



**UNIVERSITY** *of the*  
**WESTERN CAPE**

**Factors affecting the adoption of momConnect mobile application for pregnant women  
at the Retreat Community Health Centre**

**Master of Commerce Mini- Thesis**

**A research mini-thesis submitted to the University of the Western Cape in partial  
fulfilment of the requirements of the degree of Master of Commerce Information  
Management**

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**Year: 2021**

## DECLARATION

I declare that this research is my work. It is submitted in partial fulfilment of the requirements for the degree of Master of Commerce in Information Management at the University of The Western Cape (UWC). It has never been submitted before for any degree or examination in any other university or institution of learning. I further declare that I have obtained the necessary authorisation and consent to conduct this research at the Retreat Community Health Centre.



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## **ABSTRACT**

The core purpose of this study was to examine the factors affecting the adoption of momConnect mobile application for pregnant women, at the Retreat Community Health Centre (RCHC) in Cape Town South Africa. The specific objectives of the study were to identify the factors affecting the use of momConnect intervention at the RCHC and to understand the perceptions of pregnant women towards momConnect intervention. Also, the study sought to identify the barriers of momConnect use by pregnant women at the RCHC and to provide recommendations on the effective use of momConnect intervention for pregnant women. The Technology Acceptance Model (TAM) and the Technology Readiness Model (TRM) guided the study, which were the anchor theories in the study. Based on the interpretivism paradigm, the study followed a qualitative research approach as the case study research design as the research methodology of the study. Data was further collected using interviews and focus group discussions (FGDs) from users of momConnect who are ten pregnant mothers as well as six nurses at the RCHC. Through a thematic analysis, the findings of the study revealed that there is a general understanding that the momConnect mobile application has benefits as evidenced by the generated themes arising from the participants or pregnant women's perceptions of their interactions with the mobile application.

Seven main themes emerge from the qualitative study on the factors affecting adoption of mobile health (mHealth) applications which are, (i) people's traits; (ii) technological attributes; (iii) social influence; (iv) trust; (v) relevance; (vi) organisational support and (vii) organisational practices. The study recommended that there must be an effective collaboration between the nurses and pregnant woman to ensure successful adoption of momConnect mobile application at the RCHC. In addition, the management at the RCHC must put in place, a momConnect strategy and policies which will enforce the nurses to be more involved in the roll-out of the mobile application. Furthermore, the mobile application's content can be improved to reduce the frustrations pregnant women user experiences.

## **KEYWORDS**

Mobile health (mHealth); Health Information Systems (HIS); Technology Acceptance Model (TAM); Technology Readiness (TR); momConnect; Diffusion

## **DEFINITION OF KEY TERMS**

**mHealth** - mHealth is an element of electronic health used for the provision of health care services using information and communication technology (Aranda-Jan, Mohutsiwa-Dibe & Loukanova, 2014).

**momConnect** - momConnect is a South African National Department of Health (NDoH) initiative which aims to support maternal health through the use of cellphone-based technologies integrated into maternal and child health (MCH) services (Braun, 2013)

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## **ABBREVIATIONS**

AIDS - Acquired immunodeficiency syndrome

ANC - Antenatal care

Electronic health - eHealth

FGD – focus group discussion

HIS – Health information systems

HIV - Human immunodeficiency virus

ICT – Information and communications technology

IT – Information Technology

MCH - Maternal and child health

mHealth – Mobile health

mLearning – Mobile learning

NHI – National Health Insurance

MNCH – Maternal Newborn and Child Health

PNC - Post-natal care

RCHC – Retreat Community Health Centre

NDoH - National Department of Health

SMS - Short message service

TAM - Technology Acceptance Model

TRI - Technology Readiness Index

TRM - Technology Readiness Model

USA - United States of America

UWC – University of the Western Cape

WHO- World Health Organisation

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## CHAPTER 1

### 1. INTRODUCTION TO THE RESEARCH PROBLEM

Various African countries often struggle to provide adequate health care services particularly in supporting and reaching rural and remote areas. A case in study has been the COVID19 pandemic which has emphasised the role of mobile technology in supporting the health care sector reach rural and remote areas. The global impact of COVID-19 pandemic has led to a rapid development and utilization of mobile health applications. These are addressing the unmet needs of healthcare and public health system including contact tracing, health information dissemination, symptom checking and providing tools for training healthcare providers (Davalbhakta, et al., 2020). The public health sector is a sector where mobile phones can offer great potential to improve linkages between patients and health information systems (HIS) (Alam, Hoque, Hu & Barua, 2019). Mobile technology can be used to disseminate information and link patients to digital health products. The mobile phone penetration rate often reflects that Africans are more likely to have access to a mobile phone compared to any other digital device. Health care organizations can further leverage over the access to this technology platform to provide access to health services. There has been a growing trend related to the use of mobile health programs as an innovative approach to address complex health issues in low- to middle-income regions (Impact of MomConnect Program in South Africa: A Narrative Review, 2021)

According to Kiriga & Barry (2008), there are cost-effective interventions that can be used to ensure that health care services reach every member of society but are often , hindered by various Health Information Systems (HIS) challenges such as infrastructure and resources . Digital health tools which include mobile Health (mHealth) tools, can be used to reduce these burdens by increasing access to quality health care without even physically visiting a health facility. Recent research by Alam *et al.* (2019) showed that in Africa, patients travel long distances to seek medical attention due to poor roads infrastructure, which makes some receive medical attention very late, and some do not even reach the health facilities.

mHealth is vital in bridging the gap between caregivers and patients which enables the caregivers to have ubiquitous and uninterrupted access to patients' clinical data and the latest medical knowledge. Concurrently, it allows patients with chronic conditions to remain under constant observation without needing to be physically present at the clinic (Shieh, Tsai, Anavim, Shieh, Wang, Lin, 2008). Mobile devices are further helping clinicians collect quality patient data. Therefore, digital health tools and accompanying data that the the digital tool is

collecting, are changing how clinicians manage and coordinate care with patients, both inside and outside the health system (mHealthIntelligence, 2019). This study focuses on understanding the adoption of a mobile healthcare application which was designed to support the health journey of pregnant women. The study is based in the Retreat Community Health Centre (RCHC) in Cape Town South Africa.

### ***1.1.1 The Context of Health Care***

Over the past years, South Africa has faced multiple burdens of disease, with the human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) epidemic coinciding with a high burden of tuberculosis, high maternal and child mortality, high levels of violence and injuries and a growing burden of non-communicable diseases, for example, cardiovascular diseases, diabetes, chronic respiratory conditions and cancer (Mayosi, Lawn, Niekerk, Bradshaw, Abdool Karim, Coovadia & Lancet, 2012).

The South African public health system is overwhelmed by some main challenges that impact the quality of health care, for example, poor infrastructure, delays in care delivery and medical staff. The improvement in quality care means fewer errors, reduced delays in care delivery, improvement in efficiency, increased market share and lower cost (Maphunulo & Bhengu, 2019). mHealth projects can potentially be scaled-up to help tackle problems faced by health care systems like poor management of drug stocks, weak surveillance and reporting systems or lack of resources (Aranda *et al.*, 2014).

mHealth is rapidly increasing its adoption as a subset of eHealth by employing mobile telecommunication and multimedia technologies such as mobile phones and other wireless devices. In support of the above statement, with the rapid convergence of mobile and fixed information and communications technologies (ICTs), there are increasing trends towards the migration of eHealth applications to mobile platforms and the development of new mobile technologies and solutions for health care (South Africa, Department of Health, 2015).

### ***1.1.2 Adoption of mHealth Applications***

Due to the constant use of smartphones in daily life, mHealth applications might bear great potential for the use in health care support (Messner, Probst, O'Rourke, Stoyanov & Baumeister, 2019). In support of that, Aljohani and Chandran (2019), assert that mobile applications will play an instrumental role in the delivery of efficient health care services around the world. Most countries have already implemented the technology since it is

associated with positive outcomes. The adoption of mHealth application is increasing due to its benefits like quicker facilitation of information, patient empowerment and inclusion of undersupplied population groups.

The mHealth application, under the umbrella of eHealth, has become an essential tool for providing quality, accessible and equal health care services at an affordable cost (Alam *et al.* 2019). Alam *et al.* (2019) further mentioned that despite the potential benefits of mHealth, its adoption remains a significant challenge in developing countries such as Uganda (ibid). In support of that, Messner *et al.* (2016) assert that despite the availability of mHealth solutions, the acceptance of among health care providers is still moderate to low.

### **1.1.3 MomConnect**

MomConnect is a South African National Department of Health (NDoH) initiative which aims to support maternal health using cellphone-based technologies integrated into maternal and child health (MCH) services (User, 2019). The mobile application offers services for free to the user, and it is available in South Africa's eleven official languages. In August 2014, South Africa's NDoH, with support from Johnson & Johnson, ELMA Philanthropies, and the United States of America (USA) government, launched MomConnect - a mHealth initiative to help more women gain access to vital information and care needed to ensure a safe and healthy pregnancy and labour (Content Lab - U.S., 2019). MomConnect helps new and expecting mothers to seek the care they need by leveraging the widespread use of mobile phones in South Africa. It has four components:

- i) A stage-based weekly text messaging service.
- ii) A national pregnancy registry.
- iii) A help desk for mothers to ask questions and provide feedback.
- iv) A link between the feedback and the health services to improve the quality of care.

MomConnect messages are designed to build an emotional connection with mothers, encouraging and empowering them to take an active role in their health care, while providing advice on the importance of attending antenatal visits, how to prepare for a healthy and safe labour and the best ways to take care of their new-born (Content Lab - U.S., 2019). The important educational messages from the momConnect mobile application do not stop when a child is born but continue throughout the first year of infancy.

The vision of MomConnect was to use widely accessible mobile technology to empower all pregnant women accessing services in the public health sector with information to improve their health as well as that of their babies (Messner *et al.* 2016) Furthermore, MomConnect would provide the means for pregnant women to give unsolicited feedback to the health system on the quality of antenatal and post-natal care received.

## **1.2. Research Problem**

MomConnect rapidly grew to a national scale in South Africa. It scaled to use in all the provinces since it is available in all South Africa's eleven national languages. The Minister of Health and the USA Ambassador launched MomConnect together (NDH, 2016), receiving considerable media coverage that led to registrations at clinics all over the country. During the first month, nearly 50 000 pregnant women were registered on the system. The program celebrated its 1 000 000th users in 2016 and by August 2017 had cumulatively reached over 1,7 million pregnant women, representing 63% of all women attending their first antenatal care appointment (Cargo, 2013).

Ways to increase registration to achieve universal coverage with MomConnect are being explored, including offline registration, batch registration and embedded messages downloaded in the form of a mobile application (Kruse, Betancourt, Ortiz, Luna, Bamrah and Segovia, 2019). Pai and Aluther (2018) assert that despite momConnect success stories across South Africa, uptake and use of the mobile application are still low in the Western Cape with only 16% of the pregnant women actively using the application despite many being registered. Considering the many benefits that MomConnect presents to communities, this study aims to examine the factors affecting the use of momConnect intervention at the RCHC, a clinic in the Western Cape, South Africa.

## **1.3. Research Objectives**

1. To identify the factors affecting the use of momConnect intervention at the RCHC.
2. To understand the perceptions of pregnant women towards momConnect intervention.
3. To identify the barriers of momConnect use by pregnant women at the RCHC.
4. To provide recommendations on the effective use of momConnect intervention for pregnant women at the RCHC.

## **1.4. Research Questions**

1. Which factors affect the use of momConnect intervention at the RCHC?



2. What are the perceptions of pregnant women towards momConnect intervention?
3. What are the barriers of a pregnant woman using momConnect at the RCHC?
4. How can the use of momConnect be improved in SouthAfrica?

### **1.5. Significance of the Study**

South Africa, like many countries globally, is inundated with increasing demand for health care services, scarcity of health personnel, infrastructure challenges and resources constraints (South Africa, Department of Health, 2014). There is evidence that the quality of health care in South Africa has been compromised by various challenges that impact negatively on health care quality (Maphunulo & Bhengu, 2019). The South African health care system is under pressure to provide affordable and quality care to patients. South Africa currently faces multiple burdens of diseases which include HIV and AIDS, tuberculosis, high level of violence and injuries as well as high maternal and child mortality and a burden of growing communicable diseases (Mayosi, 2012). In support of the above statement, the researcher investigates the factors affecting the adoption of momConnect at the RCHC, which helps in dealing or improving the high maternal and child mortality rates mentioned above. The impact of mHealth has been well-researched in developed countries. However, much less evaluation has been done in resource-limited settings (Skinner, Delobelle, Pappin, Pieterse, Esterhuizen, Barron & Dudley, 2018). The above statement justifies the significance of the study because momConnect study is being conducted in a low resource setting in South Africa.

### **1.6. Business Relevance**

Timely antenatal care (ANC) and post-natal care (PNC) attendance decrease maternal and child mortality by improving MCH outcomes (Kabongo, Mukumbang, Delobelle & Nicol, 2019). Kabongo *et al.* (2019) assert that mHealth has been identified as an effective way of improving the uptake of MCH services. The above justifies the relevance of the study as it investigates the factors affecting the adoption of the momConnect mobile application. By understanding these factors, it helps the Ministry of Health to intervene and increase the uptake or adoption of the mobile application hence improving MCH. Furthermore, mHealth has been identified as an effective way of improving the uptake of MCH services (Mayosi *et al.* 2019)

The research will contribute to the body of knowledge which will provide information to improve the mHealth applications. Although the momConnect mobile application initiative is widely used there tend to be a limited understanding as to the modus operanti with regards to

the implementation of momConnect that is, the questions pertaining to how, why, for whom and under what conditions momConnect need to be implemented (Kabongo *et al.*, 2019). The above statement justifies the academic relevance of this study, and it is expected to provide an understanding of the factors affecting its adoption at the RCHC. In support of the above statement, Skinner *et al.* (2018) reiterates that an improved understanding of how and why the momConnect intervention improves the health-seeking behaviour of pregnant women and mothers of infants, and the HIS conditions that influence its implementation. Furthermore, this study will add to the existing literature on the broader mHealth and specifically in the South African mHealth environment. The finding of this study could prompt further research on this topic.

### **1.7. Delimitations of the Study**

The study conceptually focuses on the factors affecting the adoption of momConnect mobile application for pregnant women. Theoretically, the TAM and the TRM guided the research. mHealth applications is a very topical issue in the South African context. However, the study rather focuses only on the RCHC, which was used as a case study in this research study. There was no specific time frame, but the researcher considered the pregnant mothers who were purposively sampled at the time of data collection and nurses who were working at the RCHC at the time of data collection were considered.

### **1.8. Chapter Summary**

This chapter put forward the description and background of the problem of the research study on the factors affecting the adoption of mHealth applications in South Africa. The chapter also provides the research objectives, research questions, significance of the study as well as the delimitations or scope of the study. The next chapter provides the literature review.

## **CHAPTER 2**

### **2. LITERATURE REVIEW**

In this section, the researcher evaluates literature related to the study: the chapter analyses both the public and private health care sector and the role of technology in extending health care facility support. The chapter explores the role that mHealth has played in both the public and private health sector. The chapter further evaluates the literature on technology adoption models.

#### **2.1. mHealth Applications**

##### ***2.1.1. Concept of mHealth Applications***

The World Health Organisation (WHO) stated that no standard definition of mHealth had been established (WHO, 2015). However, for the survey that the Global Observatory for eHealth conducted in 2009, mHealth was defined “as medical and public practise supported by mobile devices, such as cellphones, patient monitoring devices, personal digital assistants and other wireless devices”. In addition, according to the *Medical News Today* (2019), mHealth applications is cellphone-based mobile applications, used by health care providers and consumers, i.e. patients in accessing health care access. mHealth is an element of electronic health used for the provision of health care services using ICT (Aranda-Jan *et al.*, 2014).

mHealth places a specific focus on the use of mobile phone technology based on text messages as a quick and cost-effective form of communication (Kaplan, 2006). mHealth refers to mobile computing, medical sensor, and communications technologies used for the delivery of health-related services and the support of medical and public health practice (South Africa, Department of Health, 2015). In support of the above statements, mHealth is a general term for the use of mobile phones and other wireless technology in accessing health care. The most common application of mHealth is the use of mobile devices to provide health and fitness information to consumers; however, it is also used for chronic disease management, treatment support and disease surveillance.

