, in the case of healthcare-seeking, the common purpose would entail successful pregnancy that is shared by maternal health clients, healthcare providers and other interested stakeholders (Recall Chapter 2). For this reason, we find the term '*community of purpose*' rather than practice more suitable for this thesis.

3.8 Chapter Summary

Currently, there is growing evidence of the potential of mobile technologies in developing countries. The evidence indicates that the strategic use of mobile innovations like mHealth could bolster the achievement of health-related SDGs. In this chapter, we focused on explicating mHealth as a nexus between technology and health. We discussed the role that ICTs have played in development and showcased the potential for mHealth in healthcare delivery in developing countries. By contributing to access of healthcare in areas like maternal health, we showed that studies that help to explain the utilisation of such innovations would complement the existing mHealth effectiveness studies. Utilisation studies would help to corroborate the evidence, since there is a paucity of studies in the existing evidence base to explain why, when and how interventions work, when they work.

Building on Chapter 2, where we argued for the need to study how socio-cultural factors shape mHealth utilisation, we further explored the concept of culture in IS studies. Herein, we confirm, based on evidence from literature, that socio-cultural issues influence technology utilisation in various ways. We aslo operationalised the term ‘utilisation’ to refer to more than using technology to accomplish a certain task, to a person’s activities to adapt, change or modify the human-technology interaction context. We refer to this as ‘utilisation behaviour’.

We also explored other factors that may influence utilisation of technology and which may vary in how they do this based on the context. We discussed trust and legitimisation. We further hypothesise that how people use technology may be influenced by the perceptions of technology that they construct. Hence we briefly elucidated the concept of technological frames and anthropomorphism which may result when users interact with technology as social actors. Together with the literature in Chapter 2, the contents of this chapter set a foundation for the remaining parts of this study.

CHAPTER 4: THEORETICAL APPROACH

4.1 Introduction

This chapter reviews the theoretical framework for the thesis. We discuss Activity Theory (AT) as the theoretical framework that the study employed. The use of mHealth for care-seeking represents healthcare-seeking behaviour that is mediated by technology. Since healthcare-seeking behaviour is a human activity that is socially and culturally situated (Alexander & Hearld, 2012; O'Donnell, 2007), AT was deemed optimal to conceptualise and understand why and how maternal health clients interact with mHealth interventions and the subsequent emerging utilisation behaviour. Viewing healthcare-seeking as a practice, practice theories like Bourdieu's Theory of Practice may have been suitable. However, AT is essentially a practice theory. The framework is suitable for studying different forms of human practice, where their individual and social aspects are interlinked (Kuutti, 1996). Another candidate theory was Actor-Network Theory (ANT) as highlighted in Section 4.2.1.

Section 4.2 justifies the selection of AT from among other possible theories. Section 4.3 further provides a rationale for AT while Section 4.4 reviews the use of AT in fields related to IS. Sections 4.5 through to 4.7 expounds and operationalise the concepts of the theory relative to this study. In Section 4.8, we elaborate the principles of AT and their empirical applications in the study. In light of the concepts and principles of AT, the study questions are restated in Section 4.9. Given the philosophical underpinnings of the study, (further elaborated in Chapter 5), Section 4.10 briefly demonstrates that the adopted interpretivist paradigm and AT complement each other, while Section 4.11 highlights some limitations of AT. We conclude with a summary of the chapter in Section 4.12.

4.2 Theoretical Positioning of the Study

This section highlights the choice of a social theory to study an IS phenomenon. It justifies the selection of AT from among the potential social theories. Subsequently, we address why mid-range theories, that have typically been used to study utilisation, were not suitable for this study.

4.2.1 Social theories in Information Systems

Research in IS has noted that in studying the interaction between technology and actors/organisations, technology has been neglected on the one hand (Cecez-Kecmanovic et al., 2014) and, on the other, there is a resort to deterministic reasoning (Leonardi & Barley, 2008). Since ITs can be considered as social actors whose characteristics manifest within the context of interactions (Al-Natour & Benbasat, 2009), the IS field has relied on social theories to explain user-technology interactions. The social theories provide the vocabulary to address the "situated entanglement of the technology and the social" (Orlikowski, 2005, p. 185).

The most widely adopted social theories include actor-network theory (ANT), structuration theory and AT. These theories have been useful in explicating the broader relationship between IT and human activity (Karanasios & Allen, 2014; Klein & Myers, 2001). Of these competing theories, ANT and AT were considered potential approaches to studying the phenomenon of interest. ANT, however, assigns equal agency between human and non-human actors (Leonardi, 2011). A human being and technology are treated equally. Potential problems in using ANT for this study arise because we are interested in studying people's interaction with technology and how the actors' socio-cultural context shapes this behaviour. Hence, we start off the study with the assumption that human agency has intentionality (Cecez-Kecmanovic et al., 2014). In other words, though human actors and technology have agency, "ultimately, people decide how they will respond to the technology" (Leonardi, 2011, p. 151).

We chose to employ AT because, in addition to providing the concepts necessary to study 'technology in use' and bringing the actor and technology together (Karanasios et al., 2018), the theory adopts the view that humans have greater agency (Kuutti, 1996). AT's perspective therefore is one of "agentic people actively pursuing an objective, not passively accepting and using technology" (Blayone, 2019, p. 457). AT offers this study the opportunity to investigate the situated entanglement without embracing technological determinism, taking the technology for granted, or allowing the technology to vanish from view (Orlikowski, 2005).

4.2.2 Shortcomings of mid-range theories in addressing context

The field of technology adoption has relied on theories such as Social Cognitive Theory and Theory of Planned Behaviour, Theory of Reasoned Action and Technology Adoption Model to

understand individuals' adoption and use of technology (Ditsa, 2003). However, such mid-range theories are criticised of being too utilitarian (Al-Natour & Benbasat, 2009), of technological determinism, and of offering techno-centric predictions (Awa et al., 2016; Venkatesh et al., 2007). These techno-centric predictions suggest that technology, rather than individuals, determine adoption (Awa et al., 2016). By extending these models to other theoretical variants like UTAUT (Venkatesh et al., 2003), we have had a better understanding on factors affecting the adoption of newer technologies such as mobile technology (Karanasios & Allen, 2014). What is common about these technology adoption theories is that behaviour (such as mobile technology use) is viewed as the result of a certain set of beliefs about technology (Ditsa, 2003). These beliefs, represented by the perceived characteristics in the innovating context, include attributes such as perceived ease of use and perceived usefulness, behavioural beliefs and outcome evaluations. The shortcoming of such definitions is in the assumption that these variables are not socially constructed, but rather that they are attributes of a technology that users respond to. With an extensive focus on the technology (Al-Natour & Benbasat, 2009; Awa et al., 2016) at the expense of context, these theories are inadequate to study complex IS environments (Hwabamungu & Williams, 2010). As has been the argument through the previous chapters, an understanding of the role of context is specifically necessary, as health and healthcare are intricately embedded in a social and cultural context. Hence context can have a far greater effect on the uptake of an intervention and therefore requires a more detailed understanding (Svoronos & Mate, 2011).

The aforementioned mid-range theories are also mostly predictive, focusing on intention to use (Al-Natour & Benbasat, 2009; Bagayogo et al., 2014). Though they may be adequate to explain why technology is adopted, they offer little in terms of understanding how the interaction/relationship between the user and the technology evolves (Al-Natour et al., 2008). These limitations curtail the usefulness of these theories for this study, as they may not offer much explanatory insight to the phenomenon of study. As discussed earlier, social theories present a more plausible way to study the complex interaction between the social and the technological aspects of IS.

4.3 The Rationale for Activity Theory

Vygotsky developed AT for explanatory rather than descriptive analysis (Karanasios et al., 2018). That is, AT does not merely analyse 'what is' as basic theories do (Gregor, 2006) but, rather, it is

a strong clarifying tool (Nardi, 1996a) in that the descriptive level it provides allows for explanatory conjectures to be made (Gregor, 2006). Hence, Karanasios et al. (2018) conclude that AT is best described as a theory "for providing a lens for viewing or explaining the world" (Gregor, 2006, p. 613). Explanatory theories may also be referred to as 'theories of understanding' (Gregor, 2006). AT provides a means to understand 'how' and 'why' a phenomenon may occur by providing the vocabulary and orienting concepts for studying different forms of human practices (Clemmensen et al., 2016; Kuutti, 1996). It is especially useful in contexts where we struggle to understand and describe 'context'(Nardi, 1996a), as is the case in IS. The concepts and principles offered by AT provide a concrete lens that can be employed to explain technology use in situ.

As already emphasised, AT also allows for a better reframing of technology in the IS field. Shunning technological determinism, AT treats technology similarly to other tools and artifacts; as mediators of human activity (Blayone, 2019). This view allows us not to focus only on the use of a system that assumes usage as being inherent in a tool (Roos, 2012), but rather to explore the system in its social and cultural context. Furthermore, instead of looking at activities of isolated human beings, AT brings to the front cultural and technical mediation of such human undertakings (Allen et al., 2011). Therefore, by focusing not only on the technology but on human activities and highlighting the contexts of individuals or groups (McMichael, 1999), AT provides a better way to holistically describe human-technology interaction contexts. It extends the focus to a meaningful interaction of the subject with an external world (Roos, 2012). In this context, there is dual agency between actors and their environment where the two are continuously affecting one another. Actors shape their environment as they engage in their activity, while elements such as norms and practices existent in the environment where the activity is enacted, shapes them. By bringing together the social context and the use of technology into the unit of analysis, AT does not suffer from analytical dualism (Karanasios, 2018). Hence, it allows IS researchers to address the challenge of studying the human-technology interaction.

In light of these benefits, we adopted AT for this study because maternal healthcare-seeking, like most health contexts, presents a complex set of relationships and activities amongst various stakeholders and other factors. AT's robustness in understanding complex relationships make the theory suitable for a health scenario which is an inherently complex system (Hwabamungu, 2014). In these environments, outcomes are a complex relationship of several subjects and objects possibly with conflicting interests and values, and activities. Therefore, we used AT because it

provides the concepts necessary to understand the phenomenon. Its elaborate theoretical vocabulary and open nature (Clemmensen et al., 2016) allows us to explore the utilisation phenomenon more freely. Besides, AT's description of the relationship between the subject, tools and objects as purposeful activities is in harmony with the construction of 'use' that we defined in Chapter 2. That is; it is an activity that involves a user, an object being used (system) and a task (what is being performed), where the task is a goal-directed activity. In the recent past, Karanasios et al. (2015) called for studies that apply AT in IS research to demonstrate the potential theoretical and empirical contributions that it offers. Our study seeks to make some contribution to this call.

4.4 Applications of Activity Theory

The use of AT in IS has generally remained limited in the past (Karanasios et al., 2018). However, there is recent acceptance among IS researchers, appreciating that AT fits with the mediating role of IS in most human activities (Hasan et al., 2017). Following this recognition, there has been an increasing number of studies demonstrating the usefulness of AT in IS and IS-related areas. This section reviews the use of AT as a theoretical framework and provides some of the benefits that AT presents to IS research.

4.4.1 Activity Theory in Information Systems

Courtesy of its origins, AT has extensively been used in the fields of organisation and social psychology (Karanasios et al., 2015). Other areas in which AT has been implemented include work development and practice such as computer-supported collaborative work, healthcare and education (Clemmensen et al., 2016). In IS-related areas, AT has been more popular in the areas of Human-Computer Interaction (HCI) and IS design (Karanasios et al., 2015; Wilson, 2008). In IS design, AT is used to explain work development and change (e.g. Korpela et al., 2002; Mursu et al., 2006). Bødker argues that analysis of systems design as an activity allows for

> "… a focus on many different levels of the total activity. We can look at the materials and tools used by a couple of programmers, or we can look at the total project group in relation to the surrounding organisational units…what are the actual social and physical conditions for their work?" (Bødker, 1991, p. 559).

In HCI, the work of early researchers (e.g. Bødker, 1996; Nardi, 1996c) have been pivotal in building a case for AT. Bødker's (1996) study reflects one of the earliest attempts to systematically apply AT in HCI research. In other IS-related areas such as ICT4D where theory has generally lagged behind compared to developments in this field, AT has not had much chance (Avgerou, 2010; Karanasios, 2014). The theory has been used minimally to problematise ICT4D or to operationalise the concept of an activity, despite having the necessary concepts that can be used to frame ICT4D research (Karanasios, 2014; Karanasios & Allen, 2014). For example, Carroll et al. (2006) demonstrated that the AT concept of development can be used to conceptualise personal development. Table 4.1 offers a review of some studies that have applied AT in different ways. The studies were loosely categorised into the domain areas indicated, though the line between HCI and IS was thin.

Crawford and Hasan (2006) explored the use of AT in IS research. However, this study is conceptual in nature. Studies such as those of Mursu et al. (2006) and Korpela et al. (2002) demonstrate the use of AT as a theoretical influence in the development of novel analytical tools. Other relatively recent studies have demonstrated the use of certain AT concepts such as mediation in Sambasivan et al. (2010), activity hierarchy in Hautasaari (2013), affordances in Wolff-Piggott and Rivett (2016) and Kaptelinin and Nardi (2012). Wolff-Piggott and Rivett (2016) employed the concept of affordances to explain why health facilities used mHealth, while Kaptelinin and Nardi (2012) provide a conceptual analysis demonstrating the usefulness of the affordance perspective in HCI. The review found evidence for the suitability of AT to study various technology use phenomenon (Chan, 2009; Park & Chen, 2012; Sambasivan et al., 2010).

Table 4.1: A review of the use of Activity Theory in IS-related studies

AUTHOR	DOMAIN	USE OF ACTIVITY THEORY
Bødker (1996)	HCI	Systematic application of AT for analysis of data to examine computers in use
Mursu et al., 2006	Information Systems Development (ISD) also known as Systems Design	Conceptual study proposing the use of activity analysis and development (ActAD) (a framework of activity analysis based on at) in ISD
Korpela et al., 2002	ISD	Employing ActAD to analyse ISD as work practice. The authors indicate that the application of the framework is still too abstract

Table 4.1 (continued).

Crawford and Hasan, 2006	General	Conceptual paper that illustrates areas where AT is suitable. Illustrate that AT is suitable for complex socio-technical environments such as is common in IS
Karanasios and Allen, 2014	IS	Used at to frame patterns of use and the components of contradiction and congruence to explain how mobile technology leads to changes in mobile technology-mediated work
Wilson (2008)	Information Science	A review of AT that builds a case for its suitability in studying information-seeking behaviour
Clemmensen (2016)	General	A review of the use of AT in HCI
Kaptelinin and Nardi (2012)	HCI	AT used as a theoretical framework for conceptual analysis. Focuses on defining the concept of affordances in HCI and illustrates its usefulness as an analysis tool in this field
Park and Chen (2012)	HCI/IS	Used concepts of AT for empirical analysis only to explain how clinicians adapted to new technology (electronic medical records). The paper considers the adaptation from an end-user design process perspective. Does not show how AT was operationalised
Sambasivan et al. (2010)	HCI	Used AT's principle of mediation to operationalise and study human-mediated computer interaction and present requirements and challenges in designing interfaces for these interactions
Dennen (2014)	IS/HCI	Used AT to elucidate the way in which new bloggers engage with the rules and tools within the blogging activity with the specific object of becoming an established member of a blogging community

Table 4.1 (continued).

Hautasaari (2013)	HCI	Used AT to analyse work activities related to wikipedia translation with the aim to provide design implication for a wikipedia translation support system. The study mainly makes use of the activity hierarchy to understand the translation strategies used by translators
Yardi and Bruckman (2011)	HCI/IS	Adopts a more extensive use of AT (operationalises engeström's 2nd generation AT) and uses it as a lens to organise the data on the role and impact of technology to the parenting process. The study provides design implications for the design of digital systems that are socially translucent
Wolff-Piggott & Rivett (2016)	IS	Uses AT's affordance perspective to provide analytical insight into the empirical clinical use of mHealth in health facilities
Chan (2009)	IS	An experimental study that shows the benefit of using AT to conceptualise decision support system use as an activity. Argues that by using AT the study can promote understanding of the interactive effects of user motivation to performing a task, and on the decision support system characteristics on an individual's use

Despite having the ability to account for context, and being presented as an IS research theory (Mursu et al., 2006), the application of AT in IS is still not as popular (Karanasios & Allen, 2014). Our review indicates that the IS body of knowledge is still deficient in studies that use AT to explain the IS phenomenon. This observation is similar to that made by Karanasios (2018). The author notes that the use of AT in IS is split into two main streams:

(i) the use of AT concepts to understand IS use and change and

(ii) use of the theory to examine how humans interact with technology to inform IS design.

The study further notes that the first stream is still relatively nascent. This study contributes to both streams.

Our review of the theory also revealed that among most of the studies that used AT for empirical analysis, a majority use selected AT concepts. Thus, the operationalisation of AT as a theory in a way that can be used by novice researchers is still lacking. Classical studies that have focused on developing and explaining AT as a theory (e.g. Bødker, 1996; Kaptelinin, 1996a; Nardi, 1996c), as well as more recent interpretations of AT such as Yamagata-Lynch (2010) were useful in operationalising AT for this study. These studies were useful in clarifying the concepts. Other reviews (Wilson, 2008) that support the use of AT to understand phenomena such as information-seeking behaviour in the field of information science also provided some background information. However, given the scarcity of studies that provided a guide on how to operationalise AT, two other non-IS PhD studies were instrumental in guiding the researcher. Frambach et al. (2014) applied AT to understand cultural complexity in problem-based learning among medical students and demonstrated the application of AT in framing the study. Nowé (2007) applied AT to explain information activities in a non-profit organisation. Both studies present different but useful levels of operationalising and using AT for empirical analysis.

4.4.2 Benefits of Activity Theory in Information Systems

AT provides a lens for "viewing and explaining the world" (Gregor, 2006, p. 613). Being a theory that emphasises naturalistic study, culture and history (Isssroff & Scanlon, 2002), AT has three major contributions to complex user-technology interaction environments (Karanasios & Allen, 2014). The first is that owing to its ability to incorporate all actors and stakeholders coupled with structure/activity and tools in the same environment, AT is able to account for the interrelationship of technology in a socio-cultural context (Allen et al., 2011). By broadening the concept of context (see Kaptelinin & Nardi, 2006, pp. 73–115), this is an essential advantage of AT to IS which has often been accused of neglecting context (Avgerou, 2010). Context is also accounted for since, in AT, an activity is viewed as being culturally and historically situated rather than just as a simple individual action (Hashim & Jones, 2007). The second benefit of AT is the use of the concept of contradictions (Section 4.8) to explain use and change in context (Karanasios & Allen, 2014; Wolff-Piggott & Rivett, 2016). The analysis of contradictions may offer insights into the observed utilisation behaviour by explaining how and why they come to be. Third, because an activity is viewed as part of a wider network of activity systems, connections and contradictions between activities and tools and how they are continually transformed can be better explicated. "The

concept of activity network is useful in analysing work practice in context…" (Korpela et al., 2002, p. 125). This concept may be particularly beneficial in studies such as computer-supported cooperative work where the activity network allows the researcher to trace developmental processes among interacting activity systems. Though we take advantage of the first two benefits of AT, we do not explore activity networks in this study because of its nature as a time-intensive undertaking that may not be of specific value to the current objectives of this study.

In addition to the two benefits, we will also draw on the strength of AT that views artifacts or any other technology for that matter as mediators of human thought and behaviour. In Kaptelinin's words, "Human beings usually use computers not because they want to interact with them but because they want to reach their goals beyond the situation of the 'dialogue' with the computer" (Kaptelinin, 1996b, p. 49). This view provides a more plausible and reasonable way to discuss the relationships between artifacts and people (Nardi, 1996c). Consequently, it provides a better understanding of the interaction between technology and those that interact with it, while including a meaningful context of the user's environment. This view is in harmony with the socio-technical view of IS that the study adopts.

As earlier stated, studying the interaction between technology and actors remains a key interest in the IS field (Karanasios et al., 2018; Orlikowski, 2005). Some of the long-standing issues related to studying human-technology interaction in IS include IT "missing in action" (Orlikowski & Scott, 2008), because of a neglect of the IT artifact on one end (Cecez-Kecmanovic et al., 2014) and technological determinism on the extreme end (Leonardi & Barley, 2008). AT has the potential to bridge this gap (Karanasios et al., 2018) because it accounts for the context as well as the technology.

4.5 Introduction to Activity Theory

Sometimes referred to as Cultural-Historical Activity Theory, AT has its foundations in Russian psychology. AT was developed by Leontiev, based on the work of Vygotsky on cultural-historical psychology (Kaptelinin & Nardi, 2006). The main ideas of AT are centred on the unity of consciousness and activity to explain human interaction with their material world (Allen et al., 2011). "An activity is a form of doing [that is] directed to an object" (Kuutti, 1996, p. 27). In this interaction, both the human subject and the world co-evolve. The human subject is social in nature

and is shaped by culture. This subject acts with and through other people in the groups he/she belongs in (Allen et al., 2011). Consequently, in AT, human activities like learning or seeking healthcare, are historically, culturally and socially situated (Leontiev, 1978).

Human behaviour, therefore, can be expressed in one or more activities which express the consciousness of individuals (Wilson, 2008). Activities represent human *agency* in undertaking purposeful actions, consequently giving meaning to human actions. Therefore, at the core of an activity is human need (Bødker, 1996; Leontiev, 1978). In Chapter 1, we presented the argument for studying technology-in-use as an appropriate strategy to investigate the phenomenon of mHealth utilisation. We further engage with this argument by suggesting that utilisation should be understood within a healthcare-seeking activity context because it is this background that carries the "fundamental needs" of the subjects (Allen et al., 2011). The fundamental needs, therefore, represented in the object of healthcare-seeking, gives meaning to users' interaction with mHealth.

The first generation of AT is often used to refer to Vygotsky's conceptualisation. This version of AT described an individual human activity as an object-oriented and tool-mediated interaction between the main actor and the need being pursued. The main concepts in this generation of AT were the *subjects*, *mediating artifact* (tools) and *object*.

The key ideas of the second generation of AT are attributed to Leontiev who added the notions of division of labour as being critical in the performance of an activity (Wilson, 2008). Later, this version of AT was expanded and popularised by Engeström in what is currently referred to as second generation AT. Recognising the biggest limitation of Vygotsky's model being the focus on the individual, Engeström extended the thought by adding three building blocks: *rules*, *community* and *division of labour*. These provided AT a further means to account for and understand context (Allen et al., 2011). In the next section, we elaborate all the AT concepts in detail.

4.6 Activity Theory Concepts

This section operationalises AT concepts from Vygotsky's and Engeström's models. We begin by defining the core concepts in Vygotsky's first-generation AT, followed by the the extension of concepts from Engeström's second-generation AT. Together, the six concepts of (i) subject (ii) object (iii) tools (iv) community (v) rules and (vi) division of labour provide the necessary orienting concepts for the study.

4.6.1 Subject, object and tools

As mentioned before, AT posits that an activity (e.g. healthcare-seeking) is a form of object-oriented and tool-mediated human existence (Karanasios, 2014). With the help of a *tool*, a *subject* undertakes an activity, motivated by a particular *motive*/*object* (Allen et al., 2013).

The *subject* is the individual "whose agency is chosen as the point of view in the analysis" (Hsu et al., 2010, p. 1246). In this study, the subject is the maternal health client. The aim of participating in an activity is to transform the object into the desired outcome.

Hence the *motive/object* is what gives meaning and direction to actions or chains of actions which are carried out by the subject (Blin & Munro, 2008). In the case of healthcare-seeking during pregnancy, a woman may engage with healthcare services using technology, with the desire for a healthy pregnancy that they hope to transform into a successful delivery of a healthy baby. However, because the object of an activity is a 'moving target' (Engeström, 2014) it is necessary to pick a focal point with the analysis of one central activity (Hasan & Banna, 2012). For this reason, this study focuses on the healthcare-seeking in the pregnancy period as the focal point. As objects can be animate (a person) or inanimate (an event), they can have a life of their own, and can resist the subject's attempt to control (Allen et al., 2013). Even though the subject exercises agency towards the object, the transformation process of an object to an outcome could lead to desired or undesired outcomes because of artifact mediation (Ditsa, 2003). In this study, whether the desired outcome is achieved or not is beyond the scope, because we do not intend to measure the health outcomes.

Artifacts or tools mediate the subject-object relationship, as shown in Figure 4.1. Artifacts are not only physical, as in the case of a hammer, but may also be conceptual, being used to advance reasoning such as a language, or technological, such as an mHealth system in the case of this study. Tools act as resources for the subject in the activity (Yamagata-Lynch, 2010). They present the subject with *affordances* which are opportunities for action that are implemented by design (Blayone, 2019). However, in line with the ontology of AT, we adopt the position that these affordances remain unrecognisable and meaningless without the object of the activity. Thus, tools may expand a subject's potential to manipulate and transform objects, but may also restrict what can be done within the limitation of the tool. For example, a school bus capacity or its fuel consumption may limit a school's transport manager looking to transport students effectively

within a budget (Yamagata-Lynch, 2010). On the other hand, state-of-the-art medical equipment may enable a doctor in pursuit of patient wellness to provide medical care.

Tools develop and transform within the activity. They, therefore, carry along an intrinsic historicity and culture in them (Kuutti, 1999). Because tools are the product of culture, they can be said to have a delegated agency where they "realise the intentions of [other] human beings" (Kaptelinin & Nardi, 2006, p. 244). As such, tools can shape the goals of the people who use them because "there are implicit goals that are usually built into the tools by their developers. The goals achieved by people equipped with a tool are often influenced by the tool's goal" (Kaptelinin, 1996b, p. 53).

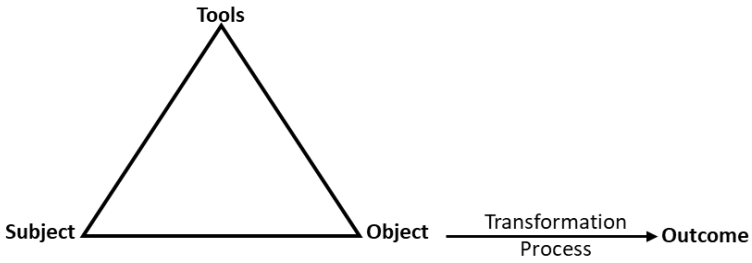


Figure 4.1: Basic AT representation: mediated relationship at the individual level (from Kuutti, 1996)

AT also holds a dialectical perspective where the subject and the object transform each other and where the subject-artifact relationship is asymmetrical. Optimistic about human self-determination, it emphasises that motive and consciousness belong only to humans. Artifacts only mediate human thought and behaviour (Nardi, 1996c).

4.6.2 The community

Engeström's extension added two more layers of mediation between the subject and community by rules, and between the community and object by division of labour (Figure 4.2). The community is generally invested in the object of the activity system. Yamagata-Lynch (2010, p. 2) clarifies that the community "is the social group that the subject belongs to while engaged in an activity". The community may, therefore, refer to a community of practice that shares common ways of seeing and doing things or a section of society (Hsu et al., 2010). Rather than the term 'community of practice', we adopt '*community of purpose'*, as introduced in Chapter 3. The motivation for the choice lies in the idea that the stakeholders in the healthcare-seeking activity are brought together by the shared object of a healthy pregnancy rather than by a common practice. From the insights in the review of literature (Recall Chapter 2 and 3), it was evident that the healthcare system is

invested in the pregnancy-related outcomes. Other invested individuals include the family members, relatives and older females in the community whose involvement is defined by social and cultural norms.

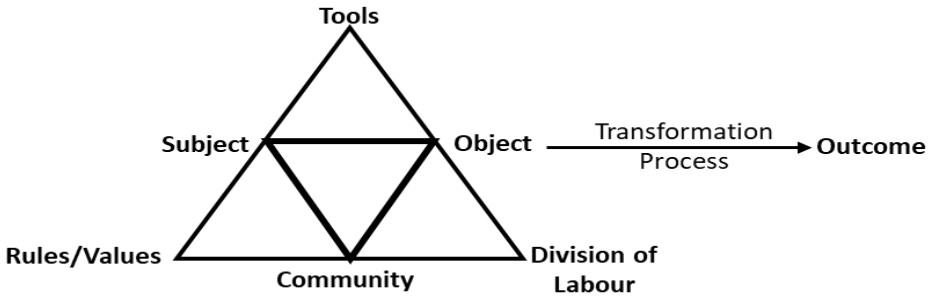


Figure 4.2: Engeström's diagrammatic representation of second generation Activity Theory (from Kuutti, 1996)

4.6.3 Rules/Values

Rules mediate the subject-community relationship. Rules are both implicit and explicit 'norms, conventions and social relations within a community'(Kuutti, 1996) and place limits on the activity being undertaken. We chose to distinguish between the explicit norms (rules) and the implicit norms (values). The latter include the healthcare system rules, while the former include the culturally shared beliefs, norms and values about pregnancy. We considered this separation beneficial to the study to allow us to identify any tensions that might have existed between the two. Brunsson (2006) argues that implicit and explicit expectations are often contradictory.

4.6.4 The division of labour

Though the community shares in the object of the activity, the division of labour defines their interaction and who can do what. This division is both horizontal and vertical; horizontal between members of the community and tasks they do toward the shared object, and vertical with regard to division of power and status (Hsu et al., 2010; McMichael, 1999). In this study, power may be an aspect of the relationships between HCPs and maternal health clients and between maternal health clients and the significant others. On the other hand, the horizontal division of labour would refer to how responsibilities are shared, say, among the significant others. How the division of labour is understood and whether it is followed may be influenced by contextual factors (Nowé, 2007).

4.6.5 A summary of Activity Theory concepts and their empirical application

Bringing together the AT concepts into the activity system clarifies that context in AT does not refer to some external outer shell. Instead, the context is the activity system itself (Nardi, 1996c). As people consciously and deliberately generate contexts (the activities themselves), Nardi argues that context is "both internal to people (involving objects and goals) and external to people (involving artifacts, other people and specific settings)" (1996c, p. 76). In summary, it is impossible to examine human consciousness independent of the context, because socio-cultural influences shape human actions. An activity is therefore object-oriented, tool-mediated and culturally-mediated (Crawford & Hasan, 2006). Figure 4.3 illustrates how the maternal healthcare-seeking activity in this study may look.

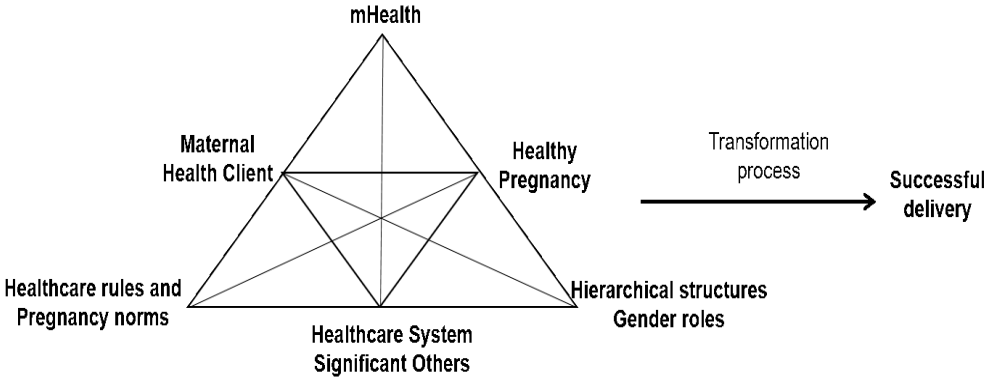


Figure 4.3: A diagrammatic representation of maternal healthcare-seeking activity

Table 4.2 offers a summary of the AT concept definitions as they were adopted in the study and how each of the concepts was applied to the empirical phenomenon.

Table 4.2: Activity Theory basic terminology and empirical application

TERM	DEFINITION	EMPIRICAL APPLICATION
Activity	A purposeful interaction between the subject and the world (Kaptelinin & Nardi, 2006) or A system of actions undertaken by subjects (actors) to transform an object with the aim of achieving a desired outcome (Kuutti, 1996)	The healthcare-seeking activity together with all the actions, actors and the artifact

Table 4.2 Continued

Subject	The individual whose agency is chosen as the focal point of analysis (Hsu et al., 2010)	Maternal health clients engaged in maternal healthcare-seeking
Object	Material or ideal prospective outcome that motivates and directs an activity (Kaptelinin & Nardi, 2006)	The ultimate motivation for engaging in the maternal healthcare-seeking activity as expressed by the participants
Tools	Physical, conceptual or technological artifacts that mediate the subject-object interaction	The mHealth intervention
Community	"The social group that the subject belongs to while engaged in an activity" (Yamagata-Lynch, 2010, p. 2)	Other maternal health stakeholders interested in the pregnancy outcome: healthcare providers, significant others: husbands, female relatives etc.
Rules/Values	The implicit and explicit 'norms, conventions and social relations within a community'(Kuutti, 1996) that potentially places limits on the activity being undertaken	*Rules:* Health system rules/policies *Values*: Culturally defined explicit and implicit pregnancy beliefs, perceptions and norms
Division of labour	"How the activity is distributed among the members of the community, that is, the role each individual in the community plays in the activity, the power each wields, and the tasks each is held responsible for" (Bellamy, 1996, p. 125)	*Horizontal:* How responsibilities are shared among the stakeholders ▪ Healthcare providers provide healthcare services and information ▪ Significant others provide care and support ▪ Ministry of Health provides guidelines for care *Vertical:* Power relationships within the maternal healthcare-seeking context

4.7 Delineating the 'Object' in this Study

Though there has been consistency in the conceptual underpinnings of the theory, the concept of 'object' has had two main interpretations owing to the theory's main developmental associations in the work of Leontiev and Engeström. The inconsistency may largely be attributed to the linguistic gap from the theory's Russian and German origins to English (See the discussion in Kaptelinin & Nardi, 2006, pp. 137–143). Delineating the object is important because the object of an activity provides "a means of understanding not only *what* people are doing, but also *why* they are doing it" (Kaptelinin & Nardi, 2006, p. 138). For a novice researcher, this delineation may be challenging but necessary (Kaptelinin & Nardi, 2006).

Following multiple iterations of understanding what the object might be, Leontiev's and Engeström's definitions (Kaptelinin & Nardi, 2006) were compared in order to understand how a choice of definition would affect the study. In the end, the definition settled at was that of Leontiev: the object (*predmet*) as the motive for the activity rather than the 'thing' or problem space that is being acted upon to be transformed to a desirable outcome. Leontiev's definition implies that the object as a motive of an activity is carried out by an individual. However, Leontiev considered activities to be social, even when they are not carried out collectively. Hence individual activities are influenced by socio-cultural practices, tools and values within the activity context. Leontiev's view is slightly different from Engeström's where the object (*objekt*) is 'the object of collective activities'(Kaptelinin & Nardi, 2006, p. 142), and is thus defined by the community rather than an individual. In this definition of the object, the community rather than the individual is the effective subject within the activity system.

We adopted Leontiev's definition of the object, because the interest of the study was to understand the phenomenon from the perspective of the maternal health client; as the active participant in the maternal healthcare-seeking activity, and the user of the mHealth technology. As a result, her maternal healthcare-seeking actions are mediated more directly by the mHealth intervention within the activity system. Following this choice, interview participants were questioned on their motives for using the mHealth intervention to understand the *what* and the *why*.

4.8 Principles of Activity Theory

There are six main principles of AT: (i) the unity of consciousness and activity, (ii) object orientedness, (iii) the hierarchical structure of activity, (iv) mediation, (v) internalisation/externalisation and (vi) contradictions (Kaptelinin & Nardi, 2006). Table 4.3 summarises the principles.

Since activities are object-oriented, objects separate one activity from another (Leontiev, 1978). The world provides humans with resistance and affordances in their pursuit of the object (Kaptelinin & Nardi, 2006). Therefore, understanding this context is a critical step in understanding human consciousness. Besides, tool mediation shapes the way human beings interact with reality. Hence, as mediators of activity, artifacts can only be understood in use (Kaptelinin & Nardi, 2006). This is why we argued earlier that it would be useful to study 'mHealth-in-use' in order to understand mHealth utilisation. The healthcare-seeking activity provides the minimum analytical context. The principle of mediation also allows us to focus on how the mHealth artifact empowers maternal health clients as well as how they utilise mHealth to fulfil their object (Kaptelinin & Nardi, 2006). Considering mediation requires one to appreciate the historicity of the tool and the activity system at large. "Activity systems take shape and get transformed over lengthy periods of time. Their problems and potentials can only be understood against their own history" (Engeström, 2001, p. 136). In this study, we incorporated the concept of historicity to understand how the pregnancy-related norms and values come to be and how the PROMPTS intervention may have developed over time.

Table 4.3: A summary of the principles of Activity Theory and their empirical application in the study

AT Principle	Explanation	Empirical Application
Unity of consciousness and activity	Human mind/consciousness emerges and exists in its interaction with the physical environment; its actions can only be understood within the context of the activity (Kaptelinin, 1996a) as the unit of analysis	This research operationalised healthcare-seeking as an activity and situated the study to understand mHealth utilisation within this context.
Object Orientedness	Objects give meaning to what people do. Hence, we cannot understand human actions separate of the object (Kaptelinin & Nardi, 2006)	Elicit the object for the healthcare-seeking activity from the participants to understand mHealth utilisation within this context

Table 4.3 (continued)

Mediation (Historicity of tool important here)	Human activities are mediated by artifacts that have been created and transformed over time and, therefore carry a historicity of their own. The use of these culture-specific tools shapes the way people act (Kaptelinin, 1996a)	Explore the design and implementation history of the mHealth artifact to provide a background to understand the tool and its mediation. Also consider the maternal healthcare-seeking historicity to elicit how women engaged in care-seeking before the intervention
Hierarchical structure of the activity	AT differentiates between different levels of processes; activities, actions and operations. These three levels represent the why, what, and how subjects pursue their motive	Studying the mHealth utilisation phenomenon from the perspective that healthcare-seeking is an activity that is motivated by an object. Explore the actions, goals, operations and conditions that may shape the user-technology interaction
Contradictions	Because of the dialectical relationship between actors and their environments, AT postulates a development that takes place due to contradictions, also referred to as structural tensions in the activity system	Look out for tensions represented by a misfit within/between the elements in the maternal health clients' healthcare-seeking activity. Analyse how users respond to these tensions and how this response results in utilisation behaviour
Internalisation/ Externalisation	*Internalisation* is the internal reconstruction of an external operation (Allen et al., 2011). It is the process in which individuals are influenced by their environment (Frambach et al., 2014) *Externalisation* is the creation of new artifacts or ways of working, triggered by the awareness of tensions in the existing system; which transforms the social and cultural environment (Frambach et al., 2014; Nowé, 2007)	*Internalisation:* Acting as a healthcare-seeking mediating artifact, the mHealth intervention provides a means for maternal health clients to act in the activity system. The healthcare-seeking socio-cultural context influences this process *Externalisation*: In light of the maternal socio-cultural context (internal 'processes') and tensions raised by interacting with mHealth, the maternal health clients adopt new ways of using the mHealth intervention to solve existing tensions

Placed at the top of the hierarchy (Figure 4.4), an activity could be composed of various actions which are carried out towards certain typically short-term finite goals (Blin & Munro, 2008). These actions represent *what* is done to fulfil the object of the activity. Operations entail *how* people carry out the actions and reflect automatic subconscious processes. How operations that are targeted to realising an action an activity are performed is, in essence, dependent on the actual conditions of the context. Hence, conditions are embedded in the material context, affecting the activity and are not under the subject's control (Roth & Lee, 2007).

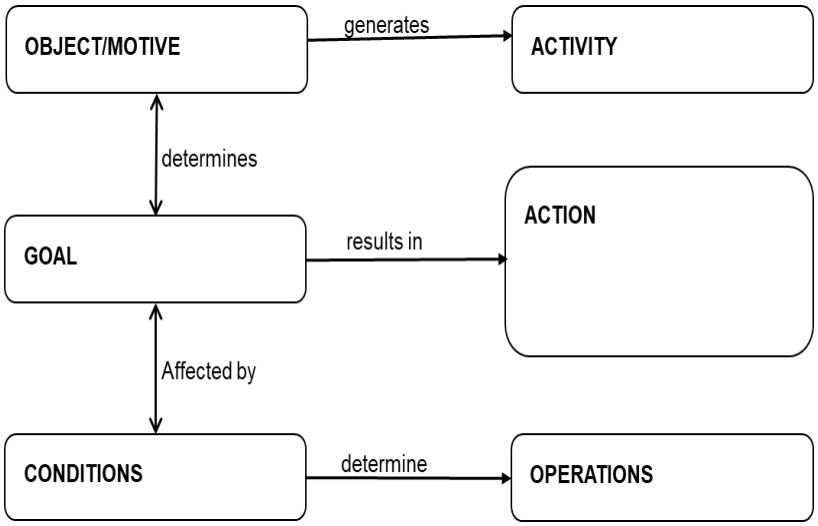


Figure 4.4:Activity hierarchy showing what and how motives are pursued

Activities can have various legitimate sets of actions that could yield to its success. However, actions in themselves, unless part of an activity, are not meaningful (Crawford & Hasan, 2006). Thus, though relatively independent, actions and operations are subordinate units of analysis, as they are understandable only in context on the activity system (Engeström, 2001). The levels are not fixed but can move up and down as conditions change (Kaptelinin & Nardi, 2006).

Engeström highlighted the concept of contradictions as the key analytical device in AT. He posits that contradictions can occur at three levels when looking at a single activity: primary, secondary and tertiary. Primary contradictions exist within each component of an activity. Secondary contradictions occur between elements of an activity such as the tool and division of labour. For example, a lag in the division of labour could prevent the possibilities made possible by the tool. Finally, tertiary contradictions exist between a dominant form of an activity and the culturally

more advanced form (Roth & Lee, 2007; Wilson, 2008), that is between older and newer versions of an activity. Contradictions are not directly observable. They "…manifest themselves as problems, ruptures, breakdowns, clashes" (Kuutti, 1996, p. 34). It is by analysing these tensions that contradictions are revealed and understood (Korpelainen & Kira, 2013). These tensions influence an activity by creating pressure that can encourage or stunt development, or be the reason for the changing nature of an activity (Yamagata-Lynch, 2010).

People's consciousness of the world around them is formed by their acting upon it (internalisation). Subsequently, their internal conception of the world is fixed through their activity in the world (externalisation) (Wilson, 2008). For instance, a child may observe a pencil being used and learn how to use it through the process of internalisation. The child may then use the pencil to draw a picture that communicates their feelings –, and this is externalisation (Allen et al., 2011). Similarly in this study, we anticipate that utilisation behaviour can be observed through internalisation as the maternal health clients act upon the mHealth mediated healthcare-seeking activity; and that as they fix any tensions, further utilisation behaviour may be seen. The internalisation and externalisation processes are highly integrated and occur iteratively (Allen et al., 2011).

AT maintains that to understand internal activities, one must understand the external activities. Consequently, internalisation and externalisation must be analysed jointly rather than separately. The responses adopted in the externalisation phase in response to the discrepancies of the activity system may be conscious or unconscious. Hence, some of the responses may be intended and deliberate or emergent and unconscious (Nowé, 2007). It is through the notions of internalisation and externalisation that this study will make sense of the mHealth-mediated healthcare-seeking activity, the habituation of socio-cultural dynamics in the human-technology interaction and the manifestation of these in utilisation behaviour.