#### **2.3. Adoption of mHealth Applications for Pregnant Women in Africa**

In this section, mobile applications for pregnant women in Africa are examined to be able to examine how momConnect adoption in South Africa fair against its African counterparts. Some of the mHealth application for pregnant women initiatives in Africa are highlighted in the next section.

### ***2.3.1. Abiye Safe Motherhood Initiative (Nigeria)***

In 2009 the Abiye Safe Motherhood initiative was launched in Nigeria's Ondo State after the region had experienced a high rate of maternal deaths each year (Ondostatemoh.gov.ng, 2019). The initiative gave free mobile phones to expectant mothers in rural areas to call for ambulance or transport to health facilities. The initiative unveils a creative approach in tackling maternal mortality not only from health care but also from the perspective of the Millennium Development Goal which seeks to reduce maternal mortality in appreciation of the role of women in the growth and sustenance of the family, the economy and ultimately in the overall interest of our people (Ondostatemoh.gov.ng, 2019). The adoption of the mHealth initiative proved to reduce the number of maternal related death, which were caused by severe bleeding, infections, hypertensive disorders, and obstructed labour. Since its take-off in February 2010, "Abiye" has proved to be one of the most effective projects of the government in its quest to permanently be a competitive mhealth system in Ondo statee (Ondostatemoh.gov.ng, 2019).

### ***2.3.2. GiftedMom (Cameroon and Nigeria)***

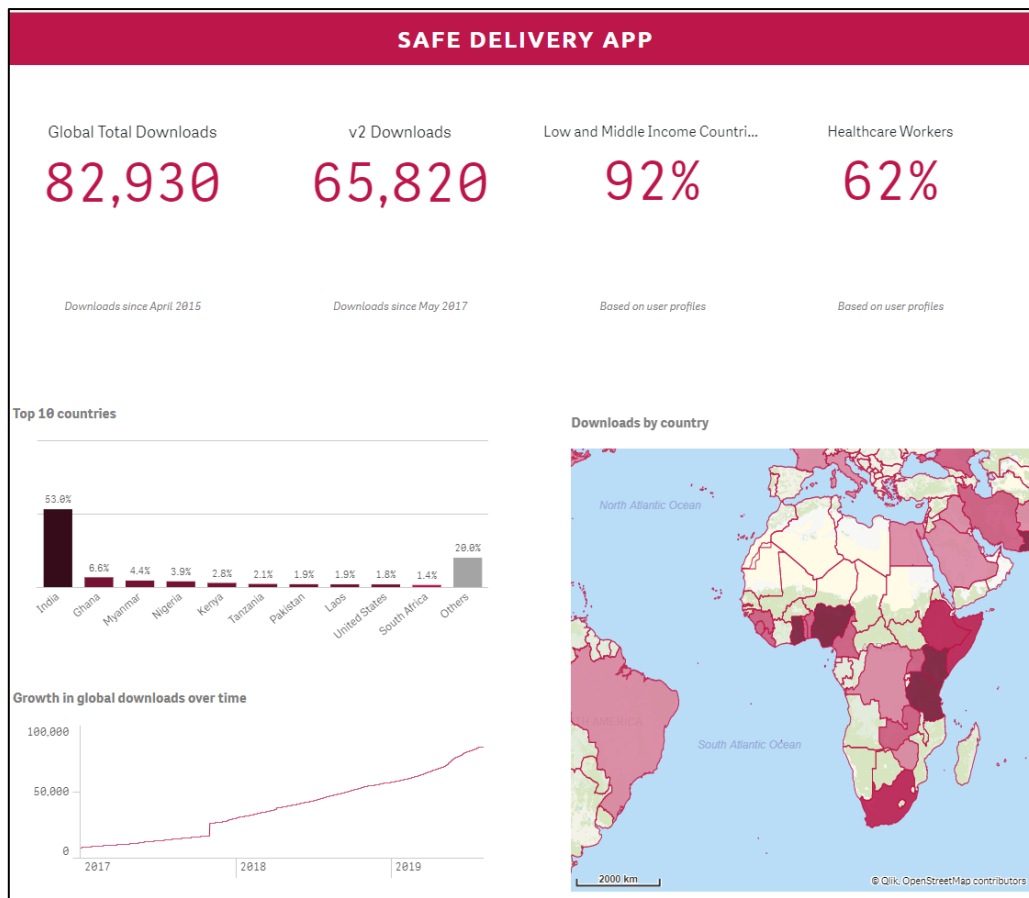
GiftedMom is a short message service (SMS) mobile application used to remind pregnant women when to go for antenatal care and why it is important to do so., GiftedMom was launched in 2012, and it now has over 70,000 users in Cameroon and Nigeria (Hlabangane, 2019) This application was launched due to high numbers of maternal related deaths. According to James, Liu & Darren (2019), seven thousand women still die annually in Cameroon from preventable complications during childbirth. The GiftedMom platform has a wide range of features which help users find a laboratory, babysitters and comparing health insurance (Hlabangane, 2019).

### ***2.3.3. Safe Delivery Application (Ethiopia)***

The Safe Delivery application can be pre-installed on mobile phones and helps health workers learn and identify basic obstetric complication during delivery through a video. The developers of the application Maternity Foundation describes it as follows:

*"The Safe Delivery application is a smartphone application that provides skilled birth attendants with direct and instant access to evidence-based and up-to-date clinical guidelines on Basic Emergency Obstetric and Neonatal Care. The application leverages the growing ubiquity of mobile phones to provide life-saving information and guidance through easy-to-understand animated instruction videos, action cards and drug lists. It can serve as a training tool both in pre-service and in-service training and equips birth attendants even in the most remote areas with a powerful on-the-job reference tool"* (Safe Delivery App - Maternity Foundation, 2019).

**Figure 1:** Statistics regarding the Safe Delivery application



Source: *Safe Delivery App - Maternity Foundation*. 2019.

According to the Maternity Foundation (2019), the application is used in 40 countries and has the following statistics. According to figure 1, the application is mainly used in low and middle-income countries which include Africa where there are poor road networks and infrastructure which hinder pregnant women from accessing health facilities in time, hence increase adoption of mHealth pregnancy applications.

#### **2.3.4. Zero Mothers Die (Ghana, Gabon, Mali, Nigeria, and Zambia)**

Zero Mothers Die is a global initiative to save the lives of pregnant women and their new-borns using mobile technologies. The Zero Mothers Die application is a unique mHealth application providing essential maternal, new-born and child health information to pregnant women, new mothers and health workers providing new-born and child health care to their community in different languages (Zero Mothers Die, 2019). This application aims to help fulfil the United Nations Sustainable Development Goals. The application is implemented in five different African countries (Ghana, Gabon, Mali, Nigeria, and Zambia) and available in English, French, Spanish and Portuguese. According to their statistics, it has reached three million women in 10

years (Zero Mothers Die, 2019). The application has made a significant positive impact in Africa as far as MCH care is concerned about leveraging mobile technology solutions to deliver essential pre- and post-natal information and services to the right women at the right time. Zero Mothers Die also seeks to build the capacity of health care workers to reduce the skills gap between developed and developing (Zero Mothers Die, 2019).

#### ***2.3.5. Wazazi Nipendeni (Tanzania)***

In 2012, the Wazazi Nipendeni initiative, which is a SMS initiative, was implemented in Tanzania (Staff, 2019). The initiative offers support to a pregnant woman to enhance healthy pregnancies. By 2015, over 1 million registrants have received cumulatively over 50 million text messages with safe antenatal, motherhood and infant health care information to Tanzania's pregnant women, mothers with new-borns, male supports and general information seekers across all the national mobile networks (Staff, 2019).

### **2.4. Adoption of mHealth Applications for Pregnant Women in South Africa**

South Africa is one of the African countries which experiences a high maternal and infant mortality rate. In 2015, it was reported that 41 out of 1 000 children (under the age of five years old) died, while 140 out of 100 000 mothers lost their lives. As a result, the NDoH launched a maternal health messaging application, momConnect (Hlabangane, 2019).

#### ***2.4.1. MomConnect***

momConnect is a South African initiative which aims to support maternal health using cellphone-based technologies integrated into MCH services. momConnect provides pregnant women and new mothers with health information via SMS and reminds patients about essential appointments and check-ups (Hlabangane, 2019). The application allows mothers even to receive SMSs after an infant is born up to when the infant reaches one year. The services are free to the user, and messages are available in the 11 official languages of South Africa (User, 2019). Since its launch in 2014, momConnect has reached over two million users and has launched a pilot WhatsApp messaging service to expand its reach. Also, the platform has expanded to reach nurses via NursesConnect and to provide additional targeted support to mothers living with HIV (Hlabangane, 2019).

According to User (2019), South Africa NDoH has implemented the momConnect mobile application for various reasons. Firstly, due to many maternal and child deaths could be avoided if some basic interventions are implemented. Secondly, some factors like breastfeeding are linked to the patient (demand side) and need a behaviour change. Thirdly, other factors are

linked to facilities and need improvement in the supply side and linked to health service improvement. Lastly, momConnect is well-placed to address some of these demand and supply-side problems. Some of the mHealth mobile application for pregnant women adopted in South Africa is mentioned in the following section.

#### **2.4.2. Mum and Me**

Mum and Me provide health information and video content based on various stages of pregnancy and childhood development in the first five years of the child's life (Hlabangane, 2019). It is available through Vodacom's Siyakha platform, which offers customers free access to a range of zero-rated sites. Like momConnect, users receive a weekly SMS to keep them updated on their pregnancy. Also, users gain access to information on a range of health topics, including sexual and reproductive health, breastfeeding, immunisation, mother-child bonding, nutrition, and HIV/AIDS (Hlabangane, 2019). The researcher did not focus much on this application since it is not only for mothers but rather for caregivers and fathers as well. Since November 2017, the platform provides a whole host of information for new fathers including advice on how to identify postpartum depression, tips on raising children and wellness information like how to lower blood pressure (Hlabangane, 2019).

Apart from MomConnect and Mum and Me, which is the two most popular applications, GiftedMom and Safe Delivery application are also adopted in South Africa. These two mobile applications for pregnant women were discussed in section 2.3.2 and 2.3.3, respectively, on the adoption of pregnant women mHealth applications in Africa.

A conclusion can be drawn from the adoption of the above mentioned mHealth applications that there are an increase and rapid growth in the adoption of mHealth applications for pregnant women. Since 2019 last year 78 000 new health application has been added to major application stores. The supply side of the market for mHealth applications shows robust growth of 25% year-on-year (research2guidance, 2019). As mobile technology becomes more ubiquitous across Africa, there will likely be an increasing amount of maternal health mobile applications that will save the lives of countless women across the continent (James *et al.*, 2019).

Although there is a push to reach African women with mobile pregnancy information, there are still millions who need access to this life-saving technology. The increasing need of HIS in Africa thus motivated the need for such a study as access to such health care facilities is still limited, requiring an understanding of the technology adoption challenges within such contexts

of use. The following section explores the various technology adoptions theories that assist in understanding the relationship between technology and human users which supports the frameworks used in analysing this study.

## **2.5. Theoretical Framework**

### ***2.5.1. The Concept of User Acceptance***

Dillion (1996) describes technology user acceptance as “the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support”. Within the context of this study, the researcher refers to technology adoption as the use for momConnect mobile application for pregnant women at the RCHC.

According to Dillion (1996), the concept of user acceptance has not been applied to instances whereby, users claim they will employ it without providing evidence of actual use, or using the technology for purposes unintended by designers and producers. mHealth interventions such as momConnect are dependent on user acceptability as all engagements are voluntary, meaning that the tools must be easy to use and useful to be successful (Skinner *et al.*, 2018). Perceived ease of use and attitude towards use had a significant positive influence on users’ behavioural intention to use mHealth (Alsswey & Al-Samarraire, 2020). Alsswey & Al-Samarraire, (2020), assert that end-users around the world use technology to perform tasks in a way that appears more natural and closer to their cultural and personal preferences. Security and privacy issues also have an impact on technology acceptance by users. In support of the above statement, existing security vulnerabilities, such as identity theft, loss or theft of mHealth devices and health information raise grave concerns in preserving privacy as well as in promoting user acceptance (Premarathne, Han, Liu & Khalil, 2015).

### ***2.5.2 Technology Acceptance Model (TAM)***

The introduction of computers and information systems in the technical terrain has made them these become popular that studies were conducted to investigate factors affecting their adoption. TAM has been developed by in 1986 by Davis. TAM is one of the most popular research models to predict the use and acceptance of information systems and technology by individual users. TAM has been widely studied and verified by different studies that examine individual technology acceptance behaviour in different information systems constructs.

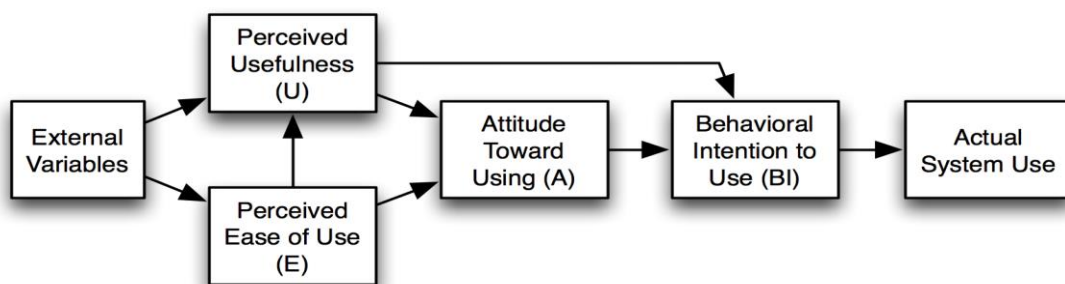
TAM has been one of the most influential models of technology acceptance, with two primary factors influencing an individual’s intention to use new technology: perceived ease of use and



perceived usefulness (Technology Acceptance Model - an, 2019). Concerning the above statement according to Braun (2013), while TAM has been criticised on several grounds, it serves as a useful general framework and is consistent with many investigations into the factors that influence older adults’ intention to use new technology”. Therefore, for example, an older pregnant woman might perceive mobile phone to be challenging to use and waste of time will be unlikely to want to adopt to momConnect mobile application, while an older pregnant woman who perceives mobile phone to users will be more likely to learn how to use momConnect mobile application.

As technology gained popularity, “researchers and practitioners devoted substantial research effort into determining which factors affect user’s beliefs and attitudes on the IS acceptance decision, and what factors contribute to user resistance” (Lee, Kozar, & Larsen, 2003:754). This led to the adaptation of Davis’s TAM, which is represented in figure 2.

Figure 2: The original Technology Acceptance Model adopted from Davis (1986)



Source: Davies (1986)

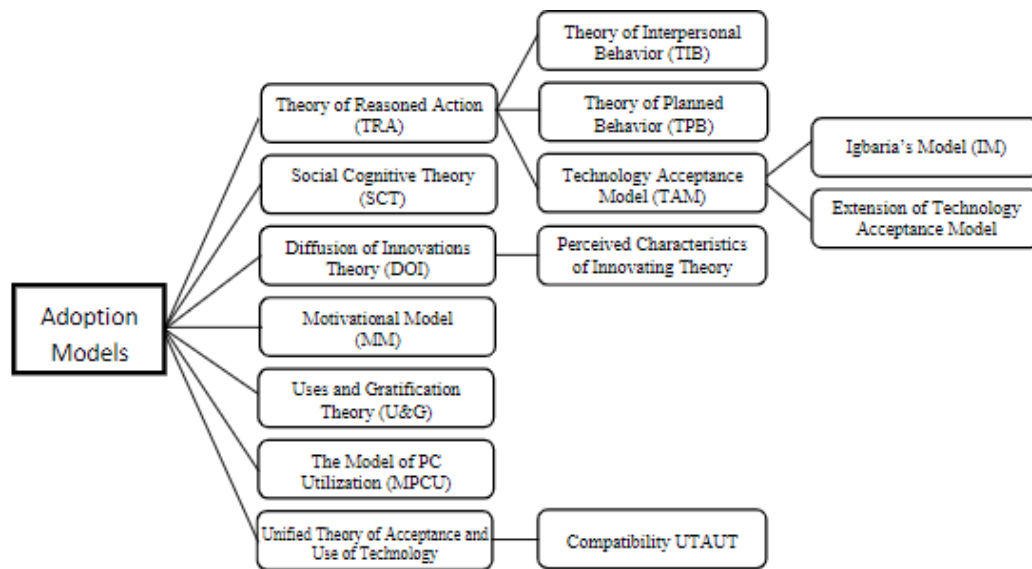
The TAM theory states that a person’s acceptance of an information system mainly lies in their evaluation of perceived usefulness and perceived ease of use of the technology. According to Yucel & Gulbahar (2013), perceived usefulness “is defined as being the extent at which a person believes that the use of a system will improve his or her performance”, while perceived ease of use of the technology “refers to the extent at which a person believes that using a given application is free of effort”. These two perceptions, perceived ease of use of the technology and perceived usefulness, directly relate to another TAM-core variable, attitudes toward technology. Most commonly, the TAM comprises at least one outcome variable: behavioural intention and/or technology use (Anon, 2019). These components mentioned above of the theory make it applicable to this study on factors affecting the adoption of momConnect mobile application for pregnant women.

Based on the available literature, the adoption of momConnect mobile application for pregnant women is relatively low in South Africa. MomConnect has the potential to continue to improve antenatal and maternal health in South Africa but requires future research to further explore its outcomes and impacts (Jahan, Zou, Huang & Jibb, 2021). Therefore, there is a need to assess the acceptance of momConnect to establish factors that hinder or promote their acceptance.

### **2.5.3. Technology Readiness Model (TRM)**

While mobile applications are the way forward for health care, not much is known about consumers' readiness to adopt such self-service technologies. Therefore, the purpose of this study was to determine pregnant women's level of technology readiness and its influence on their adoption of momConnect mobile application for pregnant woman at the RCHC. TRM is a model developed to measure people's propensity to embrace and use new technologies for the accomplishment of goals in home life and at work (Davids, 1986). Therefore, the TRM is an attitudinal construct (Lu, Yu, Liu & Yao, 2014). As a result, in terms of the TRM, people's personalities play a significant role when they adopt new technologies either in the context of work or home. Therefore, the TRM essentially explores the psychological aspects of a person's reactions to technologies. The TRM measures the readiness of an individual to use technology by four personality traits that include optimism, innovativeness, discomfort, and insecurity (Taylor & Todd, 1995). The Technology Readiness Index (TRI) score classifies five categories of adopters of technology: innovators, early adopters, early majority, late majority, and laggards. The TRI, however, does not indicate the competence of a person in using technology but shows their readiness to interact with it and their attitudes (Lee *et al.*, 2013). A review of other most popular theories and models of technology acceptance are highlighted in figure 3.

Figure 3: An overview of adoption/ Acceptance Models



Source: Taherdoost (2018)

Adoption models are rooted in a diversity of theories, for example, in the Diffusion of Innovation Theory, the Theory of Reasoned Action (Bouten, 2008), TIB, TPB and SCT (Gagon, Sanchez & Pons, 2006). All three theories have proven their effectiveness in predicting and explaining a variety of human behaviours in differing contexts. On the other hand, the Theory of Reasoned Action and TPB differ from Diffusion of Innovation in the sense that the former focuses on explaining the behaviour of individuals. The latter concentrates on adoption decisions in which the organisational characteristics play a key role, not the individual. SCT and TPB integrate the notion of perceived outcomes when forecasting behaviour, while Diffusion of Innovation Theory and TAM focus solely on beliefs about the technology. Diffusion of Innovation Theory, TAM and TPB adopt a unidirectional perspective towards the causal relationship, in which environmental constructs affect cognitive beliefs, which affect attitudes and behaviours. In contrast, SCT relies on the bidirectional nature of causation in which behaviour, emotional and cognitive factors and environment constantly and mutually affect each other (Carillo, 2010).

## 2.5.4 Theoretical Framework Conceptual Definitions

### Percived Usefulness

Perceived usefulness is defined here as "the degree to which a person believes that using a particular system would enhance his or her job performance." This follows from the definition of the word useful: "capable of being used advantageously." Within an organizational context,

people are generally reinforced for good performance by raises, promotions, bonuses, and other rewards (Pfeffer, 1982). A system high in perceived usefulness, in turn, is one for which a user believes in the existence of a positive use-performance relationship. In the current study an assumption is made that people tend to use or not use momConnect to the extent they believe it will help them perform their job better

### **Perceived ease of Use**

Perceived ease of use, refers to "the degree to which a person believes that using a particular system would be free of effort." This follows from the definition of "ease": "freedom from difficulty or great effort." Effort is a finite resource that a person may allocate to the various activities for which he or she is responsible (Radner and Rothschild, 1975). All else being equal, it can be asserted that an application perceived to be easier to use than another is more likely to be accepted by users. In the context of this study, an assumption is made that even if potential users believe that a momConnect is useful, they may, at the same time, believe that the systems is too hard to use and that the performance benefits of usage are outweighed by the effort of using the application.

### **Attitude towards Use**

Attitude of users towards use of mobile health applications is of pertinent importance in determining the adoption rate of m-Health applications. Fishbein and Ajzen (1975) define attitude toward use as an individual's positive or negative feelings (evaluative affect) about performing the target behavior. Attitude towards use in this study is defined as a number of perspectives and beliefs, positive or negative, and favorable or unfavorable feelings which pinpoint the usefulness or avoidance of using momConnect.

### **Behavioral Intention to use**

Behavioral intention is defined as the degree to which a person has formulated conscious plans to perform or not to perform some specified future behavior (Davis, 1985). In this study behavioural intention to use is defined as the motivational factors that influence a given behaviour where the stronger the intention to perform the behaviour, the more likely the behaviour will be performed. This study assume that there are many factors that affect momConnect users behavioural intention to use momConnect.

The four concepts defined above were drawn from the theoretical foundations of the study. It must be noted that there are other factors that might affect the use of momConnect that may emanate from the four core theoretical foundations concepts like people's traits, trust, social influence, technological attributes and organisational factors.

## ***2.6 Empirical Literature on Factors Affecting Mobile Applications Adoption***

Hoque, Karim & Amin (2015) investigated the factors affecting the adoption of mHealth services among young citizens in Bangladesh. Hoque *et al.* (2015) determined and measured usages of mobile phone in Bangladesh among the young age group (patients) how they use Mobile phones to solve the health-related problem. TAM was used as the theoretical underpinning to conduct this study. A questionnaire survey method was used to collect data from participants in different public and private universities in Bangladesh. The data were analysed using the Partial Least Square method, a statistical analysis technique based on the Structural Equation Model. Findings revealed that perceived usefulness ( $p < 0.05$ ) positively predicted the intention to use mHealth services, while perceived ease of use ( $p > 0.05$ ) was identified as a less significant factor in the mHealth adoption in Bangladesh. The findings from the study can serve as input to promote citizen's use of a mobile phone for better self-management of health.

Botha & Booie (2017) described the state of mHealth applications and implementation in South Africa. The study utilised a systematic review of the literature to document the findings. The study's results showed that the use of mobile technologies in the health domain is by its very nature a parasitic endeavour.. The economic unsustainability of implementations needs to be addressed in parallel to any attempts to incorporate mHealth initiatives into a large eHealth system. The gains made by some of the stakeholders towards patient-centric services and health system administration contain significant contextual learning towards broader adoption. The mHealth applications potentially show the gaps that have not adequately been explored and lack local context with little evidence of training and education as well as the application of financial transactions and incentives in the mHealth domain in South Africa. The effectiveness of these strategies in the South African context needs to be explored to guide their possible impact for implementations effectively.

Alau, Hoque & Barua (2020) researched on a patient-centric study on the factors affecting the adoption of mHealth services in Bangladesh by using the extended Unified Theory of Acceptance and Use of Technology Model with perceived reliability and price value factors.

The study examined the moderating effect of gender on the intention to use and on the actual usage behaviour of users of mHealth services. A well-structured face-to-face survey was employed to collect the data. Structural Equation Modelling with a partial least square's method was used to analyse the data collected from 296 generation Y participant. The results confirmed that performance expectancy, social influence, facilitating conditions and perceived reliability positively influence the behavioural intention to adopt mHealth services. However, effort expectancy and price value did not have a significant influence on behavioural intention. Moreover, gender has a significant moderating effect on mHealth services adoption in some instances. Finally, the theoretical and practical implications of this study are also discussed. ., Quintan, Schiavone & Vrontis (2018) explored the effect of digital technologies adoption in the health care industry. The paper reports the case study of Medical Service Directorate (MSD) Italy, the Italian subsidiary of the United States of America (USA) based company Merck & Co., Inc. The group is active in Italy with the sharing of drugs for human use, but also with the veterinary (MSD Animal Health), with Vree Health, solutions, and software-based services for health care. Their results showed that the adoption of digital technologies could improve the performance of all the main health care business processes, in particular those processes that can be simplified with the adoption of information technology (IT). More specifically, digital technologies can make services and processes more efficient and, at the same time, allow delivering better quality and reducing patient consultation times, with many benefits for several factors such as national health systems, clinicians and patient.

Pai & Aluther (2018) assessed mHealth applications with Twitter analytics. The methodology followed in this research was qualitative with the data extracted from a social networking site "Twitter" through a tool RStudio. This tool with the help of Twitter Application Programming Interface requested one thousand tweets each for four different phrases of mHealth applications such as "fitness applications", "diabetes applications", "meditation applications", and "cancer applications". Depending on the tweets, sentiment analysis was carried out, and its polarity and emotions were measured. The results showed that except for cancer application, there exists a positive polarity towards the fitness, diabetes, and meditation applications among the users. Following a system thinking approach for their results explained the causal relationships between the accessibility and acceptability of mHealth applications which helps the health care facility and the application developers in understanding and analysing the dynamics involved the adopting a new system or modifying an existing one.

Garcia, Thomas, Parra and Llorett (2018) researched an mHealth application for cerebral stroke detection and monitoring using cloud services. In their paper proposed a cerebral stroke detection solution that employs the cloud to store and analyse data to provide statistics to public institutions. Moreover, the prototype of the application was presented. The three most important symptoms of cerebral strokes were considered to develop the tasks that were conducted. Thus, the first task detects smiles. The second task employs voice recognition to determine if a sentence is repeated correctly and, the third task determines if the arms can be raised. Several tests were performed to verify the application. Results show its ability to determine whether users have symptoms of cerebral stroke or not.

Furusa & Coleman (2018) determined the factors influencing the implementation of e-health by medical doctors in public hospitals in Zimbabwe. The study was guided by qualitative research in conjunction with multiple-case studies. Qualitative data were collected using 20 semi-structured interviews from selected hospitals concerning the implementation of e-health by medical doctors in public hospitals. Hospitals were selected using random sampling, while purposive sampling was used to select the 20 doctors. This study revealed that both internal and external factors influence the implementation of eHealth by medical doctors in public hospitals in Zimbabwe. Internal factors included ICT infrastructure and e-health technologies, ICT skills and knowledge, technical support, security concerns, lack of basic medical facilities, demographic factors such as age and doctor-patient relationship whilst external factors included health policy, funding and bureaucracy.

Ndayizigamiye & Maharaj (2017) studied the determinants of mHealth in Burundi, East Africa. The researchers used the Diffusion of Innovation Theory to investigate the determinants for the adoption of mHealth by health care professionals in Burundi. From a sample of 212 primary health care professionals, their paper analysed what can influence Burundi's primary health care workers to adopt mobile health. The results indicated that the relative advantages associated with mHealth interventions are perceived as predictors of mHealth adoption in Burundi. Moreover, work-related factors, coupled with one's experience with mobile devices, are the Diffusion of Innovation Theory compatibility factors that influence the adoption of mHealth by Burundi's health care professionals. mHealth being a new concept with Burundi's

health care system, trialability and observability were found to have a significant influence on its adoption. However, mHealth complexity was found not to influence mHealth adoption—this paper advocate for education and awareness programs tailored specifically towards mHealth adoption by primary health care workers.

## **2.6. Barriers to the Use of mHealth Applications**

Kruse, Betancourt, Ortiz, Luna, Bamrah & Segovia (2019) conducted research to identify and synthesise barriers to the use of mHealth technologies such as SMS, calls, and applications to change and, where possible, improve the health behaviours and health outcomes of populations in developing countries.

Kruse *et al.* (2019) followed the preferred reporting items for systematic reviews and meta-analyses checklist. It focuses on the reporting of reviews evaluating randomised trials. However, it can also be used as a basis for reporting systematic reviews of other types of research, particularly evaluations of interventions. Therefore, deriving search criteria from the review's primary objective, they searched PubMed and CINAHL using the search of a specific term, e.g., mHealth, text messaging, and developing countries, with their respective Medical Subject Headings, limited by publication date, English language, and full text.

The literature reviewed revealed that mHealth initiatives were used extensively worldwide for applications such as maternal health, prenatal care, infant care, HIV/AIDS prevention, treatment adherence, cardiovascular disease, diabetes, and health education (Kruse *et al.*, 2019). These studies were conducted in several developing countries in Africa, Asia, and Latin America. The most prominent health outcomes improved with mHealth were infectious diseases and maternal health, accounting for a combined 20/30 (67%) of the total studies in the analysis. The most frequent mHealth technology used was SMS, accounting for 18/30 (60%) of the studies. They identified 73 individual barriers and grouped them into 14 main categories. The top three barrier categories were infrastructure, lack of equipment, and the technology gap, which together accounted for 28 individual barriers (Kruse *et al.*, 2019). Cajita, Hodgson, Lam, Yoo & Han (2019), assessed the perceptions of older adults with heart failure regarding the use of mobile technology and to identify potential facilitators of and barriers to mHealth adoption. Semi-structured interviews were used to collect data. Transcripts were analysed using

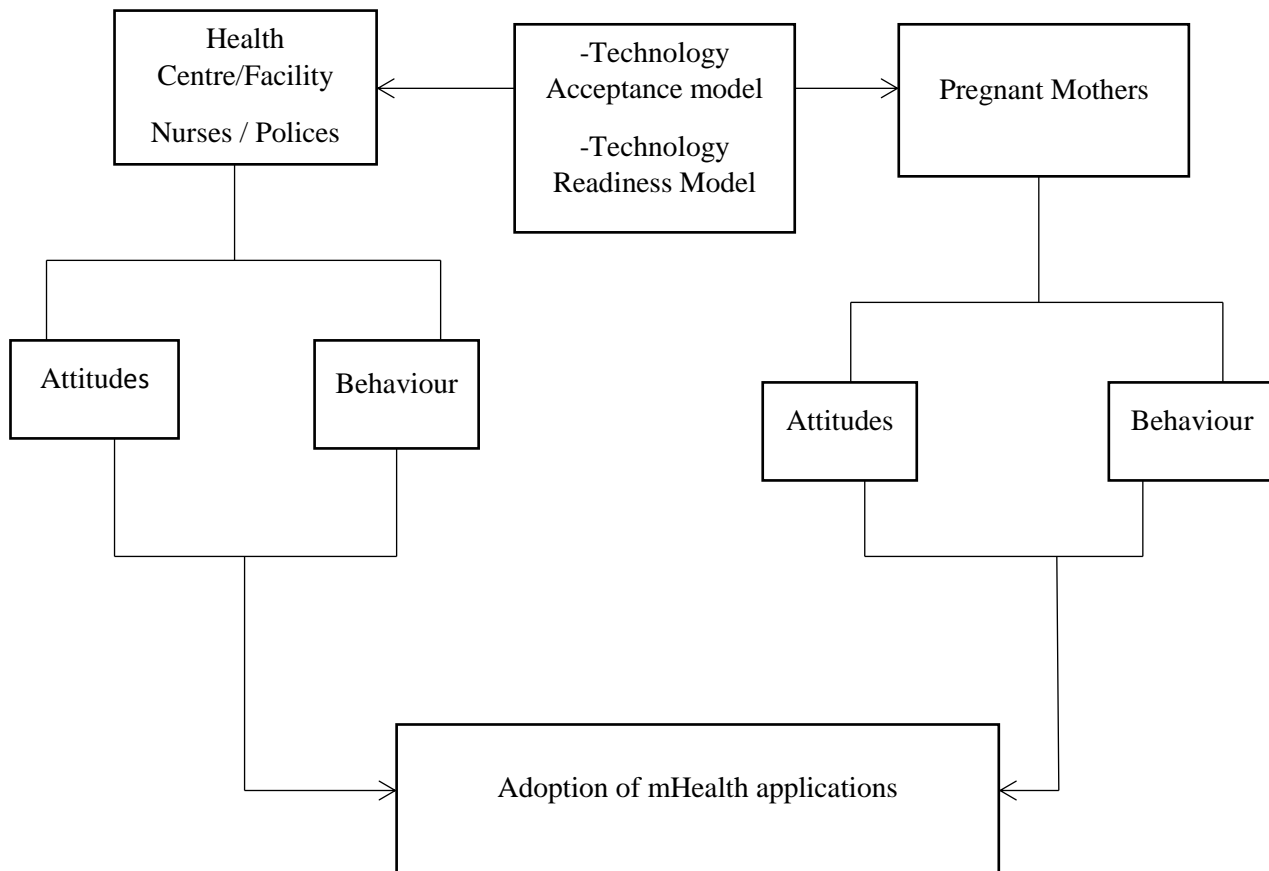


qualitative content analysis. The findings indicated that older adults do not base their intention to use mHealth solely on perceived ease of use and perceived usefulness, as outlined in the TAM. The following themes emerged from the content analysis such as facilitators included previous experience with mobile technology, willingness to learn mHealth, ease of use, presence of useful features, adequate training, free equipment, and doctor's recommendation. Barriers included lack of knowledge regarding how to use mHealth, decreased sensory perception, lack of need for technology, poorly designed interface, cost of technology, and limited or/fixed income. Overall, the findings suggest that older adults are willing to use mHealth technology, albeit with reservations. Future researchers who seek to implement mHealth-based interventions should address person-related, technology-related, and contextual barriers, and simultaneously capitalise on the influence of potential facilitators, such as a physician's recommendation, to promote mHealth adoption.