4.9 Study Questions Revisited

So far, we have argued for the need of studying the utilisation phenomenon within the context of the healthcare-seeking activity and motivated for the suitability of AT as an appropriate lens for the study. We have posited that it is this healthcare-seeking that gives meaning to the actions of the subjects and influences the human-technology interaction that takes place. Hence, we hypothesise that internalisation takes place as mHealth is appropriated within the healthcare-

seeking activity. This internalisation process is shaped by the maternal healthcare-seeking socio-cultural context. Furthermore, as maternal health clients become increasingly aware of tensions/contradictions in the activity system, they may adopt new utilisation practices (behaviour). We also assume that the maternal socio-cultural values are the internal processes that can be externally manifested in the activity system. With these assumptions, we re-state the study questions, as shown in Table 4.4.

Table 4.4: Old and new questions juxtaposed

OLD QUESTIONS	NEW QUESTIONS
What are the socio-cultural characteristics of the maternal healthcare-seeking context?	What are the socio-cultural characteristics of the maternal healthcare-seeking context?
How does mHealth mediate maternal healthcare-seeking?	How does mHealth mediate the maternal healthcare-seeking activity?
How does mHealth shape maternal health clients' mHealth utilisation behaviour?	How does maternal health clients' internalisation of mHealth shape mHealth utilisation behaviour?
How does maternal healthcare-seeking socio-cultural context shape maternal health clients' mHealth utilisation behaviour?	How does maternal health clients' externalisation of their healthcare-seeking socio-cultural context shape mHealth utilisation behaviour?

4.10 Activity Theory and Interpretivism

Interpretive research adopts the position of a reality that is constructed as a result of human cognition, rather than a reality that exists independently of human construction as in positivistic studies. The paradigmatic assumptions are elaborated further in Chapter 5.

> Interpretive methods of research start from the position that our knowledge of reality, including the domain of human action, is a social construction of human actors and that this applies equally to researchers. Thus, there is no objective reality which can be discovered by researchers and replicated by others, in contrast to the assumption of the positivist science. Our theories concerning reality are ways of making sense of the world and shared meanings are a form of intersubjectivity rather than objectivity (Walsham, 2006, para. 1).

AT seeks to understand a phenomenon in light of its social reality and how an activity develops from the perspective of the subject (Karanasios et al., 2018). We are able to analyse human

interaction as they engage towards a desired outcome. As such, AT lends itself more to an interpretive approach (Ditsa, 2003) which seeks to understand lived experiences from the perspective of those living it (Schwandt, 1994). The activity system allows us to view these interactions in light of mediating influences, hence reaching understandings that "are not based on hidden subjective analysis" (McMichael, 1999).

4.11 Critiques and Limitations of Activity Theory

AT is not originally from the IS domain. As discussed earlier in this chapter, AT has its roots in Russian Psychology and has only gained attention in IS recently (Iyamu & Shaanika, 2019). Its origins may explain one of its identified disadvantages in overemphasising cognitive aspects of human activities (Clemmensen et al., 2016). AT is criticised for being too abstract compared to other explanatory theories (Wiser et al., 2019). Owing to the fact that AT is a broad descriptive metatheory, its application is left to the judgement of the researcher which, as discussed earlier, could also be an advantage to flexibility. However, flexibility comes at an expense. The variations based on the context and the person applying AT introduces difficulties in replicating and applying AT (Mwanza, 2001).

Furthermore, using AT can potentially be daunting because of its expansive nature in complexity through activity systems, as well as the changing nature of the object (Karanasios, 2018). Hence, Engeström suggests that the researcher must select a practical level of abstraction (Allen et al., 2011; Engeström, 2001). For example, in this study, we focus on a snapshot of an individual healthcare-seeking activity. Using this level of abstraction, we are able to reduce the concepts of historicity to a particular time period, thus making the analysis more manageable. However, some studies have argued that doing this limits the potential of AT (Ang et al., 2011).

Some authors (Clemmensen et al., 2016; Karanasios, 2018) have noted the need to supplement AT with other theories in order to develop more specific analysis tools. However, other researchers (Wilson, 2008) have argued that combining AT with other frameworks may not always provide much improvement over AT alone.

4.12 Chapter Summary

This chapter reviewed the suitability of AT to guide this study. We embarked by presenting the development of AT and defining the key concepts: the subject, tool, object, rules, community and division of labour. We also expounded on the six principles of AT: the unity of consciousness and activity, object orientedness, the hierarchical structure of activity, mediation, internalisation/externalisation, and contradictions. The chapter confirms that AT provides the necessary orienting concepts for studying the role of the healthcare-seeking socio-cultural context in mHealth utilisation. Benefits of AT include its suitability for naturalistic research that studies technology in situ, while providing a more plausible way to discuss relationships between technology, people and contexts. For this study, we believe that the advantages of AT outweigh the disadvantages. Hence, while acknowledging that though AT on its own is not an analytical tool, its rich theoretical vocabulary and its open and expandable nature allow us to explore mHealth utilisation more flexibly. We therefore, use the theory as a sensitising device.

CHAPTER 5: RESEARCH METHODS

5.1 Introduction

This chapter presents the philosophical assumptions, methodology and methods employed in the study (Figure 5.1). The study employed a qualitative approach using case study research to understand the phenomenon of mHealth utilisation. Interpretivism/constructivism was employed to understand how maternal healthcare-seeking was socially constructed by the participants.

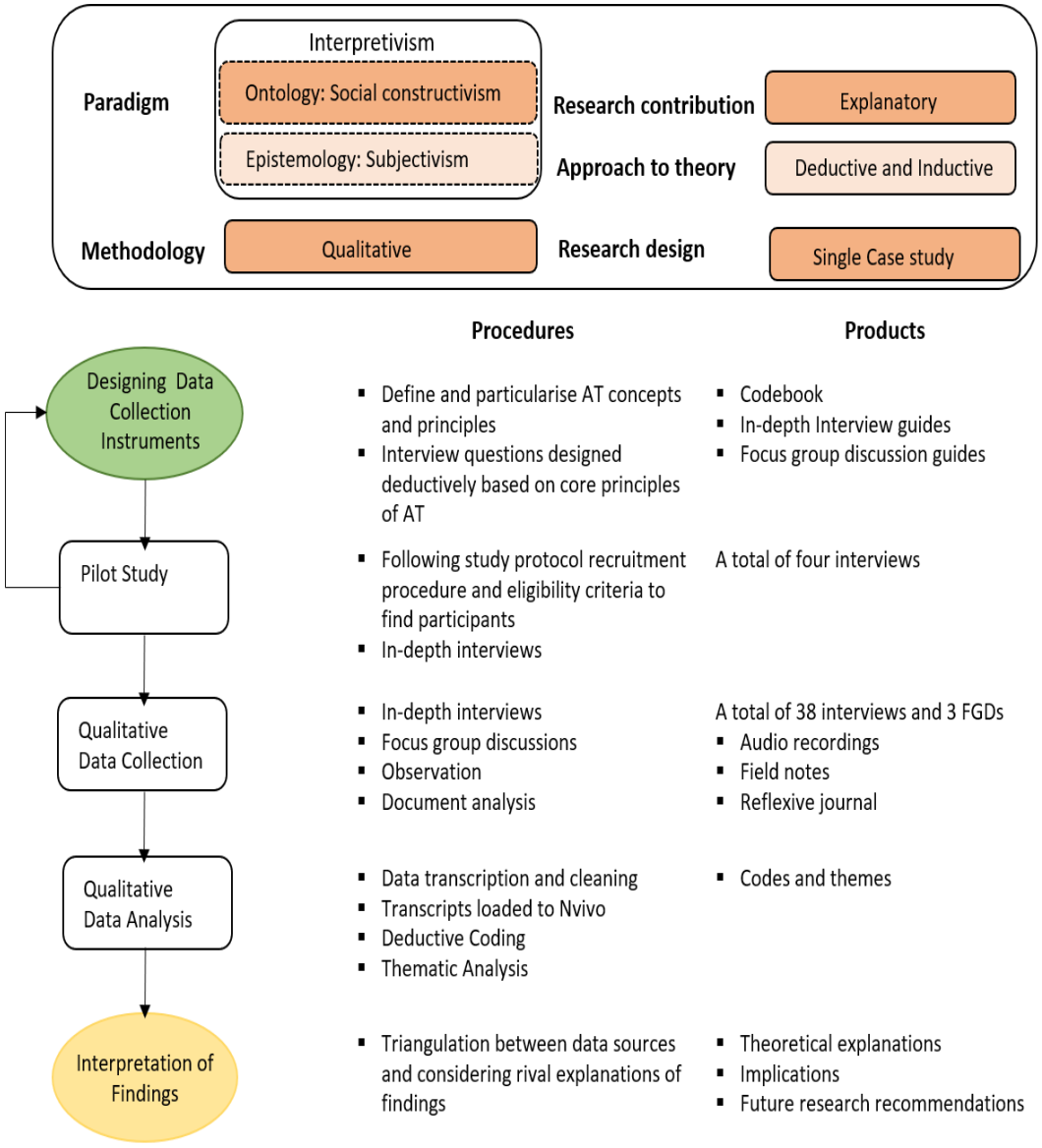


Figure 5.1: A summary of the research design

The philosophical underpinnings in terms of ontology and epistemology are addressed in Section 5.2. Section 5.3 presents the qualitative research methodology as well as the logic of inquiry used in the study. We elaborate on the research design in Section 5.4 through to 5.7. Section 5.4 addresses the appropriateness of the case study method, the selection of the case, as well as the unit of analysis. Section 5.5 shows the sampling techniques and procedures that we followed to identify rich cases for the study. The data collection methods are detailed in Section 5.6 while Section 5.7 elaborates how we analysed the data. The techniques employed to ensure the trustworthiness of the data, as well as piloting the research instrument, are detailed in Sections 5.8 and 5.9, respectively. The ethical considerations and procedures are detailed in Section 5.10 whilst Section 5.11identifies the methodological limitations of the study. The final Section 5.12 presents a summary of the chapter.

5.2 Philosophical Foundations of the Study

Paradigms are sets of beliefs that represent a person's worldview. Thus inquiry paradigms define for the researcher what would be considered a legitimate inquiry and entail their philosophical assumptions (Guba & Lincoln, 1994a). These authors proposed three main philosophical foundations: ontology, epistemology and methodology.

1) Ontology is the study of being (Crotty, 1998). Ontological assumptions therefore are concerned with what constitutes nature and the form of reality (Scotland, 2012); that is whether social and physical worlds are objective and exist independently of people, or if they only exist through human construction, hence being subjective (Orlikowski & Baroudi, 1991). Researchers take a position with regard to their perceptions of how things are and how they work (Scotland, 2012).
2) Epistemology entails the form and nature of knowledge. Thus, "epistemological assumptions are concerned with how knowledge can be created, acquired and communicated; in other words, what it means to know" (Scotland, 2012, p. 9). Epistemology seeks to determine the nature of the relationship between the would-be knower and what can be known (Furlong & Marsh, 2010; Guba & Lincoln, 1994a). This relationship is constrained by the ontological belief. So if the belief is one of the existence of 'real' reality, then the knower must take a position of objective detachment to discover this reality (Guba & Lincoln, 1994a).

3) Once we know the form of what can be known, and the relationship between the inquirer and the inquired, the next reasonable question is how can the inquirer go about finding what they believe can be known? Once again, the answer here is dependent on the ontological and epistemological answers (Guba & Lincoln, 1994a). Subsequently, based on the ontological and epistemological perspectives, methodology concerns the choice of appropriate methods that will generate valid evidence (Orlikowski & Baroudi, 1991). This involves what, when, where and how data is to be collected and analysed. Just as ontology and epistemology define appropriate methods, the choice of methodology also implies certain ontological and epistemological assumptions. For example, the use of an experimental design implies an objective and real-world to be objective about (Guba & Lincoln, 1994a).

5.2.1 The ontology of interpretivism

With regards to ontology, Archer (1988) distinguishes three existing stances as follows:

1) External realism where reality exists independent on one's construction of it; an approach often adopted by positivists
2) Internal realism where reality emerges from an inter-subjective construction of shared human experiences
3) Subjective idealism where reality changes from person to person.

Interpretive IS researchers could adopt any of the two last positions (Walsham, 1995). Both positions highlight relativism as the ontological position. Relativism is the view that reality only emerges as subjects engage with objects. This implies the existence of multiple realities which are time- and context-dependent and that are socially and experientially constructed (Guba, 1990; Orlikowski & Baroudi, 1989, 1991).

"The aim of all interpretive research is to understand how members of a social group, through their participation in social processes, enact their particular realities and endow them with meaning, and to show how these meanings, beliefs, and intentions of the members help to constitute their social action" (Orlikowski & Baroudi, 1991, p. 13). This study seeks to elucidate how maternal health clients enact their socio-cultural realities in healthcare-seeking and how these meanings and beliefs subsequently shape their interaction with mHealth.

5.2.2 Interpretivism and epistemology

Concerning the nature of knowledge claims, interpretivism holds that the knowledge of the world is a result of a person's lived experiences (Weber, 2004) or rather subjectivism. This assumption from the ontological position of social constructionism asserts that reality and the knowledge of it are social products that cannot be understood independently of the social actors (including the researcher) (Orlikowski & Baroudi, 1989). Since this reality exists only as is experienced and constructed by people, interpretive studies must focus on understanding the phenomenon of interest in its natural setting, not imposing any *a priori* understanding on it (Orlikowski & Baroudi, 1989). The objective of interpretive research therefore is to understand and not to predict or prescribe (Walsham, 2006).

Applying the interpretivist assumptions to our phenomenon of study implies that the value and meaning of maternal mHealth technologies can only be understood from the meaning that its users assign to it in their healthcare-seeking context. Rather than meaning being something that the researcher discovers, which is akin to positivist views (Orlikowski & Baroudi, 1991), it is something that is constructed between the interaction of human consciousness and the world. Because realities can be as many as the individuals, truth is a consensus of varied co-constructions. Therefore, knowledge has the characteristic of being "culturally derived and historically set" (Scotland, 2012 p. 12). Knowledge and reality are constructed as humans interact with their world and are developed and transmitted in a social context. This implies that it is essential for a researcher to understand not only the participants of a study, but their social context as well, in order to understand their realities. Interpretivism, therefore, is an ideal approach for this study as it aims to bring into consciousness the context of the phenomenon being studied. In interpretive research the researcher plays a crucial role. The inquirer and the inquired are bonded into one entity, making research findings a product of the interaction of the two. Hence, the researcher is not considered as an objective outsider but rather a subjective participant (Guba, 1990; Klein & Myers, 1999).

Since the interpretive paradigm is directed at understanding human phenomena by focusing on the individuals and their historical and cultural contexts (Creswell, 2009), suitable methodologies include action research, ethnography, case studies, among others. Both action research and ethnography are time-consuming (Walsham, 2006) and were considered unsuitable for the PhD

study. Moreover, because of the nature of the empirical environment that was characterised by dispersed study participants, both action research and ethnography were considered less practical. Action research also presents a risk "…that researchers may lose critical distance on the value of their contribution, and perhaps represent the phenomenon in too positive a light" (Walsham, 2006, p. 322). Interpretive methods contribute to deep "insights and understanding of behaviour, explain actions from the participant's perspective, and do not dominate the participants" (Scotland, 2012, p.12). These methods include interviews and focus group discussions (FGDs) which tend to provide the respondent much more opportunity to reflect the feelings and opinions, thus increasing the validity of the data (Oliver, 2010).

It is important for researchers to identify what type of interpretivism is used. This serves to make the assumptions guiding the study as plain as possible to the reader (Klein & Myers, 1999). Other studies have highlighted many forms of interpretivism (Goldkuhl, 2012; Klein & Myers, 1999; Orlikowski & Baroudi, 1989), whose explanation is out of the scope of the current study. We adopted a hermeneutic approach, which is more developed in IS literature and has been used more extensively (Klein & Myers, 1999). Using the principle of the hermeneutic circle, we posit that a holistic understanding of the phenomenon of interest will be achieved by moving back and forth between an interpretation of the whole and its parts.

5.2.3 Principles for conducting interpretive research

Following the increased popularity of interpretive research in IS (Walsham, 1995), questions on how to conduct and evaluate these kinds of studies have been raised by the epistemic community. Klein and Myers (1999) proposed a set of principles for conducting and evaluating interpretive research. Applied as parts of an interdependent whole, these principles contribute to the credibility of our interpretive study (Klein & Myers, 1999). Table 5.1 demonstrates how this study adopted and applied these principles.

Table 5.1: Applying Klein and Myers' (1999) principles of interpretive research

PRINCIPLE	THEORETICAL DEFINITION	EMPIRICAL APPLICATION
The hermeneutic cycle	Meaning and understanding is achieved by moving between the parts and the whole	The overarching principle was used to move between participants' lived experiences and the concept of utilisation behaviour. We used the concepts of technology utilisation to understand the participant experiences. The main question of the study was also broken down into sub-questions that when understood, would contribute to answering the main question
Interaction between researchers and participants	Requires the researcher to reflect on how the data is socially constructed between the researcher and the participants	Continuous reflection and documentation by the researcher on preconceptions that may have influenced the data interpretation. Also incorporated triangulation to reduce researcher bias
Contextualisation	Requires the researcher to critically consider the social and historical background of the research setting	Adopting a naturalistic inquiry that allowed the study of the utilisation phenomenon in its natural setting and within a more pointed healthcare-seeking context. The thesis also presents a thick description of the context so that it is clear how the context informs the data. The researcher used the socio-cultural context to explain utilisation behaviour
Multiple interpretations	Giving considerations to multiple interpretations among participants	We sampled for heterogeneity. This involved seeking to understand the phenomenon by gathering and comparing multiple interpretations from varied participants: maternal health clients, significant others, key informants and healthcare professionals
Suspicion	Being sensitive to biases and distortions in what participants share	Considering alternative interpretations by questioning the emerging meanings in the data analysis phase
Dialogical reasoning	Sensitivity to contradictions from theoretical preconceptions and the actual data	The fundamental philosophical assumptions of the study are made transparent. In addition to this, inductive coding is combined with deductive coding to be sensitive to the "story" the data is telling.
Generalisation and abstraction	Moving from the insights from the data interpretation to general theoretical concepts that describe the phenomenon	Moving from specific internalisation and externalisation patterns in the data to higher-level theoretical concepts that explain utilisation behaviour

5.3 Research Methodology

Interpretive methodologies must be hermeneutical and dialectical (Guba & Lincoln, 1994a). These concepts have already been discussed in the previous section. At the risk of repeating ourselves, it is necessary to reiterate that interpretive methodologies imply that participant constructions can be elicited and refined through interaction between the researcher and the respondents. These constructions are then compared and contrasted through a dialectical interchange (Guba & Lincoln, 1994a) until a more educated understanding is arrived at. Suitable methodologies include case studies, phenomenology and ethnographies (Scotland, 2012). Consequently, interpretive methods should not dominate the participants but rather yield a better understanding of behaviour and an explanation of actions from the participants' viewpoint. Suitable methods therefore, include interviews, FGDs, and observations (Scotland, 2012), all of which were employed in this study.

5.3.1 Qualitative research methodology

Unlike quantitative research whose aim is to test pre-determined hypotheses and produce generalisable results, qualitative research is useful for achieving a detailed complex understanding of a phenomenon (Creswell & Poth, 2016; Marshall, 1996). These are typically 'why' and 'how' questions (Marshall, 1996). Because of its ability to elucidate complex phenomena, qualitative research has become more popular in the IS field because of the difficulties that the field has faced in the past in reducing complex social and technical phenomena to quantitative figures (Goldkuhl, 2012). The amount of detail sought can only be achieved by talking to people (Creswell & Poth, 2016). Qualitative studies are naturalistic in nature, intending to understand a phenomenon by investigating the perspectives of the people in these situations, and within the context in which they act (Kaplan & Maxwell, 2005). This kind of naturalistic inquiry is based on the argument that what people say cannot be separated from the place where they say it (Creswell & Poth, 2016). Since the researcher is the key instrument, the final qualitative report includes the voices of the participants as well as the reflexivity of the researcher (Creswell & Poth, 2016).

Qualitative research uses data in forms of words rather than numbers. To reach an understanding of the phenomenon, qualitative researchers adopt multiple methods of data collection (Creswell & Poth, 2016). Thus qualitative research generally makes use of methods such as observations, interviews and documents (Creswell & Poth, 2016; Kaplan & Maxwell, 2005)

This study employed a qualitative methodology to understand and explain the phenomenon of utilisation behaviour from the perspective of maternal health consumers interacting with mHealth technology. The strength of qualitative studies lies in its ability to understand social meanings and context of the phenomenon being studied in its natural setting, rather than one contrived by the researcher (Kaplan & Maxwell, 2005). Thus, by using qualitative methods, we can investigate the influence of the social and cultural contexts of the phenomenon being researched.

5.3.2 Logic of inquiry

Research questions can be answered by employing one or more logics of inquiry which include: deductive, inductive, retroductive and abductive. These four methods present alternative starting and endpoints in the process of inquiry and are summarised below as presented by Blaikie and Priest (2019).

1) In *deductive* logic, the researcher formulates a possible explanation for the observed social phenomenon. This is accomplished by testing the relevance of theory by collecting appropriate data. The researcher begins by presuming one or more hypotheses. Theory is either modified or rejected based on whether data agrees with theory or not.
2) *Inductive* logic starts with data collection and then produces generalisations from the data. The aim is to describe social characteristics and is therefore useful in answering "what" type of research questions.
3) *Retroductive* logic like deductive starts with the observed phenomenon but seeks to find an explanation, by identifying the real mechanisms that are responsible for producing the observed phenomenon.
4) *Abductive* logic begins with the experiences of the study subjects; their construction and interpretation of reality. Individual meanings and motives are then abstracted into typical motives in typical situations

This study adopted a hybrid approach (Fereday & Muir-Cochrane, 2006) that incorporated both a deductive and inductive approach. This hybrid strategy allowed the tenets of AT to be integral in deductive analysis while allowing themes on utilisation behaviour to emerge directly from the data using inductive coding.

5.4 Case Study Research

The study employed a case study approach as the research strategy to collect and analyse data. Case study designs have become popular in IS research (Orlikowski & Baroudi, 1991). Case studies involve the examination of phenomena in their natural setting (Benbasat et al., 1987). Yin (2009) argues that case studies are suitable when:

1) the study's questions are a 'how' and 'why' which tend to be more explanatory;
2) examining contemporary (rather than historical) events, but actor behaviour cannot be manipulated. Additionally, the boundaries between phenomena and contexts are not evident and hence methodologies such as experiments that control variables may not be feasible;
3) there is a need to investigate a phenomenon within its natural setting, but where an understanding can be reached by considering the important contextual conditions.

This study aimed to understand *how* culture plays a role in the utilisation of maternal mHealth interventions. Because of the complexity of healthcare-seeking behaviour in connection to culture, it was not practical to use methods that would attempt to manipulate variables "directly, precisely and systematically" (Yin, 2009, p.11), such as in experiments. Methods such as experiments require more *a priori* knowledge of what the variables of interest would be and how they would be measured and also test specific hypotheses by deliberately manipulating the environment (Benbasat et al., 1987; Crowe et al., 2011). Such an approach was neither congruent with the interpretive research paradigm, nor was it considered ideal for the nature of the study which involved explicating socio-cultural issues which represent a complex phenomenon.

Thus feasible methods included those that would not be limited in their ability to investigate context (Yin, 2009). The case study method offered this study a more robust ability to deal with the complex phenomenon of culture in the utilisation of technology in healthcare seeking. Ethnography was not considered necessary because the purpose of this study was not narrowing down to a specific culture-sharing group, which is an important requirement of ethnographic studies (Creswell & Poth, 2016). Furthermore, the ethnographic study would require that the study participants be in one location and would require more time and finances, both which were constrained in this study. We therefore chose to adopt the case study method because of its

feasibility as well as suitability to answer the "how" research question and usefulness in yielding richer insights (Yin, 2017).

The main prejudice against case studies, as stated in Yin (2009), is the view that case studies do not provide a basis for generalisability. Yin provides a short answer to this, submitting that 'case studies, like experiments, are generalisable to theoretical propositions and not to populations or universes' (Yin, 2009, p.15). The idea for analytic generalisability from the case(s) is not unlike an experimental researcher where, in experimenting, the motive is to learn from it beyond the specific experiment (Yin, 2017). Therefore, rather than providing population generalisability, the goal for case studies is to provide theoretical and analytical generalisation (Yin, 2013). In interpretive studies these generalisations are 1) concept development, 2) theory building and extension, 3) generation of rich insights and 4) drawing of specific implications (Walsham, 1995). This research hopes to contribute to (2), (3) and (4).

5.4.1 Rationale for a single instrumental case study design

Case studies may be distinguished by the intent of the case analysis (Creswell & Poth, 2016) and whether it is a single or multiple case study (Yin, 2017). This study employed a single instrumental case study design.

With regard to intent of case analysis, a case study can either be intrinsic or instrumental (Stake, 1995). In intrinsic case studies, the focus is on the case itself (Creswell & Poth, 2016). These cases are not chosen because they are representative in understanding other cases, but because they provide an understanding of an unusual unique phenomenon (Creswell & Poth, 2016; Crowe et al., 2011). The researcher, therefore, defines the uniqueness of the phenomenon and what distinguishes it from all others cases.

On the other hand, instrumental case study accomplishes more than understanding one specific phenomenon. The researcher uses a particular case to gain a broader appreciation of a phenomenon, and for this reason, the researcher selects a "typical case" (Crowe et al., 2011). In this study, we were interested in understanding the phenomenon of mHealth utilisation among maternal mHealth consumers, to provide insights to other mHealth-user interactions. The study therefore adopted an instrumental case study.

In addition to deciding between an instrumental case and an intrinsic case, a case study researcher may adopt single or multiple case studies (Creswell & Poth, 2016; Yin, 2017). Though a researcher may adopt multiple case studies with the motivation to generalise, time and financial limitations may dilute the study, and the researcher faces the complex question of "how many" cases (Creswell & Poth, 2016). Rather than being interested in statistical generalisation, the focus of this study was to generate theoretical insights. This required a detailed understanding of the phenomenon and hence a single case study was considered more useful to illustrate the phenomenon of mHealth utilisation.

5.4.2 Case selection

5.4.2.1 The urban/peri-urban setting

Hofstede and Hofstede (2005) liken cultural layers to an onion; with values, the innermost ring, representing a deeper level of culture that does not change (Recall Chapter 2). The intention of this study was not to focus on eliciting and comparing specific pregnancy-related cultural practices thus narrowing down the view of culture. We acknowledge that practices would be varied based on ethnic groups in the chosen context. Different ethnic groups may subscribe to different practices with regard to what is acceptable or not acceptable in the period of pregnancy. Additionally, members of a cultural group may vary to the extent to which they hold the values of that group, because a complexion of other layers of culture and sub-cultures such as religious beliefs or social norms may influence this (Huang et al., 2003; Straub et al., 2002). These complexities of culture necessitated that culture is elicited at an individual level. Straub et al. (2002) argued that such an individual unit of analysis of culture is reasonable and appropriate because "culture can only manifest itself through the individual" and "there is no way to query or probe into the collective unconscious of an entire culture" (Straub et al., 2002, p. 19).

Given the aforementioned perspective of culture, it was not considered necessary to choose a context where participants would be associated with one specific ethnic group, as would be the case in a rural setup. Rather, to generate deeper insights on the culture at a broader perspective, an urban/peri-urban setup was considered suitable. Using a value-based definition of culture (Hofstede & Hofstede, 2005), the study engaged with individuals in an urban/peri-urban setting who had interacted with the mHealth intervention. This approach allowed the study to elucidate

culture in the phenomenon of study, despite the different specific practices that may have existed in different ethnic groups that the participants belonged to. Additionally, instead of assuming cultural values based on affiliation to a group, the requisite case would enable us to interrogate individuals as to the degree to which their values were similar to those of others in the group (Straub et al., 2002).

5.4.2.2 The intervention

Most mHealth interventions in developing countries are targeted at benefiting the underserved and poorer populations. Akter and Ray (2010) describe mHealth as the ultimate platform to serve the unserved. Demand- and supply-side barriers which include socio-cultural factors are generally more exacerbated among the poorer (Ensor & Cooper, 2004), hence studying individuals from such a socioeconomic group would provide greater insights to the phenomenon of study.

PROMPTS was therefore considered a suitable case for this study because it presented a *common* case (Yin, 2013) representing a typical developing country mHealth intervention. The intervention was targeted at women of low socioeconomic status in urban/peri-urban areas. Socioeconomic status has often been associated with other variables such as education level and autonomy, which have previously been identified as factors affecting healthcare-seeking behaviour and health service utilisation (Chapter 2). PROMPTS was also developed within the local context in consultation with the target users and the messages adapted to the different stages of pregnancy. Because the intervention was SMS-based, we assumed that the technical skill would not pose barriers to use (Recall the critical success factors of mHealth in Chapter 2). Additionally, the intervention combined SMS with two-way communication for emergencies, a feature that has been deemed advantageous for maternal mHealth (Sondaal et al., 2016). Cost is a potential barrier to mHealth utilisation (Sondaal et al., 2016). Since PROMPTS was a toll-free service, we could control the impact of cost on mHealth utilisation. Most importantly, PROMPTS was directed at the maternal mHealth clients themselves, and no proxies such as Community Health Workers (CHWs) or Community Health Volunteers (CHVs) were engaged to deliver the information. Following the choice of Kenya as the specified country context, it was assumed that accessibility to a mobile phone among participants would not be a challenge. However, we confirmed phone

ownership during recruitment as phone sharing has been reported as a common phenomenon in developing countries (Buskens & Webb, 2009; Macueve et al., 2009; Steenson & Donner, 2009).

Of the identified potential maternal mHealth projects in Kenya, a number of them were donor-funded, whose pilots had come to an end at the time of data collection. Though collecting data by asking women to reflect on the historical experiences was plausible, some of the information gathered may have been subject to recall bias (Moyer & Mustafa, 2013), which may have affected validity. Further information about PROMPTS as well as a detailed description of the context is offered further in Chapter 5.

5.4.3 Unit of analysis

This section resolves the unit of analysis in AT and case study research. In the former, the unit of analysis is always the activity. In the latter, the unit of analysis is the case. It is the concrete entity that is the main focus of inquiry (Yin, 2013). However, Yin also presents the idea of an embedded unit of analysis which offers direction in harmonising the unit of analysis in AT and the unit of analysis in case study research. Since the context in AT is not some external outer shell but rather the activity system itself (Recall Chapter 4), we conceptualised the healthcare-seeking activity as the context in our single-case study design (Figure 5.2).

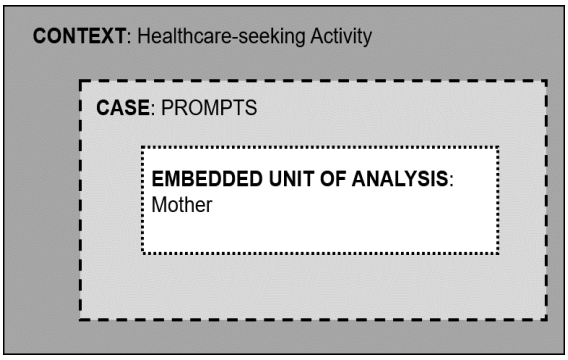


Figure 5.2: Single case-study design with an embedded unit of analysis (Yin, 2013)

Consequently, the unit of analysis would be the PROMPTS intervention. We then used the concept of an embedded unit of analysis to incorporate the maternal health clients whose experiences were used to generate an understanding of the phenomenon. The individual level of analysis was also useful because, though culture is shared in nature (Hofstede & Hofstede, 2005; Straub et al., 2002), it is manifested in individual behaviour (Srite & Karahanna, 2006) (Recall Chapter 3). It was

therefore sensible to view and analyse culture at an individual level, after which it could be aggregated to the collective (Hwang, 2011).

5.5 Sampling

In qualitative research, the primary goal is not to minimise bias and maximise generalisability as in quantitative research, but to select information-rich cases (Koerber & McMichael, 2008; Patton, 2014). In this section, we present the study population as well as the sampling methods used to draw participants from the population.

5.5.1 Study population

The relevant population for this study comprised of:

(i) Maternal health clients

(ii) Partners, female relatives/women and other interpersonal relationships who were key to the pregnancy experience (referred to as *'Significant others'* in this study)

(iii) Key informants who were involved in the implementation of PROMPTS

(iv) Healthcare professionals

The maternal health clients needed to have interacted with the mHealth intervention. Hence, we included maternal health clients from health facilities where PROMPTS had been implemented. We chose three facilities: KHR District Hospital, WGG Hospital and BHA District Hospital in Kiambu and Nairobi counties in Kenya (aliases used for ethical reasons). These facilities were selected because they had a large number of mothers who were using the intervention. Besides, the patients who attended these facilities were a relatively good representation of the target population of mostly low socioeconomic status. The maternal health clients needed to be using the intervention at the time of the study.

Since pregnancy and subsequently maternal care is a 'communal' experience within the context of the study (Recall Chapter 2), other stakeholders were involved in the study for purposes of triangulation. We used the term *'significant others'* to refer to the community of stakeholders that included partners and other female relatives/women who played a important role in a woman's pregnancy.

The key informants were members of staff from the PROMPTS project who were in one way or another involved in the implementation of PROMPTS. The HCPs were engaged in informal discussions.

5.5.2 Mixed purposive sampling technique

Purposive sampling was employed to select a representative group of participants who could best generate the insights required based on the aim of the study (Creswell & Poth, 2016). The aim for a representative sample is not for statistical generalisation as in quantitative sampling (Koerber & McMichael, 2008), but for better theoretical explication of the phenomenon being studied. In light of the nature and purpose for purposeful sampling, Patton noted that:

> "The logic and power of purposeful sampling lie in selecting information-rich cases for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the inquiry, thus the term purposeful sampling. Studying information-rich cases yields insights and in-depth understanding rather than empirical generalisations" (Patton, 2014, p. 230).

In qualitative research therefore, sampling is not to generalise information but for elucidating the phenomenon of study (Creswell & Poth, 2016). By applying a criteria (Table 5.2) to guide the selection of information-rich participants, we applied a quota technique to ensure representativeness based on the selected variables. The total sample in this study included 30 women who were enrolled in the intervention, five significant others who were recruited based on referrals from participating women, and three key informants, resulting in a total sample size of 38. The HCPs were hesitant to participate in the study. To avoid coming off as questioning their practice, they were engaged in informal discussions. The topics of discussion were limited to understanding the women's experiences rather than the health system shortcomings; which may have elicited defensive responses.

5.5.3 Sampling procedures

We used an eligibility criteria (Table 5.2) and applied quota sampling to ensure representativeness of the sample based on the following variables:

- pregnancy parity (1st or > 1)
- marital status
- level of education (primary, secondary/certificate and other).

These variables were included based on the review of literature that identified these characteristics as being vital in shaping pregnancy perceptions, behaviour and experience and hence are likely to affect utilisation behaviour (Recall Chapter 2). Consequently, varying participants on these attributes ensured heterogeneity (Suri, 2011). Sampling was progressive. We enrolled participants and conducted interviews until we were confident that the data was sufficient on the basis that no more new concepts were emerging and that previously raised concepts had been well understood (Guest et al., 2006; Suri, 2011).

Table 5.2: Study sample eligibility criteria

	Women	Significant Other (SO)	Key Informants
Population and sample size	Women N=30	Men and/or Women N=5	N=3
Study procedures	FGDs, N=2 (6 women/FGD) In-depth interviews (IDIs)	FGDs, N=1* In-depth interviews	 In-depth interviews
Recruitment	Women using the intervention (Purposefully sampled)	Referral by enrolled women	PROMPTS staff members
Eligibility	• Women ≥ 18 years varying in marital status and birth order and level of education • Confirmed pregnancy or within three months postpartum • Used the intervention ≥ six weeks • Normal pregnancy with no known pregnancy-related complications or other	• Related to a pregnant woman that is enrolled in the study • Was aware of the woman's use of the intervention • Literate in English or Kiswahili • Willing to provide informed consent	• Literate in English or Kiswahili • Willing to provide informed consent

	predisposing diseases/conditions that may put the woman and unborn baby at risk or cause stress • Daily access to shared or individual mobile phone • Literate in English or Kiswahili • Willing to provide informed consent • Willing to participate in FGD • Not enrolled in other studies	• Willing to participate in FGD • Not enrolled in other studies	
	*Though we had initially intended to have two FGDs for significant others (SO); one for female SOs, and another for male SOs, all referred SOs were partners/husbands as most other SOs were living far away from the women		

5.5.4 Demographics of maternal health clients and other respondents

Table 5.3 presents a summary of the maternal health participants who were involved in this study

Table 5.3: A summary of maternal health clients demographics

Maternal Health Clients	
Age	**Total**
18-19	1
20-24	13
25-29	11
30-34	3
>=35	2
Birth Order	
1st	10
>1	20
Marital Status	
Married	27
Not marrried/Single	2
Complicated	1
Education	
Primary	8
Secondary	16
Tertiary	6
Work Status	
Working	9
Not Working	21
Total Participants	**30**

The women were varied in education (further elaborated according to the level[1] attained), age and birth order (Table 5.4) .

Table 5.4: Detailed demographics of the maternal health clients respondents

Respondent	Age	Marital Status	Education	Level Attained	Work Status	Birth Order	FGD
Mother 1	24	Married	Primary	Class 8	Not working	1st	FGD 2
Mother 2	28	Married	Primary	Class 6	Not working	2nd	
Mother 3	25	Married	Secondary	Form 4	Casual work	3rd	
Mother 4	32	Married	Primary	Class 8	Not working	2nd	
Mother 5	25	Married	Tertiary		Primary School teacher	2nd	
Mother 6	21	Married	Secondary	Form 4	Not working	1st	FGD 2
Mother 7	40	Married	Secondary	Form 4	Self employed	2nd	
Mother 8	22	Married	Secondary	Form 4	Not working	1st	
Mother 9	19	Married	Secondary	Form 3	Not working	1st	
Mother 10	25	Married	Secondary	Form 4	Not working	2nd	FGD 1
Mother 11	25	Married	Primary	Class 7	Not working	2nd	FGD 2
Mother 12	27	Married	Primary	Class 8	Casual work	3rd	
Mother 13	22	Married	Tertiary		Casual work	1st	FGD 1
Mother 14	26	Married	Tertiary		Self employed	2nd	FGD 1
Mother 15	20	Single	Secondary	Form 4	Not working	1st	
Mother 16	31	Married	Tertiary		Accountant	1st	
Mother 17	29	Married	Tertiary		Not working	3rd	
Mother 18	20	Married	Secondary	Form 3	Not working	1st	
Mother 19	21	Married	Secondary	Form 3	Not working	2nd	
Mother 20	23	Married	Primary	Class 8	Not working	2nd	FGD 1
Mother 21	21	Married	Secondary	Form 3	Not working	2nd	
Mother 22	30	Married	Secondary		Not working	2nd	FGD 1
Mother 23	38	Single	Secondary	Form 4	Not working	3rd	
Mother 24	26	Married	Primary	Class 8	Self employed	2nd	FGD 1
Mother 25	22	Married	Secondary	Form 4	Not working	2nd	
Mother 26	23	Married	Secondary	Form 4	Not working	1st	
Mother 27	24	Married	Secondary	Form 3	Not working	2nd	FGD 2
Mother 28	23	Married	Secondary	Form 4	Not working	1st	
Mother 29	28	Complicated	Tertiary		Self employed	2nd	FGD 2
Mother 30	25	Married	Primary	Class 7	Not working	2nd	FGD 2

[1] Class is used to refer to the post-kindergarten years of formal education. E.g. Class 8 in the eighth post-kindergarten year. The Form number refers to the different years of high school (secondary school)

Courtesy of the profile of patients who visited the selected health facilities, it was assumed that the mothers were from a low-income group. A majority of the maternal health clients (80%) were in their 20s and reported having secondary education or lower. Few women (20%) had attained a college or university qualification.

Most women reported being married or living with their partner and two-thirds of the sample were not working at the time of the interviews. Of the women who worked, most were involved in informal employment except for two women, both of whom had college or university degrees and had permanent jobs in the teaching and accounting professions.

Also interviewed were the partners to the some of the participating maternal health clients. Details of the partner demographics are offered in Table 5.5.

Table 5.5: Detailed demographics of partners to the maternal health clients

Respondent	Partner to	Age	Education	Level Attained	Work Status
Partner 1	Mother 20	27	Primary	Class 8	Casual work
Partner 2	Mother 24	29	Primary	Class 8	Casual work
Partner 3	Mother 17	35	Tertiary		Teacher
Partner 4	Mother 12	30	Secondary	Form 3	Self employed
Partner 5	Mother 9	28	Secondary	Form 4	Casual work

5.6 Data Collection

This study used various data collection methods: semi-structured interviews, FGDs, participant observations and informal conversations, and field notes. Data was collected between January 2019 and May 2019. The study employed multiple techniques for data collection to ensure richness of data, as well as to triangulate it and to ensure its validity and reliability. The techniques are detailed in the subsequent sections.

5.6.1 Semi-structured interviews

We engaged the participants in an interview process designed to generate a depth of understanding rather than breadth (Rubin & Rubin, 2011). This conversation between the interviewer and the interviewee is also insightful in that it offers a means to access participant perceptions and attitudes (Yin, 2017).

5.6.1.1 Designing and developing the research instrument

To allow for a rich interview process (Rubin & Rubin, 2011), interview guides had open-ended main questions, follow-up questions and probes. We used the concepts of AT to guide the design of the interview guides (Table 5.6). For example, questions that solicited for the reasons/motivations for using mHealth, were guided by the AT concept of object/motive. Following the value-based view of culture that entails pressure to conform that is imposed on the individual by the social group (Recall Chapter 2), we sought to elicit the maternal healthcare-seeking cultural aspects by engaging study participants on societal expectations in terms of norms and beliefs that were considered important in their context rather than through individual personal importance ratings. We also included questions on who was involved in the pregnancy, why and when they were involved and who did what, to capture aspects of the community and division of labour.

Table 5.6: Activity Theory concepts and principles that guided interview questions

ACTIVITY THEORY CONCEPTS/PRINCIPLES	**HOW IT WAS USED IN INTERVIEW QUESTIONS**
Object/ Motive	Questions that solicited for the reasons/motivations for using mHealth
Rules/ Values	Questions on pregnancy and maternal healthcare-seeking norms (those imposed by the healthcare system and those imposed by culture)
Community	Questions on who was involved in the pregnancy
Division of Labour	Why, and when the different people were involved
Historicity	Questions to understand the development of mHealth intervention and socio-cultural aspects of pregnancy
Tool Mediation	Questions on how the mHealth artifact may have changed the norms and practices of maternal healthcare-seeking
Internalisation/ externalisation	Used to incorporate questions to elucidate any usage/healthcare-seeking behaviour that may have arisen from using the intervention
Contradictions	Used to explore challenges/dissatisfactions with regard to the mHealth intervention that the users/implementers faced.

In light of the principles of AT, we incorporated questions to elucidate aspects of historicity both of the activity of maternal healthcare-seeking and the mHealth artifact. Questions on the historicity of maternal healthcare-seeking sought to gain insights on how maternal health clients previously undertook pregnancy-related healthcare-seeking. The insights in these questions helped to further confirm some of the norms that had been shared by the participants under the questions guided by the concept of rules/values. The questions included further probes to elicit the norms and cultural practices surrounding the pregnancy experience. We also engaged the key informants, who were PROMPTS staff members, on questions about the development, design, and implementation of the intervention.

The principle of mediation was used to solicit information on how the mHealth artifact may have changed the norms and practices of the maternal healthcare-seeking activity. We took advantage of the principles of internalisation and externalisation by incorporating questions on participants' responses and patterns of using mHealth that may have developed over time. By including questions on challenges faced, we sought to gain an understanding of existing breakdowns and contradictions.