## **2.7. Conceptual Model**

Following the literature review and the theoretical framework discussed above, a conceptual model was constructed to guide in understanding technology adoption within the context of the study. Figure 4 below depicts this conceptual model.

Figure 4: Conceptual model



Source: Own construct, from the literature reviewed and the theoretical model underpinning this study.

Figure 4 shows the mHealth adoption model constructed for this study. The pregnant mothers and the RCHC nurses are the cornerstones in the adoption of mHealth applications. The RCHC policy on adoption of mHealth is also key to the adoption of mHealth services by the patients and its use by the RCHC staff. Based on the theoretical underpinnings of the study that is the TAM and the TRM, the pregnant mother and nurses attitudes and behaviours the study focus was establishin the adoption perspectives in the mHealth facilities. The technology attributes that were adopted from the TAM and the TRM were attitudes towards use and behavioural intention to use. The two attributes were chosen because they determine the actual use of momConnect by pregnant mothers and nurses. Adoption and subsequent use of momConnect by the pregnant mother is thus determined by their attitudes towards using the mobile application and their behaviour towards the use of momConnect. This study seeks to ascertain the factors affecting the adoption of mHealth applications. The model shows how the concepts

surrounding mHealth adoption and theories link to enhance the adoption of mHealth applications.

## **2.8. Chapter Summary**

This chapter evaluated the literature on the public health sector in Africa and the role of mobile applications in supporting health care sectors. In this section, the study defined mHealth applications and their adoption in globally and in AfricaAfrican. The chapter further considered adoption perspectives of the mobile application for pregnant women in Africa and existing studies conducted on momConnect mobile application for pregnant women at the RCHC. The chapter further presents a conceptual model that will guide the analysis process of the study. The following chapter presents the research methodology followed in the study.

## **CHAPTER 3**

### **3. RESEARCH METHODOLOGY**

#### **3.1. Chapter Overview**

This chapter discussed the research design and methodologies used in this research study. The chapter is a continuation of chapter two, which reviewed the literature on the adoption of mHealth applications of pregnant women. The chapter explains in detail the research paradigm, methodology and related data collection instruments.

#### **3.2. Research Paradigm**

Epistemology relates to relationships between the knower and what is known (Creswell, 2014:9) It tries to explain how one knows and what one know and in this, what counts as knowledge is what can subsequently be deduced (Kothari, 2015). The interpretivism philosophy was adopted in this study to be able to conduct qualitative research, which managed to inductively draw the factors affecting the adoption of momConnect mobile application for pregnant women at the RCHC.

There are several research paradigms within the field of research which guide the epistemological perspective in the study. The interpretivist research paradigm provides an understanding of the world of human experiences, suggesting that reality is socially constructed (Creswell, 2014a). The interpretivist paradigm is also considered as an “anti-positivist” paradigm as it opposes the positivism paradigm that is based on assuming what is in the real world but rather intend to examine what is in the world and interpret it (Kothari, 2015). Positivism, on the other hand, adopts a clear quantitative approach to investigating phenomena as opposed to anti-positivist approaches which aim to describe and explore in-depth phenomena from a qualitative perspective (Creswell, 2014b)

Interpretivism is premised on the principle that a phenomenon cannot be objectively observed from the outside . Instead, it must be observed from inside through the direct experience of the people. Therefore, the role of the researcher in the interpretivist paradigm is to understand, explain, and demystify social reality through the eyes of different participant (Cohen, 2007). This study followed the interpretivist paradigm, which seeks to understand rather than explain.

### **3.3. Research Approach**

There are generally two basic research approaches, namely, qualitative and quantitative research. This research, , utilised the qualitative research approach. As the interpretivist paradigm guides this research, the qualitative approach which emphasises studying phenomena in their natural setting was found to be fitting in that interpretivist researchers also stress the importance of ordinary day-to-day experiences of the subject of the research study (Fox, 2009).

Kothari (2015) reflects that quantitative research is a method of research that relies on measuring variables using a numerical system, analysing these measurements using any of a variety of statistical models, and reporting relationships and associations among the studied variables. Qualitative research inquiry, on the other hand, aims to describe and clarify human experiences as they appear in people's lives (Creswell, 2014b). Qualitative research is the research that produces findings not arrived at employing statistical procedures or other means of quantification of data (Fox, 2009).

Qualitative research is especially effective in obtaining culturally specific information about the values, opinions, behaviours, and social contexts of populations (Kothari, 2015). Qualitative research is further provides complex descriptions of how people experience given a research issue. It provides information about the "human" side of an issue, assisting in understanding behaviours, beliefs, opinions, emotions, and relationships of individuals (Bryman & Bell, 2014). It is exploratory and used to gain an understanding of underlying reasons, opinions, and motivations. This makes it the best fit of this study in understanding the underlying reasons and opinions that impact the adoption of the momConnect mobile application. It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research (DeFranzo, 2019).

Therefore, qualitative research was considered as the most relevant research study approach to conduct this study as it assisted in obtaining information on how pregnant women's behaviour and options affect the adoption of momConnect in the study context at the RCHC. The qualitative study can allow great depth in the data collection process, mainly when the sample size is not large. Using a sample of six nurses and ten pregnant women, the participant provided perspectives through a qualitative interview process. Qualitative research is also used to uncover trends in thought and opinions and provides a more profound into the problem (DeFranzo, 2019).

### **3.4. Research Design**

A research design is described as a plan that guides the researcher in the process of collecting, analysing and interpreting data (Creswell, 2014b). Fox (2009) described a research design as a plan that guides the investigator in the process of collecting, analysing and interpreting observations. The exploratory research design was used in this research study.

According to Burns and Bush (2006), the exploratory research design is referred to as gathering information in an informal and unstructured manner. The exploratory research design is most suitable when the researchers have limited insights and documented evidence on the study and its context as in the case of the factors that affect the adoption of momConnect mobile application. Its flexibility further characterises exploratory research as it tends to explore the problem. When a problem is broad and not explicitly defined, the researchers use exploratory research as an initial research design approach. Exploratory studies are a valuable means of understanding; to seek new insights; to ask questions and to assess the research phenomenon in a new light (Yin, 1994). The justification of using exploratory design in this research was to explore new phenomenon about the factors affecting adoption of momConnect at RCHC .

### **3.5. Population and Sampling**

The target population in this research focused on primary and secondary users of the momConnect platform (Creswell, 2014b). In this research, the population comprised of pregnant women who seek medical care from and nurses at the RCHC. This population was selected based on the access to research participant within the RCHC following the ethical process, which is going to be discussed further in section. The population further included qualified nurses who worked in the same clinic. The nurses were Partconsible for supporting pregnant women with access to momConnect and any related required skills. While the nurses were secondary users, they played a critical role in understanding the use, need and the different context of the system users.

A sample is the group of individuals who participate in a study, and the population is the broader group of people to whom the results will apply (Kothari, 2015). According to Creswell (2014a), a population is the set of all the individuals that possess the characteristics that are of interest to the researcher, while a sample is only a subset of said population. To come up with a sample of 16 research participant (ten mothers and six nurses), the researcher employed the

purposive sampling technique. According to Creswell (2014), purposive sampling is a non-probability sampling method where a researcher uses their judgement to choose participant for a particular research study. The type of purposive sampling used was expert purposive sampling.

In this study, the sample population included nurses and pregnant women who relied on the RCHC for maternity health care. The nurses chosen are those who deal with pregnant women at the RCHC, while the mothers are primary users of the system. Purposive sampling allows the researcher to select a participant that serves as a specific purpose consistent with the study's main objective (Cohen, 2007).

One of the challenges related to this sampling method is prone to researcher bias (Creswell, 2014b). The idea that a purposive sample has been created based on the judgement of the researcher is not an acceptable defence when it comes to alleviating possible researcher biases, especially when compared with probability sampling techniques that are designed to reduce such biases (Creswell, 2014b). Another challenge with this method is that a participant can also manipulate the data being collected. Furthermore, purposive sampling can be an ineffective method when applied to a large population group.

To overcome these challenges mentioned above the researcher made sure there was a limited number of individuals who possessed the specific traits that were being studied to be interviewed to avoid the ineffectiveness of the method when applied to a large group. To prevent the manipulation of collected data by a participant, the researcher made sure had acquired enough skills to determine the validity of data being collected. The skills were acquired through research and online courses on how to conduct research using purposive sampling methods.

### **3.6. Data Collection Methods**

In this study's context, data collection methods refer to how data was collected to assist the researcher in answering the research questions of this study as well as reach the objectives of the study. Different data collection methods are used in a qualitative research process. The most common are interviews, focus group discussions (FGDs), observational methods, and document analysis (Creswell, 2014a). Combining two or more data collections methods, for instance, interviews, as well as FGDs, are known as 'data triangulation', enhances the credibility of the study (Creswell, 2018). FGDs were used as data collection instrument and are

described in section 3.6.1. and 3.6.2. The interview instruments were used for the mothers who are considered as primary end-users of the system. FGDs were then conducted with nurses who register pregnant women to use the mobile application.

### **3.6.1. Interviews**

Fox (2009) argued that interviews are useful to explore experiences, views, opinions, or beliefs on specific matters. Creswell (2014a) defined an interview as “a two-way communication in which the interviewer asks the participant questions to collect data and to learn about the ideas, beliefs, views, opinions and behaviours of the participant”.

There are different kinds or grades of structuring interviews, namely structured, semi-structured or open or in-depth, dependent on the characteristics of structuring the interview by the researcher (Kothari, 2015). (With interviews, the researcher develops a topic list before the start of the interview, which can be used flexibly. Therefore, interviews can also probe for answers and use follow-up questions, thus allowing for the collection of vast data for answering research questions effectively, thus ensuring reliability and validity.

As the interview is a product of the interaction between the researcher and the interviewee, the setting and skills of the researcher are of importance, for example, the ability to build a sense of trust (developing rapport), the way of phrasing questions, give the interviewee room to tell a story and body language (Cohen, 2007). In this study, the interviewees had to respond to a set of predetermined questions that the researcher had formulated. (These questions are in the appendix section.) The questions in the interview guide were derived from the TAM and TRM frameworks (as explained in chapter 2 section 2.5.2 and 2.5.3) as they guided the exploratory process to understanding factors affecting the adoption of momConnect. Interviews were thus used as they permit a higher degree of confidence in the participant.

Semi-structured interviews were used to collect data from ten pregnant mothers. Semi-structured interviews were used in this qualitative study to get as much information from the participant to obtain the salient understanding of variables of the conceptual model without trying to influence or convince the beliefs that the researcher hold regarding the topic and perspectives identified in the literature. The researcher thus ensured the participant understood the questions and assured them their rights of participation through the study. The participant was assured that there was no right or wrong Partconse, and every Partconse is useful and important for the research.



The disadvantages associated with semi-structured interviews are time-consuming and require one to have interviewing skills (Cresswell, 2014b). Preparing and planning questions must be carefully done so as not to make prescriptive or leading questions. The researcher needs to interview sufficient people to make general comparison and skills to be able to analyse the data. The researcher must ensure confidentiality every time interviews are conducted.

To overcome those mentioned above challenged associated with semi-structured interviews, the researcher had to prepare for the interviews and write a guide before conducting interviews. This assisted the researcher in having an idea of what information was needed and what questions needed answers through interviews. Before interviews, the researcher introduced himself and built a rapport between him and the participant to get them comfortable and explained the purpose of the interview. The researcher ensured that confidentiality was maintained throughout the interview by explaining the whole process and made them sign consent forms. The researcher selected enough participant for the study and made sure he had data analysis skills needed for the study through learning and research.

### ***3.6.2. Focus Group Discussions (FGD)***

FGDs was used to collect data from six nurses. FGDs involve interviewing a group of six to ten participants instead of one participant at a time. In a FGD, participants with common characteristics or experience to elicit ideas, thoughts and perceptions about specific topics or certain issues linked to an area of interest. (Cresswell, 2014b). FGDs enabled the nurses to express their views without any fear. Similar to the interview participant, the FGD participants were informed that the discussion was for educational purposes only, their names were not recorded, and the information discussed was not going to be presented to anyone.

Advantages of FGDs according to Cresswell (2014b) include the following: the dynamic interaction among participant stimulates their thoughts and reminds them of their feelings about the research topic; all participant including the researcher has an opportunity to ask questions; these will produce more information than individual interviews; informants can build on the answers of others, and the researcher can clarify conflicts between participants and ask about these different views.

According to Cresswell (2014b) and Gill (2007), the disadvantages associated with FGDs highlight the following limitations of FGDs. Firstly, the researcher may have difficulty managing debate and controlling the process than in an individual interview. Secondly, some

participant may be introverts while others dominate the discussion and influence the outcome, or perhaps even introduce bias, the group climate can inhibit or fail to stimulate the individual, or it can be dynamic and generate more data, recording data can present problems. Lastly, it is not feasible to take notes when many people are talking at the same time, and data analysis can be daunting

To overcome the disadvantages mentioned above the researcher attended an online course on how to handle FGDs before the FGDs at the RCHC was conducted. To avoid taking notes, the FGDs was recorded using a mobile, and the researcher gave each participant a coded number from one - six. Each participant was given the same opportunity to Partcond to a question to avoid the dominance of speakers. Short coffee breaks further stimulated the brains of the participant during the FGDs.

### **3.7. Qualitative Data Analysis Methods**

Data analysis implies making sense of the data that is collected (Kothari, 2015). It requires one to explain the conclusions drawn in words that provide answers to the research questions (Creswell, 2014). Data were first coded from the interview and FGDs items. A thematic analysis was then used to analyse the data.

### **3.8. Trustworthiness and Authenticity**

Trustworthiness in qualitative research indicates that the results of a study and the researcher's conclusions are credible and therefore, have some value to the reader (Kothari, 2015). For credibility in this study, the researcher familiarised himself with the participant before the first data collection dialogue took place. The researcher further visited the participant at the RCHC to provide a verbal request for participation. The main purpose of the courtesy visit to the participant was to establish a relationship of trust. In that way, the researcher dealt with the participant who was willing to participate freely in the study. The researcher asked the participant to be free and comfortable from the onset of the interviews. That way, rapport with the participant was meant to be established at the same time, ensuring honesty in the participants. Results of the qualitative study should be dependable. Dependability is a criterion in qualitative research, which is concerned with the stability of the results over time (Creswell, 2014b). To enhance the dependability of this study, the researcher maintained an audit trail of the data collected, so that documented the rigour with which the researcher conducted the study. The researcher also allowed the participant involved in the interviews to read a transcript

of the dialogue, which they participated in this, was done to ensure that the transcripts for the interviews matched what the participant said in the interviews.

### **3.9. Ethical Considerations**

The relationship between the researcher and the participant must be appropriately managed. In a study, researchers must maintain the Rights to privacy, must be open, honest and avoid misrepresentation (Creswell, 2014a). Also, issues of anonymity, confidentiality and informed consent are essential (Creswell, 2014b). Research projects are evaluated by the University of the Western Cape research and ethics committee to ensure that the researcher is adhering to ethical principles and for the protection of research participant.

The research proposal for this study was first reviewed and assessed by the University of the Western Cape (UWC), Research and Ethics Committee, and ethical clearance was granted to the researcher. This was followed by an ethical health clearance for conducting this research at the RCHC owing to the involvement of patients and health care staff. It was obtained from the Provincial Health Department through its Health Research Sub-directorate after following their application process. Lastly, the research was conducted, and the researcher adhered to ethical guidelines ensuring informed consent will be obtained from the participant of the study through the use of a sign-off sheet (Kothari, 2015).

The researcher informed the participant that they could withdraw from the study at any time and assured them that anonymity and confidentiality would be preserved throughout the entire research process (Cohen, 2007). The contact details of the researcher were given to the participant on the sign-off sheet of the study to enable them to initiate contact if they had any questions regarding the research. At no stage during the research process will participant placed in any psychological or other forms of risk and a statement regarding the purpose of the inquiry was provided to all participant of the study, which outlined the participant's role in the study and how the information they provided was going to be used. All the copies involved in this ethical process are included in the Appendix section.

### **3.10. Summary**

Research design and data collection methods used in this study were highlighted in detail in this chapter. To collect qualitative data, interviews with pregnant women and FGDs from the nursing staff at the RCHC and were analysed using thematic analysis.

## CHAPTER 4

### 4. RESEARCH FINDINGS AND ANALYSIS

#### 4.1. Chapter Overview

This chapter presents findings from the data collection activities undertaken within this study in the form of semi-structured interviews. The methods with which the data was collected and analysed were discussed in chapter 3. The findings from the data collection are unpacked and aligned with the objectives of this study.

As stated in chapter 3, the data collected for this study was obtained through interviews with the RCHC nurses and a FGDs with pregnant women who were active users of the momConnect system. The interviews were semi-structured and were conducted with pregnant women and nurses at the RCHC.

#### 4.2. Research Findings

##### 4.2.1. Research Participant

Through a FGD and interview process, the data that was collected from participants. The following presents biographical information of the participants in the study. Table 4.1 and 4.2 presents the study's participants at the RCHC listing gender, age, mobile phone literacy, and the total number of pregnant women registered to use momConnect.

**Table 4.1: Pregnant Women**

|  |                      |
|--|----------------------|
| <b>Characteristics of Participants</b>   |                      |
| <b>Gender</b>  | <b>Female (100%)</b> |
| <b>Total number of pregnant women</b>  | <b>10</b>            |
| <b>Number of pregnant women who were registered on momConnect mobile application</b> | <b>10</b>            |
| <b>Pregnancies</b>   |                      |
| <b>1<sup>st</sup>-time pregnancy</b>   | <b>4</b>             |
| <b>2<sup>nd</sup>,3<sup>rd</sup>, pregnancies</b>                                    | <b>6</b>             |
| <b>Age in years</b>  |                      |
| <b>17 – 20</b>   | <b>1</b>             |
| <b>20 – 30</b>   | <b>6</b>             |

|                |          |
|----------------|----------|
| <b>30 – 40</b> | <b>3</b> |
| <b>&gt;50</b>  | <b>0</b> |

Source: Data collection, 2020

The results in table 4.1 show the characteristics of pregnant women. Out of ten participants, four had first-time pregnancy, whilst the other six had second or third pregnancies. Majority of the participants (60%) were between 20 to 30 years of age; 30% were between 30 to 40 years of age, and only one participant was between 17 and 20 years of age. The results reflect that young women are likely to have a positive attitude towards adoption and using momConnect.

**Table 4.2: Mobile phone literacy (pregnant women)**

|                 |          |
|-----------------|----------|
| <b>Minimal</b>  | <b>1</b> |
| <b>Moderate</b> | <b>2</b> |
| <b>Advanced</b> | <b>7</b> |

Source: Data collection, 2020

The participants were also asked about their mobile phone literacy. The definition of mobile phone literacy used in this study was adopted from Carillo, (2010) who stipulated that mobile phone literacy refers to people who are well-versed with mobile phones and understand how to consume, create and share digital content using a mobile phone. According to the research, 70% of the participants had advanced mobile phone literacy, and 20% had moderate mobile phone literacy, whilst only 10% had minimal mobile phone literacy. The results imply that women with advanced mobile phone literacy are likely to have positive attitudes and behavioural intention to adopt and use mobile phones. Their advanced mobile phone literacy skills enables them to navigate, interpret and contribute information, communicate through the mobile phone and orient themselves on different mobile phone applications without any difficulties.

**Table 4.3: Nurses (FGDs)**

|                                       |                      |
|---------------------------------------|----------------------|
| <b>Characteristics of Participant</b> |                      |
| <b>Gender</b>                         | <b>Female (100%)</b> |
| <b>Total number of nurses</b>         | <b>6</b>             |

|                     |          |
|---------------------|----------|
| <b>Age in years</b> |          |
| <b>17 – 20</b>      | <b>0</b> |
| <b>20 – 30</b>      | <b>2</b> |
| <b>30 – 40</b>      | <b>3</b> |
| <b>&gt;50</b>       | <b>1</b> |

Source: Data collection, 2020

A total of six nurses also participated in this study. All the nurses were female. Half of the participants were between 30 to 40 years of age, 2 out of 6 participants were between 20 to 30 years of age, and only one was over 50 years of age.

**Table 4.4 Mobile phone literacy (focus group)**

|                       |          |
|-----------------------|----------|
| <b>Minimal level</b>  | <b>0</b> |
| <b>Moderate level</b> | <b>2</b> |
| <b>Advanced level</b> | <b>4</b> |

Source: Data collection, 2020

The nurses were also asked about their mobile phone literacy level defined above under table 4.2. Four out of six nurses considered themselves to have advanced mobile phone literacy, whilst two had moderate mobile phone literacy. The level of mobile phone literacy of the nurses is likely to improve their adoption and use of momConnect.

#### **4.2.2. Qualitative Analysis – Interview Findings**

The initial phase of this study aimed to interview pregnant women who were users of momConnect to identify and verify the factors affecting the adoption of momConnect mobile application for pregnant women at the RCHC. The interviews were based on semi-structured questions used to identify the factors that were affecting the adoption of the momConnect mobile application.

In the findings, discussed in the following sections the term “momConnect” was used to describe the mobile systems as it was also used during the data collection phases to describe the mobile application. This was done to remove confusion among participants who were familiar with other mobile applications for pregnant women.

### **4.3. Thematic Analysis**

Based on the literature reviewed, a thematic analysis is a method of analysing qualitative data such as interview transcripts. The researcher closely examines the data to identify common themes – topics, ideas, and patterns of meaning that come up repeatedly (Creswell, 2014a). Boyatzis (1998) defines thematic analysis as a process for encoding qualitative information with the encoding requiring explicit codes. According to Banister, Burman, Parker, Taylor and Tindall (1994), it can be understood to be an interpretative application of content analysis in which the focus of analysis is on thematic content that is identified, categorized and elaborated based on systematic scrutiny. According to Lieblich, Tuval-Mashiach and Zilber (1998), thematic analysis is an appropriate method to analyse narrative material. It enables researchers to use a wide variety of information systematically. A thematic analysis method was used in this study to present the research findings. A thematic analysis method allows for a more generalised assessment and understanding of interviews, observations, and more casual conversations.

Thematic analysis is the method most suited to the aims of this research study, which involved eliciting and analysing the narratives of nurses and pregnant women at the RCHC. Besides its theoretical freedom, thematic analysis was selected for this study because as it provides a highly flexible approach that can be modified for the needs of many studies, providing a rich and detailed, yet complex account of data (Braun & Clarke, 2006; King, 2004).

Braun and Clarke (2006) and King (2004) argued that thematic analysis is a useful method for examining the perspectives of different research participants, highlighting similarities and differences, and generating unanticipated insights. The above statement concerning this study helped the researcher to examine the perspectives of different pregnant women towards the adoption of the momConnect mobile application. It is further useful in summarising key features of a large data set, as it forces the researcher to take a well-structured approach to handle data, helping to produce a clear, organised final report (King, 2004)

Despite the advantages, the limitations of the analysis do not allow the researcher to make claims about language use (Braun & Clarke, 2006). Also, due to its flexibility, it can lead to inconsistency and lack of coherence when developing themes derived from the research data (Holloway & Todres, 2003).

#### 4.3.1. Steps in the Analysis

In the current study, the FGDs and semi-structured individual interviews were analysed through the following steps detailed by Lieblich *et al.* (1998).

- 1) **Selection of the subtext:** At this stage, relevant texts or parts of the narrative were selected for each of the questions asked and placed in new subtexts or files.
- 2) **Definition of the content categories:** Categories were predefined by the relevant theory underpinned by literature emerging in chapter 2, literature review. All predefined categories, however, were read openly to define other content categories, or themes. Lieblich *et al.* (1998) stated that researchers bring their own theoretical or common sense assumptions to the material that they are attempting to synthesise and interpret, so even predefined categories/themes may undergo some revision, based on the text.
- 3) **Sorting materials into the categories:** Actual quotations were allocated to relevant categories/themes, which included relevant material from the same narrative or across several narratives.
- 4) **Concluding the results:** The sentences or sections of text were processed descriptively, to generate a coherent representation of the content.

#### 4.4. Themes Identified

The adoption of momConnect mobile application by pregnant women at the RCHC is a phenomenon which is identified by the interaction of many issues. These adoption issues are represented in seven themes: People's Traits, Technology Attributes, Social Influence, Trust, Relevance of momConnect, Organisational Support and Organisational as represented in table 5.

Table 5: The themes emerged for the study

| Themes                                   | Description   | Sub-themes   |
|--|---|--|
| <b>Theme 1: People's Traits</b>          | Refers to adoption issues related to individual personality and demographics. | ✓ Demographic<br>✓ Personality<br>✓ Attitude and Behaviour |
| <b>Theme 2: Technological Attributes</b> | This adoption theme refers to momConnect                                      | ✓ User-friendliness<br>✓ Reliability                       |



|   |  |   |
|---|--|---|
|   | technological attributes relating to the system ease of use of momConnect  | <ul style="list-style-type: none"> <li>✓ Mobility</li> <li>✓ Technical compatibility</li> <li>✓ Transparency</li> </ul>                                       |
| <b>Theme 3: Social Influence</b>        | Social influence refers to pregnant women influence on each other that shapes their attitudes or actions concerning adopting momConnect          | <ul style="list-style-type: none"> <li>✓ Pregnant women's image</li> <li>✓ Group norm</li> <li>✓ Social networking</li> </ul>                                 |
| <b>Theme 4: Trust</b>                   | Trust refers to the pregnant women's trust and confidence in using the momConnect application  | <ul style="list-style-type: none"> <li>✓ Trusting the mobile application confidentiality</li> <li>✓ Trusting the mobile application capability</li> </ul>     |
| <b>Theme 5: Relevance of momConnect</b> | This adoption theme refers to the relevance of adopting momConnect and its usefulness for pregnant women within their pregnancy period           | <ul style="list-style-type: none"> <li>✓ momConnect Usefulness</li> <li>✓ momConnect fit</li> <li>✓ Need and interest in momConnect content</li> </ul>        |
| <b>Theme 6: Organisational Support</b>  | This adoption theme refers to the support provided by facility management as well as nurses which encourages and facilitates momConnect adoption | <ul style="list-style-type: none"> <li>✓ momConnect strategy</li> <li>✓ Training</li> <li>✓ Recognition</li> <li>✓ Management and the nurse's role</li> </ul> |
| <b>Theme 7: Organisational Practice</b> | This theme refers to current business activities and   | <ul style="list-style-type: none"> <li>✓ Nature of the workforce</li> </ul>   |

|  |   |                          |
|--|---|--------------------------|
|  | values at the RCHC as well as the nature of the workforce that influences pregnant women adoption of momConnect | ✓ Organisational culture |
|--|---|--------------------------|

The following subsections present those themes, reflecting on experiences by both cohorts of participants under the study being nurses and the end-users of momConnect who were pregnant women .

#### 4.5. Theme 1: People’s Traits

The theme, people’s traits, was defined as adoption issues related to individual personality and demographics as in section 4.4. From the emerging patterns in the study demographics, personality, attitude, and behaviour were further discussed in this theme. The following presents findings from both cohorts of nurses and momConnect users of the system.

##### 4.5.1. Sub-theme 1: Demographics

Demographics understanding in this study refer to pregnant women’s age. Interviewed participants gave the following comments with regards to demographics:

*“Some of the pregnant mothers think that they are too old to use the mobile application.” (FGD’)*

*“You know with this technological advancement and changes in mobile phones and the applications, and only the young generation is interested and able to use this phones and apps.” (FGD)*

*“Here in the clinic, we see it every day that mature pregnant women are not keen to use momConnect. Maybe it is because they feel too old and fear technology or they will be busy with some other activities.” (FGD)*

*“You know what, I am now 40 years old with five children. I have other things to do rather than spending my time with phones and application. I have other things to do like feeding my family.” (Partc 7)*

The nurse from the FGD highlighted that pregnant women’s age had an impact on how they adopt the mobile application. The indicated that mature woman felt are too old to use momConnect. Some of the pregnant women also thought new technology advancements are for the younger generation, and they are old for new technologies.

From the nurses' FGD and the interviews with the pregnant woman, it is clear that age somehow affected the adoption of the mobile application negatively as elderly users are relatively less competent with IT as compared to the young population (Carillo, 2010). Because of the elderly's declining physiological conditions and lower level of technology self-efficacy, it is difficult for them to build trust in mHealth service (Morris & Venkatesh, 2000).

#### **4.5.2. Sub-theme 2: Personality**

Emotions, tendencies, and motives often influence an individual's behaviour. From the interviews, the following personality issues that could influence the adoption of momConnect were found: (i) confidence, (ii) momConnect enthusiasm, (iii) desire to learn, (iv) capability and (v) sense of ownership.

##### **4.5.2.1. Confidence**

Confidence in this study refers to the feelings or belief that one can have towards using a mobile phone application. Pregnant women's confidence in using the application was found to influence the adoption of momConnect. It was noted during the FGD with nurses that some pregnant women lack the confidence to use the mobile application. The following assertions were highlighted by the participants:

*"The reason why most of the women don't use momConnect is their lack of confidence in using the mobile application." (FGDs)*

Lack of confidence can hinder the adoption of momConnect amongst some pregnant women at the RCHC. One participant stated that they are afraid to ask nurses on how to use the application or when they are facing challenges using momConnect. This can be related to another Participants from the FGD that they lack even confidence to ask questions about momConnect. For example:

*"As you are aware confidence is a very important personality in life. Some of these mothers are even afraid to ask us questions on momConnect. They just lack that confidence of coming forward and ask anything they don't understand as far as momConnect is concerned." (FGDs)*

*"At times I am very shy to ask the nurse about momConnect because people will laugh me."  
(Part 1)*

From the interviews and FGD, it is evident that the lack of confidence in themselves or the ability to ask something about the application will influence the adoption of momConnect at

the RCHC. This lack of confidence will leave some of the pregnant women at a disadvantage and will not be able to access information from the mobile application. Concerning the above statement, non-users of ICT cannot compete in the market since they lack access and ability to operate the ICT tools, making them lag and are disadvantaged in comparison to the ICT users (Hoque et al, 2015).