All the interview guides were checked for coherence by two senior researchers with experience in qualitative research. Another subject matter expert and researcher in reproductive, maternal and child health were consulted to review the language used, as well as the suitability of the questions to generate the intended responses. We also tested the guides in pilot interviews before commencing the data collection. Following these steps, the interview guides, together with the research proposal, were submitted to two separate human participants research ethics review committees (Section 5.10). The double submission was necessitated by the fact that the institution where the researcher was registered at the time of the study was different from the country where the data was to be collected. The rigorous ethics processes were valuable in further fine-tuning the interview guides by incorporating the suggestions from these two ethics committees.

5.6.1.2 Participant recruitment procedures for interviews

A PROMPTS staff member supplied the researcher [with] a database of mothers who were enrolled in the intervention. The database included basic information about the maternal health client such as their mobile number, a sample of questions that they had asked if any, when they started using the intervention, and their gestation age when they had enrolled. This data from the

database allowed the for pre-sampling, so that only potential candidates were contacted based on the inclusion/exclusion criteria. Potential participants were contacted via a phone call. In this call, the purpose of the study was explained and the participant was asked for willingness to participate. If the contact agreed to participate, they were invited for further eligibility screening and a potential interview. The contacts were given a chance to ask or clarify any concerns they might have. We also used questions to confirm that the respondent understood the objective of the study. It was not possible to conduct the eligibility screening on the initial call because of the nature of the screening that necessitated asking for information that was considered private. This change was incorporated into the enrolment procedure following the insights from the pilot study. The pilot study showed that women were cautious of being asked for details like their current gestation age and were suspicious of unsolicited phone calls and messages.

When a physical meeting materialised, we engaged the contact on key information to determine their suitability in light of the differentiating variables (Section 5.5.3). Though the participant's ethnicity was not a mandatory primary variable, diverse ethnic backgrounds would offer a breadth of understanding of cultural practices and their impacts on utilisation. However, to avoid coming off as discriminatory, we opted to use the subject's name to establish their ethnic affiliation. Being Kenyan, the researcher was able to do this without any challenges. If eligible, the mother was asked if she would take the interview at that point, or a separate meeting was scheduled at a later date. Those who were ready to take the interview were taken through the informed consent (Appendix F), and permission to audio-record was sought before beginning the interview. On referral by a participating mother, the recruiting of significant others into the study followed the same process.

5.6.1.3 Interview process

Before embarking on the actual interview, we did the following:

1. Introduced the researcher and research assistant to the respondent
2. Explained the purpose of the study and the content of the consent form, and gave the respondent an opportunity to clarify any matters or ask any questions
3. Presented the consent form to the respondent for signing
4. Requested permission to audio-record the conversation.

We conducted the interviews at a private area at the ANC clinic, or participant's home, based on their preference. Interview guides (Appendix G) loosely guided the conversation to ensure flexibility in the interview process to adapt to unexpected directions (Neuman, 2007). While interviewing, we maintained discretion on deciding what entailed relevant and useful information, while giving participants room to express themselves freely (Rubin & Rubin, 2011). Interviews were conducted in 'Sheng', a hybrid language that informally mixes English and Kiswahili. The use of this language did not present any challenges because the researcher was Kenyan and understood this local cant. The interviews lasted for 45 – 60 minutes on average. The research assistant took notes during the interview. Interviews were audio-recorded upon consent from the interviewee.

5.6.2 Focus group discussions

This study incorporated FGDs in addition to interviews. FGDs are useful in comparing experiences and views between participants, gathering the "group effect" rather than relying on individual data (Carey, 1994). They also provide a breadth and depth of the phenomenon being studied. In this research, we used FGDs to gain a deeper understanding of the cultural issues during pregnancy, as well as to understand participant interpretations of the various beliefs, values, and interactions. The FGDs allowed us to understand the role of community in the experience of pregnancy and how power was assigned to various subjects within the community. FGDs were gender-constructed. This was done to contribute to data validity by ensuring that participants did not feel inhibited to discuss pregnancy-related issues that may have been gender-sensitive.

5.6.2.1 Participant recruitment for focus group discussions

During the face-to-face meeting with the maternal health clients, interest to participate in the FGD was established. We explained the nature and purpose of the FGD in the study, as well as the nature of discussions being group-based. It was explained that the nature of FGDs in being group discussions may affect privacy and confidentiality as the researcher was not in control of what the group did beyond the formal meeting. If the individual was willing to participate in the FGD, a separate return date was given to them. However, if participants still expressed hesitation in group sharing, we emphasised that their participation was completely voluntary, hence giving the option not to participate. At the beginning of each FGD session, the need for confidentiality

among all FGD participants was emphasised. Informed consent was obtained (Appendix G) at the start of each session.

5.6.2.2 Procedures for the focus group discussions

All FGDs were conducted in a private room at a nearby health facility where most mothers attended their ANC. The male FGDs were conducted in one of the private spaces at one of the facilities. The researcher moderated the FGDs while a research assistant took notes. On average each FGD lasted about two hours.

At the beginning of all FGDs, we obtained consent from participants to take notes and to audio-record the discussions. The researcher, in the capacity of a moderator, described procedures and norms for discussion and participation. Participants were given a chance to ask questions regarding the procedures before the discussion. We emphasised the need for all participants to maintain confidentiality. We also used participant aliases to maintain participant confidentiality.

5.6.3 Participant observation, informal discussions and field notes

Observations allow the researcher to understand what is happening because it produces a detailed descriptive account (Kaplan & Maxwell, 2005). The observer may also seek clarification by asking questions or engaging in informal discussions (Kaplan & Maxwell, 2005). Before engaging with participants in the study context, we conducted preliminary visits to the study sites where the primary mandate was for the researcher to take on a low-key profile and observe interactions and activities related to maternal healthcare-seeking at the facility. In this phase, the researcher was a complete observer (Creswell & Poth, 2016). The low-key profile allowed us to get acquainted with the physical setting, the terms used and to understand the structure of the social relationships and participant behaviour, as they existed in the real-world setting without the bias from the researcher's involvement.

We engaged in another phase of non-participant observation (Creswell & Poth, 2016) toward the end of the data collection period. In this phase, participants were more aware that they were being observed. However, as much as possible, the researcher tried to be unobtrusive by watching and taking field notes from a distance (Creswell & Poth, 2016). This second phase allowed us to compare insights gained from the first phase of observation to those obtained afterwards. We

maintained detailed field notes at all times. These served as reminders to some particular situations and the insights used to offer clarity to the data analysis phase. Both phases of observation were combined with informal discussions targeted at the HCPs to elucidate further what had been observed as well as to gain further insight on information gathered from the interviews.

5.6.4 Document review

"Documents, texts, pictures or photographs, and artifacts also can be valuable sources of qualitative data" (Kaplan & Maxwell, 2005, p. 40). In this study, we examined and reviewed resources related to the intervention. These included the institution's blog, relevant published peer-reviewed and grey articles about PROMPTS, and sample PROMPTS messages. In addition, we reviewed the latest Kenya demographic health survey (KDHS) and the country's eHealth policy. The information from these sources was useful to understand the study context, as well as the historical development of the PROMPTS intervention. The latter is a necessary component in AT (Recall Chapter 3). As such, the insights from the document reviews facilitated the correct interpretation of data.

5.6.5 Use of researcher's personal experience

You will recall that interpretivism is founded on the assumption that the researcher and the researched are bound together and that the findings of a study are the product of this interaction. Braun and Clarke (2019) have argued that researcher subjectivity should be understood as a resource rather than a threat to the production of knowledge. In this study, some researcher's personal reflections aided the understanding and interpretation of the empirical observations. Where this was the case, the reflection was made plain to make any potential biases explicit (Patton, 2014). A summary of the data collection methods used is offered in Table 5.7.

Table 5.7: Summary of the data collection methods and how they were used in the study

METHOD	PARTICIPANTS	HOW DATA WAS USED
Semi-structured interviews	▪ Maternal health clients ▪ Significant others ▪ Key informants	Data was analysed to provide an understanding of the phenomenon from the experiences of the participants.
FGDs	▪ Maternal health clients ▪ Significant others	Data was used for triangulation purposes. The sessions were also used for member checking to confirm our understanding and to seek further explanations on unclear issues.
Observation	▪ Maternal health clients ▪ The healthcare-seeking activity (e.g. the relationship between HCPs and patients, the structures of care)	The information was used to offer context to the inferences that were made during data analysis.
Document review	▪ PROMPTS blog ▪ Published studies linked to PROMPTS ▪ PROMPTS sample messages ▪ Kenya's demographic health survey ▪ Kenya's eHealth policy	The information was used to further understand the context by offering a thick description and to offer background to the inferences that were made during data analysis.
Informal discussions	▪ Healthcare professionals	The discussions were used to elucidate the observations made.

5.7 Data Analysis

Beyond the techniques and methods for collecting high-quality data, credibility in qualitative inquiry is also enhanced by the quality of the analysis process (Patton, 2014). Quality is generally achieved by following a systematic process. Interpretive methods should demonstrate an elicitation of individual constructions that are refined hermeneutically and compared and contrasted dialectically. This process aims to generate a few constructions where there is a substantial consensus (Guba, 1990). Thematic text analysis and open coding are consistent with these criteria of inquiry and were therefore considered appropriate methods for data analysis. Braun and Clarke (2006, p. 79) define thematic analysis as "a method for identifying, analysing and reporting patterns (themes) within data." They also provide a set of steps for conducting thematic analysis

(Table 5.8). The process involves carefully reading and re-reading the data to identify these potential patterns and themes (Fereday & Muir-Cochrane, 2006).

We transcribed and translated the interviews into English using a Word processor. The transcribed data was anonymised to remove all names and any other personal information that may have been shared in the interview process. All participants were coded as "Mother X" for maternal health clients, "Partner X" for the partners, "Informant X" for the key informants and (FGD Men/Women) for the FGDs. The transcripts were imported to Nvivo 12.4.0 for analysis. We repeatedly read the transcripts to get acquainted with the data.

In the first phase of coding, the themes were framed based on concepts from AT. In this phase, as the transcripts were read, phrases were coded according to the codebook concepts (Appendix H). The concepts of rules, community and division of labour were conceptualised as carrying the socio-cultural meanings of the maternal healthcare-seeking activity. For example, we looked through the transcripts to identify phrases that dealt with pregnancy norms in the form of what was allowed or not allowed during pregnancy, then coded these as values. Where there was mention of people who were considered important to the experience of pregnancy, these were coded in community and where there were phrases alluding to roles of different people and why these people were important, these were coded as the division of labour.

Table 5.8: Thematic analysis steps (Braun & Clarke, 2006)

PHASE	DESCRIPTION OF THE PROCESS
1. Familiarisation with data	Transcribing, reading, and re-reading data
2. Generating initial codes	Coding interesting features of the data and collating data relevant to each code
3. Searching theme	Collating codes to potential themes and gathering all data relevant to each potenatial theme
4. Reviewing themes	Checking if themes work, generating a thematic map of the analysis
5. Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story that the analysis tells
6. Producing the report	Selecting vivid, compelling examples, final analysis of seleced extracts, relating back to research question and literature, producing scholarly report

So, for example, a phrase such as "*You need to start going to the clinic when the pregnancy is showing*" was categorised as an implicit rule (defined as values) which encapsulated the participant's belief of pregnancy-related healthcare seeking. Considering a phrase like "*[a]I knew that they were going to send me very vital information that I could use throughout the pregnancy journey [b]to take care of my pregnancy*"; (Part a) was coded as a goal for using the intervention while (Part b) was coded as the object of the healthcare-seeking activity if it was the highest goal espoused. A similar process was followed using other concepts and principles from AT. This phase of coding helped to group related information together and made the second phase of inductive coding more effective.

The second phase of coding followed a more inductive approach. The inductive approach, which has its origins in grounded theory (Strauss & Corbin, 1998), is consistent with patterns of qualitative data analysis as described by other authors (e.g. Miles & Huberman, 1994). This coding process involves recognising an important piece of information and encoding it prior to the process of interpretation (Fereday & Muir-Cochrane, 2006). The groupings of data from the deductive phase were inductively analysed for concepts and themes. The primary purpose of this phase was to allow patterns of socio-cultural characteristics as well as utilisation behaviour evolving from participants' experiences to emerge, without restraints of a structured methodology (Thomas, 2006). Emerging themes were developed by repeatedly re-reading the transcripts and considering rival explanations by trying to consider other alternative ways to organise the data (Patton, 2014). Patton explains that rival explanations are not considered with the aim to disprove the alternatives, but rather to look for data that supports alternative explanations. When this process does not yield strong evidence to support alternative explanations, the researcher can have more confidence in the original explanation (Patton, 2014). We moved back and forth to understand the data and generate reasonable inferences, rather than approaching the analysis as a linear process (Braun & Clarke, 2006). Once we were confident that emerging themes had been well refined, appropriate quotations were selected that conveyed the essence of the important themes (Thomas, 2006).

5.8 Assessing Trustworthiness in Qualitative Research

Qualitative research has often been viewed as "soft" and lacking in rigour (Cope, 2014). One common criticism regards the views on the trustworthiness of the data. Positivist methods of validity and reliability can often not be applied the same way to naturalistic studies (Shenton,

2004). Guba's constructs for measuring the trustworthiness of qualitative research have gained popularity. The four constructs that Guba proposes are credibility, transferability, dependability and confirmability (Guba & Lincoln, 1982).

First, credibility deals with the congruency of reality with the findings. Thus, researchers have to make provisions to "promote confidence that they have accurately recorded the phenomenon under scrutiny" (Shenton, 2004, p. 64). This includes the adoption of research methods that "correctly" measure the concepts being studied. Suggested techniques include prolonged engagement, triangulation, tactics to ensure participant honesty, iterative questioning, debriefing, peer scrutiny, member checks, and examination and comparing findings with previous studies (Shenton, 2004). With regards to triangulation, four possible types exist; data source triangulation, method triangulation, investigator triangulation and theory triangulation (Miles & Huberman, 1994).

Second is transferability, which is concerned with "showing that the findings have applicability in other contexts" (Amankwaa, 2016, p. 121). In positivist work, this often refers to the extent that generalisation can be made by applying results to a wider population (Shenton, 2004). Since the aim of qualitative research is not statistical generalisation (Yin, 2017), researchers address transferability by giving a rich detailed description of the context that will provide a vivid picture and inform the readers (Connelly, 2016). Such 'thick descriptions' of the context facilitate judgements on the extent to which inferences may be transferable to a similar context (Guba & Lincoln, 1982). Guba and Lincoln also recommend the use of theoretical/purposive sampling to maximise the information collected.

Third, the positivist criterion that corresponds to dependability is reliability. To address the issue of reliability, positivists employ techniques that suggest that if the study were repeated using the same methods and in the same context, similar results would be obtained (Shenton, 2004). However, the changing nature of the phenomena makes such provision problematic in qualitative work. In stressing the close connection between credibility and dependability, Guba and Lincoln have argued that a demonstration of the former goes a long way in ensuring the latter (Guba & Lincoln, 1982). Addressing the issue of dependability in qualitative research requires that the processes followed within the study are reported in detail (Shenton, 2004). Lincoln and Guba (1985, as cited in Amankwaa, 2016) also propose the use of inquiry audits which involves having

a researcher who is not involved in the research process examine both the process and product of the research.

Lastly, confirmability deals with the long-standing critique by positivists of qualitative work related to the effect of the researcher's bias. Audit trails, researcher reflexivity and triangulation are some of the suggested techniques to do this (Amankwaa, 2016; Guba & Lincoln, 1982). Here, the role of triangulation is in reducing the effect of investigator bias (Shenton, 2004).

Table 5.9: Summary of techniques used to ensure trustworthiness in the study

DIMENSION	DESCRIPTION	HOW IT WAS ADDRESSED
CREDIBILITY	Extent to which data and inferences are believable	Data source triangulation: multiple participants (mothers, significant others, key informants and healthcare providers) and multiple sources (interviews, FGDs and observation); member checks; peer debriefing; expert review; considering rival explanations during analysis; researcher's reflective journalling and pilot study to familiarise with the environment
TRANSFERABILITY	Showing that findings have applicability in other contexts (Amankwaa, 2016)	Rich detailed description of the context and participants. Theoretically diverse sample
DEPENDABILITY	The extent to which the researcher's processes and descriptions are deemed dependable if the study were replicated (Guba & Lincoln, 1982)	Peer debriefing, data quality checks and explicit process documentation
CONFIRMABILITY	"Researcher's ability to demonstrate that data represents participants' responses and not the researcher's biases" (Cope, 2014, p. 89)	Triangulation and reflexivity to capture researcher's assumptions, biases and prejudices; examining rival conclusions

Table 5.9 shows the steps taken to ensure data trustworthiness in this study. Data was collected from multiple groups: maternal health clients, significant others, key informants and healthcare professionals, as well as using multiple methods: in-depth interviews, FGDs, observations and field notes, document review and informal discussions to address the issue of triangulation. A detailed researcher's memo was used to track interpretation decisions made at each stage of the

research, and a reflexive field diary capturing assumptions and biases was also documented. Member checking was incorporated into the FGDs and informal discussions to verify interpretations of data from previous interviews (Thomas, 2006). Data was transcribed verbatim so as not to lose any nuances that emerged from the discussions. To enhance the credibility of the data during analysis, we searched for alternative themes and divergent patterns, with the aim of finding rival explanations (Patton, 2014). Since the research had a component of health research involving human participants, we submitted a detailed study proposal to the Faculty of Health Sciences at the University of Cape Town, where the researcher was registered. In this process, the data collection instruments were reviewed by subject matter experts. We incorporated recommendations from this group into the final instruments before ethical clearance was issued.

5.9 Pilot Study

Because of the nature and cultural sensitivity in requiring women to talk about the pregnancy experiences, a female research assistant was engaged. The research assistant was fluent in English and Kiswahili and had previously worked as a research assistant on the PROMPTS project. She had been involved in creating awareness of the SMS service in the different facilities and helping maternal health clients to enrol when they were interested. As such, she was acquainted with some of the staff at the health facilities which helped in gaining goodwill with the facility staff to be allowed to engage with the women and offer space for the FGDs. The research assistant signed a non-disclosure agreement before embarking on the study.

With the help of the assistant, a research pilot was conducted to test the validity of the instruments. This also served as training for both the researcher and the assistant on the expectations during data collection. The pilot adopted the same sampling and recruiting procedures that were to be used in the study. The four participants in the pilot were drawn from the same population that the research targeted. This similarity ensured that the pilot was reflective of the main study. Following the pilot, some procedural changes were made to make the research process more effective. These were mainly changes in identification and enrolment as well as the interview processes.

5.10 Ethical Considerations and Procedures

The study protocol was developed in compliance with the 2013 Helsinki Declaration. The study complied with all ethical requirements from the researcher's institution and the country of study.

1) In compliance with the institutional requirements, human participants research approval was obtained from the Faculty of Health Science, University of Cape Town (see Appendix A). Documents submitted included the study protocol, research instruments and introductory and consent letters.
2) In compliance with the country of study requirements, the study protocol, research instruments and consent letters were submitted to Amref Kenya Ethics and Scientific Review Committee for ethical clearance (Appendix D).
3) The national research regulations in Kenya required that all researchers have permits before proceeding to conduct research. In light of this, we submitted the research proposal to the National Council for Science, Technology and Innovations (NACOSTI) who issued the research permit (Appendix C).

Because the study necessitated talking to PROMPTS users, we obtained permission from the project implementers who already had permission to partner with the health facilities in rolling out the implementation, and obtained a permit allowing them to conduct research studies on the intervention (Appendix E). We also sought permission to use the intervention name (PROMPTS) and were careful to ensure that this did not breach the participants' confidentiality or the researcher's 'objectivity' in any way.

We had planned to engage the HCPs to assist in eligibility screening to identify participants with no predisposing conditions/diseases. Even though the research methods were completely unobtrusive, this had been considered useful to minimise any pregnancy-related harm that may have resulted from the process of research. However, it was not possible to engage the HCPs because they were entirely disassociated from the implementation process. We therefore engaged the potential participants on this matter during eligibility screening by explaining to them why this was important. However, as an additional safety precaution, we kept some contacts of the healthcare providers (HCPs) from the mothers' ANC facility in case of any pregnancy-related emergencies during data collection.

During recruitment, it was emphasised that participation for interviews and/or FGDs was completely voluntary and that participants reserved the right to drop out of the study at any point without reprisal by informing the researcher or the research assistant. Written consent was provided for all interview and FGD participants. Participants were interviewed at a location they felt more comfortable; either at a nearby ANC clinic or in their homes. Though confidentiality among FGD participants was emphasised, we further explained to the participants that we could not guarantee this outside the FGD session. At the start of each interview/FGD, consent was obtained from participants to take notes and audio-record the discussions.

Transcribed data was anonymised. All data was stored in password-protected files on a hard disk dedicated to the study. The data was used only for research purposes without attempting to identify study participants. Data will be stored for 15 years according to the requirements of the Faculty of Health Sciences – University of Cape Town Human Research Ethics Committee. At the end of the study, participants were provided monetary compensation for their transport expenses and any other expenses incurred in the course of participating in the study. The research assistant signed a confidentiality agreement agreeing not to divulge any information except to the principal investigator.

5.11 Study Limitations, Risks and Assumptions

This study adopted a cross-sectional case study approach. Deeper insights may have been possible using a more longitudinal approach. However, this was not possible because of the nature of pregnancy as a definite time period and because most participants opted into the intervention late in their pregnancy, courtesy of the delayed start of ANC (Recall Chapter 2). Also, it might have been beneficial to compare first-time use with subsequent use to see how utilisation patterns changed or developed. However, all the women using the PROMPTS intervention were first-time users, and it was not possible to find another case where mHealth users had interacted with a specific mHealth intervention more than once. In addition, all the women who had interacted with the intervention before, but had since opted out, declined to participate in the study. This may have been linked to a fear of reprisal or their perception that this may affect how they receive healthcare services.

Though we initially hoped to speak to a bigger number of significant others, varied in relation to the participating women, this was not realised. Most mothers living in urban and peri-urban areas were far from their kin. Consequently, the closest significant other was more often than not their partner/husband. The partners were also not easy to find as they were mostly away from their homes, and any offers to interview them at their place of convenience were not successful. This difficulty may have been linked to the perception of pregnancy-related issues as a female domain (Recall Chapter 2), hence the men were not keen to be involved. These shortcomings limit the insights that may have been gained from relationship dyads.

Additional value may have been gained by expanding the study population to include rural mHealth users to compare whether their experiences were varied and how this shaped mHealth utilisation. Future studies could take on this approach. We believe that the diversity of the sample in terms of ethnicity added to the richness of understanding the context, without being too particular to the extent that findings could only apply narrowly. However, future studies may explore whether there are differences in utilisation behaviour that may stem from ethnic associations.

Backed up by literature (Recall Chapter 2), we assumed a collectivist expression of culture based on studies indicating that African culture is mostly collectivist in nature, with a strong emphasis on sharing, family bonding and a strong authority structure (Straub et al., 2002). As such, the study took off with the assumption that the pregnancy experience in such a setting would largely be influenced by socio-cultural aspects within the community that the mother belonged to. This view was corroborated by previous studies that have indicated that, in African settings, pregnancy is a somewhat ‘communal’ experience (Roberts et al., 2016; Serizawa et al., 2014).

5.12 Chapter Summary

This chapter summarised the research methods. We began by laying the philosophical foundations of the study based on the interpretivist paradigm. The interpretive inquiry approach was considered most suitable for the study because we desired to gain insights into the varied experiences from the subjective perspectives of participants. We also justified the suitability of the case study research, because it allows for studying the phenomenon in situ. This research approach allowed us to have a detailed exploration of the context. We explained the research design, including the

population, sampling techniques and unit of analysis. We also detailed the various data collection methods that the study adopted, namely interviews, FGDs, participant observation, informal discussions and documents reviews. We point out that the last three methods were useful in aiding the correct interpretation of data by providing background information about the context. Since we adopted a hybrid approach using deductive and inductive methods, we also expounded on how these were implemented in the data analysis. We further enumerated the steps that were taken to ensure the trustworthiness of data. Because the study involved human participants, we present the steps taken to ensure ethical compliance. We conclude the chapter by stating the limitations, risks and assumptions of the study.

CHAPTER 6: CONTEXT AND CASE DESCRIPTION

6.1 Introduction

This chapter describes the empirical context of the study. According to AT, an activity does not happen separately of its context (Recall Chapter 4). An activity itself is contextually situated in a social, cultural and historical setting, hence it is useful to understand these contexts in order to fully understand the activity under consideration. This chapter also provides some insight and background information useful for analysing and interpreting the participant experiences.

Section 6.2 presents the demographics of Kenya as the wider context in which the study is situated. Section 6.3 provides an understanding of the structure of the Kenyan health system that allows us to explore any structural as well as social implications on the participants in the healthcare-seeking activity. We present a high-level analysis of the maternal health sector in Section 6.4. This section explores the trends and statistics of maternal health, factors that have affected uptake of maternal services and insights on recommended standards that should guide maternal care services. Having stated that to achieve the goals for our study, we needed to control for lack of utilisation caused by potential lack of mobile ownership (Recall Chapter 5), Section 6.5 offers a background of the mobile technology landscape to justify why Kenya was considered an appropriate context for this study. Finally, Section 6.6 explains the history and development of our unit of analysis; the PROMPTS intervention which helps to situate the historicity of the tool as necessitated by AT (Recall Chapter 4). Section 6.7 offers a summary of the chapter.

6.2 Profile of Kenya

Moving away from centralised governance, Kenya adopted a decentralised governance system in 2013 (Nyikuri et al., 2017). In addition to increasing the administrative capacity of the public sector, a decentralised government was aimed at improving the delivery of public services and local governance (Hope, 2014). Thus, the country was administratively divided into 47 devolved semi-autonomous units of administration called counties (KNBS, 2014; Williamson & Mulaki, 2015). Within the health sector, this decentralisation moved service provision to the county governments, while the national government maintained policy and regulatory functions executed by the Ministry of Health (MoH) (Nyikuri et al., 2017). However, this move to decentralised

services resulted in the loss of resources for most county governments, as well as unclear lines of accountability.

The country is characterised by a relatively young population (Figure 6.1). Thirty-seven per cent (37%) of women and 39% of men fall into the 15-24 age group, while 34% of women and 32% of men are in the 25-34 age group (KNBS, 2014). Kenya has made progress in female education over the years and has achieved gender parity in primary education enrolment (Chege & Sifuna, 2006; UNESCO, 2012b). However, primary education is often not sufficient to ensure literacy (UNESCO, 2012a). Fewer women are likely to have completed secondary education or received tertiary education (KNBS, 2014). The 2014 statistics indicated that, though 93% of women age 15-49 had some formal education, only 5 in 10 had some or had completed primary education, 3 in 10 had some or had completed secondary education and 1 in 10 had studied beyond secondary education. Thus, gaps in female literacy still exist. Sixteen per cent (16%) of women lack basic literacy skills compared to 9% of men (UNESCO, 2012b).

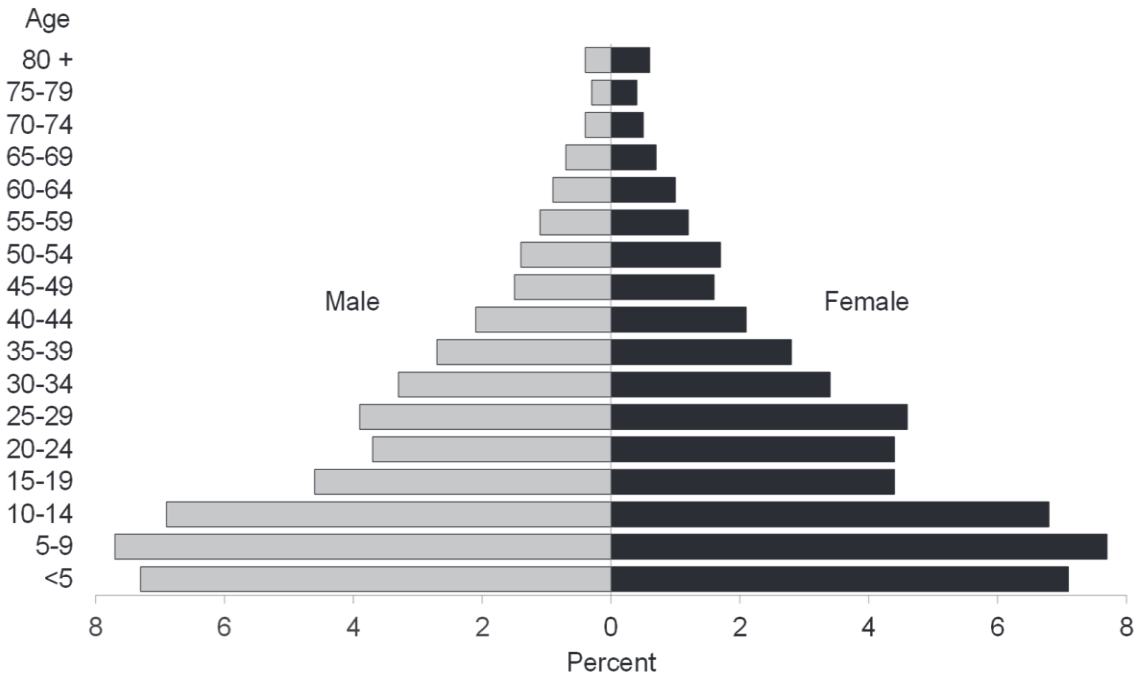


Figure 6.1: Age distribution by gender of the Kenyan population (KNBS, 2014)

The survey (KNBS, 2014) also found that more affluent women were more likely to be educated, with 31% of women in the lowest wealth quantile having no education, compared to 2% in the highest wealth quantile. This speaks to the empowerment that results from a higher economic

status, and subsequent exacerbation of conditions for those who are poorer. The survey reported that, generally, men are more likely to be employed than women, both in urban and rural places and that men are more likely to be paid for their work than women.

Close to half (48%) of women aged 20-24 are likely to be married while about 75% of the women in Kenya are married by age of 34 (KNBS, 2014). The age at which women first get married also increases with the level of education. Women with some secondary education got married about five years later than those with no education (KNBS, 2014). The demographic survey report attributed this to the years taken up acquiring the level of education, that indirectly contributes to delayed marriage. The financial independence that comes from working is facilitated by the level of education.

Though there is no clear pattern regarding earnings-related decision-making, the demographic health survey reported that there were few households with the husband/partner being the sole decision-maker of woman's earnings (KNBS, 2014). Most households indicated joint decision-making.

6.3 The Kenyan Health System

Though one of the objectives of the Kenyan Health Policy 2012-2030 is targeted at the delivery of affordable, efficient and equitable health services (Kimathi, 2017), the achievement is hampered by challenges in the Kenyan healthcare system. There is a wide range of healthcare facilities in Kenya which are run and managed by various players. These players include the government, faith-based organisations, Non-Governmental Organisations (NGOs), the international community and individual owners (Figure 6.2). As in 2015, Kenya recorded a total of 9,362 registered health facilities. Close to half of these were public, 40% were private and the remaining were faith-based organisations and private facilities (Ministry of Health, 2017a)

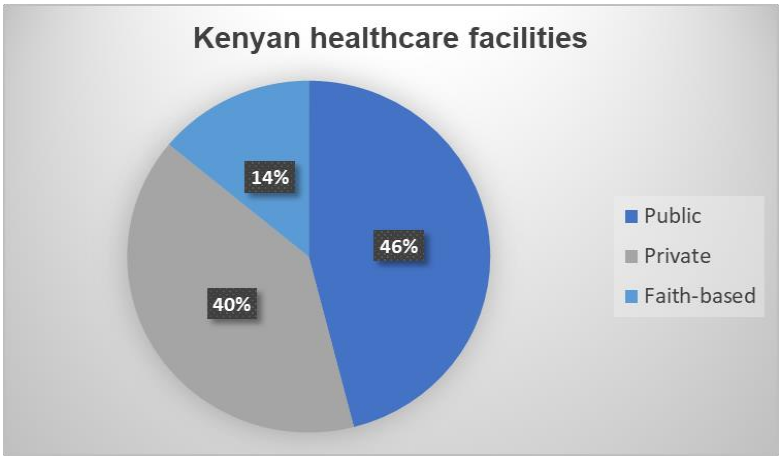


Figure 6.2: Distribution of facilities by ownership

Of the total number of facilities, 70% provided general antenatal care services and only 54% of these provided delivery services. This creates a supply challenge for maternal services. Generally, this might translate to a negative provider-patient interaction if healthcare providers feel overwhelmed.

In the devolved system, healthcare is organised in a four-tiered system, as in Figure 6.3. The county-level is responsible for three levels of care, including community health services with the mandate of promoting community involvement and serving as the first point of contact.

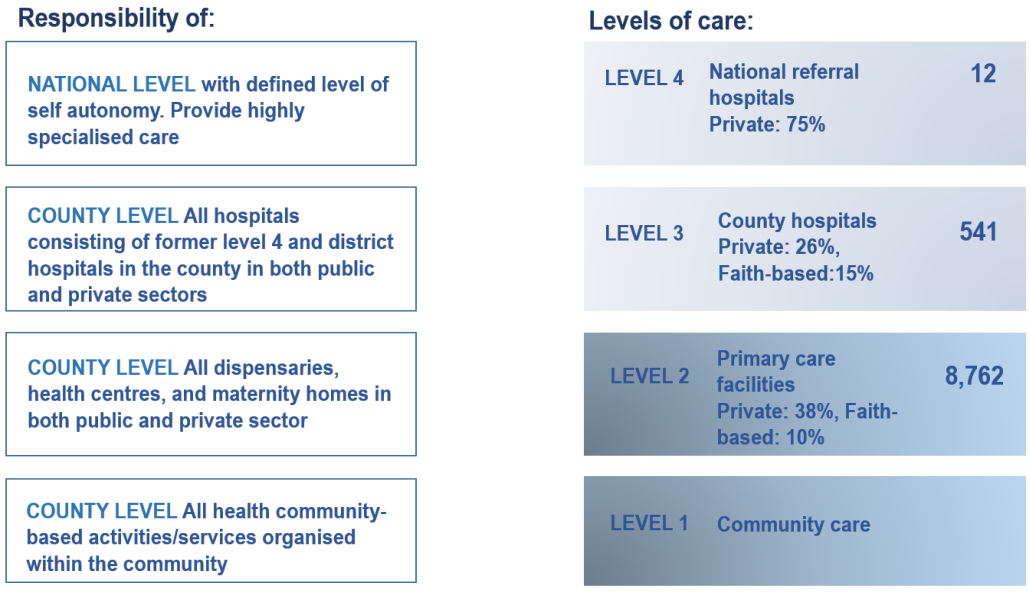


Figure 6.3: The Kenyan health system: levels of care (from PharmAccess, 2018)

To meet its mandate to provide Kenyans with the highest attainable standards of health, the "constitution has divided the healthcare responsibilities between the county and national governments" (Kimathi, 2017, p. 57). In this arrangement, the county government is responsible for health service delivery, while the national government manages the health policy, offers technical support to counties and manages national and referral health facilities.

6.3.1 Challenges facing the healthcare system

Table 6.1 summarises some of the most commonly identified health system challenges in Kenya. To begin with, just about two-thirds of Kenyans have a health facility located within an hour from their homes. Health services are unequally distributed across counties, with residents in some parts having to travel for more than two days to reach a facility (Kimathi, 2017). It is estimated that of the 47 counties, 50% have fewer than two facilities for every 10,000 people. This means that many Kenyans may still have no access to healthcare facilities and that the financial implication of reaching facilities when they are far may be a barrier for lower socioeconomic individuals. Dennis et al. (2019) suggest that the slow reduction in maternal mortality in Kenya may be partly attributed to the insufficient coverage of maternal health services.

Table 6.1: Highlights of Kenyan health system challenges

CHALLENGE	STATISTICS
Shortage of health facilities	50% of counties have fewer than two facilities for every 10,000 people
Low patient-doctor ratio	169 per 100,000
High cost of care	Health consumers are the largest contributors (36%)

The ratio of healthcare workers to the population stands at 169 per 100,000 which is below the WHO recommended ratio of 230 per 100,000 people. However, these statistics are not consistent across the board. Generally, there are discrepancies in the number of health personnel across counties. Counties closer to Nairobi, being the major capital city, are better resourced compared to their rural and marginalised counterparts (Kimathi, 2017). This unequal distribution in resources might be attributed to the devolution of health responsibilities, which necessitates that every

county appoints its public servants. But due to the shortage of funds that trickle down from the national government and high corruption rates among others (Kimathi, 2017), counties are unable to bridge the shortage of staff.

Compared to the mobile phone statistics described in Chapter 3 of about nine phones in 10 people, we can safely conclude that there are more phones per user population than there are doctors. It is no wonder then that mHealth-related innovations have gained so much popularity in Kenya, as they hold the promise to overcome some of the traditional healthcare challenges in providing care more equitably.

The other challenge that the Kenyan healthcare system presents is associated with the cost of care and who bears it. Though Kenya committed to allocating 15% of the government budget to the health sector in the Abuja declaration (Chuma & Okungu, 2011; Kimathi, 2017), the current allocation is estimated at 5.7% (Kimathi, 2017). This is a dismal allocation considering the already struggling healthcare sector. These cuts have negatively affected the quality of care and has meant that the Kenyan health system is largely underfunded. In a bid to bridge the gap, the healthcare system has relied heavily on 'out-of-pocket' payments by healthcare consumers (Chuma & Okungu, 2011), as well as a portion of taxes on employment income (Kimathi, 2017). This makes health consumers the largest contributors of health financing at approximately 36%, followed by the government and donors at 30% (Kimathi, 2017).

A majority of the population cannot afford 'out-of-pocket' payments on health care, and this is compounded by disparities in urban and rural, rich and poor (Chuma & Okungu, 2011; Ilinca et al., 2019). Though many private healthcare facilities have been established in response to the demand for healthcare, many poor people cannot afford the user fees and thus opt for public facilities, despite the perceived low quality of care in the latter (Ilinca et al., 2019). Since county governments receive less than 5% of the national health budget allocation (Kimathi, 2017); which has to be shared among the 47 counties, health financing at the county level is a cost-share between the county government and the health consumers.

Despite the health sector reforms, new policies and devolved healthcare services, the Kenyan healthcare system continues to face the same challenges that it faced ten years ago. Challenges in costs of healthcare services, unequally distributed resources, dependence on donors and

diminishing government financial support have remained persistent, as evidenced in previous reviews of the healthcare system (Ilinca et al., 2019; Turin, 2010).

6.3.2 The Kenyan eHealth policy

Following the increased growth and implementation of eHealth technologies including mHealth in Kenya, the eHealth policy was developed to address issues of sustainability and growth. The policy identifies eHealth as one of the vehicles that care providers will use to provide quality healthcare services, as entailed in the constitution. The policy attributes the accelerated deployments of eHealth innovations to the government's recognition of ICT as a key facilitator of development.

A Kenyan eHealth study (Njoroge et al., 2017) revealed that the lack of government involvement was one of the major limitations of successful eHealth implementation. The policy document is meant to act as a regulatory framework, to provide guidance on ownership of eHealth projects. The document details the principles that will help propel the health sector to achieve its main goal of making quality healthcare services more accessible through the adoption of eHealth innovations. These principles are briefly explained in Table 6.2.

Table 6.2: eHealth policy: guiding principles for eHealth success

GUIDING PRINCIPLE	SHORT DESCRIPTION
Equitable access to quality healthcare services using ICTs	By providing good quality information, eHealth should help mitigate the health inequalities from socioeconomic differences across regions
Patient-centred healthcare services	Involving patients in accordance with their preferences, needs and values
Standardisation of eHealth solutions	Appropriate standards for quality, confidentiality, privacy, security and integrity of health data
Integration into existing systems	Bringing together clinicians and health informatics in the development and implementation of eHealth
Participatory approach	Involve all the different key players in engineering, health, ICT, as well as end-users, This may necessitate public-private partnerships to accelerate eHealth adoption
Research and development	Use data from eHealth implementations to conduct further research

Other challenges that the eHealth landscape faces include the lack of public-private partnerships in eHealth implementations (Njoroge et al. 2017). This also means that most eHealth implementations such as mHealth are yet to be integrated into the wider healthcare system.

6.4 Maternal Health in Kenya

Maternal mortality ratio in Kenya stands at 510 in 100,000 (Dennis et al., 2019; World Economic Forum, 2015). In an attempt to lower these numbers, the government of Kenya has implemented policies such as the free maternity services in public hospitals across the country, to address coverage by reducing financial barriers (Dennis et al., 2019). This policy has since transformed to the 'Linda Mama' initiative. Linda Mama is a public-funded healthcare scheme that ensures that pregnant women have access to quality and affordable health services, delivered through the National Hospital Insurance Fund (NHIF) (Daily Nation, 2020). However, even with such developments in the maternal health sector, Kenya still falls far short of the SDGs and its target to reduce maternal mortality to 150/100,000 by 2030 (Gitobu et al., 2018). Free services may only serve to increase skilled deliveries at healthcare facilities, but have been shown to have no significant impact on maternal mortality (Gitobu et al., 2018). Hence, it is evident that using interventions to address maternal mortality is a complex phenomenon which requires the studying of various factors that could affect uptake, utilisation and impact.

6.4.1 Trends and statistics

Pregnancy-related deaths in Kenya have been attributed to the lack of skilled delivery. Statistics show that 61.2% of all deliveries take place in health facilities (KNBS, 2014). Though a high percentage (96%) of women in their reproductive age (15-49) receive ANC from a skilled healthcare worker, only 60% of these have four or more visits. Only 20% have their first ANC in the first trimester of their pregnancy, as recommended by WHO and stipulated in the ‘Linda Mama’ program in Kenya. ANC attendance is considered vital by WHO in contributing to the reduction of maternal deaths (WHO, 2018b). Half of the women who die during pregnancy in Kenya have never had ANC, and most women who die are experiencing their first or second pregnancy (Ministry of Health, 2017b). The majority of women continue to begin their ANC between months four and seven, with most beginning at the fifth month. Despite postpartum haemorrhage being a major cause of maternal deaths in Kenya and many other developing

countries, only 53% of women in Kenya are reported to receive postnatal care during the two-day critical period after birth. The statistics suggest that there might be more factors that affect health service utilisation by maternal health consumers.

6.4.2 Factors affecting uptake of maternal healthcare services in Kenya

Other researchers have highlighted the challenges facing the Kenyan healthcare system (Kumar et al., 2015). Some of these challenges include long queues which translate to long waiting times for healthcare consumers. In this study, it was observed that women often had to report to the clinic as early as 7:30 am and sometimes the ANC clinics would only begin at 10:00 am and close at 2:00 pm. The researcher observed that sometimes when a woman arrived late, she would be asked to come another time.

In addition to this supply-side challenge, other demand-side factors affect the uptake and utilisation of maternal services. The same KDHS report (KNBS, 2014) indicated that all women who attended ANC received the routine checks and care which included a blood sample, blood pressure and weight checks. However, only slightly more than half (58%) of them were informed on danger signs and pregnancy complications. A large proportion of women were uneducated about these complications and danger signs, the knowledge of which influences the delay to seek care (Recall Chapter 2).

Education and economic status mediate the maternal healthcare-seeking behaviour of women in Kenya. The KDHS noted that child delivery in a health facility increases with a woman's education and wealth status, with 84% of women with secondary education or higher delivering in a health facility compared to only 25% of women with no education (KNBS, 2014). Findings from other researchers (Gitonga, 2017; Nzioki et al., 2015) support the role of education as a critical factor in care utilisation in Kenya. The woman's position in society, health facility, physical proximity and weak health systems also contribute to delays in seeking care (Ministry of Health Kenya, 2017; Ronsmans et al., 2006).