#### **4.5.2.2. momConnect Enthusiasm**

This section evaluated the participants enthusiasm towards momConnect. The enthusiasm involves having a strong passion for using the mobile application. A pregnant woman with such individual passionate enthusiasm is motivated to adopt momConnect as noted:

*“I am willing to have more training to understand momConnect so that I will use it every day when I have a problem with my pregnancy.” (Partc 7)*

This enthusiasm among passionate pregnant women has been found from another participant who wanted to go an extra mile in teaching others how to use momConnect as noted:

*“My young sister is also pregnant, and I am sure I will teach her how to use momConnect as soon as she is registered at this clinic.” (Partc 3)*

The FGD with nurses also proved that enthusiasm played a significant influence on the adoption of the momConnect at the facility. A participant highlighted that if pregnant women are highly enthusiastic, they can even reach an extend of encouraging and training each other on some challenges they are experiencing on how to access the information on momConnect as reflected as follows:

*“Some of these pregnant mothers are highly enthusiastic with momConnect, and we see them trying to train others on their own on how to use the application. Some even reach the extend of asking how to register on their own so that they will be in a position to register their friends and relatives who are not even registered at this facility.” (FGD)*

#### **4.5.2.3. Desire to Learn**

Individual pregnant women who are eager to learn and gain new knowledge and understanding of how the application works are motivated to adopt the momConnect application as noted passively:

*“The use of momConnect application makes me want to explore more about the information related to my pregnancy because it gives me information which is helpful on my daily life as a pregnant woman.” ( Partc 2)*

New pregnant women are motivated to register and access momConnect so that they can learn and acquire knowledge about pregnancy. As far as the desire to learn is concerned, nurses highlighted that it had an impact on the adoption of the application. The nurses said they are always happy to work with individuals who had the desire and willingness to learn how to use momConnect. As a result, this has an impact on the adoption of momConnect as reflected as follows:

*“It’s always good to work with people who have the desire and willingness to learn momConnect. This makes life easier for us because we will be dealing and training people who are keen to learn the application. This will guarantee us that they will continue to use the application.”*  
(FGD)

#### **4.5.2.4. Capability**

If pregnant women can use and share momConnect content with their peers, this motivates the adoption of momConnect. In the study, it was found that if one knows how the application works, for example, registering and navigation easily within the mobile application is more likely to encourage others to use the application as noted on the desire to learn sub-theme:

*“My young sister is also pregnant, and I am sure I will teach her how to use momConnect as soon as she is registered at this clinic.”* (Part 3)

The lack of such capabilities will negatively hinder the adoption of momConnect. This statement can be related to what was noted by the nursing staff during the discussion. The nurses indicated that if pregnant women lack the capability of how to use momConnect, they are likely going to be demotivated and will not use the application as reflected as follows:

*“The reason why some of them are demotivated to use the application is that they cannot use the application. Some of the reasons behind their incapability are lack of interest to learn the application, and some do not attend or finish the training session when we are conducting workshops on momConnect.”* (FGD)

#### **4.5.2.5. Sense of Ownership**

Ownership is the sense of belonging that individuals feel for their organisation and its future. Interviews responses showed that, nurses who had this feeling were motivated to adopt momConnect to benefit their facility at the RCHC actively. A nurse interviewed gave the following response:

*“I feel motivated when many pregnant women are using the mobile application because that will also help to improve the standards of the health of pregnant women at the facility.” (FGD)*

Several nurses described such positive feeling towards their organisation and how it motivated momConnect adoption. For example, one of the nurses said on a FGD:

*“Every time a pregnant woman comes to me asking about momConnect information I feel more confident that our facility is doing a great job by encouraging the use of the application.” (FGD)*

#### **4.5.3. Sub-theme 3: Attitude and Behaviour**

The researcher found that the attitude and behaviour of pregnant women towards the momConnect mobile application have an impact on its adoption. Attitude is the extent to which people tend to perform behaviours automatically because of individuals past learning or experiences. The study found that bad experience with momConnect created a bad attitude towards the application which influence pregnant women’s behaviour not to use the application. A pregnant women mention the followings:

*“I have a very bad experience with the application since my first pregnancy up to now. This is one of the reasons why I do not use the application. I don’t see any improvement on the application since I am experiencing the same problems.” (Part 7)*

The nurses from the FGD also indicated that attitude and behaviour affected the adoption of momConnect at the facility due to pregnant women’s bad experience with the application which resulted in them having a behaviour of not using the application. It was found that the bad attitude reached a certain extend whereby other pregnant women discourage others from registering and using momConnect. This is reflected in the participant' responses as follows:

*“Some of the pregnant mothers have a bad attitude towards the application. This is because they have many challenges in accessing information through SMS, so in the end, they opt not to use momConnect.” (FGDs)*

*“Attitude is another factor affecting momConnect in this facility, Some of the pregnant women has a bad attitude which reaches the extent of them influencing other not to use the application” (FGDs)*

Concerning the above, “habit reflects compulsive behavioural tendencies developed during the history of the individual. Habit is found as one of the prominent factors of continuous use of IT systems as in the later stage of technology use it becomes more unintentionally where the

consumer was using the same technology initially with a curious intention as the use becomes a habit” (Makil *et al.*, 2017)

#### **4.6. Theme 2: Technical Attributes**

The theme, technical attributes, was defined as momConnect technological attributes relating to the system ease of use of momConnect, as put forward in section 4.4. From the emerging patterns in the study user-friendliness, reliability, mobility, technical compatibility, and transparency were further discussed in this theme. The following presents findings from both cohorts of nurses and momConnect users of the system.

momConnect technological attributes influence its adoption. momConnect technological attributes found are technical compatibility, transparency, user-friendliness, reliability, mobility. The mentioned technological attributes influence the adoption of the mobile application in different ways. The following will discuss each attribute and summarises how they affect the adoption of momConnect at the RCHC.

##### **4.6.1. Sub-theme 1: User-friendliness**

In general, momConnect is user-friendly, as noted by most of the participant. The participants highlighted the following comments:

*“Yes, in my opinion momConnect is user-friendly. It is very easy to use.” (Partc 1).*

*“Yes, It’s easy to use and don’t have difficulties in navigation on the application.” (Partc 2)*

*“I can say it is user-friendly, in fact, the easiest and basic application I have ever used.” (FGD)*

In relation to the above participants the degree to which momConnect is deemed user-friendliness is its ease of use. This is associated with the use of the application and less effort, thus why momConnect is perceived useful by pregnant women because they can easily use the mobile application. In support of the above statement, according to Ghalandari (2012), any technology is perceived to be useful if a consumer can use it easily or the functioning of the technology is free from the effort. Venkatesh (2012) defined ease of use (effort expectancy) as “the degree of ease associated with the use of the system”. Ease of use elicited positive emotions from momConnect and lead to pregnant women’s satisfaction and adopt the application. About the above statement, when consumers find mobile applications less confusing and easy to use, they tend to use it more often (Tang, 2016).

Therefore, pregnant women are motivated to adopt momConnect because of its user-friendliness, and one participant suggested that the application must include video calling

features. The issue of including real-time conference calls feature on the application was also highlighted during the discussion with the nursing staff reflected as follows:

*“One of the reasons I like about this momConnect application is its user-friendliness. It is basic and very easy to use. Besides that, they need to improve its friendliness that I will be able to speak and chat face to face online like skype with a doctor or nurse.” (Partc 5)*

*“The application is user-friendly but, it would be more perfect and user-friendly if it allowed features such as video calling, and voice note like WhatsApp.” (FGD)*

*“Video conference calls will improve the mobile application friendliness, and this will enable us to assist at the right time when it is needed for example when a pregnant woman is experiencing contractions and requires immediate assistance.” (FGD)*

#### **4.6.2. Sub-theme 2: Reliability**

While “reliability” refers to the performance quality of the momConnect mobile application, and it was not found to be influential on momConnect adoption. Two pregnant women mentioned that it is reliable and do not face any challenges when using the application. During the FGD, another nurse indicated that momConnect is reliable, as reflected in their responses as follows:

*“I believe the momConnect is very reliable, based on my experience with the mobile application when I was pregnant. This is from my point of view.” (FGD)*

*“Yes, it is reliable, I don’t have any challenges, I just receive SMS.” (Partc 2)*

*“Yes, it is very reliable.” (Partc 6)*

However, three-quarters of the participant agreed to some extent, but they came up with issues on messaging. It was noted that poor reliability was accepted to a certain level and eventually, poor performance form momConnect messaging tolls would harm the adoption of the application as noted:

*“It depends if maybe you ask a question late, they participate but if you ask a question early during the day, they will participate quickly.” (Partc 1)*

*“I think momConnect is not that reliable thus why at times I don’t use it. I say so because at times it takes ages to participate to my text messages.” (Partc 4)*



*“The challenges associated with the messaging system were also highlighted during the discussion with nurses. They indicated that most of the times, they received complaints from pregnant women not receiving SMS from momConnect.” (Partc 3)*

*“Every day here at the facility, we receive complains from pregnant women that they are not receiving their SMS.” (FGD)*

#### **4.6.3. Sub-theme 3: Mobility**

Pregnant women always access momConnect through their mobile phones. In this study mobility refers to the feature that allows pregnant women to use momConnect via mobile devices, usually to access the content. It was found that this feature has a positive impact on the adoption of the application, which enabled the participant to access the information from any location through a mobile device. All the pregnant women and nurses were satisfied with the mobility feature of the application, which influenced its adoption at the RCHC. For example:

*“The important feature of momConnect’s ability to allows users to access information at anytime and anywhere.” (FGD)*

*“The mobility feature makes momConnect to be amongst the best mobile applications. It enables pregnant women to access information on their cellphone anytime regardless of geographical location.” (FGD)*

*“I like the fact that I have access to information about my unborn baby anytime even on a bus.” (Partc 10)*

*“You can read it whenever you want, and you can always go back if you don’t understand you can reread it.” (Partc 2)*

*“One of the best features I like about the momConnect is that I can have access to the information on pregnancy stages everywhere through my cellphone.” (Partc 3)*

*“momConnect is a mobile application, which means I can use it when I am mobile even on the train.” (Partc 6)*

#### **4.6.4. Sub-theme 4: Technical compatibility**

Technical compatibility refers to the integration of momConnect and other systems in the communication networks, including base stations and mobile phones. This integration motivates its adoption through two adoption issues, i.e. ease of use and usefulness. It was found that momConnect makes it easy to use, as expressed by a participant:

*“It is easy to use and is very compatible with my phone.” (Partc 7)*

Also, its compatibility with different phones made it favourable and usefulness amongst participant, which showed a positive influence on its adoption as noted:

*“Yes, it is compatible with my phone because it sends me messages, helps me know something that I don’t know.” (Partc 1)*

*“I had no issues with the application with my phone. When I registered, I was using another phone. When I bought this new one, I continue to receive messages without any problems. Thus, why I love using the app because of no issues.” (Partc 5)*

*“I only have it on that phone, so I can say it's compatible based on this phone.” (Partc 2)*

However, another participant noted that momConnect had compatibility issues with her phone. Based on her responses, a conclusion was drawn that the issues might be related to other systems which momConnect interconnects with such as base stations, which mobile phones connect with to send and receive signals. Her mobile phone might be faulty, which makes it have problems to send and receive signals since the participant confirmed that it is also challenging to receive phone calls on her phone as noted:

*“Yooh this application has problems with my phone. every time I use it, I cannot send or receive messages. Even when boyfriend calls me from Eastern Cape, I struggle to communicate properly with him.” (Partc 4)*

So, this is one of the technical barriers associated with the phone, which negatively affects the adoption of the mobile application. The nurses from the FGD had a different thought on the technical compatibility of momConnect. Based on the reports and complaints they receive daily; they thought the application has compatibility issues which negatively affect its adoption at the facility as noted from their Participant reflected as follows:

*“I think momConnect has compatibility issues. We receive several reports on issues associated with SMS not being delivered. I think this issue must be addressed because it demotivates users of momConnect.” (FGD)*

*“We are overwhelmed with SMS complains so I think compatibility is an issue which must be investigated.” (FGD)*

#### **4.6.5. Sub-theme 5: Transparency**

Transparency is the visibility of momConnect users' generated content and their participation which influence its adoption. Transparency influence momConnect adoption positively and negatively for some pregnant women at the RCHC depending on their perceptions about the application. momConnect transparency enhances trusting its content and hence motivates its adoption noted by pregnant women and some nurses from the FGD.

*"I trust the application content 100% as it was developed here in South Africa for us South Africans." (Partc 1)*

*"I personal trust momConnect because I understand the application and its content more since I work for the Department of Health." (Partc 9)*

*"Most of the pregnant women trust the application, and it's content. I second that since I had used momConnect when I was pregnant, and I trust the application and its content." (Partc 3)*

For other participant, transparency issues made some participant not to adopt momConnect actively:

*"Yoh I don't trust the content of this application. As I have told you before at times, you post an SMS in the evening, and you only get the response the following day or never getting any response. Something is wrong with their content because it seems as if they wait for someone to give them a response to send to me." (Partc 4)*

The FGD highlighted that transparency is always an issue when dealing with personal health information. They indicated that some pregnant women do not trust the application because they think their personal information will be used for other purposes; for example, marketing is reflected in their response that follows:

*"It is known in the health sector that people are not willing to provide their personal health information. They are afraid that the data might be compromised and end up in other hands. Some are not technologically educated, so they think the information they send through momConnect will be sent somewhere and people will end up knowing their private information"*  
(FGD)

#### **4.7. Theme 3: Social Influence**

The theme, social influence, was defined as pregnant women influence on each other that shapes their attitudes or actions concerning adopting momConnect as put forward in section 4.4. From the emerging patterns in the study, pregnant women's image, group norm and social

networking were further discussed in this theme. The following presents findings from both cohorts of nurses and momConnect users of the system.

Social influence is the pregnant women's influence on each other to shape their attitude towards the adoption of momConnect at the RCHC. It was found that social influence plays a significant role in the adoption of momConnect since it can either motivate or hinder the adoption of momConnect. Concerning the above according to Eckhardt *et al.* (2009), acceptance of any concept in the society is mostly hit by views and reviews of the people who are essential to the consumer and consequently influence consumer decision regarding adoption of the application. Social influence includes sub-themes which are as follows: social networking, group norm, pregnant women's image.

#### ***4.7.1. Sub-theme 1: Pregnant Women's Image***

Individual pregnant women adjust their usage of momConnect to maintain their image within a group of pregnant women at RCHC. Women are generally concerned about their image amongst themselves, and it has a significant influence on the adoption of momConnect at the RCHC. Pregnant women were categorised in two groups: The first group believed that "momConnect would enhance image" and as therefore, as agreed by half of the participants. The nurses from the FGD indicated that using momConnect improved pregnant women's image among themselves, and this motivated them to use the application as reflected below:

*"Using momConnect application is prestigious in this facility. The mobile application raises their status as technologically and well-organised mothers." (FGD)*

*"Using momConnect amongst other women, pregnant women at the clinic gives a proper image that I am responsible mom to be." (Partc 2)*

*"The fact that I raise my hand when the nurse says, "May all those registered on momConnect raise your hands" it makes me feel proud and confidence over those who are not registered." (Partc 6)*

*"I believe using momConnect raise my status as an organised mother." (Partc 10)*

The second group, which had a smaller group of participants and believed that using momConnect will have no influences on their image amongst other pregnant women as noted:

*"momConnect is just like other ordinary applications, so I don't see it as having any influence on my image." (Partc 4)*

*“As much as I trust and know the application inside and out, I don’t see how it affects or raise my status as an ordinary pregnant mother.” (Partc 9)*

Concerning the last-mentioned participant above, some of the nurses agreed with the participant, as reflected below:

*“I beg to differ that momConnect raises the status of pregnant women. Nowadays phone is owned and used by almost everyone, so I do not see the reason why one would say momConnect raises somebody social status.”(Partc 4)*

#### **4.7.2. Sub-theme 2: Group norm**

When most pregnant women use momConnect other women are influenced to adopt it, as noted:

*“if the all the pregnant women are adopting/using momConnect, well then you want to fit in with the other women” (Partc 1). This is due to “peer pressure, and everybody is using momConnect.” (FGD).*

It was found that the group norm influences even the level of pregnant women’s engagement with momConnect, as one participant said:

*“I feel more engaged using momConnect if other pregnant women also engage and use momConnect.” (Partc 5)*

#### **4.7.3. Sub-theme 3: Social networking**

Although women have different responsibilities, they form their communities to share views, opinions, and interest. Women in these communities work together and have a strong influence on each other regarding choices. This togetherness and oneness amongst themselves, have a positive influence on the adoption of momConnect at the RCHC, as noted by the participants form pregnant women and nurses, as reflected below:

*“I started using momConnect when I was introduced to it by my friend.” (Partc 7)*

*“All my friends used momConnect so thus the reason why I decided to register for momConnect.” (Partc 10)*

*“Most of them make friendships when they visit the clinic for their pregnancies check-ups, so through those friendships thus where they encourage or discourage each other to use momConnect.” (FGD)*

*“Using momConnect raise my social status when I am with my other pregnant cousins at home.”*

*(Partc 2)*

In summary, this theme of social influence proved to be an important theme towards the adoption of momConnect at the RCHC. Pregnant women’s image, group norm and social networking create pressure, which can motivate or hinder an individual’s engagement with momConnect. Consumer’s decisions are highly influenced and shaped by the reviews and posts of the peers, relatives, friends, and other users (Yadav, Sharma & Tarhini, 2016). The customers who are part of the social network are more influenced are likely to be avid users of mobile applications (Kim, Yoon & Han, 2014).