User fees have for a long time played a critical role in enabling or limiting the use of maternal healthcare in Kenya. Some studies have shown that a woman in Kenya who has the necessary resources to pay for delivery is four times more likely to use skilled delivery (Nyongesa et al., 2018). However, despite access to free maternity services in public hospitals, the use of these

services is still below standard and necessitates the study of the role of other factors (Dennis et al., 2019).

In summary, some of the main contributors across the board which delay seeking maternal healthcare services include: access to financial resources for seeking treatment, proximity to the healthcare facility, not wanting to visit the facility alone and getting permission for treatment. These statistics based on the background characteristics of education, birth order and wealth quantile are summarised in Table 6.3. Most of the barriers are similar to those discussed in literature from developing-country contexts (Recall Chapter 2).

Table 6.3: Percentage distribution of women aged 15-49 and their utilisation of various maternal healthcare services based on background characteristics, according to KDHS, 2014.

Background characteristic	Delivery within a health facility	Informed on danger signs and pregnancy complications	ANC from a skilled provider (Doctor or Nurse)	Receipt of postnatal care	At least one problem in accessing care
Education					
No Education	25%*	36%	82%	21%	66%
Primary Education	67%	58%	97%	58%	48%
Secondary Education	84%	70%	99%	70%	34%
Birth Order					
1	79%	67%	97%	66%	39%
2-3	66%	60%	97%	57%	40%
6+	48%	48%	90%	31%	62%
Wealth Quantile					
Lowest	30%	45%	89%	31%	68%
Highest	93%	72%	99%	74%	24%

Note: The survey used different population sizes for each category. E.g. The sample size of women with no education was not the same as that of women with primary education. Thus, entries should not be totalled to 100%

*****For example, out of all the women with no education that were surveyed, 25% delivered within a health facility. (Apply similar strategy to understand all entries)

6.4.3 Provider guidelines for maternal healthcare services

In compliance with WHO recommendations for focused ANC (WHO, 2018b), it is recommended that pregnant women attend at least four targeted and personalised ANCs. The first one should be done within the first 16 weeks of pregnancy, the second at 16-28 weeks, the third at 28-32 weeks and the last one at 32-36 weeks. Services to be offered at the ANC include preventive services with regard to tetanus, malaria and HIV/AIDS, nutrition services including counselling on the proper diet, developing an individualised birth plan and education on danger signs and postpartum care.

6.5 Mobile Landscape and Mobile Innovations in Kenya

A systematic review of SMS-based mHealth interventions in developing countries by Deglise et al. (2012) reported that mHealth projects were mostly concentrated in South Africa, Kenya and India. A separate study by Lee et al. (2017) aimed at providing a spatial data analysis of mHealth projects in SSA found that there were generally more mHealth projects in the east of SSA with Kenya leading with the most mHealth programs, followed by Uganda and Tanzania. Therefore, being one of the countries that has become a hot spot for mHealth, Kenya can take a leading role in moving mHealth in SSA forward.

Other well known mobile innovations in Kenya have included M-Pesa, Kenya's mobile money service that has transformed the banking industry, and "Ushahidi" a crowdsourcing application that was used by Kenyans to report post-election violence (Aker & Mbiti, 2010). The growth in these innovations may be attributed to the exponential growth of the mobile technology industry in Kenya. Together with South Africa and Nigeria, Kenya's mobile economy ranks high in Africa (GSMA, 2018). In Kenya, mobile phone ownership has grown exponentially over the past decade from 33% in 2007 to an estimated 86% in 2018 (Pew Research Center, 2019). The Communications Authority in Kenya reported over 100% penetration rate attributed to multiple SIM card ownership among cellular subscribers (Communications Authority of Kenya, 2018). This growth in mobile technology has led to the budding of mobile innovations in the country, making it a hub of such innovations on the continent. mHealth is one such innovation that has presented the potential to leapfrog traditional healthcare barriers, and help meet the health SDG targets.

With the opportunities and conveniences for banking enabled by M-Pesa, the reliance on mobile devices to execute monetary transactions has continued to increase (Njenga, 2009). However, with the increased benefits in allowing banking and mobile money transfers, there has equally been increased financial frauds perpetrated through mobile phones (Wanjohi, 2017). Unsuspecting subscribers tend to lose money in social engineering scams (Buku & Meredith, 2012). In an attempt to guard users against such scams, the Communications Authority of Kenya encourages users to be suspicious of unsolicited messages and to never give out their personal information, amongst other measures (BBC News, 2018).

6.6 The PROMPTS Intervention

6.6.1 Background and description of the case

The PROMPTS innovation developed from a postnatal checklist intervention. CHWs were responsible for administering this checklist to women after birth. The intervention aimed to encourage the uptake of postpartum care services among women. The trained CHW delivered the checklist either by making a home visit or over the phone. The components of the checklist and their sources are described in the paper by McConnell et al. (2016).

However, due to the limitations of in-person home visits in a resource-constrained environment, and with the desire to reach more women, the program evolved into a mobile phone SMS service. The postnatal checklist messages were adapted for use as SMS. In this process of adaptation, the implementers consulted maternal health clients by inviting them to focus group discussions. These sessions aimed to solicit details of the information that women felt they needed after delivery, and this was combined with information that was prioritised by healthcare providers as being pertinent for antenatal and postnatal care.

The subsequent focus groups tested messages for language clarity and understanding, frequency preference and language preference. As an SMS intervention, the program was evaluated in 2017 in a randomised trial involving three hospitals. Messages were periodically adjusted based on maternal health clients feedback and common questions.

The program has since expanded to four other counties and has enrolled more than 25,000 women since May 2018, and answered over 30,000 questions. Continuous evaluations are conducted through phone surveys and focus groups for adaptation to new contexts. PROMPTS was

implemented as a free text-messaging platform to send staged messages and was combined with a clinician-supported helpdesk to answer questions (Figure 6.4).

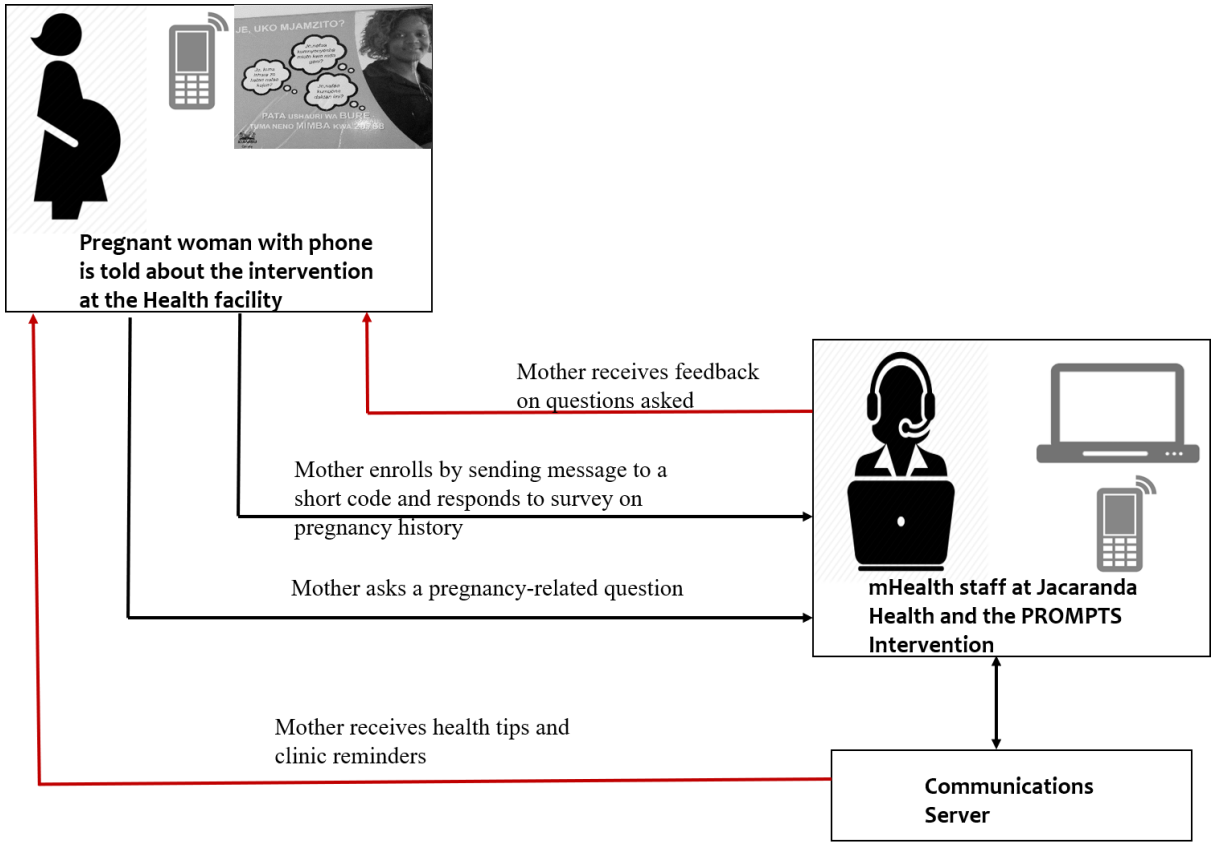


Figure 6.4: A diagrammatic representation of the PROMPTS architecture

6.6.2 Implementation of the PROMPTS intervention

This section is reported based on the field visits done before the actual data collection to engage with the empirical environment through observation. The researcher visited two of the three facilities with the highest mHealth service enrollment for two weeks; one week for each site. This was done to get acquainted with the context.

We observed that on the walls of the ANC section, the facilities had several posters showcasing the intervention. These posters were generally in the waiting bay where ANC clients waited to be attended to. A PROMPTS research assistant visited the clinics on certain days of the week to explain the intervention to the waiting ANC clients while encouraging them to enrol. Though the women were given an opportunity to ask questions about the intervention, none asked. After explaining the process of enrolling, the PROMPTS research assistant would go round to assist

women who were interested in opting in by directing them to send the word '*MIMBA*', Kiswahili word for pregnancy, to a short code also indicated on the poster. The SMS service would then require the woman to respond to an initial set of questions about her gestation age and whether she would like to receive messages in English or Kiswahili. Thereafter, the maternal health client would begin receiving messages based on her gestation age.

6.6.3 History of the PROMPTS intervention

Most activities are not an isolated unit, but rather nodes in hierarchies and networks of other activities that influence it (Kuutti, 1996). This section highlights the activity system (Figure 6.5) that led to the development of the PROMPTS intervention. By highlighting the previous activity, we elucidate the historicity of PROMPTS, being the artifact/tool that is mediating the healthcare-seeking activity under consideration (Recall Chapter 4). Tools are culturally developed, and hence they carry with them a particular history. These historical aspects of the tool shape the subject-object mediation and should be considered when thinking about human activities. The PROMPTS background is expected to provide insight in contextualising and understanding the interactions between the tool and the other elements of the healthcare-seeking activity.

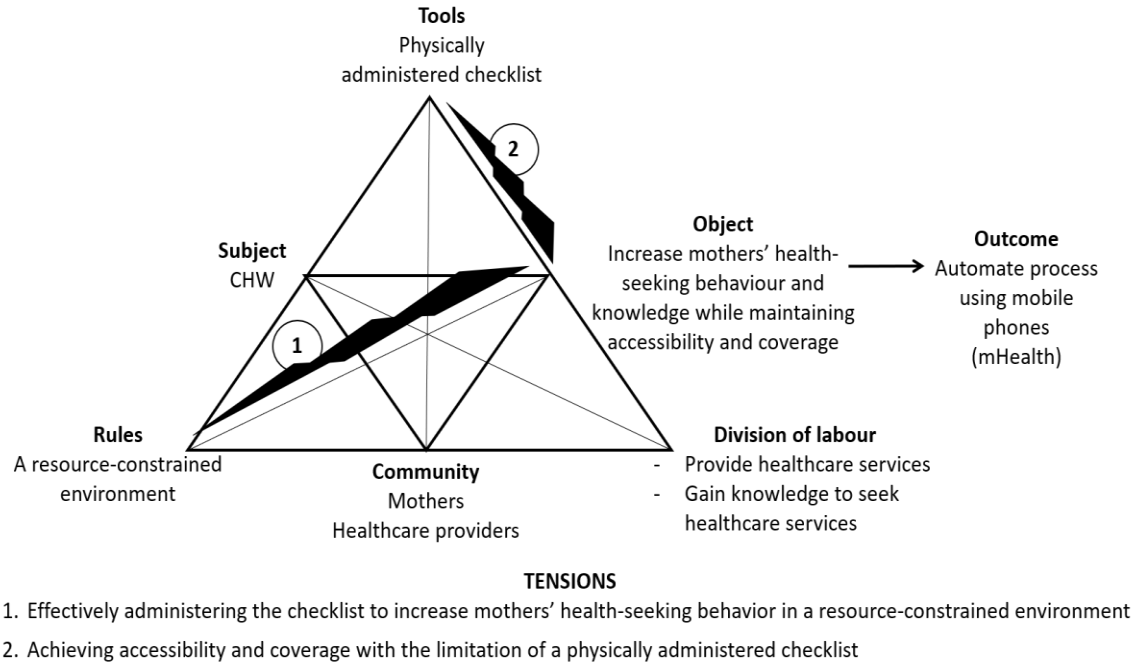


Figure 6.5: Provide postnatal care activity system

The two contradictions: 1) using CHWs in a resource-constrained setup while increasing accessibility and coverage and 2) achieving accessibility and coverage with the limitation of a human administered checklist, led to the development of the mHealth intervention. The mHealth artifact was thus developed to educate maternal health clients on pregnancy danger signs as well as to provide targeted pregnancy information to influence their use of maternal healthcare services during pregnancy. A sample of the messages sent to the women is provided in Table 6.4.

Table 6.4: Sample messages sent to women on the PROMPTS intervention

TOPIC	ENGLISH	KISWAHILI
CLINIC REMINDER	Did you know that consistent ANC care ensures the health of both you and your baby? At each visit, your provider will discuss important information about your pregnancy and may recommend scans or labs as needed. If you haven't started your clinics soon, you should go as soon as possible. It's never too early to start!	Je,unajua kufuatilia kliniki zote inakuhakikishia kua afya yako na ya mtoto wako iko sawa? Kwa kila kliniki muhudumu wako atajadiliana nawe kuhusu vitu za muhimu wakati huu wa ujauzito. Pia anaweza kupendekeza vipimi ama scan. Kama hujaanza kliniki yako, aanza hivi karibuni.
HEALTH INFORMATION	Did you know that certain cravings in pregnancy are related to iron deficiency? If you are craving things like ice chips, dirt or stones, it can mean that your iron levels are low and *this is unhealthy for both you and your baby.* Please discuss this with your healthcare provider at your next visit.	Je, unajua kuna hamu ambazo husababishwa na upungufu wa iron mwilini? Kama una hamu ya vitu kama chips, mchanga ama mawe, inaonyesha uko na upungufu wa iron na inaweza kudhuru afya yako na ya mtoto. Tafadhali jadiliana na muuguzi wako ukienda kliniki
SEX	Hey mama, do you wonder if it is OK to have sex during pregnancy? Actually, women who have an uncomplicated pregnancy may have sex until they go into labour. Sex does not harm the baby. But, there are circumstances where you may need to avoid sex like a very low placenta or preterm labour. If you are unsure, please discuss this at your next clinic!	Je umewahi jiuliza kama ni sawa kushiriki ngono wakati wa uja uzito? Kwa kweli baadhi ya kina mama walio na uja uzito usiokuwa na shida wanaweza shiriki ngono hadi wakati wa kujifungua kwani sex haina madhara kwa mtoto. Kuna nyakati au hali zinazoweza kukufanya uepuke kushiriki ngono kama vile ukiwa na placenta ya chini, au kina mama walio na uchungu wa kujifungua kabla ya wakati. Iwapo hauna uhakika muulize muuguzi wako ukienda cliniki.

Table 6.4 (continued)

SUPPLEMENTS	It is important to take a prenatal vitamin every day with enough iron and folic acid to maintain a healthy pregnancy. Other good sources of iron are meat, lentils or beans. If you are not already taking a prenatal supplement, please ask your healthcare provider.	Ili kukua na ujauzito ulio na afya, ni muhimu utumie supplements zilizo na iron na folic acid. Pia unaweza kula chakula kilicho na iron kama aina zote za dengu, maharagwe au nyama. Kama hujaanza kutumia hizo supplements tafadhali mwambie muuguzi ili akupe.

6.7 Chapter Summary

This chapter provided a detailed description of the context. We highlighted the health sector demographics, presented the maternal health statistics and some barriers to the uptake of maternal health services by health consumers in Kenya. The findings in this chapter indicate that on the supply-side, barriers to utilisation of health services are mostly related to the shortage of both physical as well as human resources. On the demand side, factors include the lack of knowledge, high costs, low socioeconomic status, education levels and other socio-cultural factors. These challenges are similar to those identified in the literature on health service utilisation in developing countries (Recall Chapter 2). We argue that having achieved high mobile technology growth, while at the same time experiencing high MMR like most developing countries, Kenya presents a suitable country context to study the phenomenon. The high mobile ownership and penetration rates allow us to control for mHealth barriers that may be linked to lack of phone ownership and poor mobile infrastructure. On the other hand, high MMR allows us to study other factors that may be affecting the uptake of maternal health services within this context. Such data may be useful in shedding light and offering an understanding of how the design and implementation of these innovations can be improved to increase their overall success. Finally, the chapter ends with a detailed description of the development and implementation of PROMPTS. We highlight that the innovation was, in fact, a result of systemic contradictions in a separate activity. By so doing, we present the historicity of the tool as necessitated by AT.

CHAPTER 7: FINDINGS

7.1 Introduction

This chapter presents the findings of the study based on the concepts and principles of AT. We use excerpts and vignettes to support the findings from our analysis. The vignettes are data stories that combine multiple accounts of various participants into one story. In the past, vignettes have been used as hypothetical accounts in qualitative and quantitative studies where the issues being researched are sensitive (Gourlay et al., 2014; Hughes & Huby, 2002). Some studies (e.g. Anzul et al., 2003) have shown the value of vignettes in presenting findings in qualitative studies. In this study, the vignettes were not hypothetical. We developed the data stories using the verbatim accounts of the respondents. In using vignettes, we desired to bring out a detailed description of the experiences of the study respondents than would be captured using single quotes. These vignettes contribute to offering a "thick description" to capture realities and meaning within the setting (Cousin, 2005).

Section 7.2 provides an overview of the healthcare-seeking activity. Section 7.3 describes the maternal health clients in their role as subjects within the activity system. Sections 7.4 through to 7.10 describe the maternal healthcare-seeking context and interactions in three broad categories:

- Pregnancy and its socio-cultural norms
- Maternal healthcare-seeking related behaviour
- mHealth and mHealth interactions with the context

We describe this context and interactions through the lens of AT concepts. A summary of the chapter is offered in Section 7.11. Most of the empirical findings were similar to those drawn in pregnancy and maternal healthcare-seeking literature. Consequently, though we accessed these findings from a sample of respondents, we assumed that their perceptions were representative of the wider community beliefs, norms, practices and behaviour.

7.2 Overview of the Maternal Health Clients' Healthcare-Seeking Activity

The ultimate cause behind human activities is needs (Kaptelinin & Nardi, 2006 p. 60). The findings in this study show that the healthcare-seeking activity was motivated by the maternal health

clients' need to achieve a healthy, successful pregnancy. In light of this need, the goals for maternal health clients were two-fold:

(1) access pregnancy-related care and support
(2) access information

These goals both directed and motivated their mHealth mediated healthcare-seeking activity. Consequently, the use of mHealth was an action within the healthcare-seeking activity targeted at achieving these two goals. Karanasios (2018) corroborates this thinking. He posits that in the IS context where an activity is mediated by an IT artifact, users' interaction with the technology can be viewed as an action. How the maternal health clients realised this action was dependent on the conditions under which the users operated. Our analysis did not explore operations, since these may have been cognitive subconscious processes (Recall Chapter 4) that this research was not equipped to access. However, we examined the manifestations of these subconscious processes in how maternal health clients interacted with the mHealth intervention. Figure 7.1 elaborates this hierarchical structure of the healthcare-seeking activity as conceptualised by the researcher based on the data. The illustration lays a foundation on how we understand the interactions within the activity system.

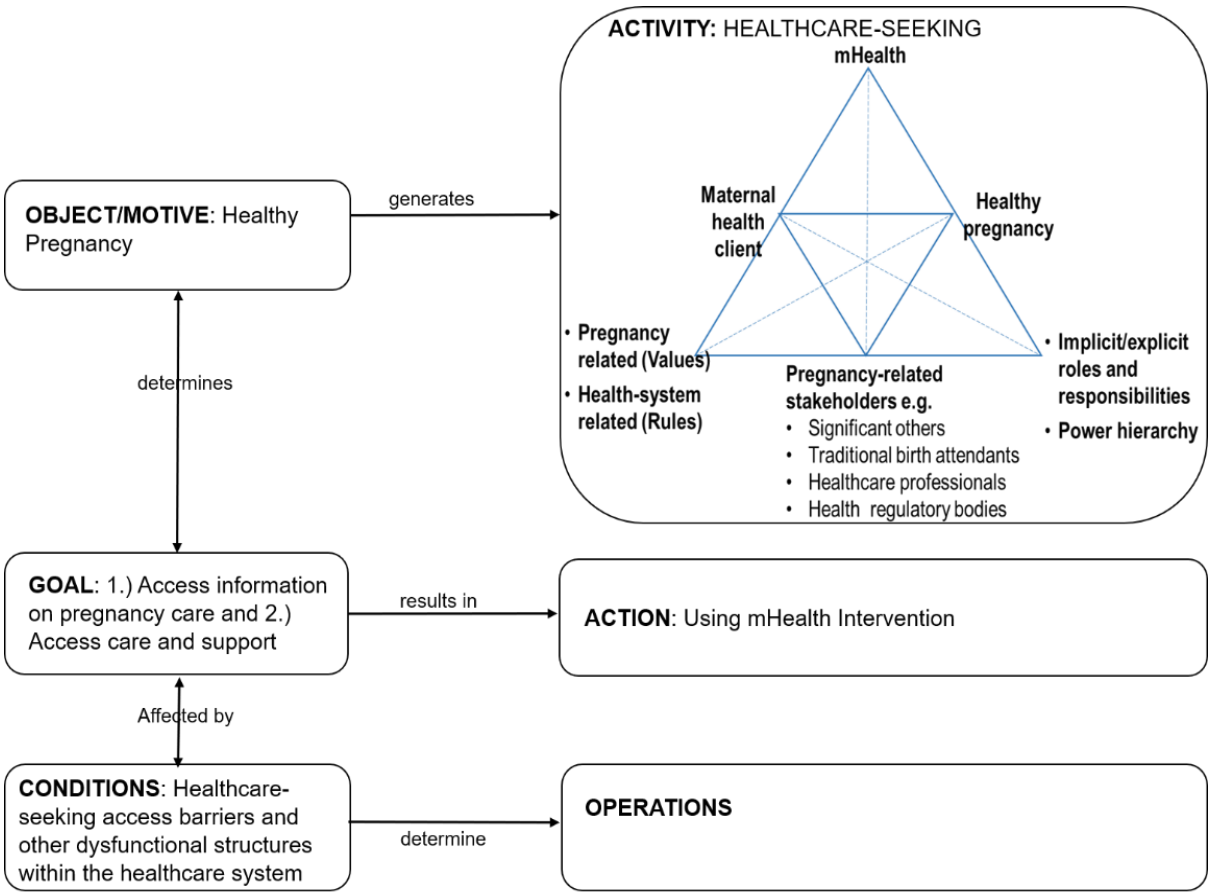


Figure 7.1: Hierarchical structure of the maternal health clients' healthcare-seeking activity

7.3 Description of the Subject

7.3.1 The maternal health clients

Most maternal health clients living in urban/peri-urban areas lived away from their extended kin in rural places. This phenomenon is explainable by the rural-urban migration that SSA has experienced from increased urbanisation. In part, the migration is due to high poverty levels that are associated with undeveloped rural economies (Agesa, 2004; Saghir & Santoro, 2018). The relocation is, therefore, necessitated by the desire for better livelihood through increased employment opportunities and increased access to better social services, which include health and education (Agesa, 2004; Beguy et al., 2010). Most times, this migration begins with the male members of the household such as the husbands. Though male migration is mostly motivated by the prospects of a better livelihood, females typically migrate in order to be with their families (Beguy et al., 2010). The evidence of the extensive rural-urban migration can be seen in the

temporary migration back to the rural places during long festive seasons. In Kenya, travel peaks as people travel back to their places of origin to join their kin for celebrations (Beguy et al., 2010). Other than periodic visits, another mechanism by which such individuals may maintain social ties and loyalty is by maintaining social and cultural norms and values that are similar to those of the places of origin (Falkingham et al., 2012).

Living away from kin may affect women's healthcare-seeking behaviour. Kin support has always been an important aspect of relationships in SSA (Kankonde, 2010). Pregnancy literature shows that female kin support is core to the context of maternal healthcare-seeking (Recall Chapter 2). Women have especially relied on kin support for responsibilities related to child care and other areas that are considered female domains (Clark et al., 2017). Therefore, being away from kin significantly reduces kin support for women (Madhavan et al., 2018). This disadvantage may increase the impact of the opportunity costs related to visiting the healthcare facility (Recall Chapter 2) or limit the networks of care and support for pregnant women, as seen in Nyakang'o and Booth (2018). These challenges may be particularly heightened for poor women living in urban areas, because of the difficult dilemma for the need to work as well as fulfil the female responsibilities at home (Clark et al., 2017).

In addition, among most lower socioeconomic families in Kenya, once a young woman gets pregnant outside wedlock, getting married or moving in with their partner is seen as an immediate solution. These steps ease the financial burden of taking care of the child as responsibility is relegated to the husband's family (Gitau et al., 2016) and may also be a way to deal with the stigma that arises from being pregnant outside of wedlock (Recall Chapter 2). These realities may explain why it was challenging to find single mothers to participate in this study. Among the sample, even the younger women indicated that they were married. We also observed that married as status was a social construct. Thus, two people who had moved in together as necessitated by a woman's pregnancy often described themselves and lived as a married couple. This social construction may explain why we did not observe any differences among the participants in terms of their marital status.

7.3.2 Mobile phone ownership among maternal health clients

Ownership of a mobile phone does not always translate to increased female autonomy linked to mobile phone opportunities. Relationships with male partners may complicate the role that mobile

phones play (Porter et al., 2020). Silberschmidt (2005) posits that where traditions of patriarchy condition men to expect total control, female phone ownership may threaten male control. The authors advance that this vulnerability is more likely among lower socioeconomic groups. In these groups, male partners may exercise some form of control over the woman's phone to keep track of any mobile communications (Burrell, 2010, a study of rural Uganda). In addition to male control, limited empowerment from phone ownership may also be attributed to control of household resources. Where men control a household's income and women have limited resources of their own, they may be forced to depend on men's generosity for airtime (Porter et al., 2020). These socio-cultural dynamics around female phone ownership and use may explain the following observations in this study:

> *"During recruitment, most women mentioned having to ask their husbands for money to come to the health facility. Some of the women who had agreed to participate and had preferred to meet at the health facility did not show up on the appointed date. They later explained that they did not have money to come to the meeting venue "* [Researcher's diary].

Most women reported no regular income, and this might have explained the reliance on their male partners, whose socially defined responsibility was to provide for the family. "*He is the provider*" [Mother 3], so he has to "*cater for fare to go to the hospital, food to eat…and clothing*" [Mother 14]. We also observed that some maternal health clients could not be involved because their husbands did not allow them. The women obliged because doing otherwise *"might cause conflict, and I didn't want that"* [Mother 9].

For some of the women, it was their husbands who received their phone calls even though all women indicated that they had their own phone. During interviews, the women reported that their partners knew about the mHealth intervention that they were using.

> *"I thought that the women were sharing the PROMPTS pregnancy-related information with their husbands. In later interviews, I learnt that the partners knew about the intervention because they read through their wives' messages. I have had some interviews at the homes of the women. Whenever I have asked the partner, where present, if he would mind excusing us, I noticed that he would walk out with both the woman's phone and his phone "* [Researcher's diary].

7.4 Socio-cultural Values of Maternal Healthcare-seeking

This section explores the implicit pregnancy-related rules shared among participants of the healthcare-seeking activity, which we referred to as values (Recall Chapter 4). These values defined the behaviour, actions and practices that were considered acceptable in the maternal healthcare-seeking context. As such, these implicit rules influenced the women's maternal healthcare-seeking behaviour and subsequently played a role in how women interacted with the mHealth intervention.

7.4.1 Health consumers' perceptions on the use of maternal health services

Similar to the findings in other studies, pregnancy was seen as a normal condition, with some of the potential risks being considered a natural part of the journey (Atukunda et al., 2020; Mumtaz & Salway, 2007; Zamawe, 2013). Consequently, the women indicated seeking care only when they experienced something that was deemed to be unusual or when a symptom persisted. The partners shared a similar opinion regarding when to seek care.

> *"If she falls sick before the required time [referring to pregnancy-related symptoms], she might start attending the clinic earlier… [After she starts the clinics], if there is anything serious before the clinic appointment, then the mother can go back to the clinic"* [FGD Men].

Other studies (Atukunda et al., 2020; Uldbjerg et al., 2020) observed similar behaviour among women in developing country contexts. Following their perception of pregnancy as a natural process, these women sought services only when complications arose.

The maternal health clients in this study demonstrated a similar behaviour with the mHealth intervention. Most women reported asking questions only when they were *"in pain, or I felt something that I didn't understand…"* [Mother 12].

Similar to Ugandan women in Uldbjerg (2020), the women and their partners in this study believed that the appropriate time to start ANC was when the pregnancy began to show. Consequently, many women sought maternal care in the second or third trimester. *"…whenever the pregnancy becomes visible; she should start attending the clinic"* [FGD Men].

In addition, women's perceptions about the HCPs informed their interaction with maternal health services. Women reported not seeking pregnancy-related information from the care providers when they were rough and unkind. This finding is similar to other studies that have explored the

role of providers on the uptake of maternal services (Gabrysch & Campbell, 2009; Mannava et al., 2015). Such negative perceptions towards HCPs among maternal health clients led to a preference of TBAs, as also observed by other studies (Atukunda et al., 2020; Dako-Gyeke et al., 2013; Uldbjerg et al., 2020). The women perceived the one-on-one services that the TBAs offered to be superior to the HCP's services. Nevertheless, most maternal health clients agreed that the alternative services did not replace those of the healthcare providers.

7.4.2 Maintaining secrecy of the pregnancy

The women and their partners in this study perceived pregnancy as an uncertain period. Consequently, the women had to keep the pregnancy secret to mitigate the uncertainties which had their roots in:

(i) the physiological nature of pregnancy with possibilities of failing to culminate in birth

(ii) the belief in the 'evil eye' that may interrupt the pregnancy leading to its loss or to an undesired outcome

(iii) the result of being an inexperienced mother and following the wrong information given by people.

These uncertainties informed the women's healthcare-seeking behaviour in a bid to safeguard the pregnancy from these unwanted outcomes. With regard to uncertainties from the physiological nature of pregnancy, the mothers indicated that it was better to do certain things after the baby was born, like buying the baby's clothes. They felt that *"you might end up not giving birth to the baby"* [Mother 20], hence it was better to wait. The loss they mostly referred to was from the premature failure of the pregnancy through a miscarriage.

Both the mothers and their partners considered sharing the news of one's pregnancy a bad idea.

> *"Some people are not good and they might do some things that might cause you to lose the pregnancy through miscarriage"* [Mother 4].

> *"We live with different types of people with different motives, and some are jealous, and they might look at [the pregnant woman] with an evil eye and cause a miscarriage or stillbirth"* [FGD Men].

Most primigravidae women felt that their inexperience in pregnancy left them in a precarious position. *"…the first pregnancy is normally tricky because you don't know what to expect…"* They also felt that it was not prudent to rely on other people because "*someone might give you misleading information which might hurt you and the baby…"* [Mother 26].

How women engaged with maternal health services was shaped by some of their past experiences with these uncertainties. *"After having the three miscarriages, I decided to be free and open up more with the healthcare providers because I believe that when you ask you will be answered but when you keep quiet, then nobody will know what is bothering you"* [Mother 10]. A similar observation was made by the reviewed KDHS report (Recall Chapter 6) which noted that women who had experienced challenges in past pregnancies were more likely to seek ANC care than women who never had any problems.

These uncertainties also shaped why the women adopted mHealth. Interacting with the intervention's information was a means of gaining reassurance regarding the pregnancy, *"so that the baby's growth can be monitored, and she ends up with a successful delivery"* [FGD Men]. The need for information was particularly cited more among first-time mothers.

Other studies (Graner et al., 2013; Mathole et al., 2004) have also noted the need for reassurance among pregnant women and the surveillance of foetal development. Multiparous women who had never had a pregnancy complication seldom expressed the need for reassurance. Similar results were noted by Mathole et al. (2004), where primigravida and nulliparous women (those that were pregnant for the first time or had never given birth) engaged more with ANC services to be reassured that the baby was growing well. In contrast, older women who had not had any complications before often felt experienced and found it unnecessary to seek care in subsequent pregnancies (Mathole et al., 2004).

> *"I engaged [the doctors] more in the first [pregnancy] because I didn't know anything. With this [current pregnancy], I felt that I had the experience. With the first baby you don't know anything and anything they tell you [to do], you do"* [Mother 22].

7.4.3 Pregnancy and social status

The findings in this study suggest that pregnancy is associated with some form of social status for the woman. As such, a pregnant woman could attract envy from other women. Consequently, mothers in this study reported the need to guard their pregnancy. They felt that their pregnancy could be jeopardised because *"there are people who are very envious and they might be involved in witchcraft and they might do things that might affect [the] unborn baby"* [Mother 4]. Because their pregnancy could be a source of jealousy, there was a need to be careful and keep the pregnancy secret until they delivered.

> *"I am not supposed to share with anyone about my pregnancy. I can only tell my mum or my aunt, but it has to be someone that I am very close with. If someone is not happy about your pregnancy or if they are your enemy, then they might do something that might hurt your pregnancy"* [Mother 8].

This finding is consistent with previous literature suggesting that, in most developing countries, and especially among uneducated women, childbearing is women's means of gaining social status (Farré, 2013; Thaddeus & Maine, 1994). Other studies have illustrated that child birth may offer an opportunity for women to demonstrate courage and honour to their families (Atukunda et al., 2020; Sargent, 1985). In most African settings, barrenness in women is considered a curse. Therefore, pregnancy may provide a means to disconfirm this notion, allaying a woman's fears and gaining acceptance into the family in which she is married. This acceptance into the new family safeguards the economic security for the women (Mboho et al., 2013).

In addition to the status gained in the community, we observed that pregnancy gained the woman status in her immediate family during the period of pregnancy. For example, even though the men were the major family decisionmakers, pregnancy-related decisionmaking was one in which the woman was involved, and her voice heard. This new status may have been attributed to the sensitivity of pregnancy, coupled with the value placed on children in this society.

> *"I will tell my wife my views and then she will tell me whether we should go to the traditional birth attendant or the health care provider… I respect the mother's opinion, and if she tells me that she wants to go to the hospital, I cannot stop her because if anything happens, I don't want to live with the guilt"* [Partner 2].

7.4.4 Pregnancy taboos and properness

We use *'properness'* to refer to the acceptability of a woman's pregnancy based on a group's values, and perceptions of when the 'right' time is for a woman to be pregnant. In our study, it emerged that pregnancies at an early age of a woman's life (in her late primary or early secondary school years) were looked down upon as inappropriate. This was especially true if the young woman at the time of her pregnancy was still in school pursuing these levels of education. Women at a higher level of secondary education were less stigmatised from getting pregnant. The younger, pregnant women felt ashamed to dicslose or acknowledge their pregnancy. The concept of shame in pregnancy has been highlighted before. When pregnancy was seen as an obvious manifestation of sexual activity, pregnant women avoided public spaces, including seeking for ANC (Mumtaz & Salway, 2007). Negative maternal healthcare-seeking behaviour among younger women may be linked to fear, shame and desperation from unwanted pregnancies (Magadi et al., 2000, 2007; Thaddeus & Maine, 1994).

The women identified many taboos related to pregnancy. Of interest to this study was the taboo on discussing certain pregnancy-related topics like sex and pain or problems in areas that the women felt they could not openly discuss. For example, maternal health clients maintained that they were not free to discuss when they had a vaginal discharge and when they wondered if having sex during pregnancy would harm the baby. Talking to people face-to-face about such matters was accompanied by shame and the fear of being 'judged'. Consequently, in face-to-face interactions, the women did not readily engage HCPs or other stakeholders, even when they had questions on these subjects.

> *"There are questions that you might be uncomfortable asking the care providers because after asking them then they will be giving you that look every month; they will be looking at you as if they want to confirm if you got help for the previous issue you had"* [Mother 3].

Consequently, the use of the mHealth intervention afforded the women an opportunity to engage more openly with these sensitive pregnancy-related topics. The intervention eliminated the need for face-to-face communication and increased anonymity.

> *"I became even more comfortable [when I was using PROMPTS] because I was using the mobile phone to ask. I didn't have to worry about anyone; at times when you are [in face-to-face] contact*

with someone, you fear[to ask] because they might judge you. But over the phone, I just send a message" [Mother 4].

"Since you don't know the person on the other end, you can easily text without thinking the other person will judge you" [Mother 16].

"You see, sometimes one feels awkward asking someone something that is private … but through the phone, you feel free because the person you are asking doesn't see you" [Mother 13].

7.5 Rules Imposed on Maternal Healthcare-seeking by the Healthcare System

This section explores the explicit norms (referred to as rules – Recall Chapter 4) that were imposed by the healthcare system. As elucidated in the context description in Chapter 6, the healthcare system to which the healthcare-seeking activity belonged to, operated autonomously of the PROMPTS mHealth intervention. However, being part of the community to which the activity of a woman's healthcare-seeking belonged to, the activity system inherited some of its rules from this wider context.

For mothers to deliver at the hospital, they needed to have a clinic card also referred to as '*Linda Mama*' card, which granted them access to hospital facilities and care during the delivery process. Access to the health facility for delivery, and fear for being reprimanded by healthcare workers for not having the card, motivated their reasons for attending ANCs at the health facility and informed when and why the mother attended her first ANC. The fear of HCPs may have been a factor of the context. From the researcher observation, we noted that patient-provider interactions were characterised by '*yes'* and '*no'* responses on the side of the patients. Another study in a developing country context (Atukunda et al., 2020) reported women's fears to be reprimanded by HCPs when they did not have a clinic card. The need for antenatal cards has therefore been reported as a common motivation to attend ANC in LMICs (Finlayson & Downe, 2013; Zamawe, 2013). HCPs may refuse to admit pregnant women who do not have their clinic cards (Finlayson & Downe, 2013; Mrisho et al., 2007). Thus, the power and authority of those in high positions (in this case, the healthcare providers) might be seen as one of the primary motivators for using maternal health services.

Following the first ANC attendance, mothers felt that they could only go back to the clinic on their next appointment as scheduled by the HCP on the clinic card. Mothers rarely went back to the health facility before the appointed date even if they had a question. They would generally wait to consult the HCP in their next ANC visit if necessary. However, mothers who had a previous history of pregnancy-related complications were more willing to visit their healthcare provider in between ANC appointments; whenever they recognised their symptoms as potential danger signs that could harm their pregnancy.

> **VIGNETTE DEMONSTRATING RULES IN THE HEALTHCARE-SEEKING ACTIVITY:** *The first time when I came [for ANC] at eight months, I was so scared because I knew the healthcare providers were going to ask me where I had been all those months, and why I had not come to the clinic earlier. And in some cases, if you never used to go for the clinics, and then you go to the hospital at the last minute to deliver, some healthcare providers can send you away. [I was lucky] because I had received my clinic card where I used to attend the [ANC] clinics before. And so when I [travelled] back to my rural home and my due date came [to deliver], I was not asked many questions [by the doctors in this other facility], because I used that same card [that I had received before] for delivery. So it's crucial that even if you are using the traditional birth attendants, you should ensure that you also have a clinic card. [The card is also important because] they write the next [appointment] days when I should go back to the clinic. That is what I followed.*

Despite the health system-imposed rules to attend ANC early, some women felt that there was no point adhering to this because *"At times you would go [to the healthcare facility] and they would just tell you that your pregnancy is still young, and you should come back later"* [Mother 20]. This may have been the case because the facilities relied on manual methods to confirm the pregnancy. The facilities in this study did not have an ultrasound machine that is used in most private facilities. As noted in the context description (Chapter 6), public health facilities in Kenya are more likely to be under-resourced than private facilities. Such is likely to be the case in most public health facilities in LMICs (Ilinca et al., 2019; Mannava et al., 2015).

7.6 Information-Seeking Actions and Interactions in Maternal Healthcare-seeking

In this section we expound on various actions and interactions related to information-seeking in the maternal health context. As noted earlier, the women engaged in pregnancy-related information-seeking as one of the actions to achieve their object of a healthy pregnancy and, ultimately, the desired outcome.

7.6.1 Choosing information sources

The uncertainties of pregnancy informed the choice of pregnancy-related information for maternal health clients. Table 7.1 summarises these preferences. The women indicated that it was better to have a few sources of information so that one could track if something went wrong. *"I opted to get advice from one person, rather than listening to too many people, so that if anything goes wrong, then I would know who misled me"* [Mother 9].

When needing to seek information before their interaction with the PROMPTS intervention, the maternal health clients relied on older and/or experienced female individuals. Most women preferred to ask their female kin because they trusted them to have their best interest *"…you know those people are related to me and when I ask them anything they cannot lie to me"* [Mother 22]. However, seeking information from the trusted kin was not always possible because these individuals lived in rural areas, away from the maternal health clients. Hence, consulting these folk required the women to have airtime on their phones to make a call. *"My sister-in-law and mother-in-law are very far, and I have to use my airtime to [consult] them"* [Mother 22]. Because of strained economic resources, phone airtime was not always accessible. The women consequently found themselves relying on other female individuals within their proximity. *"Whenever I had any pregnancy-related questions before I started using the SMS service, I would ask friends or the elderly women where I stay, or my neighbours who were experienced..."* [FGD Women]. However, this meant involving multiple people in place of the few trusted sources, as a way to establish the accuracy of the information that was shared by comparing the sources.

Table 7.1: Characteristics of preferred information sources for maternal healthcare-seeking

PREFERRED CHARACTERISTIC	MOTIVATION FOR THE PREFERENCE
Few information sources	For traceability of any harmful consequences
Trustworthy sources	Mitigate pregnancy uncertainties
Accessibility and availability	To help the maternal health clients to monitor and track pregnancy by knowing what is happening or what to expect
Confidential/Anonymous	Maintain pregnancy secrecy, hence mitigating uncertainties
Benevolent	The desire for maternal health clients to feel 'cared for'
Completeness	To help monitor and track pregnancy by having all the required information

Ultimately, the women did not consider the dependence on other people for pregnancy-related information ideal. In addition to the aforementioned challenges, these individuals were not always available when the women needed them.

> *"Sometimes, when asking involves a person, you have to go and look for him/her, and sometimes you find that the person is not around. So, you'll have to wait with your problem"* [Mother 17].

In the maternal healthcare-seeking context, the women preferred information sources that expressed care, patience and kindness.

> *"I preferred speaking to my granny because she was more polite with me and she would explain things to me calmly. You know mothers can be harsh at times, so my granny was my preferred choice"* [Mother 8].

In light of this preference, HCPs were not a very commonly cited sourced of information because the women feared them. *"I was told you can ask a question and they [the healthcare providers] answer you rudely or they get upset at you"* [Mother 28].

Since pregnancy was surrounded by secrecy, women preferred confidential information sources. *"Sometimes you can go to somebody, and you share your experience with that person. When you walk out, you hear some people talking about what you shared. It feels very bad"* [Mother 17].

These preferences influenced maternal health clients' mHealth utilisation. *"…the [intervention] kept encouraging me to do this and that, and that really made me feel cared for"* [Mother 26]. The women appreciated the completeness of the mHealth messages. *"It was the detail in the information that I liked"* [Mother 27], and *"I realised they were sending me all the information that I needed"* [Mother 28]. They also used the intervention because *"you can talk [freely] since you don't know who you're talking to"* [Mother 17]. The anonymity gave the women a sense of confidentiality of the intervention. They also felt that by using the intervention, they would be able to *"ask questions and get a response quickly"* [Mother 16], hence giving the perception of being more accessible and available.

7.6.2 Consumers legitimising the information

Legitimising the information sources was considered necessary by the maternal health clients to establish the credibility of the pregnancy-related information, given the various uncertainties. Legitimacy is defined as "a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions" (Suchman, 1995 p. 574). We explored how mothers legitimised health-related information, including those that they received from the PROMPTS intervention.

Because trustworthiness of the information was critical to the pregnancy experience and outcome, the women adopted various legitimisation strategies. The findings suggest that the women:

- Compared new information with existing knowledge
- Compared information across multiple sources

The women determined the information's reliability against a priori knowledge. *"At times there are some questions you sort of already have the answers, but you just ask to make a comparison"* [Mother 27]. Previous studies allude to this behaviour by indicating that patients' compliance with a health system's advice is sometimes based on the recommendation fitting in with the patient's perception

of the situation (Jimison et al., 2008). When one trustworthy source was not available, the women established the credibility of the information by comparing across multiple sources.

> *"I had two sources of information, the SMS and the doctors at the clinic. After receiving the messages I would verify some of that information by asking the doctor the same questions, and that led to the total trust because I saw that the information was accurate"* [Mother 10].

The behaviour of engaging multiple sources of information and care-seeking has been noted by other researchers (Aikins, 2014; Graner et al., 2013) as a process of legitimation based on pluralistic knowledge (Aikins, 2014). The need to validate health-related information is often the reason for this behaviour. We also attribute this behaviour to the sensitivity of pregnancy as described by the women and, consequently, the amplified need for accurate information to guard against uncertainties.

The findings show that the women achieved the legitimisation of the mHealth intervention based on three main aspects (summarised in Table 7.2):

1) Legitimisation from perceived personal gains
2) Legitimisation by association
3) Legitimisation by 'character of the tool'

Table 7.2: How the mHealth intervention was legitimised by the users

LEGITIMISATION SOURCE	DESCRIPTION
Legitimisation from perceived personal gains	- Ask questions at any time - No additional cost - Saving time - Access to information
Legitimisation by association	- Associated with the health facility (a trusted entity)
Legitimisation by 'character of the tool'	- Truthfulness - Responsiveness - Confidentiality - Dependability

7.6.2.1 Legitimisation from perceived personal gains

Pragmatic legitimacy, which includes legitimisation from perceived gains, has its basis in the evaluator focusing on the direct benefits that they will gain (Suchman, 1995). The women in this study felt that by using the mHealth intervention; they could ask questions at any time without any additional costs while saving time.

The toll-free implementation of the mHealth intervention presented two main gains to the maternal health clients:

- It removed the barrier of cost as a hindrance to care-seeking.
- It gave the mothers the sense that the system could be trusted, because they concluded that the intervention was not out to exploit them financially.

Following these perceived gains, the maternal health clients attributed to the intervention the qualities of caring for the woman's well-being. These two aspects increased the access and acceptance of the mHealth intervention and subsequently influenced utilisation.

Since the intervention was designed to deliver stage-based messages, mothers often felt that the intervention 'knew' their needs, as their concerns at each stage of the pregnancy were often pre-empted and solutions offered through the messages. These perceived gains, coupled with the consistency of messages through their pregnancy and after delivery, played a role in endearing the intervention to the mothers.

> **VIGNETTE ON LEGITIMISATION FROM PERCEIVED BENEFITS:** *Now, through the SMS project I can just ask all the questions that I have and it is free of charge, and you can ask anytime. You see for me to go to the hospital, I have to travel, sometimes you don't have even that fare; so, it becomes difficult. On this [intervention], all you need is to have is power [battery charge], on your mobile phone, and you can [ask questions and receive care]. They would follow up on how we are doing, ask about your blood volume and when your next clinic dateis. So I felt that the messages showed that someone cares. At least it makes you feel that someone somewhere wants to know how you are progressing. When I received those messages, I saw as if these people are caring for the life of the pregnant women.*

Thus, in the intervention, the women felt that they had "*someone to help [them]*" [Mother 1] and "*an invisible personal friend*" [Mother 12]. Though not discussed as legitimisation behaviour, previous

research has shown similar findings. In Jimison et al. (2008), the patients' perception that an electronic health system was helping them was reported to be the most important driver to HIT use.

7.6.2.2 Legitimisation by association

Sometimes, actors enjoy privileges that are granted to them because of the high status assigned to them in a social system (Deephouse & Suchman, 2008). When processes are associated with such actors, what results is a 'legitimisation by association'. The findings indicate that the health facilities and doctors in the context of this study represented highly esteemed actors. Consequently, the women believed that information accessed and gained from the health facility could only be genuine. False information or any kind of malice was perceived to be incongruent with these institutions of health. This perception of health facilities as legitimate entities was corroborated by the researcher in the process of data collection.

> *"Some interviewees have confessed that they were suspicious about my phone call and hesitant on whether they should meet me. Most have indicated that the option to meet at the health facility, or a preferred location of their choice, dispelled some of their fears"* [Researcher's Diary].

> **VIGNETTE ON LEGITIMISATION BY ASSOCIATION:** *I received the information at the hospital, and I was sure that if they have put the poster in the hospital, then, they must have followed some proper procedure to get the permission to do this. Because the poster was in the hospital, I was very sure it was genuine, and they were not going to mislead me on something. Hence, [I could trust the intervention] because I felt that these people must be healthcare providers who are competent, and they know what they are doing. My husband asked me about these messages. I told him it's something like an online clinic through our phone, and that the doctors were from XYZ Hospital. And then he said it was okay. I remember that my husband was concerned [about me meeting you]. "Where will you be meeting?" I told him that it would be at the hospital.*

This way of legitimising the intervention was also echoed by the partners:

> *"I was very happy because she told me that she knew about [the intervention] at the hospital and that made me comfortable because I knew that the hospital could not put up posters if the information was not genuine"* [FGD Men].

Legitimisation by association played a critical role in the women's perception of mHealth in this study. The context was characterised by susceptibility to fraudulent activities perpetrated through the mobile phone. Therefore, the women were wary of being conned with claims such as the intervention being free of charge. *"They might say it's free of charge and maybe you have only twenty Shillings[2] credit [3], and then you send the message, and they [the mHealth intervention] consume your credit, yet you thought that it was free"* [FGD Women]. Being associated with a trusted entity therefore allayed some of their fears.

7.6.2.3 Legitimisation by 'character' of the tool

We use the word 'character' to refer to the moral qualities that the maternal health clients may have assigned to the mHealth intervention. An entity may be legitimated according to how it mirrors the collective beliefs, values and norms of the people within the group (Deephouse & Suchman, 2008).

Following the fears on whether the intervention was free of charge, the women used the initial interaction period after registering to evaluate the intervention's integrity. After their registration, all the subsequent messages received free of charge increased their trust.

> *"So I was like I have to start now and see whether they can respond. And I see whether they are free. And when I sent, they replied immediately… and they did not use my airtime. So I decided to be getting information from them"* [Mother 22].

Receiving a response seems to have played a critical role in trusting the intervention. This may be associated with the preferred characteristics of information sources discussed in Section 7.6.1, or the role that responsiveness may have had on establishing the realness of the intervention. The women indicated that they became *confident* about the intervention when they received a response.

> *"In the beginning, I wasn't sure if I was going to receive the correct advice. Of course, I was cautious, but when I sent a message 'MIMBA' to the SMS number, and I started receiving messages, then I knew it was genuine"* [Mother 23].

[2] Approximately 0.2 US Dollars
[3] Prepaid airtime or talktime that allows the mobile phone user to make calls or send text messages.

Though most maternal health clients expressed some dissatisfaction towards the PROMPTS turn-around time for responses, its previous record of responsiveness gave others a sense of trust that they would finally receive a response. *"In the beginning, I was anxious because I was not sure if they were going to respond or not. But later on, I became more comfortable because I knew they would eventually respond even if they got delayed"* [Mother 28]. For some, the delay led to a measured level of trust which they resolved by accessing other sources of care while they waited for the response, or completely abandoned the mHealth system.

> *"I thought that [the delay] was not good because it could be an emergency and when you are asking for information, you require the response immediately. When they do not respond for more than a day, most likely you will have sorted out the issue on your own"* [Mother 5].

The tool's perceived confidentiality compared to sharing or asking people was congruent with the women's expectation of healthcare services (Recall Section 7.6.1), and this led to further trust.

The initial period of interaction between the maternal health clients and PROMPTS was critical in helping the women determine if they would use the intervention. *"I was just patiently waiting to see what messages they were going to send. I knew that if it was good, then I would continue using it"* [Mother 20]. During this period, the women were likely to establish dependability of the intervention if they associated it with a strong record of the delivery of beneficial information. In addition, the maternal health clients further legitimated the intervention when the received health information delivered the desired health outcomes.

7.6.3 Legitimisation of the intervention by the implementers

The mHealth implementers engaged in intentional and unintentional activities/actions that may have contributed to legitimising the intervention. We identify the unintentional aspects of legitimacy as such, since the implementers did not deliberately incorporate them into the intervention's design and implementation as a means of legitimating the intervention. Nevertheless, these aspects may have elicited trust among the maternal health users.

Intentional legitimisation:

As part of the implementation strategy, the implementers of PROMPTS incorporated a human face to deliver information sessions to the women. This was done when the implementers noted that the posters alone were insufficient to interest the women. In the information session, a PROMPTS

representative explained to the women what the intervention was about while they were waiting to be served at the ANC clinic. This process had a positive impact on the maternal health clients' perception of the intervention.

> *"We had to convince the [maternal health clients] that the intervention was legitimate and that it's something approved by the county… their trust issue, they said was that different people or conmen or scammers send them messages [referring to general mobile phone scams especially those related to mobile money] of which they don't know if they are true or not"* [Informant 3].

The women's uncertainty of the intervention may have been exacerbated by the mobile phone scams that were common in the context of the study (Recall Chapter 6).

Unintentional legitimisation:

The unintentional legitimisation was mostly the result of the programmatic design of the intervention. These included the anonymous registration process and interaction, the stage-based messages, toll-free implementation and joint development of some of the content. At this point, we discuss the latter and deal with the remaining points in Section 7.8.2.

The PROMPTS messages were designed in a consultative discussion with a group of maternal health clients who were similar in demographics to those who were currently using the intervention. This meant that the developed messages catered for the needs of the maternal health clients both in terms of language preferences and matters of concern. The empirical data suggests that this factor in the design of the messages may have played a role in the maternal health clients' satisfaction with the content of the messages, which developed trust. Suchman refers to this type of legitimacy as procedural legitimacy, where the quality and validity of procedures and protocols (in this case messages) are understood by users (Harris-Lovett et al., 2015; Suchman, 1995).

7.6.4 Perceptions of questioning in information seeking

This section begins with the researcher's reflection of her own past experience, which was brought to the fore by interacting with the experiences of the maternal health clients in this study. The women's experiences allowed the researcher to reflect on her own past actions. The subsequent interpretation of the women's lived experiences may have been influenced by this reflection.

> *"It was the first year of my doctoral studies. I had received my assignment feedback from the course convenor, and one of his comments was for me to operationalise my theoretical*

framework. As a novice researcher, I did not quite understand what that meant. After some research, I thought I had done just that. My second and third assignment had the same comment. Feeling frustrated, I walked into the convenor's office to seek clarification on what he meant. After offering clarification, he had one question for me; "Why didn't you ask before?", to which I had no answer. I quickly moved on with my PhD journey, never pausing to reflect on this situation until I was interacting with the marternal health experiences in this study. I realised that this seemingly innocent behaviour had its roots in cultural perceptions in high-power distance environments where the ones being accorded power were to be revered. In the education system, I had experienced most of my life, asking questions was either considered bothersome to the respondent or disrespectful if the questioner was of a different opinion. Thus, even when I did not understand, it was better to go read up myself." [Researcher's reflection]

In search of health information, the women in this study expressed reservations around seeking clarification from high-power individuals. Table 7.3 illustrates some of the scenarios related to questioning that emerged in our study.

Table 7.3: Sample quotes on deferring to high-power individuals

EXAMPLE OF POWER AT PLAY	SAMPLE EXCERPT
• **The women respected maternal healthcare-seeking traditions. Hence, they complied to these norms and when they disagreed, they did not openly say so.**	*"I washed [the unborn baby's clothes] and hang them in the house. It's always [been done that way]; because even when I had my firstborn, my mother-in-law took the clothes and washed them at my sister-in-law's house. It was a private compound so nobody could see them. I didn't ask why she did that. I just decided to believe it because I saw my mother-in-law doing that"* [Mother 12]. *"I told [my mum] that I was going to [follow the advice she had given me], but in the real sense I knew that I was not going to do what she had asked me to do"* [Mother 26].
• **The women defered to the HCPs as the powerful stakeholders in the maternal healthcare-seeking context.**	*"If a provider tells [the mother], you're good, go home, it's unfortunate that still very few people can oppose a provider or give their own opinion even if they feel it's not right…"* [Informant 1].

The respect of maternal health traditions as a cultural norm was corroborated by the partners. They indicated that when it came to pregnancy-related advice that was given by older women, they *"Did not ask the reasons why, but followed the [advice] because there could be a reason why and you don't want to go against what you have been warned"* [FGD Men].

Contrary to the limitations of the questioning norms, the PROMPTS intervention offered its users a different experience. Mothers expressed that using the intervention, one could *"ask as many times as you wanted", [Mother 27]* and *"even ask up to three questions at a time"* [Mother 25], without *"feeling like I am bothering anyone with my many questions"* [Mother 8]. In contrast, when asking a person, the women felt that they could not *"bombard [the individual] with three separate questions"* [Mother 25]. Besides, the women indicated that they always received a response to their question from the mHealth intervention. In light of this responsiveness, the women indicated *"[feeling] really good because whenever you sent a message, they used to respond"* [Mother 12]. The responsiveness of the mHealth intervention also encouraged further interaction from the women. *"When I asked the question, and I got an answer, I gained that confidence to be asking questions"* [Mother 27]. Entwistle et al. (2010) reported that patients appreciated receiving responses from the physician, as it provided them reassurance and gave the impression of being valued.

7.7 The Action of Healthcare-seeking Using mHealth

7.7.1 Object of the healthcare-seeking activity

The maternal health clients engaged in the healthcare-seeking activity in pursuit of a healthy pregnancy. However, since pregnancy was a highly uncertain period, the construction of a healthy pregnancy also involved the management of the various uncertainties. The women and partners considered pregnancy with complications as being unnatural and undesirable as it was partly associated with an 'evil eye'. Therefore, maternal health clients defined a healthy pregnancy as precluding any complications, including caesarean sections for delivery.

> *"Healthy pregnancy is when there are fewer complications, and you deliver safely. You and the baby are both safe and healthy"* [FGD Women].

"It is whereby you don't end up giving birth prematurely before the due date that is in nine months, and you didn't experience any complications during delivery" [FGD Women].

7.7.2 The implementers' goal for offering PROMPTS

The mHealth implementers provided PROMPTS to empower women with information. This information was targeted at helping women to identify pregnancy-related danger signs and the need for regular ANC attendance. The implementers considered this information necessary to mitigate any potential pregnancy-related complications. They also hoped that access to this information would lead to a behaviour change among maternal health clients on utilising maternal services such as ANC, antenatal immunisation and proper nutrition. The main aim of the mHealth system, therefore, was to complement the healthcare structures.

"We were hoping that mothers would get information and the changes which we expected were like visiting the ANC for a checkup. We hoped to see mums having knowledge of pregnancy-related issues, like knowledge of danger signs, knowledge on diet, knowledge on over the counter medicines or vaccinations that they are supposed to get. Not all facilities give health talks to mums when they visit them and so our SMSs filled up that gap of the health talks that mums usually don't get at the facilities" [Informant 3].

7.7.3 Maternal health clients' goal of using the mHealth intervention

In pursuit of a healthy pregnancy, the women had two main goals:

1) To access information
2) To access care and support

As discussed in previous sections, accurate information was critical to the pregnancy experience. Accessing pregnancy-related information was, therefore, necessitated by the 'information-dependent' nature of pregnancy. The maternal health clients considered the information essential for monitoring and tracking the progress of the pregnancy in order to manage uncertainties.

VIGNETTE ON SEEKING AND ACCESSING HEALTH INFORMATION: *I knew that they were going to send me very vital information that I could use throughout the pregnancy journey to take care of my pregnancy. Because at times some women experience some issues and they think they are normal. Therefore, through the messages, you will be able to see that there are certain things you*

might be going through that are not normal; and then you can seek care. [Also], the experience of pregnancy that you had before, may not be the same…Like I didn't know the foods I was supposed to eat during the first pregnancy so that the baby can grow. [The intervention] helped me to know many things, and I got to ask them questions easily.

On the other hand, visiting the health facility for care was not always possible or desirable. Some of the most cited barriers expressed by the women included the lack of resources on their part, the loss of time, and poor quality of healthcare services. Subsequently, PROMPTS presented maternal healthcare clients an opportunity to pursue their goals more effectively while overcoming the barriers of the healthcare system.

VIGNETTE ON SEEKING CARE AND SUPPORT: *What motivated me to register was that I might be in the house and I encounter a particular challenge, and maybe I don't have money at that moment. Sometimes, one can have an urgent problem, and perhaps you're not in that condition to reach the hospital. Then, while I am sitting in my house, I can send a message telling them I'm experiencing this and the other. So I knew that once I register, they could guide me appropriately through my pregnancy. They remind you to go to the facility for the [ANC] visit. [This is important] because sometimes, I forget my appointment dates.*

7.7.4 Conditions influencing the use of mHealth by maternal health clients

This section explores the conditions that may have influenced how the maternal clients used the mHealth intervention. The maternal health clients identified existing barriers in the healthcare system that shaped how they utilised the intervention. These barriers include:

- a resource-constrained healthcare system
- negative attitudes and behaviour of HCPs and
- socioeconomic barriers which affected when and how they sought care

These barriers are similar to those that have been reported before in literature (Gabrysch & Campbell, 2009; Moyer & Mustafa, 2013; Thaddeus & Maine, 1994). Some studies have reported that there is a link between the perceived benefits and use of HITs. The perceived benefit of HITs in solving the cost of transportation, loss of time and productivity was an important variable in user acceptance of a health intervention (Ahlan & Ahmad, 2014). Hence, the respondents use of mHealth in this study was motivated by the desire to overcome these healthcare-seeking barriers.

Resource-constrained healthcare system:

The participants shared experiences that alluded to the resource constraints that influenced their healthcare-seeking behaviour. These strains in the system manifested in under-staffed health facilities and long waiting times for patients. Consequently, this had an impact on how patients were attended to as personalised care was not always possible. *"It is often difficult to give individualised care because of the workload"* [Healthcare Providers].

The PROMPTS intervention, therefore, offered the women the opportunity to seek care without these barriers.

> **VIGNETTE:** *The [healthcare facility] is crowded or congested, and at times you come here, and there is a long queue. So you end up staying for too long, and you have left other things unattended to at home. Like you could wait here from morning until the afternoon because they have many people to attend to and the healthcare providers are few. The healthcare providers don't have time to tell you all the information you need because they have many patients to attend to. The [education] sessions at the clinic are also done very fast, and you might miss out on some information.*

The key informants acknowledged the strain in the healthcare system and associated it to the public health facilities. Other studies have suggested that quality of care is likely to be worse in publicly than privately owned health facilities in developing countries (Mannava et al., 2015).

> *"Sometimes, the women do not get the required information from the health facilities… [because] you find that where there is access to free care like in these public hospitals, the providers are most likely overwhelmed by the numbers and [they might not have the time] for sharing the necessary information"* [Informant 1].

Negative attitudes and behaviour of healthcare providers:

The maternal health clients reported poor quality of care from negative attitudes and behaviours of HCPs. The attitudes and behaviour of clinicians affect the use of healthcare services and patient outcomes (Atukunda et al., 2020; Mannava et al., 2015). These often manifest in patients fearing the HCPs as corroborated by a key informant in this study. "The wom[e]n will not ask any questions because [they are] afraid [of the healthcare providers]" [Informant 1].

> **VIGNETTE:** *[When I started my clinics] I had already been warned that the healthcare providers were very harsh. And so I came when I was already scared. I didn't get a chance to ask any questions because I was told you can ask a question and they answer you rudely or they get upset at you. But how they treat you depends on their moods; because today you might find the healthcare provider in a good mood, then another time you find them in a bad mood. So even if you had a question, you would be scared to ask.*

Socioeconomic barriers:

The cost of healthcare-seeking is one of the barriers to using health services (Recall Chapter 2). Other than the cost of healthcare, the cost of travelling to the facility and the opportunity cost in terms of the time taken were all aspects of the socioeconomic barriers. The time taken to visit the hospital is often associated with the loss of income or time to do other important household chores (Fotso et al., 2008). Hence, both the toll-free programmatic design of the intervention, and its subsequent impact on accessibility (Recall Section 7.6.2.1), presented the opportunity to use mHealth to overcome some of the cost-related barriers of healthcare-seeking.

> **VIGNETTE:** *In some cases, the health facilities are far… You see for me to go to the hospital, I have to travel, [but] sometimes you don't even have that fare. On this [intervention] all I need is just one minute to send the text and continue doing my work while waiting for the answer. So it saves me time [and] money [because] I don't have to buy credit to look for them to ask a question.*

7.8 The Tool: mHealth Affordances in the Healthcare-seeking Activity

Tools or artifacts in the activity system can be both limiting and enabling (Recall Chapter 4). In this subsection, we further explore the characteristics of the mHealth intervention in terms of affordances that may have shaped the healthcare-seeking activity. The empirical data indicated that there were two main levels of affordances:

- Those related to mobile technology and that were technically independent of the intervention. These affordances may have been 'inherited' by the mHealth intervention.
- Those related to the features offered by the mHealth innovation and may thus have been a result of the design and implementation of the tool (programmatic design)

The mHealth users did not perceive these affordances as existing separately. We only separate the two for the sake of analysis.

7.8.1 Technological affordances

In this study, the mobile technology affordances that were most relevant to the maternal health clients include ubiquity, confidentiality and personalisation (that the mobile technology was already part of their day-to-day life).

Ubiquity: The women felt that they could use the mHealth intervention anytime and anywhere.

> *"Anytime you have a question you can ask because the phone is mobile you can go with it anywhere"* [FGD Women].

Privacy and Confidentiality: The women perceived the messages from the mHealth intervention to be confidential because they received them on their own personal phone, which ensured privacy. The privacy of the mHealth intervention was congruent with the perceptions of secrecy of pregnancy. *"There is privacy because when the messages are sent, they come to my [personal] phone"* [FGD Women].

Personalisation: the fact that the women daily used mobile technology in other ways and that women had personal access to their own cell phones made the mHealth intervention more convenient. *"I always have [the phone] with me."* [FGD Women]. Jimison et al., (2008) posited that technology interventions that cannot be incorporated into patients' everyday lives pose a major barrier to use.

7.8.2 mHealth features and affordances

The maternal health clients cited other mHealth features that may have enabled varied affordances and that influenced their utilisation of the intervention:

- Anonymous registration process and interaction
- Stage-based programmatic design
- Toll-free programmatic design
- Use of SMS as the mHealth technology

First, PROMPTS did not require identifiable information like name of the patient upon enrolling or subsequent interaction. By not asking for the women's personal information, the intervention averted some of the fears related to it being a scam. *"When I subscribed they didn't ask my name, age, or where I reside, those personal details about me. And then the first message after I subscribed was generally about pregnancy"* [Mother 1]. In addition, the SMS intervention used a short message code, and there was no 'face' to the interaction. For mothers, this anonymity translated to more confidentiality. Subsequently, the women engaged with the intervention freely by asking questions that they would typically find difficult to ask in a face-to-face conversation. *"But when the person you are asking doesn't see you, you feel free to ask even the private questions"* [Mother 13]. Similar results were reported in Jimison et al. (2008) and Dean et al. (2012) where patients using mHealth for HIV/AIDS care cited anonymity and the non-judgemental nature of interacting with computer health systems as a benefit.

Second, PROMPTS was designed to offer 'staged messaging' or messages appropriate for the different stages of pregnancy. This programmatic design feature translated to a sense of personalisation, making the women feel that the intervention 'knew' their needs because every message was relevant to what they might have been experiencing.

Third, the intervention was offered to the users as a toll-free service, and this made the mothers feel 'cared for', hence prompting further interaction with the intervention. Being a toll-free service also increased the accessibility for the women. *"I didn't have to spend time and money coming to the clinic"* [Mother 1].

Fourth, based on the fact the messages were delivered via SMS, the women felt that they had a place to refer back to in case they forgot some of the details. *"After reading them, I can still refer back, unlike when you call someone. Once you disconnect [the call] you cannot refer back [to what they said] unless you call them back again"* [FGD Women].

7.9 The Maternal Healthcare-seeking Community

In this study, the broader health institutions and regulatory bodies, healthcare providers, traditional healers and significant community members were all part of the healthcare-seeking community (Table 7.4). The health institutions at an international and local level such as WHO and the MoH defined the standards for care. These standards imposed certain expectations on the HCPs. For

instance, the HCPs indicated that they were providing care in adherence to the WHO standards that required women to attend at least four ANC sessions, beginning in the first trimester. However, in reality, women often started their ANC later in the second or third trimester and hence, it was not always feasible for the HCPs to schedule them for four ANCs.

The significant others were primarily those who were trusted and shared social ties with the mother. Though their specific responsibilities differed, these stakeholders traditionally provided care and support through the pregnancy. Other caregivers like TBAs played a crucial role in pregnancy, because the women believed that these midwives were 'annointed' to deal with certain pregnancy experiences that the doctors may not have been able to deal with. Other maternal health-related studies (Kaiser et al., 2019; Kawaguchi et al., 2014; Roberts et al., 2016; Serizawa et al., 2014) have confirmed the important role of significant others within the pregnancy experience.

7.10 The Maternal Healthcare-seeking Division of Labour

The division of labour within the healthcare-seeking activity system was mostly implicit. The sharing of responsibilities depended on the social capital and the gender roles surrounding the pregnancy experience. These two dimensions were the sources of power and responsibility. Table 7.4 provides a summary of some of the responsibilities among the maternal health stakeholders.

Table 7.4: Division of tasks and power structures within the maternal healthcare-seeking activity

	Tasks/Responsibility	Power Structures
Health institutions and regulatory bodies	Provide health regulatory standards and policies	Authority in providing regulations and standards for care that other stakeholders (healthcare providers) need to comply to
Healthcare providers	Provide healthcare services	Power accorded to them based on their expertise, training and education. Hence their direction was to be followed by the mothers. Thus, the woman and all the other stakeholders are subservient to the healthcare provider.
Traditional healers and older female relatives	Provide care and protection against and arising from pregnancy complications	Their place in the woman's pregnancy is based on social capital and the perception of the women and larger community on their experience to care for and avert potential pregnancy complications.

Table 7.4 Continued

Significant others	Provide support	Social structures inform who does what. The woman's partner is considered the head of the household and the main decision-maker. Other female relatives' position was anchored on gendered relations with pregnancy being perceived as a woman's domain. This perception of pregnancy has been observed elsewhere in literature (Aarnio et al., 2018).

7.10.1 Social capital in pregnancy-related care

Women engaged with different sources of care, based on the perceived roles of each of them. Social capital was the main source of determining how responsibilities were shared between the HCPs and the other traditional care-givers such as the TBAs. Whereas most mothers believed that they needed to give birth in a health facility because of the infrastructural/technological related advantages, TBAs were trusted more in certain pregnancy-related conditions. For instance, in breech presentation (i.e. the unborn baby being in the wrong position in the womb), the women felt that the TBAs were best suited to turn the baby by massaging the belly. They attributed this power to the experience and the 'special anointing' that they believed the TBAs had. The older experienced women, like the TBAs, were also esteemed as trusted sources of care and support, compared to younger or inexperienced women. Experience was considered a factor of age and birth experience and hence young medical practitioners, though trained, were not fully trusted by the mothers. On the contrary, other women in society who had had children were trusted more, because of this experience. Similar results have been reported in Aarnio et al. (2018), where social capital gave TBAs and other women the right to provide care to pregnant women.

The women and their partners believed that it was the HCPs responsibility to provide routine healthcare services to pregnant mothers. These routine services included prenatal vaccines, supplements and healthcare education on how to take care of the pregnancy. The maternal health clients also indicated that they considered advice from the HCPs more reliable because of their medical training which qualified the reliability of the information they gave. Graner et al. (2013) reported a similar finding.

> ***VIGNETTE ON SOCIAL CAPITAL IN MATERNAL CARE-GIVING:*** I would say not only the healthcare providers are doctors, but the traditional birth attendants too. *There are things that the traditional birth attendants know that the doctors don't know and vice versa.* [While the doctors] *at the clinic will use their skills and technology to check the position of the baby and give me my injections, the traditional birth attendants massage the womb so that they can put the baby in the right position. [The TBAs]* will also give the expectant women herbs so that the delivery is fast and smooth. *Those ladies are special, and their hands are annointed with the traditional medicine for that. Even if the baby has gone sideways, if she comes and [massages] your stomach, the baby will turn. [On the other hand] for delivery, you might go to the traditional birth attendant, and then a complication arises, and she might not be able to handle it because she doesn't have the right tools. [The challenge with the hospital is] at times you find the nurse is younger than you and maybe you feel that they are not very experienced to respond to the questions you wanted to ask them.*

Because of the advantages that the maternal health clients believed different sources of care offered, they often used multiple sources of care at any one point. Other studies have reported that this behaviour is a common practice in African countries. The decision on where to seek care is often associated with the nature and type of threat associated with the pregnancy complication (Dako-Gyeke et al., 2013), as well as the quality of the patient-doctor interaction (Finlayson & Downe, 2013; Kyomuhendo, 2003).

7.10.2 Gendered roles

Significant others within the context of maternal healthcare-seeking shared responsibilities based on socially-defined gender roles. Acknowledged as head of their households, husbands played an essential role in providing financial resources. Women expressed that they expected their husbands to provide for their food and well as meet the healthcare-related expenses. "*They are the heads of the family, and we need financial assistance, so you inform them so that they can give you money*" [FGD Women].

The findings on male involvement in pregnancy are similar to the findings from similar contexts in Malawi, Nigeria, Zambia and Ghana (Aarnio et al., 2018; Bougangue & Ling, 2017; Kaiser et al., 2019; Sharma et al., 2019), where males' involvement in pregnancy was mostly limited to financial support. A key informant corroborated this construction of gender roles in pregnancy.

> *"We're finding that the [husbands] are the ones who are ensuring that the woman is eating the right diet during pregnancy because most of the times husbands are the providers, especially in our setting… where most women stay at home, and the husbands go to work. So, they're basically the providers"* [Informant 1].

At the same time, pregnancy was regarded as a female domain. *"These are my messages because I am the one who is pregnant so they are meant for me…"* [Mother 2]. This gendered definition of pregnancy necessitated the involvement of other female relatives. Other areas related to child-care were also the woman's responsibility. Hence, female relatives supported the pregnant woman by offering child care and other domestic chores support during pregnancy. These findings are similar to those reported in Atukunda et al. (2020).

> *"The aunties [are important] when you are at an advanced stage of your pregnancy, and maybe your husband has gone out to [fend for the family]. The aunty can help you with some household work. Maybe you have another smaller child, and you are pregnant, they can take care of the other children"* [FGD Women].

Notwithstanding their gender-defined roles in pregnancy, the findings show that the mHealth intervention allowed the men to engage differently with the pregnancy. For example, when the men got to read some of the messages that the women were receiving, they reported being able to support their wives more.

> *"For instance the issue of accompanying her to the clinic, when I read that it is advisable for me to accompany her to the clinic if I had the time I thought it was a good thing to do"* [Partner 2].

7.11 Chapter Summary

This chapter presented the empirical findings of the study, using the concepts and principles from our theoretical framework. The chapter provided an understanding of the healthcare-seeking activity as conceptualised by the researcher based on the participant experiences. This conceptualisation featured the use of mHealth as an action within the activity hierarchy. This action had two goals: to seek health information and access care and support. We elucidated how healthcare system conditions may have shaped the actual use of mHealth.

Using the concepts of rules/values, division of labour and community, this chapter also explored the socio-cultural context of the maternal healthcare-seeking activity. By presenting how the

mHealth as the activity system artifact mediated the healthcare-seeking activity,we were able to elaborate the interaction between technology and the context. These findings have given preliminary insights on how the healthcare-seeking context might influence mHealth utilisation. We build further upon these insights in the next chapter.

CHAPTER 8: THEORETICAL ELABORATION OF THE FINDINGS

8.1 Introduction

This study embarked on the premise that since pregnancy is intricately experienced within a cultural setup, the socio-cultural context is an important dimension in maternal healthcare-seeking related studies. The aim of this study was to investigate **how the maternal healthcare-seeking socio-cultural context shapes maternal health clients' mHealth utilisation behaviour**. By operationalising healthcare-seeking as an activity that presented the relevant socio-cultural context, we were able to elucidate utilisation by analysing the interaction between the maternal health clients and the mHealth intervention within this context. Following the empirical findings, we acknowledge that this study could have been positioned in feminist approaches to yield further insights on issues of power, autonomy and other relevant aspects in women's lives. However, due to the researcher's background, education and training in IT, this was only a post hoc consideration.

The chapter elaborates the findings according to the sub-questions that guided the study:

1) What are the socio-cultural characteristics of the maternal healthcare-seeking context?
2) How does mHealth mediate the maternal healthcare-seeking activity?
3) How does maternal health clients' internalisation of mHealth shape mHealth utilisation behaviour?
4) How does maternal health clients' externalisation of their healthcare-seeking socio-cultural context shape mHealth utilisation behaviour?

Section 8.2 offers a high-level summary of the findings that will be discussed in the chapter. We further elaborate the individual components in Sections 8.3 through 8.6. Section 8.3 presents the socio-cultural characteristics of the context as posed in the first sub-question. Section 8.4 shows how mHealth mediates the healthcare-seeking activity and answers the second sub-question. Sections 8.5 and 8.6 explain the maternal health clients' utilisation behaviour that arises from the internalisation and externalisation processes within the mHealth-mediated healthcare-seeking context. Finally, Section 8.7 succinctly answers the main research question. We conclude the chapter by providing the theoretical propositions in Section 8.8.

8.2 Summary of Findings

Table 8.1 highlights the socio-cultural factors in the healthcare-seeking context and shows how these factors shaped the maternal health clients' utilisation behaviour. The cultural characteristics are presented using Hofstede and Hofstede's (2005) typology of culture. We acknowledge that this choice of perspective involving an application of the predetermined cultural dimensions may have risked the loss of identifying cultural characteristics unique to the setting. In light of this, rather than adopting a deductive approach to the identification, we adopted a more inductive approach as explained in Chapter 5. For the sake of offering a bigger picture, a summary of the design and implementation implications is also included in the table. We however elaborate the latter in Chapter 9.

Table 8.1: A high-level summary of mHealth utilisation behaviour as shaped by the healthcare-seeking socio-cultural context

CULTURAL FACTOR	CONTEXTUAL FACTORS	INTERNALISATION	EXTERNALISATION	IMPLICATION TO DESIGN/IMPLEMENTATION
Uncertainty avoidance	Pregnancy uncertainties Urban setting Socioeconomic status Healthcare system factors	Hesitation to adopt technology	The women developed technology legitimisation strategies. Hence, those who adopted did not trust the intervention immediately, but rather legitimised it over some time in the course of use.	Interventions may be validated if they were championed/supported by healthcare providers in the implementation process. Intervention characteristics/features and technology affordances may prove useful for overcoming perceived risks and enabling agency for adoption
		Substitutive use based on perceived advantages/usefulness	Technology framing reinforces substitutive use Humanising technology	Integration so that mHealth represents a continuum of care

	Exclusive Community of Purpose (CoP)	Dissonance in use	Technology coping strategies (Technology accommodation and abandonment	Integration may cause further breakdowns if perceptions of technology (say between HCPs and patients) are varied. The balance in integration calls for further research
Gendered relations (femininity/masculinity) and collectivism	Gender roles Individual demographics: (e.g. socioeconomic status and education)	Autonomy in decision-making for initial adoption without engaging stakeholders	Negotiated use with other stakeholders for purposes of facilitating continued use	Intervention designers may not need to engage stakeholders at the point of decisions to adopt but should consider the role of the community in continued use
Power distance: hierarchy	Individual demographics: (e.g. socioeconomic status and education		Agency for the maternal health client redefining her role in the CoP (allowing her to participate in knowledge-sharing among peers)	Since doctors/HCPs are a respected source of information, their involvement in mHealth delivery may be critical to the assimilation of mHealth content. However, this may work only if mHealth is integrated into existing healthcare structures because the interaction between the user and mHealth creates a reality that takes away power from the HCPs

8.3 Socio-cultural Characteristics of the Healthcare-Seeking Activity

At the onset of this study, we positioned the research on the argument that healthcare-seeking does not happen in a vacuum. Thus, we sought to answer the following question: *What are the socio-cultural characteristics of the maternal healthcare-seeking context?*

Applying Hofstede and Hofstede's (2005) typology of culture to our empirical findings brings up four cultural dimensions (Table 8.2). For ease of mapping the discussion to the study objectives, these cultural dimensions are presented separately from the resulting utilisation behaviour that they shaped. These cultural dimensions interacted with other social factors, some of which we highlighted in Table 8.1 and which shall be discussed in different sections in this chapter.

Table 8.2: Socio-cultural characteristics of the maternal healthcare-seeking context

DIMENSION	DESCRIPTION
SOCIAL	Autonomy, economic status, education, family structures (defined division of power and gender roles in pregnancy), healthcare-seeking beliefs and pregnancy practices
CULTURAL UNCERTAINTY AVOIDANCE	The maternal healthcare-seeking context was characterised by high uncertainty avoidance. This cultural dimension was seen in the suspicion and hesitation by maternal health clients, based on the perceived risks towards adopting the mHealth intervention.
MASCULINITY/ FEMININITY	Pregnancy, being considered a female domain, translated to autonomy in the maternal health clients' decision to use the mHealth intervention. The autonomy was further facilitated by the fact that the intervention was associated with an entity that was considered legitimate by the actors in the maternal healthcare-seeking context. Hence, the use of the intervention may have been socially accepted as a culturally appropriate healthcare-seeking action.
POWER DISTANCE	A high power distance was observed in the unequal power distribution between the women and various other stakeholders, and the socially accepted appropriateness of deferring to these 'authorities'. mHealth provided the opportunity to mediate power distance by giving access to information and negotiating the woman's power to exercise agency to use the intervention.
COLLECTIVISM	Due to the interdependent nature of the maternal healthcare-seeking activity, the maternal health clients engaged the significant others in the process of negotiating their use of the intervention, to make it an appropriate behaviour within the healthcare-seeking context.

8.3.1 Uncertainty avoidance

The healthcare-seeking context was characterised by high uncertainty avoidance, as manifested in the following ways:

1) In the factors that influenced participants' choices of information sources and dependence on the people believed to have more experience

2) In the maternal health clients' initial response to the mHealth intervention.

The empirical findings show a culture where the doctor is believed to 'know' and to have all the answers. A patient, on the other hand, is largely dependent on the doctor. Similar to this is a classroom environment where students are uncomfortable with the notion of a teacher not knowing. In this study, the maternal health clients expected anyone in the position of the healthcare provider to know. This perception, in turn, influenced the expectations that users had of the mHealth intervention, having equated the service as being from a doctor. Hence, being referred to physically consult their healthcare provider whenever they desired treatment may have led to dissonance for the maternal health clients.

The results also show that the women perceived the use of mHealth as an opportunity to maintain the exclusivity of the CoP (Discussed in Section 8.4). This was seen in their use of mHealth to resolve the 'multiple versions of truth' that they were subjected to following the dysfunctional structures. Women indicated that prior to using the intervention, they depended on multiple people including friends and neighbours. Consequently, they were often uncertain of the accuracy of the information that they were receiving from these multiple sources. The nature of pregnancy as a highly uncertain experience may have exacerbated the uncertainty avoidance in the context of this study (Recall Chapter 7).

Hence, the high uncertainty avoidance likely influenced the women's response to the mHealth intervention:

- Despite the posters being set up in strategic locations at the health facility, most women enrolled only after a face-to-face information session that was delivered by a PROMPTS representative.
- Maternal health clients did not immediately trust the intervention. Instead, the women developed further *legitimisation strategies* to determine the information credibility.

We expound on these responses in later sub-sections. This evidence corroborates with other findings on the relationship between uncertainty avoidance and the use of technology (Vance et al., 2008). In the study, French people who were described to be from a high uncertainty avoidance context had less propensity to trust an IT artifact compared to American people who were believed to be from a low uncertainty avoidance culture. In a separate study by Straub (1994), high uncertainty avoidance resulted in Chinese workers' preference of fax over email as a communication channel because of its higher perceived information richness. As noted by Hofstede and Hofstede (2005) and Vance et al. (2008), and confirmed in this study, IT adoption behaviour is attributed to the risk that the uptake of new information technologies present.

8.3.2 Masculinity/Femininity

The context of this study reflected a highly gendered society with pregnancy being defined as an exclusively female domain. The culturally acceptable way for men to participate in the maternal healthcare-seeking context was by providing financial resources. Their duty therefore was to facilitate transportation to the healthcare facility and meet any healthcare-seeking costs, as well as providing food for the expectant woman. Other researchers have reported similar findings regarding gendered pregnancy responsibilities with male involvement being limited to financial support, in Malawi, Ghana and Bangladesh (Aarnio et al., 2018; Bougangue & Ling, 2017; Shahabuddin et al., 2017; Sharma et al., 2019). A similar scenario may thus be expected in other developing countries that are characterised by such division of gender roles.

The results indicate that in addition to the healthcare-seeking context being characterised by masculinity based on the gender division of pregnancy responsibilities, the healthcare profession was also considered feminine. The healthcare recipients desired nurturing and caring qualities from the HCPs. It was not enough that the provider was skilled to provide clinical care. The lack of nurturing and caring qualities in their HCPs resulted in the women choosing alternative sources of care such as the TBAs.

8.3.3 Power distance

This cultural dimension was observed in women's perceptions of acceptable behaviour when dealing with individuals of higher power status such as the HCPs and older female relatives such as the mothers, mothers-in-law and grandmothers. These 'more powerful' stakeholders were to be

respected and the women generally avoided getting into open conflict with them. For example, even when the women did not understand or agree with some advice from the powerful stakeholder, they avoided open conflict by not seeking clarification. *"If a provider tells them, you're good, go home, it's unfortunate that still very few people can oppose a provider or give their own opinion even if they feel it's not right… very few people will [seek clarification]"* [Key Informant 1].