#### **4.8. Theme 4: Trust**

The theme, trust, was defined as the pregnant women’s trust and confidence in using the momConnect application, as put forward in section 4.4. From the emerging patterns in the study, trusting the mobile application’s confidentiality and capability were further discussed in this theme. The following presents findings from both cohorts of nurses and momConnect users of the system.

Pregnant women and nurses need to trust the mobile application. This study revealed that trusting the application is an expectation, and it motivates the adoption of momConnect. In relation to the above statement, lack of trust/anxiety about the risks may defer the consumer from application adoption and usage. In the presence of trust, it can be said that the consumer’s perceived risk will decrease, thus increasing the intent to adopt and use the mobile app (Malik, Suresh and Sharma, 2017). Most specifically, trust includes trusting mobile application confidentiality and capability. The following elaborates how these two sub-themes affect momConnect adoption.

##### ***4.8.1. Sub-theme 1: Trusting Mobile Application’s Confidentiality***

It was found that most of the participants do not trust the application. Based on the evidence provided by the nurses and pregnant women, transparency is one of the factors affecting the adoption of momConnect at the RCHC. Most of the participant does not trust the application’s confidentiality and are afraid that the information they provide is used for other purposes other than improving maternal health care as noted:

*The problem is that most of them do not trust the confidentiality and content of this application.*

*Thus, why we have a problem of drop out after registering them on momConnect. Some of them*

*complain that the feedback content takes ages to reach them and feel that the information they provide is used for other purposes.” (FGD)*

*“I don’t trust this application with the information I am giving them about my unborn baby pregnancies.” (Partc 4)*

*“Ummm I can say I don’t trust it 100% because you never know these days with technology. One day you might be surprised to be told that this unborn baby I am using momConnect for is not mine or I have already agreed to give him up for adoption because of the too much information we provide the application.” Partc 7*

However, some participant has trust in the application’s confidentiality as noted:

*“I trust, and I am very confident with momConnect and believe that all the information is kept confidential.” (Partc 2)*

*“I trust momConnect and have never experienced a trust issue since I have used in on my past two pregnancies.” (Partc 8)*

Most of the FGD participants trusted the mobile application’s confidentiality. The indicated that the application uses coded registration numbers in the form of cellphone numbers in producing reports and information on pregnant women. This keeps information as confidential as possible as reflected in their Participant as follows:

*“momConnect is one of the most confidential application. The application maintains confidentiality by using coded cellphone numbers, and this helps people not to compromise confidentiality if the information falls in wrong hands.” (FGD)*

*“Most of the pregnant women don’t know the more technical aspects of momConnect thus why some of them don’t trust it with their information. They do not know it is the safest and confidential mobile application since it uses coded numbers when producing reports.” (FGD)*

#### **4.8.2. Sub-theme 2: Trusting the mobile application’s capability**

The study found out that there were mixed feeling as far as trusting the mobile application’s capability. Some of the pregnant women trusted the application’s capability, as reflected below:

*“Yes, I have a positive feeling because the application is capable and gives you information that you don’t know.” (Partc 1)*

*“I believe the application is capable of giving you the corrected content based on the information you requested.” (Partc 2)*

The nurses also highlighted that some pregnant women do not trust the application's capability due to lack of more technical knowledge about momConnect. This subject matter was the same as the one mentioned confidentiality quoted below:

*“Most of the pregnant women don't know the more technical aspects of momConnect thus why some of them don't trust it with their information. They do not know it is the safest and confidential mobile application since it uses coded numbers when producing reports.” (FGD)*

The researcher believed that pregnant women lack enough information about the application on issues around trust. Adequate information about the application's confidentiality and content must be given to pregnant women during registration so that they have trust in the mobile application, which in turn will have an impact on its adoption.

#### **4.9. Theme 5: Relevance of momConnect**

The theme, the relevance of momConnect, was defined as the relevance of adopting momConnect and its usefulness for pregnant women within their pregnancy period, as put forward in section 4.4. From the emerging patterns in the study, momConnect usefulness, momConnect fit, need, and interest in momConnect's content was further discussed in this theme. The following presents findings from both cohorts of nurses and momConnect users of the system.

The use of momConnect by pregnant women at the RCHC was found to be critical in the adoption process. The degree of relevance in momConnect adoption varies from case to case according to the benefits of using the mobile application, pregnant women's need of momConnect's content and its alignment between the mobile application and pregnant stages. Therefore, the theme, relevance of momConnect, can be classified into sub-themes (i) momConnect usefulness, (ii) momConnect fit and (iii) need for momConnect content.

##### **4.9.1. Sub-theme 1: momConnect Usefulness**

In this study, usefulness refers to momConnect being a practical mobile application for use by pregnant women. Pregnant women in this study identified many benefits such as improving maternal-child health care, exchanging pregnancy knowledge and enhancing collaboration between pregnant women and the NDoH, which motivates the adoption of momConnect at the RCHC. During the discussion with the nurses, they recommended that momConnect is very useful to pregnant since it provided information which improved maternal-child health care and provided useful feedback to the NDoH. Adoption of utilitarian applications like



momConnect, which are used for information seeking is most affected by perceived usefulness. Concerning the above statement, “factors like the user interface or perceived ease of use, perceived usefulness and aesthetic appeal are more influential in the adoption of utilitarian applications” (Malik *et al.*, 2017).

Both pregnant women and nurses from the FGDs agreed that momConnect is useful, as reflected below:

*“In life, when you find something exciting and informative and give you more knowledge, one would say if that’s helpful for me without doubts, I should use it more often. So, some of these pregnant women find momConnect more helpful in improving their unborn child’s health to them, and they continue to use it.” (FGD)*

*“Yoh...I don’t know, but I have been registered for four months now, and then it’s useful for me because every time it reminds me of how to raise my child and everything about the pregnancy.” (Part 1)*

*“momConnect is very useful. I provide me with vital and relevant information about my pregnancy.” (Part 9)*

The researcher found three issues relating to the usefulness of momConnect that shape its influence on the adoption of momConnect at the RCHC. “Short-term usefulness” is the first issue. Sometimes momConnect usefulness is appreciated after a successful baby delivery, and this hinders its adoption. A participant commented said:

*“momConnect has got a short life span of nine months, and I find it to have short term usefulness, and that makes it less useful to me.” (Part 4)*

Secondly, momConnect usefulness can be “past experienced”. The adoption of momConnect can be influenced by the history and experience of using the application before as noted:

*“The usefulness of the application in this clinic depends on how the pregnant women history and challenges faced before in previous pregnancies using the application. Some might say it is not useful because last time I used it, I had a miscarriage, or didn’t like it etc.” (FGD)*

*“Me I don’t want to lie to you, last time I used this momConnect application I gave birth to a child with complications, but I was following all the information they provided me. I felt like I was betrayed but the application...and for that reason, it’s not useful.” (FGD)*

*Thirdly, momConnect can be a “soft benefit”. MomConnect provide benefits such as “exchanging expertise information about pregnancy from the doctors to be used by pregnant women.” (Partc 8)*

In summary, the usefulness of momConnect influenced the adoption of momConnect when benefits are tangible. However, there are issues which hinder a positive adoption of momConnect; for example, past experiences with the application can negatively impact the uptake of the application. This goes beyond the pregnant women only as was noted that one of the nurses during the FGD had a bad history with the application. This nurse will not be able to encourage pregnant women to trust and use the application since there is a conflict of interest based on their past experiences with momConnect.

#### **4.9.2. Sub-theme 2: momConnect Fit**

momConnect fitting refers to the extend which momConnect aligns with the daily activities of a pregnant woman during the pregnancy period. It was found the pregnant women value and engagement with the momConnect application more when it is aligned with their needs during the pregnancy period because they perceive it as more relevant.

*“I have been registered for four months now, and then it’s useful for me because every time it reminds me of how to raise my child and everything about the pregnancy.” (Partc 1)*

*“It makes life easy because some of the things that I didn’t know on my first baby now I know because every time they send me a message for my pregnancy they tell me how and what I must do and what I mustn’t do for my pregnancy and the health of my baby.” (Partc 2)*

*“This application fits well in my daily routine activities as a pregnant woman as far as pregnancy is concerned, because it gives me valuable information when I most need it.” (Partc 5)*

However, one participant firmly stated that momConnect does not fit well with her routine as a pregnant woman. She complained that most of the times she receives the wrong SMS about the stages of her pregnancy. Some of the participants from the FGD experienced the same, as highlighted below:

*“But I don’t think momConnect fits well, I get wrong SMS, I am 4 months pregnant, but it sends me information for a nine months pregnancy.” (Partc 4)*

*“Some of the pregnant women complain that this application does not fit well with them as pregnant women. This is because at times they receive the wrong SMS from momConnect. For*

*example, they receive SMS for eight months pregnant while she is only three months pregnant.”*  
(FGD)

#### **4.9.3. Sub-theme 3: Need and Interest in momConnect content**

momConnect content refers to the content generated by the application which is sent to users over the phone. As noted by many participants, the “need for momConnect content” influences its adoption according to the relevance of its content. The content makes life easier for them, and they can access it anytime. The participants noted that the content provides more information than the one they receive from the nurses at the clinic since they will be busy attending to other patients.

*“It’s not that different, but on momConnect, they give me more information than the nurses because on momConnect you can access information about the pregnancy at any time at your own pace than the nurses who are always quick to finish their work and don’t give you all the attention and information as compared to the application.”* (Partc 8)

*“You can read it whenever you want, and you can always go back if you don’t understand you can reread it.”* (Partc 2)

*“I find the content to be very resources, informative and educational more than the ones we receive from nurses when we visit the clinic.”* (Partc 6)

During the FGD, the nurses the need and interest in momConnect by pregnant women, they agreed that pregnant women are interested with the application because it gives them all the attention they need then the pregnant women can live in the sense that they can access the information at any given time even after hours when the facility is closed, as reflected below:

*“The pregnant women have the need and interest in momConnect content because it’s services are always available compared to us. Also, they get all the attention rather than compared to us who are at times busy attending to other patients in the facility”* (FGD)

The relevance of momConnect is an important theme in the adoption process of momConnect at the RCHC. MomConnect becomes relevant to pregnant women if it has important content. Also, pregnant women values and appreciate that momConnect benefits make such mobile application useful and relevant. Therefore, the relevance of momConnect is an important issue on the adoption of the application at the RCHC.

#### **4.10. Theme 6: Organisational Support**

The theme, organisational support, was defined as the support provided by facility management as well as nurses which encourages and facilitates momConnect adoption as put forward in section 4.4. From the emerging patterns in the study momConnect strategy, training, recognition, management and nurse's role was further discussed in this theme. The following presents findings from both cohorts of nurses and momConnect users of the system.

The adoption of momConnect mobile application to benefit pregnant women and improve maternal health care in South Africa at large needs organisational support. Organisational support at the RCHC encourages and facilitates its smooth adoption. The management and nurses can provide such support in several forms: developing a momConnect strategy, providing training and encouraging adopters, the involvement of management and nurses in the adoption of the mobile application. This theme can be divided into the following sub-themes: (i) momConnect strategy, (ii) Training, (ii) Recognition (iv) Management and nurse's role.

##### **4.10.1. Sub-theme 1: momConnect Strategy**

Unlike other social network application, momConnect adoption requires extra effort being implemented by organisations. It was found that momConnect application is endorsed and highly supported by nurses and management at the RCHC, and pregnant women are motivated to adopt it as indicated by a participant. For example:

*“The nursing staff at this centre formally communicated the use of momConnect application, and they always encourage us to use the application every time we come for the monthly routine and check-ups.” (Partc 2)*

In relation to the above mentioned, the nurses from the FGD also highlighted that they support the adoption of momConnect by introducing the application to newly pregnant women registering at the facility.

*“In this facility, we introduce new pregnant women who are registering for the first time to register and use momConnect.” (FGD)*

This strategy will help the health facility enrol as many pregnant women as possible since they will be communicating and encouraging them to use the application. However, some participants mentioned that momConnect had not formally communicated them since they visited the facility; for example, one participant said:

*“momConnect has never been formally communicated to me at this facility. I am now five months pregnant. I registered myself on the application through my sister who told me about the application.” (Partc 6)*

The majority of the participants agreed that they were given an introduction to the application formally. However, there was no further follow-ups or encouragement to continue using the mobile application as noted:

*“To be honest, at this facility, they don’t encourage us to continue using the application. Ever since I was registered, I didn’t hear any word form nurse in this facility as far as momConnect is concerned.” (Partc 1)*

*“They only register us for the first time and thus it. They don’t follow up to see if we are experiencing any problem with the application or receiving any messages.” (Partc 5)*

During the FGD, the researched discovered that the nurses do not regularly do follow-ups to encourage pregnant women to use momConnect after registering them, as reflected below:

*“As you know, a health facility is always busy, so at times we don’t have time to do follow up on each and everyone to check how they are experiencing the application. This is because every day we register new people. Besides that, we have other patients to attend to besides pregnant women on momConnect.” (FGDs)*

In summary, a momConnect strategy is important in the adoption of the mobile application at the RCHC. The advantages of having a strategy at the facility will help endorse the application and set out rules and guidelines, which must be implemented towards the rollout of the mobile application to pregnant women. This will show management support and enforcing the full adoption of the application directly or indirectly via adoption issues such as “usefulness” and “momConnect content”. This will encourage adoption since it will enforce nurses to continue encouraging pregnant women to continue using the application even after initial registration.

#### **4.10.2. Sub-theme 2: Training**

In this study includes formal and informal instructional ways of teaching pregnant women about the momConnect application and the skills to use the application. The researcher found that training was not a critical adoption issue. However, it motivated some pregnant women to use the application in some cases. It was found out that most of the participant does not need the training to use momConnect:

*“Training on how to use momConnect doesn’t motivate me at all.” (Partc 2)*

The above response is one good example of a participant regarding the need for training to motivate the adoption of momConnect. However, some indicated that they do need training on how to use momConnect as noted:

*“As much as I am well versed with my phone and mobile applications, I do appreciate training on how to use the mobile application. Maybe this one the reason why I struggle to receive SMS as mentioned earlier.” (Part 4)*

*“No, I didn’t receive any training, I just get the messages. I would like to learn more about the application.” (Part 6)*

Therefore, in summary, providing training on how to use momConnect could motivate the adoption of the mobile application in situations where momConnect is perceived to be a complex application to use. Also, the nurses must provide training regularly as it was found that they just register them on the application and do not train them as noted by one nurse during the FGD:

*“This is an easy application, and they have to figure out themselves on how to use the application. We do not have time to sit down with pregnant women and talk to them about momConnect. We are a busy facility.” (FGD)*

#### **4.10.3. Sub-theme 3: Recognition**

Recognition refers to positive intangible rewards such as an appreciation for momConnect active users. According to the study, most pregnant women noted that there was no appreciation and recognition from using the momConnect mobile application. For example,

*“Using momConnect application does not have any benefit because there is no acknowledgement for us as pregnant women who are using the mobile application.” (Part 4)*

*“I think being acknowledged for using the mobile app would continue to motivate us as pregnant women to use the application. It was much better if they could at least prioritise those using the application, for example, to be saved first and not to queue in the facility.” (Part 6)*

*“It is better if they save us first or give us statistics like who have interacted most in using the mobile application.” (Part 3)*

Concerning pregnant women participants, the researcher discovered from nurses that pregnant women are not recognised in any way for using momConnect. They highlighted that the application is for their benefit, so there is no need for the facility to appraise them, as reflected below:

*“This application benefits pregnant women, so there is no reason whatsoever for the facility to recognise them because they are one benefiting from an application provided to them by the Department of Health.” (FGD)*

In summary, pregnant women who are, active adopters of momConnect application like to be seen and recognised as important members within the RCHC. For this reason, recognition is critical because it motivates and encourages that proactive momConnect mobile application to continue using it actively.