Wang et al. (2009) noted that Chinese students from a high power distance society refrained from asking questions in face-to-face interaction with the instructor. However, when using mobile phones for learning, their interaction with the teacher increased, since these students found it easier to send text messages than to speak face-to-face with the instructor.

The findings also indicate that the power structures were intricately dependent on the pregnancy context. At the highest level was the HCP, because of the power they wielded in terms of determining the success of the pregnancy. Maternal health clients felt that, at the end of the day, they would have to visit the healthcare facility for delivery. Among the remaining stakeholders, power was divided based on their role in pregnancy. For example, partners wielded more power concerning financial-related decision-making. The maternal health clients felt that the TBAs were best suited to deal with concerns such as breech presentation which were associated with 'evil' powers rather than clinical anomalies, and thus could not be solved by the HCP.

Within the pregnancy healthcare-seeking context, experience was a source of power status. Older and multiparous females therefore wielded more power compared to nulliparous women. This power norm was seen in how the maternal health clients placed more value on information from, say an older female relative than from peers.

8.3.4 Collectivism

The findings show that the women in this study considered themselves as part of a ‘we’ group in relation to maternal healthcare-seeking, because they were dependent on several stakeholders for other healthcare-related needs. Because the interest of the wider community prevails over personal interests in a group characterised by collectivism (Hofstede & Hofstede, 2005), maintenance of harmony within one's social environment is a key virtue. Hofstede and Hofstede use the example of a former Dutch missionary's exegesis of a Biblical story of a man and his two sons to demonstrate this cultural dimension.

> A man had two sons. He went to the first and said, 'Son, go and work in the vineyard today.' The boy answered, 'I will not.' But later he had a change of heart and went. The father went to the other son and said the same thing. This boy answered, 'I will, sir,' but did not go. Which of the two did his father's will?[4]

In the missionary's unexpected exegesis, the last son observed formal harmony and did right by not contradicting his father. In this study, we associate the maternal health clients' negotiated use of mHealth with a desire to observe cultural norms, by making their action to use mHealth a culturally/socially appropriate behaviour within their healthcare-seeking context. The need to maintain harmony was also seen in the properness associated with the wantedness of pregnancy. Hofstede and Hofstede (2005) explain that in a collectivist culture, trespasses in societal norms lead to shame and loss of face. In this study, younger participants, whose pregnancy was deemed unwanted, experienced shame. This feeling resulted in trying to hide the pregnancy for as long as possible; thus avoiding mainstream healthcare services.

8.4 How mHealth Mediates the Healthcare-seeking Activity System

This section answers the second sub-question: *How does mHealth mediate the maternal healthcare-seeking activity?* Nardi (1996a) classified ways in which an IT artifact could support human activities (see Appendix I). Our findings are in harmony with this classification and show that:

- the users' interaction with mHealth reveals two levels of conceptualisation: 1) the artifact level and 2) the socio-material level
- mHealth shapes the healthcare-seeking goals of maternal health clients
- mHealth helps to redefine the maternal healthcare-seeking community, division of labour and negotiate rules

The following sub-sections discuss these results, which are also summarised in Table 8.3 and further elaborated in various sub-sections in this chapter.

[4] Biblical parable in Matthew 21:28 - 32

Table 8.3: How mHealth mediates the healthcare-seeking activity

	ENABLED BY:	IMPLICATION
LEVELS OF CONCEPTUALISATION		
Artifact – level	▪ Negative affordance such as fraud ▪ Mobile phone affordances (Mobility, ubiquity, personal ownership of phone) ▪ mHealth programmatic features and subsequent affordances (No cost, association with a legitimate entity, i.e. the healthcare facility, anonymity) ▪ Gender roles Maternal healthcare-seeking as a woman's domain	Hesitation to adopt Maternal health clients could adopt mHealth without engaging other significant others
Socio-material level	▪ Culturally and socially defined norms and values (Interdependence of healthcare-seeking and implicit roles and responsibilities, pregnancy uncertainties, materiality of pregnancy-related decisions)	Maternal mHealth users have to negotiate the use. In this case, the use is related to appropriating information.
DIALECTICAL RELATIONSHIP BETWEEN MHEALTH AND USERS	▪ Delegated agency and affordances of the intervention ▪ Perceptions formed about technology (These are partly shaped by the contextual factors such as socially-constructed usefulness)	Tensions/contradictions within the activity system

Table 8.3 (continued).

REDEFINING COMMUNITY, DIVISION OF LABOUR AND RULES	▪ Community - Dysfunctional healthcare structures (breakdown between the CoP and the division of labour). - Perceived usefulness of mHealth	Redefined role and subsequent partial substitution of the CoP
	▪ Division of labour -'Equalising' effect of mHealth in terms of access to information	Mediating power distance and inreased agency for maternal health clients as active participants in the CoP
	▪ Rules/Values • Affordances such as privacy	mHealth enabled the users to negotiate values such as receiving care while maintaining the secrecy of pregnancy.

8.4.1 Levels of mHealth conceptualisation

At the artifact level, the healthcare-seeking context and the artifact (mHealth) affordances facilitate the autonomous interaction by maternal health clients with the mHealth intervention. The artifact affordances include mobile phone affordances and affordances related to how the mHealth intervention was designed and implemented (programmatic affordances). The mobile phone affordances could have existed independent of the mHealth intervention. These affordances of ubiquity, mobility and personal ownership of a phone afforded the women the opportunity to *"ask a question anywhere because the phone is mobile, and you can go with it anywhere…[and] when the messages are sent, they come to my phone [so it is convenient]"*.

The intervention programmatic features, such as being 'toll-free' afforded the women more accessibility by giving them the opportunity to adopt mHealth without involving other stakeholders. *"I would have had to inform [my husband] and tell him that I need money if it involved cash"* [FGD, Women]. The contextual affordances include the gendered context which assigned women the responsibilities related to maternal healthcare-seeking, because pregnancy was viewed as a female domain.

At the socio-material level, the mHealth intervention combined with the socio-cultural structures in the women's healthcare-seeking context. At this level, the cultural norms around maternal healthcare-seeking and the implied roles from the social structures were pertinent. These factors influenced the nature of interactions between the women, the mHealth intervention and the healthcare-seeking context, giving rise to unique utilisation behaviour. For example, the women continued to use the mHealth intervention because it was perceived as trustworthy and legitimate between them and significant others. In this case, the fact that it was associated with a health facility made the intervention trustworthy. *"I told [my husband] that [the intervention] is an online clinic platform through our phone, and he asked me where the doctors were from… And when I told him they were from [XYZ] hospital, he said it was okay."* [Mother 9]. Thus the idea of the health facility being a '*legitimate entity'* was co-constructed among the healthcare-seeking stakeholders, and was significant to how the mHealth intervention shaped the maternal health clients' healthcare-seeking context. When *"I showed the messages to [my aunty]… she [approved of them] and [encouraged me] to continue receiving them. Since she is more experienced, [I trusted her advice] …"* [Mother 20].

Another pertinent example within the socio-material level was the separation between adoption of mHealth as a technology and the appropriation of information. Rogers (2003) differentiates between two broad phases of use. The first is adoption, which describes the decision stage. The second is appropriation, which deals with users' integration of technology into everyday life and actual use patterns. We specifically use the term appropriation to refer to the use of information from the mHealth intervention. Leidner and Kayworth (2006) argued that users may respond differently to technology when its information aspect is considered valuable. This presupposes a separation of an IT artifact to its technological aspect where IT is seen as an artifact, and its information aspect (Leidner & Kayworth, 2006). We further elucidate the influence of the socio-material level on mHealth utilisation in section 8.6.4.

At the material level, there was also evidence of maternal health clients interacting with mHealth as a social actor. Hence, the women personified technology as seen in statements such as feeling that they had a '*personal friend'* that '*walked*' with them through the journey of pregnancy. Others felt that they had a '*personal healthcare provider'* who could assist them at any point if they had problems. Significant others like the partners attributed to the intervention abilities such as being their '*helpers'* in that they would not have to bear the responsibility of answering all pregnancy-related questions, most of which they had no knowledge of. These findings of how people

personify technology align with seminal studies that suggest that users view IT artifacts as social actors. Consequently, interactions with these artifacts are interpersonal in nature and individuals interact with them as they would in social situations (Al-Natour & Benbasat, 2009). This unconscious process of assigning human attributes to computing technologies was studied by Marakas et al. (2000) and referred to as '*metaphorical personification'* or '*anthropomorphic behaviour'*.

8.4.2 Dialectical relationship between mHealth and maternal health clients

The findings show that mHealth shaped the healthcare-seeking goals of maternal health clients and that the maternal health clients formed perceptions about mHealth that determined how they interacted with it. In pursuit of the object of a healthy pregnancy, women interacted with the intervention as a means to reach their desired outcome. In many ways, what they could achieve with the mHealth intervention may have been influenced by the inherent possibilities made accessible by the developers. "Goals achieved by people equipped with a tool are often influenced by the tool's goal" (Latour, 1993, as cited in Kaptelinin & Nardi, 2006, p. 53). Hence, maternal health clients had two main goals: accessing health information and seeking care and support. However, their definitions of the goals and their expectations differed from the definitions of mHealth developers. For the women, the goal to seek care, support and information translated to an opportunity to substitute the health facility visits. Thus, rather than mHealth being a tool to complement care as intended by the developers, the maternal health clients adopted it as a substitute. In the healthcare-seeking activity system, this tension created a contradiction between maternal health clients and the PROMPTS intervention developers (Figure 8.1). The implication of these differences in users' utilisation behaviour is further discussed in Sections 8.5.3 and 8.6.3.

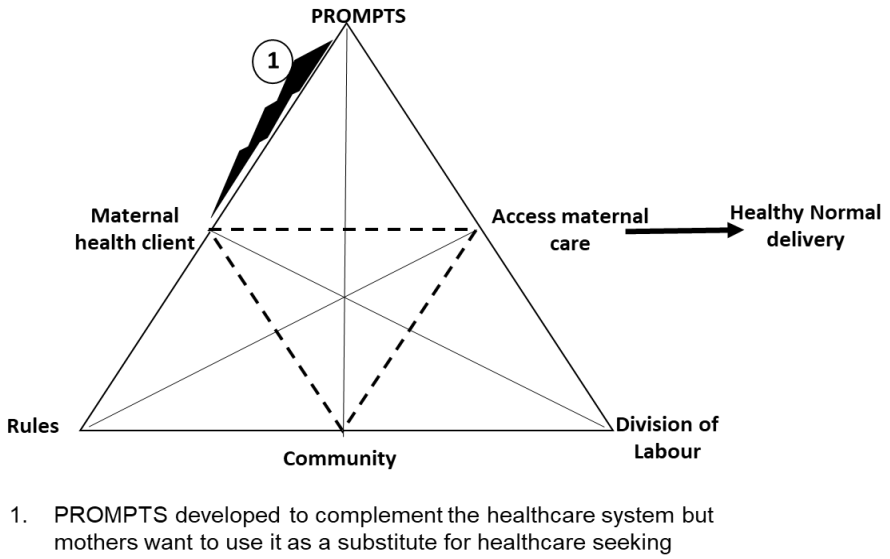


Figure 8.1: Activity system contradiction from conflicting perceptions of technology

8.4.3 mHealth redefines the maternal healthcare-seeking community, division of labour and rules

8.4.3.1 The community and division of labour

Traditionally, the term community of practice has been used to refer to a group of people who share a craft or profession who interact and learn from each other on an ongoing basis (Wenger et al., 2002). In this study, we adopted an alternative term – community of purpose – because rather than sharing a common practice, the maternal health stakeholders shared in the common object of a healthy pregnancy. Such communities are characterised by interpersonal trust and division of labour being a predominant source of social solidarity (Duguid, 2012). The maternal healthcare-seeking context in this study indicated an implied division of labour among the key actors in the community of purpose:

- Courtesy of their position as care providers, the HCPs were expected to provide information, care and support.
- On the other hand, significant others such as older female relatives, courtesy of their experience, were expected to support the maternal health client.

These findings are consistent with previous studies suggesting the importance of the community in the pregnancy experience of women in developing country contexts (Kaiser et al., 2019; Qureshi

et al., 2016; White et al., 2016). However, unlike these findings where the role of the maternal healthcare-seeking community is to provide care, the use of mHealth redefined the role of the community to that of a referent group, being used by the women to legitimise the intervention, and negotiate their use (Section 8.6.1 and 8.6.4 respectively).

The implied division of labour within this community failed due to:

- spatial separation between the women and their experienced and older relatives whose responsibility it was to offer information and support
- the low doctor-patient ratio that resulted in hurried consultations with limited time to provide sufficient information. *'It is often difficult to give individualised care because of the workload'* [Healthcare Providers].

These specific responsibilities within the community allude to an exclusive CoP, where pregnancy-related knowledge-sharing generally occurred within a close trusted circle of specific maternal health stakeholders. This exclusivity has been observed before in other studies (Atukunda et al., 2020; Kaiser et al., 2019). In these studies, the maternal health clients depended on healthcare workers and older experienced women in the community for knowledge about pregnancy. We refer to the breakdowns between the CoP and division of labour (DoL) within the healthcare activity system (see Figure 8.2), as '*dysfunctional structures*'. The mHealth intervention provided an avenue to resolve this contradiction by providing alternative access to pregnancy-related information and care, hence, partly subsituting the CoP.

At the vertical level of the DoL, mHealth helped to mediate the power distance that was linked to the exclusive ownership of information by the aforementioned stakeholders. The women reported not needing to seek information from the HCPs and other stakeholders once they started using the intervention. The classic study by Ainsworth-Vaughn (1992) confirms that one-sided ownership of information tends to translate to unequal power distribution between the doctor and the patient. At the horizontal level of the DoL, empowered women with access to information became educators of other maternal health clients in their circles. In this way, mHealth allowed the women to exercise increased *agency* by participating in knowledge sharing, thus making them active participants in the CoP.

8.4.3.2 Negotiating rules/values

With regard to negotiating rules, the mHealth intervention allowed both the women and their partners to negotiate various pregnancy norms. Prior to using the intervention, maternal health clients' healthcare-seeking was limited by their perceptions of pregnancy. They considered it appropriate to seek health services when the pregnancy was 'showing' despite clinical guidelines that required them to attend ANC as soon as they were pregnant. The mHealth intervention allowed women to interact with maternal services while maintaining their value system.

The findings also show that the mHealth educatiomal messages led to increased engagement of the partners with the pregnancy. This helped to mediate the cultural 'rules' that naturally excluded the men or limited their participation to financial responsibilities. *"For instance the issue of accompanying her to the clinic, when I read that it is advisable for me to accompany her to the clinic if I had the time I thought it was a good thing to do..."* [Partner 2]. mHealth interventions that involve men in a typically female area may be more effective in improving womens' health outcomes (Harrington et al., 2019) because of the pivotal role that men play in the use of health services.

8.5 Utilisation Behaviour from the Internalisation of mHealth

This section provides an answer to the third sub-question: *How does maternal health clients' internalisation of mHealth shape mHealth utilisation behaviour?* Using AT's principle of internalisation to understand how the healthcare-seeking socio-cultural context shaped maternal health clients' response towards mHealth revealed the following utilisation behaviours:

1) Hesitation to adopt mHealth
2) Agency to adopt mHealth
3) Using technology as a substitute
4) Dissonance in use

8.5.1 Hesitation to adopt mHealth and agency to adopt

In this section, we discuss the hesitation and the agency to adopt together since they were closely linked. The uncertainties and perceived risks within the maternal healthcare-seeking context resulted in hesitation to adopt mHealth. Some of the risks were associated with the urban setting

while some were attributed to the maternal healthcare-seeking activity itself (Recall Table 8.3). Table 8.4 summarises the uncertainties:

Table 8.4: Uncertainties in the maternal healthcare-seeking context

UNCERTAINTY	DESCRIPTION
Uncertainties about pregnancy	▪ uncertainties from the physiological nature of pregnancy, with possibilities of failing to culminate in birth ▪ uncertainties associated with an 'evil eye' that may interrupt the pregnancy, leading to its loss or to an undesired outcome ▪ uncertainties as a result of being inexperienced and hence being at risk of following wrong information from other people.
Uncertainties about the intervention	Two Levels: ▪ At the system level for fear that it may be a scam ▪ At the information level where the fear was about the accuracy of the information (Discussed in Section 8.6.1).

The context of the study was characterised by high susceptibility to fraudulent activities perpetrated through mobile phones (Recall Chapter 6). Maternal health clients were generally suspicious of unsolicited messages for fear of being conned. In light of this, the women expressed suspicion about whether the intervention was toll-free. The low socioeconomic status of the women may have heightened this perceived risk. *"They might say it's free and maybe you have only twenty Shillings' credit*[5]*, and then you send the message, and they consume your credit"* [FGD Women].

Following these uncertainties, the maternal health clients indicated that learning about the intervention from the health facility engendered a sense of trust that the intervention was legitimate. We referred to this as '*Legitimisation by association*' in Chapter 7. Earlier, we explained that this concept of a legitimate entity was socially constructed among the actors, instead of being solely the maternal health clients' perception. The mHealth toll-free feature also enabled the maternal health clients to overcome some of the perceptions of risk and uncertainty about the intervention being a fraud.

[5] Prepaid airtime or talktime that allows the mobile phone user to make calls or send text messages

Facilitated by the perception of pregnancy as a female domain, and enabled further by being toll-free, the women were able to engage with the mHealth intervention as a valid healthcare-seeking action. These factors allowed them to exercise agency to adopt without involving their partners. The husbands were considered the financial decision-makers of the home and needed to be involved in financial-related decision-making and expenditure. Though adoption of mHealth was largely autonomous, we noted that in the course of pregnancy, there were decisions such as visiting a TBA that were not made by the woman alone. In such instances, relevant stakeholders, such as older female relatives, needed to be involved.

The anonymity in the PROMPTS registration process in not requiring any personal information facilitated additional trust for the adoption of mHealth. Hence, the findings of the study show that the context in which an intervention is situated may stir up a level of trust or distrust towards the intervention. Other researchers have noted that, as long as the risk of adoption is high, potential IT users *hesitate to adopt* technology (Lee et al., 2013). Overcoming the perceived risks is therefore necessary to facilitate the initial adoption of technology. This study noted some mHealth implementation characteristics that aided users' trust thereby facilitating initial adoption of the intervention. Table 8.5 summarises the perceived risks within the maternal healthcare-seeking context and how mHealth users overcame these risks.

Table 8.5: Uncertainties, perceived risks and mHealth characteristics facilitating initial trust

CONTEXTUAL FACTORS	UNCERTAINTIES AND PERCEIVED RISK	INITIAL TRUST FACILITATED BY:
Uncertainties about pregnancy - Susceptibility to risks of unsuccessful pregnancy	▪ Trustworthiness of the information being legitimate ▪ Trustworthiness of the intervention (being at no cost) ▪ Trustworthiness of the intervention (being legitimate)	▪ Richness of communication media to share information about new technology ▪ Association to legitimate entity (the healthcare facility) ▪ Increased trialability in the intervention being toll-free ▪ Intervention design characteristics that enabled anonymity
Uncertainties about the intervention - Urban setting characterised by fraudulent activities perpetrated on the mobile phone		

We begin by pointing out the similarities of adoption in the empirical context to the insights alluded to by Rogers Diffusion of Innovation Theory (Rogers, 2010). The Diffusion of Innovation suggests that mass media alone is not enough to drive the adoption of technology. Zhang et al. (2015) observed a similar inadequacy of mass media channels on the uptake of an e-appointment service among patients in Australia. In our study, having a 'human face' to the poster, by having someone physically explain the details of the intervention, minimised the perceived risks and uncertainties. This observation may point to the need for rich channels of communication (e.g. face-to-face) to share information about new technology in high uncertainty contexts. Such channels are preferred where uncertainty and ambiguity is high (Straub et al., 1997).

Second, being a toll-free service may have increased the trialability of the intervention. Trialability of an innovation is positively correlated to the likelihood of adoption (Rogers, 2010). In healthcare, trialability is linked to minimal financial investment (Cain & Mittman, 2002). While the toll-free design may have enabled affordances related to accessibility and adoption, we note that having an active line, in the first place was dependent on the mobile subscriber keeping their line active by ensuring consistent airtime top-ups. Lines that were not topped up within a certain period were disabled. Hence, this contextual factor may, in the long-term have limiting effects on usability of mHealth for low income earners. For this study, the impact that being toll-free may have had on facilitating adoption may be linked to other contextual factors. The findings suggest a hierarchy of decisions in pregnancy with different levels of significance attached to them. So long as the intervention was offered free of charge and was associated with a legitimate entity, the decision to adopt mHealth may have been considered immaterial in terms of consequences. Decisions like visiting a TBA, for example, were not made by the woman autonomously. Evidence of varying levels of autonomy on maternal health decision-making is not new in pregnancy literature (Ghose et al., 2017; Kawaguchi et al., 2014). However, the materiality of the decisions to adopt maternal mHealth interventions may need to be further studied for better understanding.

These findings support the relationship between initial trust and initial adoption. Initial trust plays an important role in helping technology users overcome the risk and uncertainty associated with the use of new technology (Benbasat & Wang, 2005; Li et al., 2008). The findings of the study indicate that technology characteristics can be leveraged to aid initial trust among users. This is consistent with prior findings associated with the trust of technologies such as mobile banking (Kim et al., 2009; Lin, 2011; Zhou, 2011), all of which show that innovation

attributes/characteristics play a significant role in eliciting trust and continued use. For example, in mobile banking, structural assurances to ensure payment security, as well as information quality, were valued by users (Zhou, 2011). For an eHealth system (Sillence et al., 2007), quality of information was crucial for the development of trust. These findings from this section suggest the following theoretical proposition:

> **Proposition 1:** *Where context makes the decision to adopt mHealth immaterial, and technology is sufficiently legitimised for initial trust, users are likely to adopt mHealth*

8.5.2 Using technology as a substitute for care and support

The findings indicate that maternal health clients used mHealth as a substitute. As discussed earlier, the CoP for maternal care was exclusive. The exclusivity may have been linked to uncertainties of pregnancy and the need to safeguard these pregnancies from potential harm. Thus the women felt the need to keep pregnancy secret and only engaged specific stakeholders when necessary.

We earlier elucidated that the CoP and DoL were dysfunctional (Recall Section 8.4.3). In addition to the challenges stated earlier, this dysfunction contributed to maternal health clients having to deal with ‘multiple truths’ from other individuals outside the desired CoP. These multiple 'interpretations' of the truth increased the uncertainty, especially among inexperienced maternal health clients.

Subsequently, the use of mHealth presented the opportunity to 'create' a new CoP where the women believed they could access trusted information while maintaining the exclusivity of the pregnancy experience. The participants explained that once they started receiving information from PROMPTS, they stopped engaging all the other stakeholders, including the HCPs, for information. The women also felt that they were able to ask all kinds of questions, including those that they initially could not ask in face-to-face interaction. Hence, we note that the use of mHealth led to modification of the CoP through ‘partial substitution’. Subsitution of certain healthcare structures is not new to maternal health literature. Maternal health clients have been seen to substitute facility deliveries with alternative birthing options within the community when they perceived the options as being more convenient (Atukunda et al., 2020).

CoPs entail social structures. Technology may substitute, complement or modify existing structures (Weltevreden, 2007). It has been noted that technology-mediated interactions, such as the use of social network sites, may afford users the opportunity to create new forms of social capital (virtual social capital) that may oppose or complement the social capital that exists offline (Alessandrini, 2006). Yang (2009) demonstrated that the use of blogs facilitated the creation of a new community of practice for student teachers in Taiwan. Technology can also facilitate the creation of new communities by changing how knowledge is accessed, shared and facilitated (Hoadley & Kilner, 2005). Providing the women access to the information, the mHealth intervention increased the maternal health clients' level of empowerment and reduced their dependence on other stakeholders who may have been considered 'gate-keepers' to pregnancy-related knowledge. Various studies support empowerment through access to information (Bordin et al., 2007; Macueve et al., 2009; Vo et al., 2019).

Contrary to the assumption made in Rai et al. (2013) that complementary or substitutive use of mHealth is a conscious preference, this study notes that these may be unintended outcomes. The women in this study did not make any conscious choice to use mHealth as a substitute. From these findings, we present the following proposition:

> **Proposition 2***: When healthcare structures are dysfunctional, maternal health clients' use of mHealth as a substitute to care may modify the community of purpose*

8.5.3 Dissonance in use

Even when maternal health clients received advice from the intervention to visit their healthcare provider for further care, some women persisted in asking for assistance through the mHealth platform. Some reported changing the technique of subsequent messages as though they were asking on behalf of someone else, with the hope that this would elicit the desired response to be treated. The healthcare-seeking circumstances that gave rise to this behaviour were mostly those related to urgent questions and concerns around pregnancy-related complications. Maternal health clients wanted to be 'treated' and not to be sent to the hospital. Not receiving the expected assistance/diagnosis often led maternal health clients to feel frustrated.

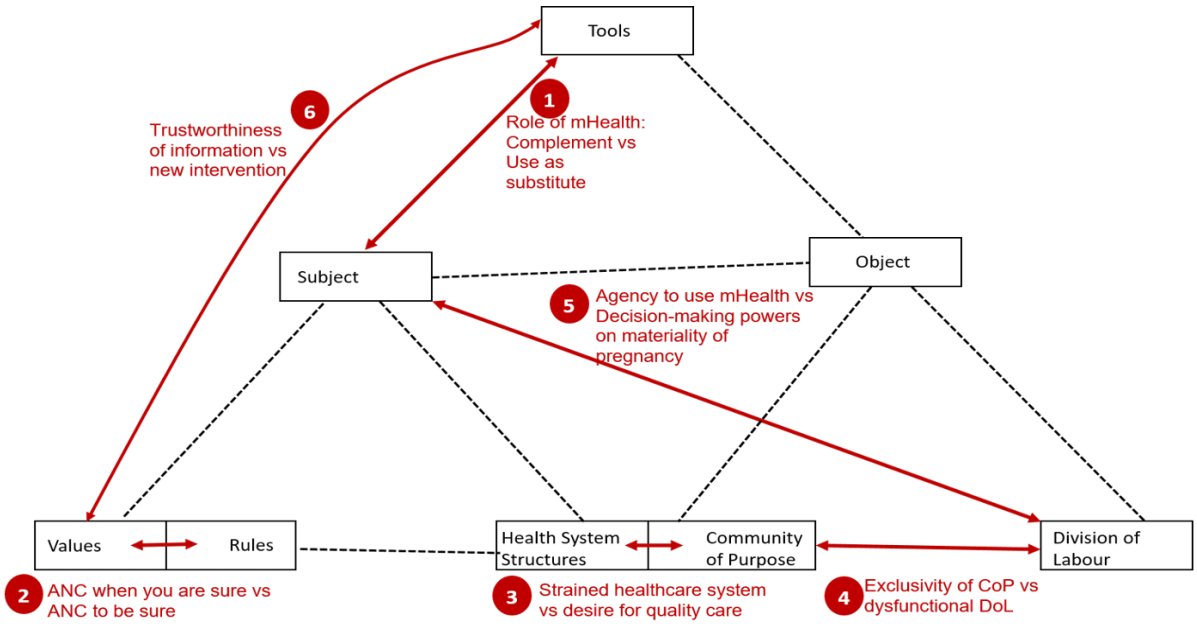
We relate the dissonant behaviour to the perception of usefulness that maternal health clients developed, which contradicted the utilisation intentions of the mHealth implementers. (This is further addressed in Section 8.6.2). Since this dissonance in behaviour is linked to the subsequent coping strategies that the users adopted (Section 8.6.4), no theoretical proposition is offered at this time.

8.6 Externalisation and Utilisation Behaviour

In this section, we answer the fourth and last sub-question: *How does maternal health clients' externalisation of their healthcare-seeking socio-cultural context shape mHealth utilisation behaviour?* As maternal health clients experienced tensions/contradictions/challenges within the activity system (Figure 8.2), further utilisation behaviour was elicited in the attempt to resolve the tensions. Using AT's principle of externalisation, this section offers insights on how the maternal health clients adopted newer forms of interacting with the mHealth intervention, following activity system tensions.

The contradictions detailed in Figure 8.2 resulted the following utilisation behaviour:

1) Legitimisation of the intervention
2) Humanising technology
3) Technology framing
4) Negotiated utilisation
5) Technology coping strategies



1. PROMPTS developed to complement the healthcare system but mothers use it as a substitute to care.
2. The maternal health clients would rather visit the ANC facility after they are sure about the pregnancy while the health system rules require them to visit as soon as they are pregnant.
3. There is a desire for better quality healthcare in a strained health system.
4. The maternal healthcare-seeking CoP is exclusive in that its constituency is limited to specific maternal health stakeholders. However the responsibility structures do not work partly because of the health system challenges and partly because of spatial separation between mothers and their kin whose roles are important in CoP.
5. Based on the non-materiality of the mHealth adoption decision, the maternal health client is able to exercise agency to adopt mHealth. However other stakeholders share decision-making powers in pregnancy-related decisions that have higher stakes.
6. Maternal health clients need for trustworthy information given the uncertainties surrounding pregnancy. However, the intervention is new and women need to determine the trustworthiness if the information being sent to them

Figure 8.2: Contradictions in the maternal healthcare-seeking activity system

8.6.1 Legitimisation of the intervention

At the core of legitimacy is reducing uncertainty by developing trust, based on performance and social acceptance that is culturally defined (Deephouse & Suchman, 2008). Thus it is impossible to discuss legitimisation without talking about trust. The findings show that maternal health clients legitimised the mHealth intervention to build further (post-adoptive) trust to use it. We observed two levels of legitimising the intervention:

- Legitimisation of the mHealth messages/information
- Legitimisation of the platform

Benbasat and Wang (2005) confirmed that trust in human-technology interaction contexts evolves; they emphasised the need to understand factors that lead to trust formation. Figure 8.3 illustrates

how trust may have evolved in this study and the mHealth characteristics that may have shaped each of the trust phases.

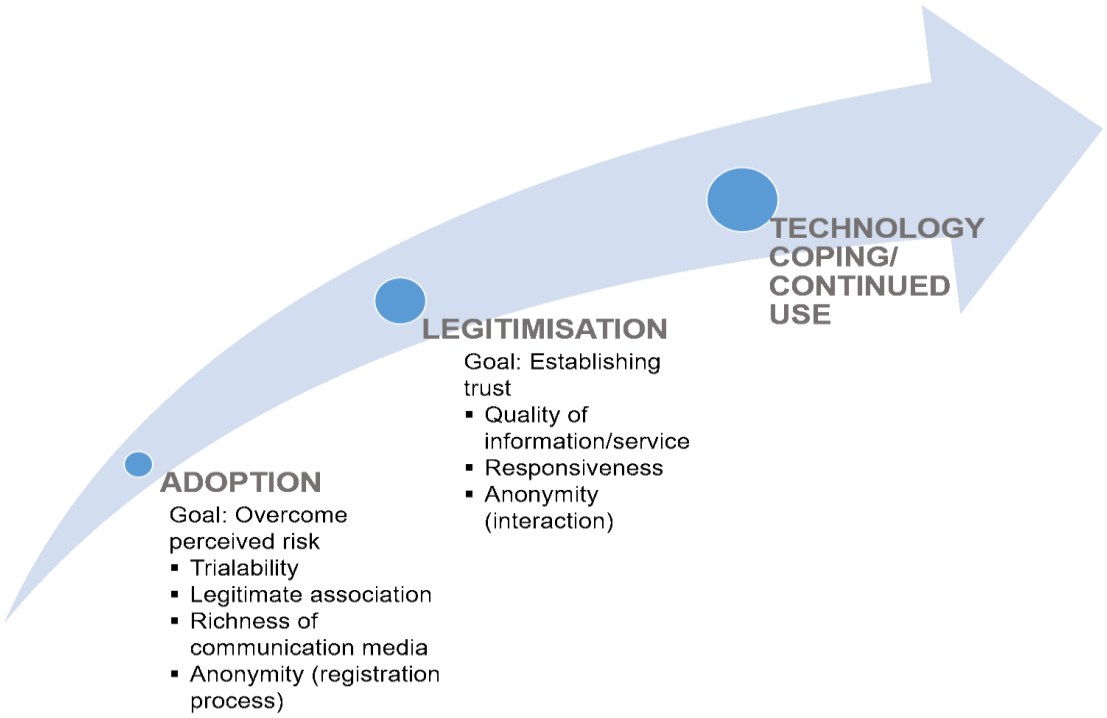


Figure 8.3: Evolving trust in the mHealth utilisation process

In legitimising the mHealth information, the message attributes that the women valued mapped to interpersonal trust beliefs (Table 8.6). Such trust beliefs have been used to explain trust in technology (Benbasat & Wang, 2005). The maternal mHealth intervention, therefore, may have been more readily legitimised because of the trustworthiness that could be associated with its messages. Other studies have confirmed that trust increases perceived usefulness (Benbasat & Wang, 2005). Consequently, perceived usefulness has been shown to increase satisfaction of technologies such as mHealth (Akter, D'Ambra, et al., 2013; Kaium et al., 2020) and mobile banking (Susanto et al., 2016). Satisfaction influences continued use, which is critical if benefits of technology are to be realised (Nabavi et al., 2016).

8.6.1.1 Legitimisation of the mHealth information

The intervention presented maternal health clients the opportunity to use mHealth as the singular source of 'truth' of pregnancy-related information. However, other sources of information were not immediately abandoned after adopting mHealth. The need to establish the trustworthiness of the messages was necessitated by the uncertainties surrounding pregnancy and the potential risks from following the wrong information. Hence, maternal health clients continued to consult with multiple sources to establish the credibility of the mHealth messages. Over time, the nature, consistency and quality of information as ascertained by corroborating accounts between the engaged stakeholders and the mHealth messages resulted in increased trust of the intervention. The sources used to legitimise these messages included the trusted stakeholders in the CoP comprising of HCPs or other experienced women, female relatives and partners. The use of multiple sources of care including multiple sources of information for maternal healthcare-seeking has often been cited in literature (Aikins, 2014; Graner et al., 2013) and is considered part of the culture of medical pluralism that is common in African contexts (Aikins, 2014).

The quality of the information was also linked to developing positive attitudes about the quality of service. The women indicated feeling '*cared for*' because they were offered high-quality access to information and support at no charge. The tone of the messages also made them feel '*special and important'*.

We posit that the quality of information played a critical role, since pregnancy in this context was seen as a highly information-dependent experience with many uncertainties. Other researchers (Lee & Chung, 2009) have reported the importance of quality of service delivered by accurate and adequate information in building users' trust in similar information-dependent domains such as mobile banking. Moreover, some researchers have suggested that when technology is 'faceless', users build trust by assessing the quality of the information (Beldad et al., 2010). In healthcare, the importance of the perceived quality of mHealth services in their utilisation has equally been emphasised before (Akter et al., 2010). Thus, mHealth may be underutilised when its users express low trust in their integrity and benevolence (Fox & Connolly, 2018), or when there is no demonstration of in-depth knowledge and clear concise information (Sillence et al., 2007).

Table 8.6: Trust associated with the mHealth intervention

TRUST ATTRIBUTE	EXCERPT
Benevolence	*"They also give you additional information that you didn't know about."* [FGD 2]
	"I decided not to stop because they were helpful." [Mother 1]
Competence	*"Information I received was sufficient, and it was quite broad. I would rather use the SMS because the information was more detailed…"* [Mother 19]
	"When I ask, the answer is complete" [Mother 21]
	"…it was the detail in the information that I liked…" [Mother 27]
	"I realised they were sending me all the information that I needed." [Mother 28]
Integrity	*"They replied to me; I was very satisfied…"* [Mother 22]
	"In the beginning, I was anxious because I was not sure if they were going to respond or not. Later on, I became more comfortable because I knew they would eventually respond even if they got delayed." [Mother 28]

8.6.1.2 Legitimisation of the platform

The women were able to legitimise the intervention further, based on other characteristics of the platform, such as its responsiveness and its anonymity. The consistent responsiveness demonstrated by the system in responding to all their questions increased their trust that the intervention was legitimate. Responsiveness may have led to trust since it may have reduced the 'unfamiliarity' of the intervention following the high uncertainties of the context. Furthermore, the anonymity of the interaction enabled the women to overcome the perceived risks inherent in face-to-face communications such as '*being judged.*' This trust facilitated further engagement with the mHealth intervention on subjects that the women would typically not talk about.

Other studies (Dean et al., 2012; Jimison et al., 2008) have reported similar findings on perceived benefits of anonymity in areas where stigma is common, such as HIV/AIDS. The preference for anonymity may appear contrary to other findings that have vouched for personalisation of mHealth interventions (e.g. Fjeldsoe et al., 2009). It is argued that interventions that personalise the message by saluting the recipient by name may promote the sense of 'being known'. Though the PROMPTS messages were not personalised by salutation, the timeliness of the messages (being stage-based) made the women feel that the intervention *'knew'* their needs. Therefore, we conclude that the

nature of the personalisation of an intervention may be context-dependent. In healthcare contexts where suspicion, secrecy and uncertainty are high, tailoring information might be more beneficial than tailoring to include personal information. This argument has been supported before by Ryan and Lauver (2002) who emphasised the importance of identifying the most salient characteristics to be tailored in the delivery of health interventions. The relevance of the messages in being stage-based positively influenced the mHealth satisfaction of maternal health clients, which may have subsequently influenced continued use. Satisfaction is positively linked to continued use of technology (Bhattacherjee & Premkumar, 2004). Other studies (Akter, D'Ambra, et al., 2013) have found that satisfaction is necessary for continued use of mHealth interventions.

Following these arguments, we propose the following theoretical proposition:

> **Proposition 3***: mHealth users employ technology characteristics and the community to legitimise the intervention beyond initial trust*.

To summarise our arguments on legitimisation, we point out the fact that, to date, most literature on legitimisation is presented from the perspective of IS owners and implementers engaging in strategic actions that build legitimacy for their information systems. Such studies (Flynn & Du, 2012; Flynn & Hussain, 2004; Kaganer et al., 2010) show the importance of IS developers and implementers in building legitimacy to achieve stakeholder acceptance for information systems. Our findings differ from these studies in that, in addition to the intervention having attributes that helped make it legitimate, the IS user was also actively involved in legitimising the IS artifact. We consider this view of legitimisation useful in understanding the agentic actions of users in technology interaction contexts.

With a plethora of recent studies examining trust in IT itself (Califf et al., 2020; Carter & Liu, 2018; Lankton & McKnight, 2011; Talwar et al., 2020; Zhang et al., 2019), our findings contribute to this discussion. We conclude that trust is the cornerstone for the legitimisation process that users engage in, and that the outcome of this legitimisation process is critical for continued use decisions.

8.6.2 Humanising technology

The findings suggest that the interpersonal characteristics in the mHealth interaction context may have contributed to humanising technology. The mHealth users attributed to the intervention qualities that would typically exist in interpersonal relationships. In using the intervention, the women felt that they *'[had] someone to help [them] now'* and that they had *'an invisible personal friend'*. Studies have shown that users sometimes interact with technology as social actors which may result in technology personification, where users imbue technology with human qualities (Al-Natour & Benbasat, 2009; Moussawi et al., 2020; Söllner et al., 2012; Wang, 2017). In a similar study (Aamir et al., 2018), female health extension workers felt that the mHealth application was their '*helper that gave them the confidence'* to perform their duties more efficiently; this perception arose because of the skills and knowledge they gained through the use of the phone.

Personification is often made possible by the social cues a technology presents (Benbasat & Wang, 2005; Nass & Moon, 2000). In this study, one of the needs for maternal health clients was to feel 'cared for'. Maternal health clients expected doctors to offer both psychosocial support and clinical care during pregnancy. The mHealth system presented the friendliness and nurturing traits and thus had the desired HCP's persona. Other researchers (Sprague & Simon, 2014; van der Kop et al., 2013; Ware et al., 2016) have noted similar findings where participants valued HCP's friendliness and nurturing traits over just their professional expertise and clinical services. Since the mHealth intervention was accompanied by the expected health provider's persona, mHealth users could readily substitute the physical interaction with the HCP with the 'mHealth doctor'. We therefore suggest the following proposition:

> **Proposition 4:** *When mHealth systems present appropriate social cues, users may humanise these interventions.*

8.6.3 User framing of technology shapes technology utilisation

The maternal health clients' perceptions of the value of the mHealth intervention were based on the opportunities that it provided to:

- overcome the healthcare system barriers in accessing maternal care and
- overcome the uncertainties related to pregnancy and manage pregnancy exclusivity.

The perceived usefulness from the opportunities that the intervention provided resulted in maternal health clients using mHealth as a substitute to visiting the hospital. Orlikowski and Gash (1994) noted that, sometimes, people develop their own perceptions of technology that might be different from what it was supposed to offer. In this study, the mHealth implementers provided the mHealth intervention to complement existing healthcare structures. However, the perceived usefulness of the intervention as adopted by the women resulted in using mHealth as a substitute. This view of usefulness, that is dependent on context rather than being inherent in technology, has been addressed by Nocera et al. (2007) as a social construct.

Different technological viewpoints/frames facilitate or impose barriers to users' interaction with technology. Since different groups of people might have different technology frames, incongruence is sometimes inevitable (Nocera et al., 2007; Orlikowski & Gash, 1994). This manifested as an activity system contradiction between the mHealth intervention and the maternal health clients (Recall Figure 8.1).

From the findings of the study, we suggest that the extent to which the maternal health clients used technology as a substitute was likely triggered by other factors. These factors included their socioeconomic status and the limited options of effective healthcare. The shortcomings resulted in a dependence on technology as an antidote to their challenges. Socioeconomic factors are critical because cost-related access barriers affect the use of technology (Venkatesh & Brown, 2001). Consequently, removal of this barrier to adoption may have amplified the perceived usefulness of the intervention in avoiding healthcare-seeking costs. These observations support the following theoretical proposition:

> **Proposition 5***: When the perceived usefulness of mHealth presents the opportunity to use it as a substitute, mHealth users may develop undesired technology framing.*

8.6.4 Negotiated utilisation by the maternal health client

The data revealed that maternal health clients used the intervention to back-up their actions. For example, maternal health clients often needed certain foods that had been communicated as being nutritious for their pregnancy. However, some of these might have been accompanied by pregnancy-related food taboos that forbade the woman from consuming them. Moreover, in the context of the study, the women were dependent on their partners and other stakeholders for

financial support that included buying the food. Hence, the women could not follow through with the health tips unless the stakeholders shared in the same value of the need for compliance. We therefore observed that when needing to enact a certain course of action that conflicted with the shared norms, women engaged the requisite stakeholder by referring to the mHealth messages as being what '*the doctor has said*'.

The partners also reported being increasingly aware of the care and support that they needed to offer the maternal health clients to ensure safe pregnancy. For example, some reported helping in certain household chores or finding someone to help their partners, based on some of the messages that they had read. Thus, the mHealth intervention *'empowered'* the maternal health clients by giving them *'a voice'* and enabling them '*to be heard'*. This allowed them to put into practice the information they received, especially where they were previously limited.

Earlier on, we alluded to the role of access to information on empowerment which is reported to be useful in helping women make informed decisions about utilising healthcare services such as regular ANC and skilled delivery (Lund et al., 2014). Our findings suggest that maternal health clients do not only benefit from empowerment by access to information, but also empowerment from the redefined division of labour facilitated by the intervention. In the following subsections, we focus on this form of empowerment, how it translates the use of mHealth to enrol other stakeholders and the resulting concept of negotiated use.

8.6.4.1 mHealth empowering users

Though there are many definitions to the word 'empowerment', we use the term here with reference to power to make decisions and to be heard (Macueve et al., 2009). As indicated, the mHealth intervention empowered the women by allowing them to negotiate the rules within the healthcare-seeking activity (Recall Section 8.4.3). Since women's healthcare-seeking behaviour was initially constrained by the norms of secrecy surrounding pregnancy, the mHealth intervention allowed them to engage with care while maintaining their belief. This role of technology in negotiating rules within the activity system was elucidated by Kuutti (1996). With the emerging CoP that allowed women access to information previously owned by a select few, maternal health clients were able to engage their voice to be heard by using the mHealth intervention to back them up. Ilozumba et al. (2018) reported a similar finding on mHealth ‘giving voice’ to CHWs whom

the mothers in the study listened to because ‘they [CHWs] were not telling. Rather it was the intervention was telling’. Obayelu and Ogunlade (2006) noted the role of ICT in giving rural communities in Nigeria a voice to contribute to development processes, while Brouwer (2006) noted the role of an online forum in giving girls a chance to express themselves. Cummings and O'Neil (2015) also noted that where social [and cultural] norms do not hinder the access and use of technology, ICTs may increase women's voice to participate and to be heard. In this study, women did not experience any barriers to the access and use of mobile technology in light of ownership, technical skills and infrastructural access.

8.6.4.2 Users employing technology to enrol other stakeholders

The empowered women engaged in a process of using mHealth to enroll significant others. The findings show that this process may have been necessitated by the critical role that these stakeholders played at the level of appropriating the mHealth information. We also posit that the success of using mHealth to enrol stakeholders was facilitated by the fact that the mHealth intervention was already associated with a legitimate entity among the stakeholders. Consequently, it was easy for the maternal health clients to use the intervention to back them up. Making their use of the mHealth intervention acceptable may have been considered necessary by the women to safeguard themselves from any blame, should there have been risks from using the new intervention. The results showed that the enrolled stakeholders consented to the woman's course of action and/or went ahead to facilitate it when this behaviour could be backed up by the mHealth intervention.

8.6.4.3 Using technology to negotiate use

We borrow the concept of negotiated use from the work of Weilenmann (2001, p. 139) which arises from the assumption that "when coming into an activity at the beginning to use technology, people already have expectations and opinions of this technology" (Weilenmann, 2001, p. 139). As such, negotiations among the users need to occur to reach a common understanding and establish norms of when, where and how to use the technology. Weilenmann thus uses the concept to refer to several users of technology negotiating the practice of technology use, depending on their varied interpretations of the role of the technology. However, we modify

the term to refer to users justifying their use of technology to other users who may not necessarily interact with the intervention, but are considered important in the continued use of the technology.

Technology adoption models often address the influence of other people on the use of technology through the concepts of social influence and subjective norm (Al-Gahtani et al., 2007; Venkatesh & Zhang, 2010). In HIT research, these concepts have been used to show that people may adopt technology when significant others think they should (Or et al., 2011; Or & Karsh, 2009; Phichitchaisopa & Naenna, 2013). These studies illustrate that such compliance on the part of the users is to show 'appropriate behaviour'. Though different in that there was no expectation for women to use mHealth technology, the concept of negotiated use that we adopt builds on the principles from these models. The principle is that, sometimes, information systems users adopt utilisation behaviour that conforms and is deemed acceptable, based on the norms and values of the groups they belong to, as observed in Goh et al. (2010). In the study, students from Asian societies, influenced by their cultural disposition, used technology (a blog) in a way that maintained harmony by not posting feedback that would offend their classmates.

The idea of seeking appropriate use is also supported by the concept of compatibility in diffusion of innovation theory. Rogers (1995) defines compatibility as the degree to which using an innovation is perceived as consistent with the existing socio-cultural values and beliefs of the adopters. Seeking to make their use of mHealth a culturally appropriate behaviour may have been important to the women, because of the interdependent nature of the maternal healthcare-seeking context. Such behaviour is more likely in collectivist cultures than in individualistic cultures (Al-Gahtani et al., 2007). In individualistic societies, individuals are less likely to follow norms, whereas, in collectivist cultures, people are less independent and hence conform more (Hofstede, 1984). These empirical observations support the following theoretical proposition:

> **Proposition 6***: When stakeholders play a vital role in the CoP, mHealth users employ legitimated mHealth interventions to negotiate use.*

8.6.5 Strategies to Cope with Technology Dissonance

The empirical findings indicate that maternal health clients were sometimes dissatisfied with the mHealth intervention because of the waiting times to get a response. This was especially true when they considered their concern urgent. "*I thought [the delay] was not good because it could be an*

emergency and sometimes when asking for information you require the response immediately...". The delay in the response was due to the fact that the PROMPTS intervention was a hybrid system with a human component (Recall Chapter 6). Though the push messages were automated, responses to maternal health clients' questions were mediated by a trained PROMPTS staff member. The resulting delay in receiving responses led some mHealth clients to adopt alternative strategies, such as seeking alternative sources of information and care as they waited, while some completely abandoned the intervention because they felt frustrated.

Dissonance in technology use (Recall Section 8.5.3) may create ambivalence, which leads to anxiety for the user and the need for coping strategies (Mick & Fournier, 1998). Some studies have identified the *'engaging/disengaging'* paradox as one that technology users may face (Jarvenpaa & Lang, 2005; Mick & Fournier, 1998). This paradox refers to users' desire "…to choose when to engage in a discourse and when to disengage… People want to know what is going on…" (Jarvenpaa & Lang, 2005, p. 16). The need for urgent care was one such scenario where maternal health clients wanted to engage. Thus, when the intervention 'failed' in engaging them by providing quick feedback, some mHealth users accommodated the technology, whereas some completely abandoned it. Viswanathan et al. (2017) demonstrated that mobile app customer disengagement, based on users' judgements on the app's failures, had a negative impact on use. Paradoxes may create ambivalence which creates anxiety for the user and the need for coping strategies (Mick & Fournier, 1998).

8.6.5.1 Accommodation of technology

Though "*the response sometimes delayed ... eventually they would respond*". This participant feedback demonstrates the users' accommodation of the mHealth intervention. However, while waiting for a response, the women sought alternative sources of care. In maternal health, the delay in receiving care is identified as one of the major contributors to maternal mortality (Thaddeus & Maine, 1994; Thorsen & Sundby, 2012). Hence, this period of waiting may be dangerous to maternal health outcomes, as the maternal health clients may engage with sources of care that offer contradictory information which may worsen health conditions. Moyer and Mustafa (2013) note that, more often than not, cultural norms and beliefs run contrary to formal care procedures. From the empirical observations, we suggest that mHealth users tended to accommodate technology if it had been sufficiently legitimised in their preceding interaction with it.

8.6.5.2 Abandonment of technology

The contradictions in the role of technology between the users and the mHealth implementers may have contributed to incongruence, dissatisfaction and ultimate abandonment of technology by some users. *"No matter how much we clarify that we'll get back to you within 48 hours, somebody will get so impatient and angry and opt out..."* [Key Informant 1]. Viswanathan et al. (2017) noted that a technology's disengaging features, especially when it debilitates the user from achieving their goals, ultimately leads to the customer's discontinued use. For the women in the study, the delay in receiving a response to their urgent questions threatened their very maternal healthcare-seeking goals. These findings on technology coping strategies support the following proposition:

> **Proposition 7***: When mHealth is considered disengaging at critical points of care; users may accommodate technology or abandon it*

8.6.5.3 Explaining differences in behaviour

The hierarchy of activity depicted by motives, goals and operations (Recall Chapter 4) is useful in using AT to understand people's behaviour (Karanasios, 2018). This concept proved useful to offer an understanding of the maternal mHealth clients in the face of the aforementioned technology paradoxes. Karanasios (2018) explains that when conditions (at the lowest level of the activity hierarchy) change, requiring actors to adopt new actions and goals, people may *adapt* providing the motive of the activity remains unchanged. However, people get unsatisfied when their motives are frustrated. We suggest that where the mHealth intervention was sufficiently legitimised for the maternal health client, the need to wait for a response reflected a change in conditions, rather than the frustration of the motive. This led to adopting technology accommodation-coping strategies. On the other hand, for the maternal health clients for whom technology had not been sufficiently legitimised, the delay in receiving a response threatened their very motive of healthcare-seeking. For this reason, such users abandoned the use of the intervention.

8.7 Healthcare-seeking Provides the Context for the Dialectical Relationship Between mHealth and the Maternal Health Clients

In the previous sections, we have demonstrated that we have adequately responded to each sub-question that guided this study. In this final section of the chapter, we summarise all that we have stated by presenting the answer to our main question even more succinctly. Hence, we provide an answer to the question: *How does the healthcare-seeking socio-cultural context shape maternal health clients' mHealth utilisation behaviour?*

The findings showed that the shaping was not exclusive to the socio-cultural context alone. The technology and its agency were also intra-actively involved in exploiting inadequacies which facilitated the ongoing production of utilisation behaviour. This behaviour emerged through the maternal health clients' internalisation of mHealth, and externalisation of their socio-cultural context. Maternal health clients therefore engaged in this complex dialectical process within the healthcare-seeking context. We emphasise that the internalisation and externalisation do not take place separately. These are enmeshed into each other, and the separation in this thesis is only done for the purpose of making the discussion clear. This interaction, albeit simplistically, is depicted in Figure 8.4.

The newness of technology, coupled with high uncertainty avoidance, resulted in non-adoption or hesitation to adopt the mHealth technology. However, when the technology introduction context had factors that limited the liability of newness, and the context supplied the enabling opportunities, maternal health clients were able to adopt mHealth. Adoption may also have been facilitated by the perceived usefulness of mHealth. As an 'information dependent' experience, the perceived usefulness of mHealth was intensified by dysfunctional healthcare structures. Despite adopting the intervention to curb the challenges, the technology was not immediately trusted. The uncertainties within the maternal healthcare-seeking context necessitated further legitimisation.

Maternal health clients engaged in a process of legitimising the mHealth information to deal with the uncertainty surrounding its trustworthiness. The legitimisation process involved engaging trusted pregnancy-related stakeholders. The message characteristics also furthered this trust. Hence we note that there were two main levels of trust: (i) trust arising from use of the intervention and (ii) trust enabled by the legitimisation process. This finding supports the notion of the evolving nature of trust (Benbasat & Wang, 2005; McKnight et al., 2011).

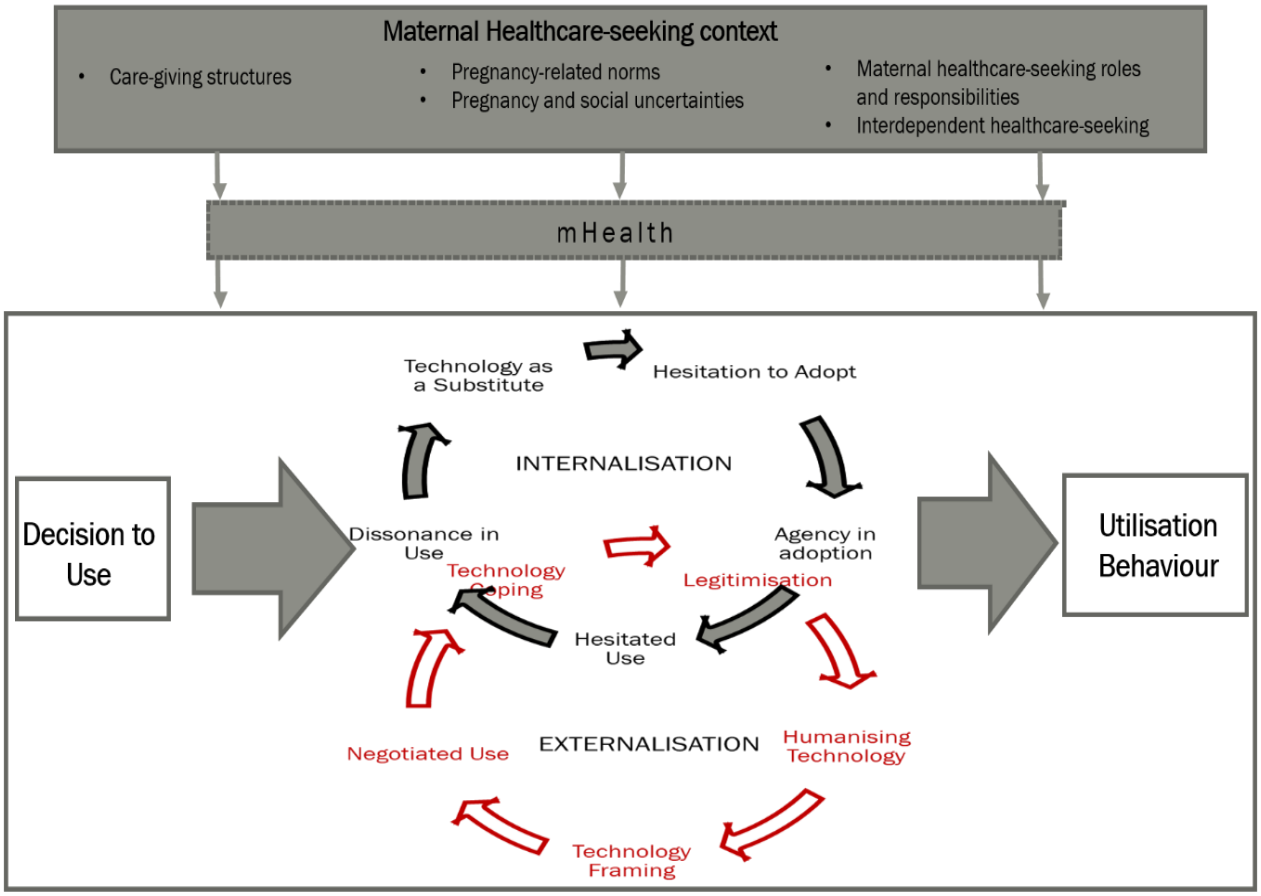


Figure 8.4: Maternal health clients' mHealth utilisation behaviour

Once the intervention was to a large extent legitimised, it was used to substitute the dysfunctional structures in the healthcare-seeking activity. The substitutive use created dissonance because it differed from the intended use by the implementers. To cope with the dissonance, the users adopted technology-coping strategies that involved accommodating the technology or abandoning its use.

Though adoption of technology was an autonomous decision, the appropriation of information depended on the material context. To explain this, we point to the separation of an IT construct into its technological and information aspects (Leidner & Kayworth, 2006). These authors argued that though uncertainty avoidance may lead a technology user to resist adoption of the technological artifact, the perception of what constitutes valuable information may cause users to decide positively towards using the technology. In the case of this study, the maternal health information shared by the PROMPTS intervention constituted valuable information for the maternal health clients. This information allowed them to mitigate the uncertainties surrounding pregnancy. However, to allow them to further appropriate the information, the maternal health

clients used the legitimised intervention to enroll relevant stakeholders and negotiate their use. By negotiating use, the maternal health clients sought to make their action of using mHealth a culturally-appropriate behaviour.

These results therefore demonstrate that though the adoption of technology may be an individual decision, post-adoptive utilisation is more complex. This use emerges only as the user negotiates their interaction with technology within the socio-cultural context. In this study, the maternal health clients engaged the technology to negotiate social norms and make their mHealth use an acceptable action.

8.8 Chapter Summary

This chapter provided an in-depth theoretical elaboration of the four research questions that guided the study. The answers to these questions explicate how mHealth utilisation behaviour arises. In light of the discussion, seven theoretical propositions were suggested. The following is a summary of the theoretical propositions:

1. Where context makes the decision to adopt mHealth immaterial and technology is sufficiently legitimised for initial trust, users are likely to adopt mHealth.
2. When healthcare structures are dysfunctional, maternal health clients' use of mHealth as a substitute to care may modify the CoP.
3. mHealth users employ technology characteristics and the community to legitimise the intervention beyond initial trust.
4. When mHealth systems present appropriate social cues, users may humanise these interventions.
5. When the perceived usefulness of mHealth presents the opportunity to use it as a substitute, mHealth users may develop undesired technology framing.
6. When stakeholders play a vital role in the CoP, mHealth users employ legitimated mHealth interventions to negotiate use.
7. When mHealth is considered disengaging at critical points of care; users may accommodate technology or abandon it.

CHAPTER 9: SUMMARY, CONCLUSION AND RECOMMENDATIONS

9.1 Introduction

The aim of the study was to investigate mHealth utilisation behaviour in the light of contextual factors. We argued that for mHealth utilisation, the healthcare-seeking activity itself provided the minimum context. Therefore, we focused on the socio-cultural factors related to maternal healthcare-seeking. Building upon the socio-technical view of IS, we showed that the context in which the technology is implemented shapes how potential users understand, perceive, interact and use the technology.

The study employed a qualitative approach. We employed case study research and an interpretivist paradigm. We used AT as a lens to describe and explain mHealth utilisation as anchored in the healthcare-seeking activity. Since it provided orienting concepts to study the phenomenon in situ, it complemented the research methods adequately.

The primary question that we sought to answer was: **How does the maternal healthcare-seeking socio-cultural context shape maternal health clients' mHealth utilisation behaviour?** To answer the question, we explored the dialectical relationship between the technology and the users and how this interaction within the healthcare-seeking socio-cultural context resulted in the observed utilisation behaviour. The primary question was addressed through four sub-questions which were originally stated in Chapter 1 and restated in Chapter 4, based on the theoretical concepts as shown in Table 9.1.

Table 9.1: Sub-questions as stated in Chapter 1 and Chapter 4

Sub-questions as stated in Chapter 1	Sub-questions as restated in Chapter 4
What are the socio-cultural characteristics of maternal healthcare-seeking context?	What are the socio-cultural characteristics of maternal healthcare-seeking context?
How does mHealth mediate maternal healthcare-seeking?	How does mHealth mediate maternal healthcare-seeking activity?
How does mHealth shape maternal health clients' mHealth utilisation behaviour?	How does maternal health clients' internalisation of mHealth shape their mHealth utilisation behaviour?
How does maternal healthcare-seeking socio-cultural context shape maternal health clients' mHealth utilisation behaviour?	How does maternal health clients' externalisation of their maternal healthcare-seeking socio-cultural context shape mHealth utilisation behaviour?

To conclude this study, Section 9.2 gives an overview of the research from the goals and objectives, to methods, findings and interpretation. Section 9.3 presents a summary of the research findings, and Section 9.4 proceeds to discuss the implications for the design and implementation of mHealth, based on the insights gained in the study. We discuss how our work contributes to theory and practice in Section 9.5. Section 9.6 addresses the limitations of the study, while Section 9.7 offers suggestions for future research. The researcher's reflection of the process is documented in Section 9.8. Section 9.9 offers an evaluation of the study based on Whetten (1989) and, finally, we offer our parting remarks in Section 9.10.

9.2 Overview of the research

Following the objective of the study **'to explain how the maternal healthcare-seeking socio-cultural context shapes maternal health clients' mHealth utilisation behaviour'** we formulated the research questions based on the argument that there is a dialectical relationship between technology and its context. Hence by studying mHealth in its context of use, we postulated it was possible to reflect on the design and implementation of mHealth innovations that are context-appropriate.

Subsequent chapters situated the phenomenon of study within the wider body of knowledge. We elaborated the concept of utilisation in relation to IS acceptance. We concluded with the thought that since "mHealth adoption is not only a technology acceptance behaviour but also a health-related behaviour" (Guo et al., 2015, p. 661), relevant studies should study mHealth acceptance in the healthcare-seeking context.

Following the explanatory nature of the study, we adopted qualitative methods. We justified the use of an interpretivist paradigm as well as using a case research strategy. Accompanying data collection methods included interviews, FGDs, observations, informal discussions and document review. Using a Kenyan mHealth intervention case, we purposively sampled various categories of participants ranging from maternal health clients to care givers. We drew upon Activity Theory , which we argued provided a more plausible way to discuss relationships between technology, people and contexts. The main advantage of AT for this study was in providing the necessary orienting concepts to explore the phenomenon of technology utilisation, while not being a strict descriptive theory.

By applying a hybrid analysis approach where deductive analysis was followed by inductive analysis, the findings revealed an intricate interaction between technology and the context. It was evident that as an action within the healthcare-seeking activity, the use of mHealth was both motivated and directed by the nuances of the context as well as how mHealth mediated the healthcare-seeking activity.

The detailed theoretical elaboration revealed various insights (See Section 9.3) which we summarised to seven theoretical propositions (Recall Chapter 8). These propositions suggested that the resulting utilisation behaviour was not a product of the context only, but also the technology and its agency.

9.3 Summary of Research Findings

Applying AT's principles of internalisation and externalisation revealed the dialectical nature between technology and the users that was shaped by the maternal healthcare-seeking socio-cultural context. We noted that utilisation behaviour develops in this complex continuous cycle of internalisation and externalisation that are interlinked rather than separate. Some of our conclusions were similar to findings in previous studies, while others were new. The following points offer a summary of our findings:

- *Agency in initial adoption of technology* – Maternal health clients' agency to adopt was enabled following the legitimisation of the intervention based on its association with a trusted entity such as a healthcare facility. However, adoption was not the sole result of a legitimated intervention. Adoption was mediated by other factors in the material context that enabled agency. These included the removal of financial barriers in the intervention being toll-free and the immateriality of the decision to adopt technology within the context of study. Other technological features such as anonymity in registration contributed to reducing the perceived risks, thus facilitating initial trust for mHealth adoption.
- *Use of technology as a substitute* – The perceived usefulness of mHealth based on the shortcomings of the healthcare-seeking context led the mHealth users to use the interventions as a substitute to the dysfunctional structures.

- *Dissonance* – Through a process of activity system contradictions, the substitutive use resulted in mHealth users experiencing dissonance. Their subsequent use of technology was characterised by expectations from their own conceptualisation of what the intervention should do.
- *Legitimisation of the intervention* – In high uncertainty health domains, where the health consumers are heavily reliant on information, as was the case for the pregnancy context in the study, mHealth users may develop strategies that facilitate further trust. Initial trust that facilitates adoption is not sufficient to ensure continued use. The maternal health clients in this study developed legitimisation strategies. In the maternal health context where the role of community was key, the relevant stakeholders played a crucial role in helping the maternal health client legitimise the intervention. In addition, other intervention characteristics, such as the quality of the information and the quality of the service, also played an essential role in facilitating this process by building trust. While the initial phase of legitimisation helps to overcome the risk of adoption, the second phase of legitimisation is necessary for continued use.
- *Humanising technology* – Following the users' expectations of health services and the congruence of the mHealth intervention with these perceptions in displaying appropriate social cues, an anthropomorphic response was elicited. In this study, we observed that the maternal health clients attributed to the intervention human characteristics, because of the desired persona of a HCP that accompanied the services offered through the intervention.
- *Technology framing and utilisation* – Users' perceptions of mHealth usefulness which was influenced by factors such as dysfunctional structures, led to the development of an undesired technology frame. This perception was different from the implementers' intended use. The conflict created breakdowns from how the users used the interventions and the expectations they had.
- *Negotiated use* – The mHealth users in the study employed legitimated interventions to enrol other important stakeholders, and to negotiate their use of the intervention. We posited that this process was necessitated by the need for maternal health clients to maintain harmony by adopting a culturally appropriate behaviour. In this study, the maternal healthcare-seeking context was largely collective, with clearly defined roles

among stakeholders. Decisions that were material to the pregnancy experience necessitated compliance to the group's norms.

- *Coping strategies* – When mHealth interventions are perceived to be disengaging when their users want to engage, people may adopt technology-coping strategies that include accommodating technology or abandoning technology, as was seen in this study. The technology-coping behaviour that is adopted is dependent on the extent to which the perceived technology paradox is seen to challenge the motive of healthcare-seeking and the extent to which the technology is legitimised to the user.

Figure 9.1 provides a summary of how these concepts are linked.

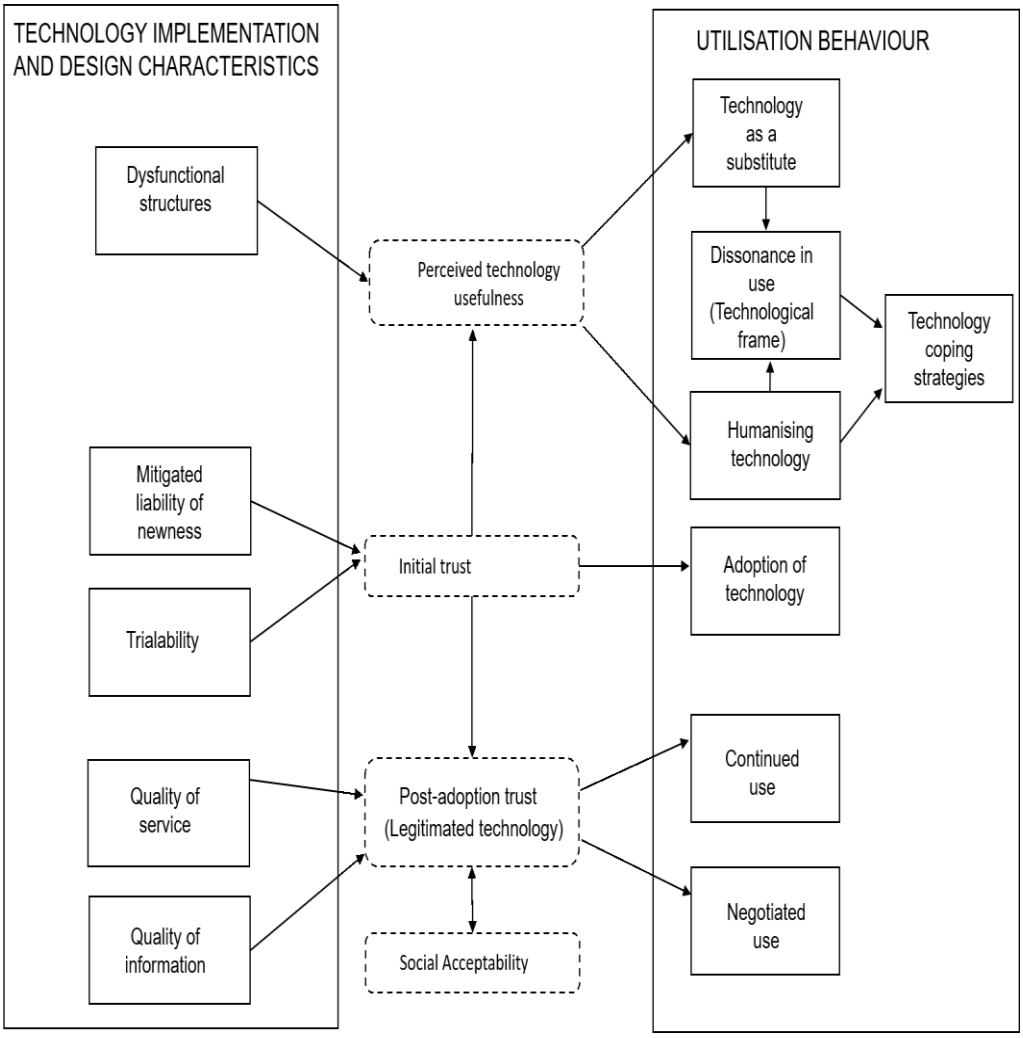


Figure 9.1: How the maternal healthcare-seeking context shapes maternal health clients' mHealth utilisation behaviour

9.4 Implications for Design of mHealth

By studying utilisation of mHealth within the healthcare-seeking context, we are able to reflect on some implications for design and implementation of such interventions. The findings of the study revealed that technology characteristics and affordances were important in how women interacted with the mHealth intervention at different points (Recall Chapter 8). In this section, we reflect on some of the aspects that mHealth developers and implementers may engage with in building/designing for context. Table 9.2 summarises these considerations.

Table 9.2: A summary of mHealth design and implementation considerations

DESIGN/IMPLEMENTATION CONSIDERATIONS	
Technology characteristics to facilitate utilisation	
▪ Facilitating initial adoption	To facilitate initial adoption, consider characteristics that will enable the user to adopt in light of the socio-cultural dynamics of the material context. (For example, being toll-free in this study enabled women to exercise autonomy in adoption since they did not have to depend on financial resources from their partners).
▪ Building for initial trust	Thinking about characterisctics that will help to overcome the contextual risks that are associated with adoption e.g. an anonymous registration process to overcome suspicions related to fraud.
▪ Legitimating and facilitating legitimisation	mHealth implementers and developers could seek legitimacy by incorporating design and implementation aspects that make these interventions more acceptable among their target users. For example engaging target users in the design of mHealth content to ensure that they are relevant and relatable. They could facilitate legitimisation that is done by the users by incorporating aspects such as responsiveness, good quality messages, good quality of services, among others (Recall Chapter 8).
Involving healthcare workers to champion mHealth interventions	Involving HCPs to champion these interventions may increase their use. However, their involvement may also present potential challenges based on health consumers' perceptions of HCP attitude and in health domains where health consumers prefer anonymity.
Involving significant others	The stakeholders in maternal healthcare-seeking context may be critical in helping the woman to legitimise the mHealth information. Designers and implementers may need to think of ways to take advantage of this special role of the community in facilitating the success of their interventions.
Integrating mHealth into healthcare system structures	Integration may help to extend the HCP's care and support beyond the physical hospital setting. This may be useful in the resource-costrained setting that is common in developing country contexts. It may also result in positive attitudes towards the patient-provider relationship that may encourage health services utilisation and better health outcomes.

9.4.1 Designing to promote utilisation of mHealth interventions

9.4.1.1 Building mHealth to facilitate initial adoption

Implementers need to consider contextual factors such as the materiality of technology adoption decisions in the context of implementation. The results of this study indicate that in the light of the context, maternal healthcare-seeking was considered a female domain and the decision to adopt toll-free mHealth services was not considered material enough to warrant the involvement of other decision-makers. Consequently, autonomy in adoption was made possible. However, while the phone itself suggests the potential to be empowered by making access to information easy, this potential for low socioeconomic mHealth users is only unlocked when the service is free of charge. This was evident in how maternal health clients in this study preferred to seek information from the mHealth intervention over consulting with family members, because, for the latter, they needed airtime to make a call. The maternal health clients' experiences implies that interventions that truly hold the potential to be adopted and to empower those in lower and disadvantaged socioeconomic groups are those that are offered free of charge. Paid-for mHealth interventions may only exacerbate the health inequalities among the poor and the rich. Toll-free interventions encourage adoption by limiting the cost of trialability.

9.4.1.2 Building mHealth for initial trust

To ensure initial trust, designers and implementers need to think about factors that would reduce the liability of newness of mHealth interventions in the contexts in which they are implemented. This may include associating the interventions to trusted entities. As seen in this study, the maternal health clients built initial trust in the technology because it could be associated with a healthcare facility.

Over and above reducing the cost of trialability, interventions that are offered at no cost may reduce the uncertainty associated with financial scams where the implementation context is faced by such realities. In the case of this study, the susceptibility to mobile phone frauds made participants wary of adopting the intervention. Following the decision to adopt, the fact that no personal identifiable information was required increased the users' initial trust. This suggests that implementers need to consider the extent of personal information collected upon initial interaction with mHealth technologies, especially in settings where suspicion is high. The reality of suspicion from

fraudulent activities is likely to be more heightened in urban areas, though further studies should be conducted to confirm this assumption.

9.4.1.3 Building mHealth to aid legitimisation for continued use

With the importance that this study has elucidated on the role of legitimisation on continued use, mHealth designers and implementers need to consider effective mHealth design attributes that will facilitate this. From this study, we highlight some of the attributes that may be of interest and indicate the need to further study other factors that may shape the legitimisation of mHealth interventions by its users.

The study pointed out the importance of the quality of information and quality of the mHealth service in facilitating continued trust. With regard to the information, qualities such as being accurate and relevant, that may have been attributed to the message design and development, were useful in facilitating the maternal health clients' legitimisation of the intervention. The messages were designed and developed to be i) stage-based; ii) developed in collaboration with women in the target group and iii) delivered in a language that they could understand. These factors may have contributed to enhancing the perceived value. In addition, various characteristics of the messages (Recall Chapter 8) elicited trust, which contributed to continued use.

The perceived quality of the service from the mHealth characteristics, such as being responsive and anonymous, were also critical for trust and legitimisation. However, the findings also demonstrated that the waiting time in two-way asynchronous interventions may have a negative impact on use. As we saw in this study, perceived disengagement from the mHealth intervention at critical points of care led maternal health clients to pursue alternative healthcare-seeking behaviour. To mitigate health consumers' waiting anxiety which leads to engagement with alternative sources of care, mHealth designers may need to consider various ways of engaging with such clients while they wait for a response. This engagement is likely to be critical in asynchronous communication, as is the case with most mHealth interventions in developing countries that employ SMS (Recall Chapter 3). This design implication may also mean incorporating intelligent systems to engage users while they wait for a human-mediated response when necessary.

The balance between anonymity and personalisation, especially in mHealth application areas where taboo or inappropriateness surrounds information-seeking, is an important one. Designers and implementers need to identify the most salient characteristics to be tailored in the delivery of health interventions (Ryan & Lauver, 2002). In this study, though the messages were not tailored by name to the receiver as seen in other mHealth studies (Fjeldsoe et al., 2009), the content was tailored to the gestation age of the mother. Subsequently, the women felt that the intervention consistently '*knew what they needed*'. At the same time, the anonymity enabled them to continue interacting with the intervention, without the hesitations that typically accompanied face-to-face conversations.

9.4.2 Involving healthcare workers to champion mHealth interventions

The findings of the study demonstrated that associating mHealth interventions with an entity which the community already trusts (e.g. hospital and healthcare workers) contributed to the initial legitimisation of mHealth interventions, which facilitated users' adoption. Therefore, it can be concluded that there might be benefits to be gained by involving healthcare providers in championing mHealth innovations, even when these innovations are implemented by a separate entity. Involving HCPs in the implementation of such HITs would serve to mitigate the uncertainty avoidance associated with these innovations. Having the support of healthcare providers may also encourage adoption, because of the power that they wield in the healthcare-seeking context, especially in high-power distance societies. Agarwal et al. (2013) makes a similar observation that HITs are likely to be more successful if providers encourage patients to use them. Other findings in technology acceptance literature support that people may adopt technology based on the belief that important others think that they should (Holden & Karsh, 2010; Li et al., 2008).

Though involvement of HCPs in the implementation of mHealth may offer some benefits, this is not without a downside. Previous studies (Agarwal et al., 2013) have shown that dissatisfaction with providers where they were part of the health intervention had a negative impact on usage of HITs by the patients. This, therefore, implies that designers and implementers must strike a fine balance. For example, in a strained healthcare system, it may be useful that providers are involved to encourage patients to adopt mHealth. However, the operations of the intervention may need to run separately, to ensure adequate resourcing while allowing patients to interact freely with these interventions where anonymity is preferred.

9.4.3 Involving significant others in mHealth implementations

Another important finding of this research is related to the new role of the community of pregnancy stakeholders. Previously, maternal literature noted the role of community in maternal healthcare-seeking, especially with regard to influencing a woman's autonomy and decision-making about healthcare-seeking. Though our study reported similar findings on the importance of the community, their role was redefined to that of helping the maternal health clients to legitimise the mHealth intervention. Anchoring on Leidner and Kayworth's (2006) understanding of separating the IT construct to its technological and information components, the findings showed that though context may facilitate autonomous adoption of the artifact, the community played an important role in the appropriation of information. The pathways that make this possible are:

1) the community helps the woman to legitimise the information. Corroborating accounts between the sources help to build trust.
2) once the intervention is legitimated, the mHealth user employs it to negotiate her own use, with the aim of making this action a culturally appropriate behaviour within her healthcare-seeking context.

Subsequently, users were able to appropriate the information shared through the intervention. These insights point to the unique role of stakeholders in contributing to the success of mHealth interventions among the target users. . Other studies (Ilozumba et al., 2018) corroborate the value to be gained from mHealth interventions targeting other stakeholders in contexts where maternal healthcare-seeking is characterised by unequal power distribution. mHealth implementers need to engage with this insight and think of ways to involve community stakeholders that facilitate the legitimisation process.

9.4.4 Integrating mHealth interventions into existing healthcare structures

The study alluded to a changing healthcare-seeking experience for maternal health consumers in urban areas that may be attributed to spatial separation that keeps them away from their kin who play an important role in pregnancy (Recall Chapter 7). However, the pregnancy and childbirth practices may not be changing to the same extent. Women may still hold to the perceptions of pregnancy as a secret experience and may potentially have its downside, given that low socioeconomic women prefer to engage with care later in pregnancy following these perceptions.

Thus, mHealth, if adopted early, may provide a means to engage with care while maintaining the cultural exclusivity of pregnancy. Though further research will be needed to explore strategies for early uptake of mHealth among pregnant women, this study speaks to the benefit that integration into the existing healthcare system may offer to ensure successful mHealth interventions.

With the changes in healthcare-seeking practices, maternal health clients, especially in urban areas, may become more provider-dependent for pregnancy-related information. However, with the health system facing the same challenges it did many years back, it has not been possible for the health system to offer healthcare consumers quality services. mHealth interventions could help to bridge this gap by expanding the abilities of HCPs to 'interact' with their clients outside of the physical hospital setting. This would help to bridge some of the challenges of a resource-constrained healthcare system. The findings in this study indicated that maternal health clients felt cared for when they received messages about their pregnancy. This positive feeling may translate to better doctor-patient relationships and consequently lead to more positive attitudes towards healthcare-seeking. Subsequently, positive attitudes may positively impact maternal health outcomes. A strong patient-provider relationship has the potential to improve health outcomes for patients and to affect CHIT acceptance (Agarwal et al., 2013).

The study also revealed that mHealth may create a reality that takes away power from the HCPs, which in the long run may lead to deeper breakdowns when mHealth is managed as a separate implementation that is not integrated into the healthcare system. Parallel implementations of mHealth interventions run the risk to be used by users to substitute mainstream systems, thus yielding negative unintended utilisation behaviour and challenging the very potential for mHealth in developing countries. Other researchers (Aranda-Jan et al., 2014; Beratarrechea et al., 2014; Sondaal et al., 2016) have identified the need for mHealth to be integrated into existing systems. When integrated into the healthcare system, the interaction with mHealth outside the facility would reflect a continuity of care, rather than being perceived as a separate care system. However, it might be worthwhile to engage more on how to balance anonymity with integration, because the former was one of the motivators for using mHealth for maternal care.

9.5 Research Contributions

9.5.1 Theoretical contributions

The first theoretical contribution arises from operationalising AT to elucidate the mHealth utilisation phenomenon. We argued for studying technology-in-use, thus proceeded by conceptualising healthcare-seeking as an activity that provided the minimum context to reasonably understand and explain utilisation. Consequently, we demonstrated that the principles of internalisation and externalisation offer a means to understand the phenomenon.

The second theoretical contribution emanates from the seven propositions derived from this study that demonstrate the complex interaction between the users and technology within the healthcare-seeking socio-cultural context. In this study, we see that socio-cultural factors do not only moderate the intention to use (Srite & Karahanna, 2006), but rather that these factors influence adoption, initial use and post-adoption use. Technology and its agency is also moderated by the users' socio-cultural context. The propositions contribute to understanding the complex adaptation process that takes place as users interact and respond to mHealth, and the subsequent utilisation behaviour that this adaptation process brings about. The theoretical propositions that were suggested can be considered plausible because they are drawn from key empirical claims that were supported by the empirical observations. The following propositions were offered to understand maternal health clients' mHealth utilisation behaviour:

1) Where context makes the decision to adopt mHealth immaterial and technology is sufficiently legitimised for initial trust, users are likely to adopt mHealth.
2) When healthcare structures are dysfunctional, maternal health clients' use of mHealth as a substitute to care may modify the CoP.
3) mHealth users employ technology characteristics and the community to legitimise the intervention beyond initial trust.
4) When mHealth systems present appropriate social cues, users may humanise these interventions.
5) When the perceived usefulness of mHealth presents the opportunity to use it as a substitute, mHealth users may develop undesired technology framing.
6) When stakeholders play a vital role in the CoP, mHealth users employ legitimated mHealth interventions to negotiate use.

7) When mHealth is considered disengaging at critical points of care; users may accommodate technology or abandon it.

9.5.2 Practical contributions

This study provides opportunities for mHealth developers and implementers to reflect on the role of context in the design and implementation of maternal mHealth interventions. The results demonstrate that context plays a critical role in shaping the interaction between mHealth and its users, and that this interaction is developed dialectically. These insights could also be reflected upon to think about interventions in other mHealth application areas.

The results of this study lend support to previous literature indicating that trust in the technology itself affects consumers' technology acceptance behaviour. However, beyond confirming previous results, the study elucidates some specific attributes of the mHealth interventions that may lead to trust, legitimisation and subsequently to adoption and continued use. Thus, both initial trust and post-adoption trust must be thought about by designers and implementers of mHealth interventions.

We also recommend that over and above thinking about effective technology attributes in light of the context, mHealth designers and implementers need to:

- Involve healthcare workers in the implementation of interventions. This is likely to have positive effects in the initial legitimisation of interventions and would encourage adoption.
- Involve community stakeholders who are critical in facilitating post-adoption legitimisation and the appropriation of mHealth information by mHealth users.
- Consider the benefits to be gained by integrating mHealth into existing healthcare structures. This includes strengthening doctor-patient relationships and mitigating unintended technological frames that result in negative utilisation behaviour.

9.6 Limitations of the Study

This study is not without limitations. In Chapter 5, we discussed some of the methodological limitations. In the subsequent sections, we further elaborate on them and discuss further limitations related to using AT as the theoretical framework.

9.6.1 Methodological limitations

The scope of this research was narrowed down to the context of maternal healthcare-seeking during pregnancy. This may have presented a highly particularised context and raises questions on the generalisability of the results. Though other health domain areas may present varied realities, we believe that the insights gained from this study can offer direction for research and practice to other potential calibrations of mHealth. Further research can explore the specificities of the other health domain contexts.

With regard to the sample, we note some limitations. First, we presented the reasons for choosing a peri-urban site over a rural site (Recall Chapters 2 and 5). Though advantageous in studying cultural complexity in this study, the specific urban geographic context may raise concerns on the generalisability of the findings to rural populations. This may be attributed to the specificity of some of the mediating contextual variables that may have been the result of being in an urban context. Further research should therefore consider a mixed sample, or compare cases in urban and rural areas, to uncover any insights that this study may have missed. Second, it has been noted that as a determinant of healthcare utilisation, autonomy, which may be measured in women's level of education as well as variables like control of finances and decision-making, could moderate behaviour. Therefore, influence of socio-cultural factors is known to be stronger among women who are less empowered. It might be useful to elucidate and compare the role of socio-cultural factors on utilisation in a more heterogeneous sample. Third, we believe that richer insights would have been gained if we had been able to engage with mHealth users who had dropped out from using the intervention. This was not possible because all the potential participants who were approached declined to participate in the study. Fourth, the HCPs in the context of this study wielded too much power. This may have resulted in maternal health clients downplaying any negative experiences, for fear that inappropriate statements may result in reprisal and negatively affect their care-seeking at the health facilities. However, the researcher took steps to mitigate this (Recall Chapter 5 and further discussion in the researcher's reflection in Section 9.9).

The choice of the case study approach as well as the cross-sectional nature of the study present further limitations. Ethnography may have presented an alternative approach. However, other than the challenge related to time and financial implications, the intervention was relatively new, with most users having interacted with it for no more than a few months. Also, with the contextual

reality of delayed ANC start dates, which is when the maternal health clients generally enrolled to the intervention, participants were not accessible to the researcher in the earlier phases of pregnancy. This had two main implications:

1) on the choice of the case study approach over ethnography – which may have resulted to a diminished understanding of other socio-cultural factors related to maternal healthcare-seeking
2) that the participants could only share from their short interaction with the technology which meant the data was more cross-sectional in nature.

To overcome some of these factors, we employed triangulation methods to access and compare multiple views. Other measures were taken to ensure that interviewed participants had at least interacted with the intervention for one month. However, since cross-sectional data may not be representative of the actual use of mHealth, future studies could consider longitudinal approaches. Such an approach may help to unfold user experiences with mHealth over time, to extensively understand the mechanisms through which mHealth utilisation behaviour might develop.

The use of interviews for data collection may have subjected the study to reporting bias. In addition, the interpersonal nature of the interview process may have inevitably resulted in the researcher influencing the participants and consequently the data. However, we believe that interviewing multiple people, as well as using multiple data sources, helped to triangulate and validate the information. An extensive reflection by the researcher is also included to report any bias that may have affected the data.

9.6.2 Theoretical limitations

While the use of AT was considered a strength of the study, this choice also presents possible limitations. An important element of AT is the perspective of an ever-changing activity depending on contradictions and tensions with the activity system, as well as the needs of the subject and the community (Allen et al., 2011). This perspective calls for an analysis of various stages of the activity, and multiple activity systems that interact with the activity under study. However, the process presents a complexity that novice researchers using AT would need to surmount. Since we did not deem this analysis critical for the current study, we instantiated the healthcare-seeking activity at a chosen point in time.

Some researchers (Kaptelinin & Nardi, 2018; Karanasios, 2018) have noted that there may be value to be gained by combining AT with other theories in the study of human-technology interaction. However, we believe that the use of AT as a lens for orienting the study, while allowing an understanding of the phenomenon to emerge from data, mitigated against possible shortcomings from over-precision. Using AT alone also helped to avoid conceptual fuzziness which may emerge from combining theories (Kaptelinin & Nardi, 2018).

As discussed in Chapter 2 and 5, the adoption of a dimensional approach to culture may have limited the identification of emergent cultural characteristics in the empirical context. We would encourage other researchers adopt other definitions of culture to compare if the results and nuances on utilisation would be different from those proposed in this study.

9.7 Suggestions for Future Research

Our first recommendation for further research is to apply feminist approaches to replicate the study and compare the findings. We believe that such an approach may yield richer insights. Feminist approaches engage with women's lived social realities (Kiguwa, 2019). Such an approach would therefore provide opportunities to look deeper into aspects of social roles, power, domination, patriarchy, women's economic status, among others that may play out in gendered relations. Such factors are expected to play out to different extents based on the contextual cultural backgrounds of maternal health clients in developing country contexts.

Second, a longitudinal study that involves samples that have had repeated use of mHealth technology may be useful to further our understanding on how utilisation behaviour changes in subsequent use. There are also some maternal mHealth interventions that target both maternal health clients and their partners. Most such interventions have been reported in reproductive health, in the ared of family-planning (Jennings & Gagliardi, 2013). It would be useful to study how utilisation behaviour evolves among mHealth users when this is the case.

Third, though this study provides seminal evidence indicating that socio-cultural factors shape mHealth utilisation among maternal health clients, it might be worthwhile to consider other mHealth application areas where the socio-cultural context is believed to have a strong impact. The results of such research can be compared with those presented in this study.

Fourth, we suggest that some of the unintended utilisation behaviour that may have resulted from the perceived perception of mHealth usefulness may have been largely exacerbated by the women's socioeconomic status and education levels. We assume that affluent and more educated women are unlikely to construct similar perceptions of usefulness, which may limit the extent of unrealistic expectations on such technologies. Future research should compare technological perceptions between these two groups to confirm this assumption and offer more insights.

Lastly, with regard to users trusting technology, we suggest that there is need to further examine the unique mHealth features, characteristics and attributes that contribute to the initial and post-adoption trust outcomes for users in a variety of mHealth application areas. Based on the findings in this study, we expect that these characteristics that elicit trust will differ from one mHealth domain to another. However, it might be possible to provide a minimum set of requirements that mHealth designers and implementers could use. Furthermore, it is not clear whether all mHealth interventions will be equal in the extent to which users interact with them as social actors. The characteristics of mHealth interventions that facilitate its users to imbue them with social attributes needs to be further investigated.

9.8 Researcher's Reflection

Undertaking this research has substantially influenced my way of reasoning and improved my philosophy of science. Every stage had its challenges and opportunities for growth. In the following sections, I make my reflections on the journey explicit. First, I reflect upon the research methods and how my perceptions changed through the process, a principle that is crucial in interpretive research (Klein & Myers, 1999). Next, I reflect on the potential biases from being an engaged participant in the research process. Patton posits that "Because the researcher is the instrument in qualitative inquiry, a qualitative report must include information about the researcher" (Patton, 2014, p. 1198). This information is necessary in interpretive research, because the researcher often has to access participant interpretations, filtered through his/her own preconceptions and history (Walsham, 1995).

9.8.1 Reflections on the methods of the study

First, I acknowledge that the case selection for this study was not entirely purposeful but also opportunistic. In the first year of my doctoral studies, while I was completing my academic

residency at the University of Cape Town, I established contact with a number of potential mHealth programs in Kenya, Malawi and South Africa that could serve as cases for the study. This process of finding a case proved challenging because some interventions had come to an end, and traceability of the women was going to be a challenge. Others were not keen on having student researchers and the rest were just not interested for one reason or another. On discussing my challenges with one senior researcher who had experience in the field of mHealth, she explained that most interventions that were run as social enterprises were often not keen on research that might subject them to scrutiny. This may have explained the challenges I was facing. By the end of the year, there was only one potential case from Kenya – a social enterprise, which I went back to pursue. After six months of trying to schedule an appointment, it became clear to me they may not have been keen to be the case of study. I began the search for another case and this continued for another 18 months. When I was finally connected to PROMPTS, it did not have all the desired aspects that I had hoped for such as engaging with both the maternal health clients and their partners. However, all other aspects of the case were relevant to allow me to answer the research questions dependably. Thus, I settled on PROMPTS because it was available, convenient and willing to participate in the study

I struggled in pinning down the 'unit of analysis' in the study because the unit of analysis in AT is the activity itself, whereas, in case study research, it is the case. However, I came across Yin's (2013) elaborate definition of a single case study design and the concept of an embedded unit of analysis and this resolved my dilemma. I finally settled on the fact that the context in my study was, in fact, the healthcare-seeking activity, and that the PROMPTS intervention was the primary unit of analysis, with the mHealth user being the secondary/embedded unit of analysis (Recall Chapter 5, Section 5.4.3).

When I was planning for data collection, I did not anticipate a very low sample of unmarried women, because I assumed that the database of registered mothers was already a heterogeneous population which would make a mixed sample possible. However, this was not the case. Most maternal health clients, regardless of age, reported being married or at least living with their partner; which was labelled as married. In the thesis, we pointed out that this reality might point to a properness linked to pregnancy where women are expected to have children when they are married. Consequently, those who may have become pregnant outside wedlock move in with their partners, which translates to a 'married' status. We also believe that this move may have been

necessitated by their low socioeconomic status, as literature indicated the economic stability for women associated with marriage (Recall Chapter 2).

Based on literature, I initially assumed that women in this setting would defer to the decisions of their partners regarding healthcare-seeking. As I interacted with the women, it became clear that this assumption was wrong. Women were only limited to the extent that care-seeking had financial implications. Other than this, when they had access to money, they could access care without first seeking permission from their husbands, and any expenditure of household income on sickness was understood and accepted. Also unexpected to me, was the status that pregnancy afforded the women. Some of the data alluded to the fact that men tended to prioritise the woman's needs and preferences when she was pregnant. Prioritising the needs of the pregnant woman may be associated with the value placed on children in the African setting (Recall Chapter 2) and thus the men needed to protect their heritage. However, though the women indicated not needing to seek permission, there was the general concession that they needed to inform their partners of their whereabouts outside the home. This behaviour may have been necessitated by the gender role of women as the home-makers, while the husbands were to fend for the family outside the home.

9.8.2 Reflections on my role as the researcher

The role of the researcher as an objective observer is totally inconsistent with interpretive research. Who we are, and how we experience the world, play a central role in how we understand ourselves, others and the world (Guba & Lincoln, 1994b). For this reason, interpretive researchers must reflect on their own consciousness. This section declares the researcher's training, experiences and preconceptions that may have informed how data was understood and the interpretations thereof.

Literacy and social barriers attributed to being a doctoral student may have implicitly influenced the researcher's interaction with the participants. It was difficult to know whether the participants were holding back and feeling inferior. The Kenyan academic and healthcare system is characterised by power dynamics. In most schools, the student cannot gain-say or question what the teacher says. The Kenyan healthcare system replicates similar power dynamics between patients and doctors, which may be worsened by gaps in economic status and education levels. I observed that the women visiting the facilities were reserved and hardly ever asked the provider any questions. Most of their interactions were characterised by '*yes'* and '*no'* responses. Having

been schooled in this system, my own experience in power relations between the student and the teacher informed how I interpreted some of the women's experiences.

Rubin and Rubin (2011, p. 84) state that "in establishing an acceptable research role, you have to show who you are in ways that the interviewees accept and understand." Being aware of the subjects' reserved nature and in a bid to mitigate their effects, I explained to the participants in every interview that my interest was in their experience and that there were no wrong or right answers. To confirm to potential participants that this was not a scam, I had to continuously remind the participants during the initial contact over the phone that the decision to meet up physically was completely voluntary and that they were at liberty to say no. In choosing how to present myself to the interviewees, I was keen not to distort my identity bur rather present those aspects that were acceptable in the participants' worldview (Rubin & Rubin, 2011). To this extent, I simply stated that I was a student without stating at which institution and at what level of study, as knowledge of these aspects created unnecessary communication barriers between the interviewer and the interviewees. I also explained that I had no relationship with the HCPs or the mHealth owners. To build some sense of trust, I spent the first few minutes of the interaction with participants in pleasantries and finding out how they were doing. To connect more with the participants, the interviews were conducted in a local cant that informally mixes Kiswahili and English and is often referred to as 'Sheng' in the local context. Being a native of Kenya, this was not a problem.

After the first few interviews, I learnt that some potential participants thought that they would be required to pay in order to participate in the study. This was strange and it did not become apparent to me in the course of study why they thought so. However, in subsequent enrolment procedures, I had to explicitly state that involvement did not have any financial implications.

Being a married childless woman in Africa, I have interacted with various beliefs regarding childlessness, some spoken and some unspoken. I also belong to a support group of women without children. This has given me access to a range of other childless women experiences. These have ranged from ultimatums given to them by their in-laws, humiliations among fellow women with children with the innuendos that these childless women were lesser women, and husbands walking away from their childless wives. These experiences may have influenced how I approached this study and the way I interacted with the data as well as the emergent interpretations of participant experiences regarding the unspoken value that is attached to pregnancy and children.

Finally, as a novice researcher, I did not have any previous training in qualitative research and therefore the study presented many learning points. I invited other trained qualitative researchers to review some of the research processes and instruments to determine that they were appropriate in answering the research questions. The extended two-year delay in finding an appropriate case and the fact that I was not funded at the point of data collection exacerbated the pressure on time to complete the process within a limited timeframe.

9.8.3 Reflections on using Activity Theory

One major strength of the study regards the use of AT as a lens to guide the research. As discussed in Chapter 3, rather than being a strong predictive theory, AT is a powerful orienting tool to understand human-technology interaction with a strong focus on the context. Using AT to provide the necessary vocabulary, we were able to have a broad perspective and view of the issues emerging from the phenomenon.

AT may be robust, but it is also complex. Originating in the work of Russian psychology, with definitions losing meaning in English translation, I struggled with many of the concepts and spent time comparing various texts (e.g. Kaptelinin & Nardi, 2006; Leontiev, 1978; Nardi, 1996b). I also faced the challenge that most IS papers elucidating on AT were conceptual in nature, showing the potential for AT in IS studies and rarely demonstrating how they were applied empirically. Consequently, it was difficult to find examples of how to implement AT in the various phases of research. I ended up learning from papers and articles in the field of education where AT has gained more popularity. My application of AT therefore may reflect some of these realities.

9.9 Evaluation of the Research

Whetten (1989) poses seven questions that can be used to evaluate a study's contribution: What is new? So what? Why so? Well done? Done well? Why now? Who cares? Though answers to these questions can be found in different sections of this thesis, a summary of these questions is once again offered in Table 9.3.

Table 9.3: Evaluation of the study's contribution (Whetten, 1989)

EVALUATION QUESTION	ANSWER
WHAT IS NEW?	The study provides a significant contribution by addressing a relevant and persisting gap (Recall Section 1.3 and Section 3.5.2). This has been answered through the formulation of theoretical propositions (Sections 8.5-8.6) that offer an understanding of how technology and users within the healthcare-seeking socio-cultural context interact and the resulting mHealth utilisation behaviour. Thus, our study moves beyond the adoption of technology to understanding user-IT artifact relationship (Al-Natour et al., 2008). We have elucidated how the characteristics of the mHealth artifact, combined with the users' socio-cultural context, facilitated the ongoing utilisation behaviour.
SO WHAT?	The theoretical propositions that this research has offered suggest implications in the design and implementation of mHealth interventions, as discussed in Section 9.4. Though these propositions were derived from a maternal health context, they offer insights to mHealth developers and implementers on socio-cultural factors that they may need to consider in the healthcare-seeking contexts of a given mHealth intervention. The insights include examples of technology design attributes and characteristics that developers and implementers could pay attention to, that may contribute to successful implementations.
WHY SO?	The study responds to a persisting call for studies that consider context to understand why, when, and how mHealth interventions are used (Recall Chapter 1 and 3). To achieve this, the study employed AT which allowed for an in-depth analysis of the maternal healthcare-seeking activity, while allowing the analysis of technology and context together. The concepts and principles of AT were useful in formulating and answering the study questions that enabled a more complex view of utilisation as a dialectically emerging user response in a human-technology interaction context. The qualitative study methods that included the case study approach were ideal for the research purpose in helping to generate rich insights on the phenomenon. The study methods were detailed and justified in Chapter 5.

Table 9.3 (continued).

WELL DONE?	We have reason to believe that this thesis is complete and thorough. First, the study embarked with a detailed review of the literature to help with gap-spotting. Second, the choice of the theoretical framework was motivated as being appropriate to achieve the research purpose and its concepts particularised to the study. We also provide information on how the framework was employed at different stages of the study. Third, the research approach and methods have been followed systematically and thoroughly detailed to allow for repetition and verification by other researchers.
DONE WELL?	We believe that this dissertation is well written. The contents are organised in a logical manner that allows for systematic readership and the arguments presented in coherent and cohesive manner. We included enough material to provide adequate understanding while avoiding being too verbose.
WHY NOW?	The results and insights of this study could contribute and advance the current discussions in the epistemic and practice communities. As acknowledged by many IS researchers, the interaction between technology and users is complex. This study reveals and engages with some of these complexities. Discussions such as users attributing trust to technological artifacts, users being the active legitimisers of technology and negotiating their use are just but a few. We suggest that moderated by the context, various technology characterisctics may play a role in these behavioural manifestations. Therefore, it may be useful for researchers to further engage with such characteristics in the contexts in which technology is implemented. We also elucidate the complexity of dissonance and other unintended utilisation behaviour that may arise from incongruencies in perceptions between the developers and users. This discussion may help to further the understanding of user-technology interactions within different contexts. The thesis also re-engages with older discussions in IS such as anthropomorphism and how it contributes to technology perceptions and use. Mobile technologies are likely to be enmeshed into the user's life. Therefore, future research needs to consider how anthropomorphism shapes people's interaction with these mobile innovations. Already, we can see evidence of these discussions coming up (Moussawi et al., 2020; Zheng & Jarvenpaa, 2019).

Table 9.3 (continued).

WHO CARES?	Policymakers, mHealth (and other innovation) developers and implementers may find this study relevant. We offered insights on how context may influence the use of mHealth interventions. Researchers and doctoral students who are seeking to interrogate and understand the complexity between human-technology interaction may also benefit from the insights in this study. From a theoretical point of view, the study would be of interest to researchers seeking to apply AT in IS-related studies.

9.10 The Final Word

mHealth is relatively nascent and various studies may still be needed to offer an understanding of the complex interaction between this technology and its context of use. This relationship is bound to be complex because most CHITs are likely to be used only to the extent that they benefit the user's healthcare-seeking behaviour. Yet at the same time, good health is a right and hence technologies applied in healthcare should promote the achievement of this goal rather than create further inequalities. Consequently, understanding how individuals interact with health technologies such as mHealth in their various healthcare-seeking contexts is crucial. This goal must be prioritised, if mHealth would help to bridge the health inequality gap by helping to deliver healthcare to the underserved and the marginalised, while offering additional value to all its users. This study was founded on the existing gap as to why, when and how mHealth interventions work (or not) depending on their contexts. We have laboured through the chapters to provide a methodologically and theoretically sound explanation on how utilisation behaviour emerges as users interact with mHealth technology. The results offer insights to the design and implementation of interventions that developers and implementers may reflect on. These insights have the potential to contribute to mHealth implementations that are contextually fit (Avgerou, 2008). Contextually relevant interventions may better contribute to their success to meet health-related goals. We have engaged with various arguments that the epistemic community can build on to explore how utilisation behaviour may differ in other contexts and other mHealth application areas. We believe that this research has responded adequately to the call for research that examines how mHealth innovations are accessed and used in light of their varied contexts (Chib et al., 2015; Hatcher & Bonell, 2016). Hence, we believe that we have bridged this understanding one step closer. We conclude by encouraging other researchers to respond to this call and build on the evidence herein provided.

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APPENDICES

A. University of Cape Town- Faculty of Health Sciences Ethical Clearance

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: sumayah.ariefdien@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

09 July 2018

HREC REF: 346/2018

Prof W Chigona
Department of Information Systems
Upper Campus
UCT

Dear Prof Chigona

PROJECT TITLE: THE ROLE OF CULTURE ON MOTHER'S UTILIZATION OF MATERNAL MHEALTH INTERVENTIONS FOR HEALTHCARE SEEKING IN THE CONTINUUM OF PREGNANCY (PhD CANDIDATE - MS KAREN SOWON)

Thank you for your response letter dated 02 July 2018, addressing the issues raised by the Human Research Ethics Committee (HREC).

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 July 2019.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

We acknowledge that the student: Ms Karen Sowon will also be involved in this study.

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

Signature removed to avoid exposure online

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

B. Researcher Introduction Letter

Department of Information Systems
Leslie Commerce Building
Engineering Mall, Upper Campus
OR
Private Bag X3 - Rondebosch - 7701
Tel: +27 (0) 21 650 2261 Fax: +27 (0) 21650 2280
Internet: http://www.commerce.uct.ac.za/informationsystems/

Jan 2019

Dear Sir/Madam,

REQUEST TO CONDUCT RESEARCH AND INTERVIEW PARTICIPANTS

In light of the requirements for completing a PhD Degree in Information Systems at the University of Cape Town a research study is required.

The researcher, in this case Karen Sowon, has chosen to conduct a study entitled ***The role of culture on mothers' utilization of maternal mHealth interventions for healthcare seeking in the continuum of pregnancy.*** The researcher would like to request you to participate in this study as one of the users/stakeholders of the mHealth intervention. The objective of the research is to provide insights on how culture plays a role in mHealth utilization, in order to inform future design and implementation. The data collection for this study will run for about 4 months.

All information will be treated in a confidential manner and used only for the purpose of this study. Once the study is completed and the final report is written, all notes and audio-recordings will be destroyed. No individual names will be recorded or published. You will not be requested to supply any identifiable information, ensuring anonymity of your responses. There are no known risks or dangers to you from participating in the study. Your access of healthcare and/or communication services will not be affected. You can choose to withdraw from the research at any time for whatever reason, in accordance with ethical research requirements. You can do this by informing me or the community health volunteer.

The data collection method will be one-on-one interviews and focus group discussions with the users of the intervention as well as relevant stakeholders. The interviews will be conducted at your preferred location in one hour sessions. If you are willing to participate in this study as a participant, you will sign a separate consent form.

Should you have any questions regarding this research, please feel free to contact me on (+254)720-228382 or email: csowon@gmail.com. Your participation in this study would be greatly appreciated, but is entirely voluntary.

Sincerely,

Karen Sowon
Researcher \ PhD Student, (UCT)
Department of Information Systems
University of Cape Town
Email: csowon@gmail.com

Prof Wallace Chigona
Research Supervisor
Department of Information Systems
University of Cape Town
Email: Wallace.chigona@uct.ac.za

C. Authorisation to Conduct Study in Kenya: National Commission for Science, Technology and Innovation (NACOSTI) 2018/2019 Permits

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: 020 400 7000,
0713 788787,0735404245
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/18/65511/21653** Date: **6th March, 2018**

Karen Cheruto Sowon
University of Capetown
SOUTH AFRICA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"The role of culture on mothers utilization of maternal M-health interventions for healthcare seeking in the continuum of pregnancy"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **6th March, 2019.**

You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

Signature removed to avoid exposure online

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471, 2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/65511/27950**

Date: **4th February, 2019**

Karen Cheruto Sowon
University of Capetown
SOUTH AFRICA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"The role of culture on mothers' utilization of maternal M Health interventions for healthcare seeking in the continuum of pregnancy,"*** I am pleased to inform you that you have been authorized to undertake research in **all Counties** for the period ending **1st February, 2020.**

You are advised to report to **the County Commissioners, the County Directors of Education and the County Directors of Health Services, all Counties** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

Signature removed to avoid exposure online

DR. MOSES RUGUTT, PHD, OGW
DIRECTOR GENERAL/CEO

Copy to:

The County Commissioners
All Counties.

The County Directors of Education
All Counties.

D. Kenyan ESRC: Human Participant Research Ethics Clearance

amref health africa

Amref Health Africa in Kenya

REF: AMREF – ESRC P496/2018 January 24, 2019

Karen Sowon
University of Cape Town
P.O. Box 42276 (00100), Nairobi.
Tel: +254 720 228382
Email: csowon@gmail.com

Dear Karen Sowon,

RESEARCH PROTOCOL: THE ROLE OF CULTURE ON MOTHERS' UTILIZATION OF MATERNAL MHEALTH INTERVENTIONS FOR HEALTHCARE SEEKING IN THE CONTINUUM OF PREGNANCY

Thank you for submitting your protocol to the Amref Health Africa Ethics and Scientific Review Committee (ESRC).

This is to inform you that the ESRC has approved your protocol. The approval period is from January 24, 2019 to January 23, 2020 and is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc.) will be used.
b) All changes (amendments, deviations, violations etc.) are submitted for review and approval by Amref ESRC before implementation.
c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the ESRC immediately.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to Amref ESRC immediately.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period (attach a comprehensive progress report to support the renewal).
f) Clearance for export of biological specimen or any form of data must be obtained from Amref ESRC and the relevant government authorities for each batch of shipment/export.
g) Submission of an executive summary report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

Please do not hesitate to contact the ESRC Secretariat (esrc.kenya@amref.org) for any clarification or query.

Yours sincerely,

AMREF - ESRC 24 JAN 2019 P.O. Box 30125 - 00100, NAIROBI

Prof. Mohamed Karama
Chair, Amref ESRC

CC: Samuel Muhula, Monitoring & Evaluation and Research Manager, Amref Health Africa in Kenya

E. Jacaranda Health Permission Letter

17th January 2019

To The Ethics Committee

University of Cape Town

Private Bag, Rondebosch 7700

Cape Town.

Dear UCT Ethics Committee,

RE: PERMISSION TO CONDUCT STUDY AT JACARANDA HEALTH

The purpose of this letter is to indicate our consent to grant Karen Cheruto Sowon, a PhD student at University of Cape Town, permission to access participant information from Jacaranda's Health maternal mHealth intervention for her doctoral research: *The Role of culture on Mother's Utilization of Maternal mHealth Interventions for Health-care Seeking in the Continuum of Pregnancy*. Participants will complete a separate consent form before initiating involvement with Ms Sowon's project, which has ethical approval from the National Commission for Science Technology and Innovation (NACOSTI/P/1/18/65511/21653) and University of Cape Town Faculty of Health Sciences Human Research Ethics Committee (HREC REF 346/2018). We are aware that the study will entail interviewing the intervention's stakeholders, including mothers enrolled into the project who volunteer to participate. We hereby indicate our commitment to support Ms Sowon in the scope of activities she proposed and take this opportunity to wish her well.

Yours sincerely,

Signature removed to avoid exposure online

Rachel M. Jones

Research Program Manager

Jacaranda Health.

F. Participant Informed Consent Forms

IDIs

Study Title	The role of culture on mothers' utilization of maternal mHealth interventions for healthcare seeking in the continuum of pregnancy
Investigator(s)	Karen Cheruto Sowon Tel No: (+254) (0)720 22 83 82
Study Sponsor(s)	None
Collaborators	

This Informed Consent Form has two parts:

- **Information Sheet (to share information about the study with you)**
- **Certificate of Consent (for signatures if you choose to participate)**

You will be given a copy of the full Informed Consent Form

Part I: Information Sheet

As a requirement for completing a PhD Degree in Information Systems at the University of Cape Town (UCT) a research study is required. The researcher, in this case Karen Sowon, has chosen to conduct a study entitled *The role of culture on mothers' utilization of maternal mHealth interventions for healthcare seeking in the continuum of pregnancy*. The goal of this study is to generate insights on how culture plays a role in maternal mHealth use. These insights will hopefully inform the design and implementation of more culturally-relevant mHealth solutions in the future.

Why are you being asked to Participate?

You are being asked to participate in the research as (1) A mother who has interacted with a mobile health (mHealth) intervention during pregnancy or (2) As a significant person to a mother who has interacted with an intervention.

Must I take part in the study?

No. Participation is totally voluntary. You are free to refuse to participate. Your refusal will involve no penalty or loss of benefits of your normal access to healthcare and mobile communication services. Should you decide to participate, and later change your mind before the study is over, you may discontinue participation without any penalty. You may do so by contacting me using my supplied details below.

What Is Involved in this Project?

You will be interviewed with regards to your use, experience and perceptions of the mHealth intervention. You will also be requested to participate in a focus group discussion (FGD) that will have other participants like you. A focus group is a small group of ten to twelve people led through an open discussion session. The interviews will be conducted at your preferred location: a nearby health center or at your home in one-hour sessions. The FGD will be conducted in a private area in nearby location. An additional consent to provide more information about FGD will be provided to you. If any changes are made to the study while it is ongoing, you will be informed.

How Long will the Project Last?

The data collection period will last for 4 months. However, your participation will only be required on the day you are being interviewed and on the day of the FGD. The final report based on this study is expected to be ready one year after the data collection has ended.

Are there any risks?

There are no foreseeable risks emotionally, physiologically or mentally as the study methods are totally non-invasive. If in the course the research something arises and continuing in the study would pose any risk to your pregnancy, participation will immediately be discontinued. Participating in the study will in no way affect your pre-natal or post-natal healthcare services.

What are the Benefits?
At the end of the study, you will be provided Ksh 500 compensation for transport expenses you may have incurred. Should have taken part but decide to stop before the research ends, you will be compensated a prorated sum for participation expenses you may have incurred. Snacks and refreshments will be provided in all the focus group discussions.

How will we Protect your Information and Confidentiality?
You will not be requested to supply any identifiable information and no individual names will be recorded or published. All that you share will be treated in a confidential manner and will not be shared with anyone else. Information will be used by the researcher for the purpose of this study only.

What will Happen with the Results?
The results of this study will be presented in a thesis and any published works from this research will be kept anonymous.

Who Can I Contact?
If you have any questions regarding this research, you can ask me now or at any point during this research whenever you have a concern. You may contact me on 0720-228382 or email: csowon@gmail.com. If you have questions about your rights or welfare as a research participant in this research study, you may contact any of the following:

The University of Cape Town's (UCT) Faculty of Health Sciences Human Research Ethics Committee +27 (0)21 406 6338 Cape Town, South Africa.	The Research Officer Amref Health Africa in Kenya Wilson Airport, Lang'ata Road +254 (0)20 6994000 P.O Box 30125-00100 Nairobi, Kenya

What else would you like to know regarding any of the following or any other matter? Who is doing the study? What happens if I don't want to be in the study? Who will see the information I share with the research? Will I continue to access healthcare services normally? Will my mobile services be affected? Will taking part in the study affect my daily life?

Part II: Certificate of Consent

I have read the above information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant	
Signature of Participant	
DD/MM/YYYY	

If visually impaired, physically impaired, mentally impaired or illiterate

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print Name of Participant	
Thumb/Foot print of Participant	
Signature of Witness	
DD/MM/YYYY	

Statement by the researcher/person taking consent

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher/person taking the consent	
Signature of Researcher/person taking the consent	
DD/MM/YYYY	

FGD

Informed Consent Form - FGD

This Informed Consent Form will:
Share all information about the focus group with you. It has two parts:

- **Information Sheet (to share information about the study with you)**
- **Consent Page (for signatures if you choose to participate)**

Part 1: Information Sheet

What is a Focus Group?
A focus group is a small group of ten to twelve people led through an open discussion session. We would like to gain a deeper understanding from you of culture and pregnancy and use of mHealth interventions. This information will help contribute to the insights on how culture plays a role in maternal mHealth use. The session will last about one and half to two hours.

What will be required of me?
There will be no wrong or right answers. We would like to hear many different viewpoints. Therefore, we hope you can be honest even if your opinion does not agree with the others in the group. We will ask you not to tell anyone else outside the group anything that was discussed in the group.

What are the Benefits?
Snacks and refreshments will be provided in all the focus group discussions.

How will we protect your Information and Confidentiality?
We will ask you and the other people in the focus group to use only the identification numbers given in the sessions to refer to each other and not individual names. We will also ask group members not to tell anyone outside the group what any particular person said during the discussion. However, outside the FGD we may not guarantee that everyone will keep the discussions private.

You will be providing a lot of useful information and we may not be able to write as fast. For this reason, we will take audio recordings. However, all the information will remain anonymous and no names will be mentioned in the report.

Who Can I Contact?
If you have any questions regarding this research, or the focus group, you can ask me now or at any point during this research whenever you have a concern. You may contact me on 0720-228382 or email: csowon@gmail.com. If you have questions about your rights or welfare as a research participant in this research study, you may contact any of the following:

The University of Cape Town's (UCT) Faculty of Health Sciences Human Research Ethics Committee +27 (0)21 406 6338 Cape Town, South Africa.	The Research Officer Amref Health Africa in Kenya Wilson Airport, Lang'ata Road +254 (0)20 6994000 P.O Box 30125-00100 Nairobi, Kenya

Part II: Certificate of Consent

I have read the above information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant	
Signature of Participant	
DD/MM/YYYY	

If visually impaired, physically impaired, mentally impaired or illiterate

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print Name of Participant	
Thumb/Foot print of Participant	
Signature of Witness	
DD/MM/YYYY	

Statement by the researcher/person taking consent

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher/person taking the consent	
Signature of Researcher/person taking the consent	
DD/MM/YYYY	

G. Data Collection Instruments

In-depth interview: Women

In-depth Interview Guide: Women

The questions below will be used as a guide for the conversation with female participants. Questions may be rephrased and probed in various ways.

SOCIODEMOGRAPHIC INFORMATION

Age	Marital Status	Education	Work Status	Gestation Age	Pregnancy Order	Date of First Use?	Own Phone?

Activity and Motives

How did you learn about the intervention?

- What were your initial thoughts about receiving pregnancy related information on your mobile phone?

Please describe how you decided to enrol for the intervention

- Did you consult anyone? (If yes, who and why?)
- What motivated you to enrol? (Prompt: What was/is your reason for using the service?)
- What other considerations did you make?

Historicity

Before enrolling to the free SMS program: When you had pregnancy related questions/concerns, how would you have them answered? (The probe questions should help women tell the experience of pregnancy in their culture)

- Who would you talk to? What informed who you would talk to?
- When in the pregnancy would you talk to them and did the people you talked to change through your pregnancy?
- How free are you to share your pregnancy related emotional and psychological thoughts and experiences with friends and family before the baby is born?
- In your culture, what other things can you do/not do during pregnancy to safeguard your pregnancy?

Before enrolling to the SMS program: When in the pregnancy would you seek care from a health professional?

- What informed when you had your first ANC? Subsequently, when did you visit the health centre?
- Who in your family has the final say in the decision to seek care and pay for healthcare expenses?
- Who do you talk to/consult with when deciding to seek professional care?
- Did you ever visit the health centre to have your pregnancy related questions answered? How free are you to talk to the healthcare provider about your concerns on pregnancy related questions?

Multi-voicedness

Who are the other entities/people that have a say on the pregnancy?

- Who are the important people to be involved?
- What other support structures do you or other women use to support them during pregnancy?
- How do you decide on what source of care to use through your pregnancy?

Contradictions

What challenges have you experienced with the SMS service?

- What conflicts (if any) do you experience with the SMS program? (in: information received, the process of having your questions answered, who answers them etc.)
- When you experience a conflict how do you resolve it?
- Are there any other challenges you would like to share?
- What aspects have gone smoothly regarding using the SMS service for pregnancy care?

Expansive Transformation

How has the SMS service changed how you seek pregnancy care?

- How has it changed how you involve others during pregnancy? (who you talk to and when you talk to them)
- How has it changed how often you have questions/concerns addressed?
- How has it changed how free are you to share your emotional and psychological thoughts and experiences?
- How has the program changed how you interact with the healthcare provider?
- What else would you say you now do you now do differently as a result of using the SMS intervention?

Is there anything else you would like to comment on regarding your use of the SMS service?

In-depth interview: Key Informants

In-depth Interview Guide: Key Informant

The questions below will be used as a guide for the conversation with the relevant healthcare giver based on the intervention. Questions may be rephrased and probed in various ways.

Please describe your understanding of a pregnant mothers' healthcare system.

- What defines a successful pregnancy?
- Who are the important people that play a role in making a successful pregnancy possible?
- Among these people, how is responsibility shared? (Probe: Who does what? How are responsibilities defined? What defines wo does what?)
- What are the guiding rules that ensure a successful pregnancy? (When to visit clinic, how often etc?)

Why did you implement the SMS program?

- What was the motivation and what goal did you want to achieve?
- What change(s) did you desire to see in how the SMS service would alter how mothers went about pregnancy care seeking?
- What process did you follow in implementing the program?
- Who did you talk to in this process?

Describe the structure(s) that you deem important to a woman achieving a successful pregnancy.

- As a health practitioner, what would you say are the structures/ways that exist to support pregnant women to a successful pregnancy?

What difficulties/challenges have you experienced while implementing and applying the SMS service? (In the lifecycle of the SMS service)

- How would you explain how mothers use and apply the information from the SMS service?
  - Do they express any reservations in using the service?
- In what ways do you think various relationships around the mother affect her use and application?
- What aspects have gone smoothly?
- How would you describe how the use of the SMS service for pregnancy information and care differs from mothers' traditional (without the SMS service) methods of pregnancy care and support?

Since the initial implementation of the SMS service:

- What changes/adaptations have you had to make? Please explain why they have been necessary.
- How have mothers' use, changes and perspectives on pregnancy informed these adaptations? (if they have)

Focus group discussion guide: Women

FGD Discussion Guide – Women

The questions below will be used to engage the focus group participants (women) to gain further insights on culture, relationship dynamics in relation to healthcare seeking behaviour in the mHealth environment.

Describe the experience of pregnancy in your community

- What defines a successful pregnancy?
- Which people do you deem important in ensuring a successful pregnancy?
- (Among the people involved) how are the roles defined? (Probe: who does what? Who is responsible for what in the pregnancy of the woman?)
- Traditionally, what are the rules surrounding pregnancy? (when to start visit the clinic, how many times during pregnancy to visit, when to begin talking about your pregnancy)

Please share about the traditional methods of pregnancy-related healthcare seeking behaviour

- Socially and culturally, who are the people a woman should/could involve? (Probe: How would a woman have pregnancy related questions answered)
- When is it acceptable to be open about your pregnancy and does this affect when you start clinics?
- Who are the main decision makers with regards to pregnancy?
- What is the decision making responsibility based on? (Probe: Why is it that that's the person making the decision?

What are the other structures that support women during pregnancy?

- What role do you think these other structures play in the overall healthcare system? (**N.B**. You want to get them talking about issues like TBAs and what role/place they think TBAs still have in the pregnancy experience)

What challenges have you experienced with the use of the SMS service for pregnancy support?

- How does involving someone else (that you do not know) through the SMS program make you feel? (Why is this easy or hard?)
- What problems/challenges did you experience with the introduction of the SMS service into your pregnancy experience?

How has the SMS program changed your healthcare-seeking experience during pregnancy?

- How would you describe your experience in asking questions using the platform? (Probe: Fears, Confidence etc)
- How has the intervention changed your perception and interaction with the healthcare provider and healthcare services?
- How would you describe how the intervention has impacted your relationship with the community (other women, SOs etc) with regards to your pregnancy?

Focus group discussion guide: Significant Other

FGD Discussion Guide –Significant Other

The questions below will be used to engage the SOs to gain further insights on power dynamics and decision making process in the mHealth environment that affect utilization of mHealth interventions

Describe your understanding of the pregnancy experience:

- What is the definition of a good/successful pregnancy experience?
- What rules and guidelines exist in your community/family/society to make this goal possible?

Please share about the traditional methods/your previous ideas of pregnancy-related support

- Before learning from the SMSs or from the health facility, what were your ideas on:
  - the role of the healthcare provider during pregnancy
  - when a pregnant woman should start seeing the healthcare provider
  - how many visits to the doctor during pregnancy?
  - the procedure for having her pregnancy related questions answered: who can she talk to and what informs who she can talk to?
- When in the pregnancy are these people involved? (pregnancy stage or circumstances necessitating involvement)
  - Among the people who can be involved, who is responsible for what?
- Who is responsible for the decision of when, where and how a pregnant woman seeks care and support? (if not husband, what is the role of the husband in this decision making process?)
- What is the decision making role/authority based on?

How else can a mother within your society achieve a successful pregnancy?

- What is the role of other alternative sources of care like TBAs in the pregnancy care system?
- What do think about your partner following all that the intervention prescribes? Are there things you felt it necessary to seek a second opinion to confirm what you received from the SMSs?
- Please describe what you see as your role in the decisions regarding following/adhering to what the intervention though the SMSs would prescribe.

What challenges have you experienced with the used of the SMS service for pregnancy support? (Any conflicts in the nature of information, the asking/answering of questions etc.)

- How agreeable are you to her following everything the intervention says?
- Please describe your process of resolving conflict if what the SMS says is different from what you knew before.

How do you feel the SMS program has changed the healthcare seeking experience for you and your partner?

- Did the use of the SMSs by your partners change your place and role in the healthcare seeking decision making process? How? How did you feel about this?
- How did the SMS program change your involvement and engagement with the pregnancy?
- How did the SMSs change your interaction with the healthcare providers?

How else would you say the SMSs have transformed the pregnancy experience for you as a partner?

H. Codebook

Concept	Definition	Empirical Application	Sources of Empirical Observation
Activity	A purposeful interaction between the subject and the world (Kaptelinin & Nardi, 2006) or A system of actions undertaken by subjects (actors) to transform an object in order to achieve a desired outcome (Kuutti, 1996)	Healthcare-seeking activity	(Predefined)
Actions	Conscious goal-directed steps which may be taken to reach the motive/fulfill the object (Kaptelinin & Nardi, 2006)	Steps with specific goals that are taken by maternal health clients	Conscious healthcare seeking steps taken by maternal health clients
Operations	Automatic/routine processes oriented toward the conditions in which the subject is striving towards the goal (Kaptelinin & Nardi, 2006)	Spontaneous adjustments by participants in their interaction with mHealth	Spontaneous adjustments by participants in their interaction with mHealth (may not be evident since some may be mental)
Subject	The individual whose agency is chosen as the focal point of analysis (Hsu et al., 2010)	The maternal health client	(Predefined)
Object	Material or ideal prospective outcome that motivates and directs an activity (Kaptelinin & Nardi, 2006)	Motivations for using mHealth and for engaging in other care-seeking activities as expressed by participants	Reasons given for using mHealth intervention (both actuated and desired) Reasons given by other stakeholders for motivating their different actions with regards to the woman's healthcare-seeking

Goal	The desired short-term outcome of a conscious action	Reasons for the actions	The desired outcomes for the identified actions
Conditions	Situations that are embedded in the context that affect the subject's activity and which the subject is not in control of	Factors that affect how an action within the healthcare-seeking activity is executed	Healthcare systems barriers Environmental barriers Technological challenges Any other barriers that motivate how mHealth was used
Outcome	The intended or unintended result (a translated motive)	The desired/perceived outcome of the healthcare-seeking	Ultimate goal for healthcare-seeking during pregnancy as desired by participants
Tools	Physical, conceptual or technological artifacts that mediate the subject object interaction	The mHealth intervention	(Predefined)
Mediation	*Affordances*: properties of the artifact that provide possibilities for action. The possibilities for action are culture-dependent (Kaptelinin & Nardi, 2006) Agency: User response to the affordance or initiation of mediation	Technology facilitation and constrains in achieving user goals The impact of technology on provoking/resolving conflicts between goals Developmental transformations in use	User interaction with the technology Integration of technology with the social environment
Community	"The social group that the subject belongs to while engaged in an activity" (Yamagata-Lynch, 2010, p. 2) The community of practice to which the activity/subjects belongs to	Other stakeholders interested and participating in the maternal client's pregnancy and in her healthcare-seeking	People/institutions identified and inferred to by participants as playing a crucial role in maternal healthcare-seeking
Rules/Values	The implicit and explicit 'norms, conventions and social relations within a community'(Kuutti, 1996)	Explicitly stated in maternal healthcare provision standards and implied in cultural	Standards of healthcare provision practiced by doctors as provisioned by WHO or MoH

	that potentially places limits on the activity being undertaken	norms/practices/beliefs about pregnancy	Barriers to maternal healthcare-seeking expressed by participants Norms and beliefs that guide behaviour in pregnancy
Division of labour	"How the activity is distributed among the members of the community, that is, the role each individual in the community plays in the activity, the power each wields, and the tasks each is held responsible for" (Bellamy, 1996, p. 125)	Responsibilities among the stakeholders Power relationships and structures Resources ownership and sharing	Power relations/Authoritative structures in: relationships between mothers and other community members and mothers and healthcare provider Expectations of who does what in the period of a mother's pregnancy.
Contradictions	Structural tensions in the activity system.	Challenges, shortcomings and bottlenecks experienced by mHealth users and other stakeholders by the introduction of mHealth into the healthcare seeking activity Challenges in other healthcare-seeking alternatives	User frustrations, challenges and limitations expressed or manifested in the use of mHealth New ways of using/interacting with the mHealth intervention (Changes and adaptations) Challenges in the implementation and use of the intervention
Internalisation Externalisation	Reconstruction of external objects and transforming internal activities into external ones	Manifested patterns of use in response to mHealth implementation and availability for healthcare-seeking activities	New user behavioural: responses and patterns of use in the mHealth interaction

I. A Classification of ways that IT Supports Activities (Nardi, 1996a)

Operation-level support	Action-level support	Activity-level support
Tool, instrument		
Automating routines	Supporting transformative and manipulative actions Making tools and procedures visible and comprehensible	Enabling the automation of a new routine or construction if a new tool
Object		
Providing data about an object	Making an object manipulable	Enabling something to become a common object
Actor		
Triggering predetermine responses	Supporting sense-making actions within an activity	Supporting learning and reflection with respect to the whole object and activity
Rules		
Embedding and imposing a certain set of rules	Making the set of rules visible an comprehensible	Enabling the negotiation of new rules
Community		
Creating an implicit community by linking work tasks of several people together	Supporting communicative actions Making the network of actors visible	Enabling the formation of a new community
Division of labour		
Embedding and imposing a certain division of labour	Making the work organization visible and comprehensible	Enabling the reorganization of the division of labour