#### **4.10.4. Sub-theme 4: Management and the Nurse’s Role**

Management is a critical part of momConnect mobile application as it influences the adoption of the application in two ways: motivating and hindering. Firstly, nurses support pregnant women by engaging with them and register them to use the application as noted:

*“We don’t have any standard procedures or policies on how to train pregnant women on using the mobile application, and we just register them.” (FGD)*

*“Since pregnant women sign up voluntarily, it is difficult to enforce those expected to join and register the mobile application.” (FGD)*

However, a nurse from the FGD noted that little is done as far as the management is concerned about training pregnant women on how to use momConnect, which will positively increase the adoption of the application. These participants from the FGD can also be linked with participants who stated that they had never received training after registration:

*“I registered six months ago, and from there I have never trained again on how to use momConnect. I would prefer refresher training.” (Part 4)*

In summary, there is a lack of management support on momConnect training, which hinders its adoption.

#### **4.11. Theme 7: Organisation Practice**

The theme, organisation practice, was defined as current business activities and values at the RCHC as well as the nature of the workforce that influences pregnant women adoption of momConnect as put forward in section 4.4. From the emerging patterns in the study nature of the workforce and organisational culture were further discussed in this theme. The following presents findings from both cohorts of nurses and momConnect users of the system.

The adoption of momConnect is associated with how they operate at the RCHC as well as their organisational values. Many health facilities have different organisational practices. Therefore,

pregnant women's adoption of momConnect varies from one health facility to another. Two practices were found to influence momConnect adoption at the RCHC, namely: organisational culture and nature of the workforce. These sub-themes are explained below.

#### **4.11.1. Sub-theme 1: Organisational Culture**

Each organisation has its own shared beliefs and customs. If the organisational culture at the RCHC fully supports momConnect as identified by a participant, momConnect adoption will be encouraged. This study proposes that momConnect organisation cultures involve nurses' empowerment and collaboration. Discussion of how these organisational values motivate the active adoption of momConnect is as follows:

##### **4.11.1.2. Nurses' Empowerment**

In an organisation, empowering employees is a fundamental organisational value. Suppose nurses at the RCHC feel empowered. In that case, they will be motivated to involve themselves in the adoption of momConnect actively. This is evident from some of the participants during the FGD, which shows that the nurses feel that the management at the facility was not doing enough to empower them on how to use the application so that they can train the pregnant women:

*"Us as nurses we don't receive any training on how to use the mobile application which will make it very difficult for us as well to be able to train the pregnant women at our facility." (FGD)*

*"We don't have any standard procedures or policies on how to train pregnant women on using the mobile application, and we just register them." (FGD)*

The statements above show that there is a lack of empowerment among nurses, which makes them feel less motivated to enforce the adoption of momConnect.

##### **4.11.1.2. Collaboration**

momConnect culture is all about collaboration, and it is embraced from the top to the bottom level, the active adoption of momConnect is encouraged. momConnect is about interacting and collaborating between the health facilities and pregnant women. The nurses must collaborate in such a way that they encourage pregnant women to continue using the application as well as listening to the challenges when using the application. The management, at the same time, must collaborate and ensure the nurses at the RCHC are trained for them to be able to deliver training to pregnant women as well. Therefore, a supportive culture makes nurses feel empowered, to collaborate with pregnant women and management.



#### **4.11.2 Sub-theme 2: The Nature of the Workforce**

In this study, it was found that the two workforce issues influenced the adoption of momConnect at the facility. Firstly, is the distribution of work among the nurses. It turns out that some of the nursing staff are bored working with momConnect pregnant women daily as noted:

*“I work with momConnect daily since as far as I can remember. I am bored to hear the same stories and registering people on the application every day. At times I just seat and do nothing to register.” (FGD)*

The above statement reflected that there is a level of boredom amongst some nurses. This negatively affects the adoption of momConnect since they do not register people to use the application because of their boredom. The management must rotate the nurse who works with momConnect daily. Secondly is the age factor amongst the nurses. The study showed that elderly nurses not to see the value of momConnect, and this affected the adoption of the application as noted:

*“Especially me, I think I am now too old for these mobile applications.” (FGD)*

*“Even my phone is not a smartphone, so I don’t realise the importance of momConnect since in the past we didn’t have these applications but, we assisted women to give birth without any help from phones.” (FGD)*

In summary, the age distribution amongst nurses also, to some extent, affected the adoption of momConnect at the RCHC. They did not trust the application since they have not used it in the past during their career as nurses, so they did not encourage pregnant women to use it.

#### **4.12. Conclusion**

This chapter discussed and summarised the factors affecting the adoption of momConnect and how they influence the adoption of momConnect. In this study, the data collection presented qualitative data, and it was collected through interviews and FGDs. The qualitative data that was collected was analysed using thematic analysis. Research findings will be discussed in the next chapter.

## CHAPTER 5

### 5. CONCLUSION AND RECOMMENDATIONS

#### 5.1. Chapter Overview

This study examined the pregnant women's adoption of the momConnect mobile application at the RCHC. The objective of the study was to understand how a range of adoption factors influence the adoption of such technology towards the enhancement of momConnect implementation at the RCHC. This chapter presents the conclusions derived from the findings of this study on the factors affecting the adoption of momConnect at RCHC are described. The chapter further reflects on the research question of this study, and a revised and final research model is presented and explained. The limitations of this study, as well as the future research area that can be built on this study, are outlined. Resultant recommendations of the study are explained, and they are based on the conclusions and objectives of this study. The following presents a summary considering the study research objectives as outlined in section 3.1.

#### 5.2. Summary of Findings

Adoption of such mobile applications by pregnant women was found to be a lengthy process requiring an effort and sufficient time. In relation and support of the above statement, previous research such as Venkatesh *et al.* (2003) indicated that adopting new information systems is often challenging. The study found technical issues to be less challenging for momConnect adoption at the RCHC.

The study evaluated perspectives of momConnect from nurses and pregnant women. This provided a two-fold perspective of the user experiences. It was found that nursing staff use momConnect mobile application to facilitate work activities. On the other hand, pregnant women used the application to facilitate their daily activities as far as pregnancy is concerned and for social status amongst their peers. The study indicated that organisational practices at the RCHC, such as the nature of workforce and organisation culture, provide the basis for using momConnect adoption. Some of the issues associated with the organisation culture at the facility were the lack of policies and standard operating procedures (SOPs) toward the adoption and training of momConnect from the management to the nursing staff. Nature of workforce also affected the adoption of momConnect as some of the nurses complained that there was no rotation of duties on those who dealt with momConnect, which led to boredom and affected how they conduct training and registration of momConnect to pregnant women.

This study found that there were different levels of user engagement with the mobile application in this study. Perspective from participant reflected that there is a relationship between adoption themes discussed in chapter 4. The study further reflected that there are two ways of engagement with momConnect, which are active/passive and frequent/less frequent. Concerning the above statement according to the studies of Carbone, Contreras, Hernández and Gomez-Pereza (2012), and Levy (2009) supported these research findings through the identification of two types of momConnect users according to the levels on engagement: active and passive. This indicates that pregnant women adoption behaviour with momConnect varies, and not every individual necessarily fully adopts momConnect.

Lastly, the factors affecting the adoption of momConnect identified in this study showed that adoption is a process that may change in future due to the influence of different interrelated issues, for example, due to the application usefulness and relevance of momConnect content. The research found that some of the participants felt that the information and content, provided by the application, were irrelevant and outdated.

### **5.3. Factors Affecting the Use of momConnect Intervention at the Retreat Community Health Centre**

In this study, the researcher looked attributes from two adoption theories, namely the TAM and TRM. The researcher found that some of the investigated attributes seemed to be referring to the same thing or overlapping each other. Therefore, the study investigated 23 attributes impacting the adoption of the mobile application. The attributes derived from literature included in chapter 2, demographic, personality, attitude, behaviour, technical compatibility, user-friendliness, mobility, reliability, transparency, group norm, social networking, pregnant women's image, trusting the mobile application confidentiality, trusting the mobile's application capability, momConnect usefulness, need for momConnect content and work, training, momConnect strategy, gratitude for recognition and management role. In contrast, a study by Alau *et al.* (2020), on factors affecting the adoption of mHealth services revealed that performance expectancy, social influence, facilitating conditions and perceived reliability positively influence the behavioural intention to adopt mHealth services. In the same study effort, expectancy and price value did not have a significant influence on the behavioural intention.

Moreover, gender has a significant moderating effect on mHealth services adoption in some instances. A study by Furusa and Coleman (2018) determined the factors influencing implementation of eHealth by medical doctors in public hospitals in Zimbabwe revealed that

both internal and external factors influence the implementation of eHealth by medical doctors in public hospitals in Zimbabwe. Internal factors included ICT infrastructure and e-health technologies, ICT skills and knowledge, technical support, security concerns, lack of basic medical facilities, demographic factors such as age and doctor-patient relationship whilst external factors included health policy, funding and bureaucracy.

### ***5.3.1. Perceptions of Pregnant Women towards momConnect Intervention***

There is a general understanding that momConnect mobile application has benefits as evidenced by the generated themes arising from participants or pregnant women's perceptions of their interactions with the mobile application. Rogers (2003) states that relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. Participating pregnant women believed the momConnect application improved the quality of care of their unborn baby through the access of information on the application at any given time. Participant positively identified the mobile application as an improvement in their daily lives as pregnant women. The momConnect application allowed quick access to information regarding their pregnancies. The results of this study augur well with a study by Hoque *et al.* (2015) which revealed that perceived usefulness ( $p < 0.05$ ) positively predicted the intention to use mHealth services, while perceived ease of use ( $p > 0.05$ ) was identified as a less significant factor in the mHealth adoption in Bangladesh. The participants indicated that the application is easy to use, and its mobility factor makes it reliable since they can access the information anywhere if they have mobile network connectivity.

Nurses also perceived momConnect to be a useful and resourceful mobile application that improved MCH care. They argued that the information provided by the application is freely accessible at any given time, which benefited pregnant women to have access to information even after hours when the health facility is closed. They highlighted that from the statistic momConnect has helped to reduced child mortalities among registered pregnant women who use momConnect. The nursing staff appraised momConnect that it makes life easier for pregnant women because of its mobility capabilities and ready availability of information.

The results of this study were in contrary with a study by Laurenza *et al.* (2018) which revealed that the adoption of digital technologies could improve the performance of all the main health care business processes, in particular those processes that can be simplified with the adoption of IT. In the same study, digital technologies were able to make services and processes more efficient and, at the same time, allow delivering better quality and reducing response times, with many benefits for several factors such as national health systems, clinicians and patient.

### **5.3.2. Barriers of momConnect Use by Pregnant Women at the RCHC**

The study revealed that there are barriers to the adoption of momConnect at the RCHC. Firstly, this study found that there was an issue of security and privacy of personal health information. Some of the participants indicated that they do not use the application because they were afraid that their personal health information would be compromised. The research found that this was due to a lack of knowledge about the application amongst pregnant women. The woman thought that their personal information would be used for other purposes. The research study was in contrary Alu *et al.* (2020) who asserts that usefulness, convenience, and monetary values of mHealth positively influence adoption intention.

Furthermore, convenience and monetary values are strongly perceived by individuals who have experienced illness. However, the effect of illness experiences on the usefulness value is insignificant. Gender, age, and income do not influence the adoption intention (Lee & Han, 2015).

Secondly, there was a lack of clinical evidence among nursing staff. As indicated during the FGDs, some of the nurses highlighted that there is no clinical evidence supporting the viability and efficacy of the mobile application. The research found that this was due to lack of proper reporting feedback from the NDoH on the impact of momConnect as far as improving maternal health care is concerned. This negatively impacted the adoption of momConnect as some of the nursing staff could not see the benefit; hence, it could not encourage pregnant women to use the application. Similarly, research by Kruse *et al.* (2019) identified 73 individual barriers and grouped them into 14 main categories. The top three barrier categories were infrastructure, lack of equipment, and the technology gap, which together accounted for 28 individual barriers.

Thirdly, it was the issue of interoperability or inability to integrate. Health care providers work with a wide range of systems, and the momConnect mobile application would have been more beneficial if combined with other systems. During the FGD, it was highlighted that the nursing staff would have appreciated if the application shared information with other systems used at the RCHC. In relation to the above statement, however, most of today's medical data lack interoperability: hidden in isolated databases, incompatible systems and proprietary software, the data are difficult to exchange, analyse, and interpret. This slows down medical progress, as technologies that rely on these data – artificial intelligence, big data, or mobile applications – cannot be used to their full potential (Botha & Booie, 2017).

## **5.4. Findings Based on Research Themes**

### **5.4.1. Organisation Practise**

In this study, organisational practises, culture, and the nature of the workforce play a fundamental role in pregnant women's' perceptions of the relevance of momConnect. Different health facilities have different policies on the adoption of momConnect. Therefore, this study found that the need for and ability of pregnant women to adopt momConnect vary accordingly depending on the facility's organisational practises. Nature of work activities among the nursing staff affects the adoption of momConnect at the facility. The research found that a heavy workload and routine work among nurses daily negatively affected the adoption of the mobile application at the RCHC. This was due to boredom which made them not encourage pregnant women to adopt the application. Therefore, understanding the organisational culture and nature of the workforce is important on the adoption of momConnect at the facility. This would assist in making use of momConnect mobile application relevant, thereby enabling nursing staff to see and appreciate its usefulness in their daily activities.

### **5.4.2. Relevance of momConnect**

The usefulness of momConnect is dynamic, considering its nature of such service in helping to support its adoption. This research indicated that pregnant women could gain many benefits from using momConnect mobile application at the RCHC through learning, collaboration as well as retrieving relevant information concerning the pregnancy. Therefore, such benefits make momConnect useful and encourage pregnant women to adopt the application. In support of the study finding according to the TAM, Venkatesh *et al.* (2003) specify that the perceived usefulness of IT is an important condition in its adoption.

Furthermore, this research extends the concept of its usefulness by exploring the nature of momConnect usefulness and identifying the issues that shape its influence which is long term, soft benefits, and the changing nature of usefulness. momConnect provides long-term usefulness to pregnant women based on the quality and relevance of the information provided by the application. This factor is critical because if pregnant women cannot see the usefulness of the mobile application at the early stages of using the application, they would be less motivated to use it. With regards to the above statement, the nurses perceived momConnect usefulness as long-term. They argued that momConnect provides quality and relevant information on all the stages of pregnancy and after birth for one year sending messages with advice on what must be done to the infant as well as what vaccines an infant must get. The nurses further argued that the mothers would benefit and the knowledge acquired will be used

for the rest of their lives and can even be applied on their next pregnancies or assist others in their communities in future.

#### **5.4.3. Technological Attributes**

Some of the technological attributes identified as affecting the adoption of momConnect mobile application are user-friendliness, technical compatibility, mobility, reliability, and transparency. With the TAM, most of these attributes influence an individuals' perceived usefulness and perceived ease of use of momConnect application. They influence a user's intentions of using the system. The research found that understanding momConnect application capabilities would help in overcoming their negative influence as well as strengthening their positive influence.

#### **5.4.4. People Traits and Goals**

It is important to identify the potential momConnect adopters as well as knowing which personality issues affect them. Understanding people's trait will help us understand how they affect the adoption of momConnect mobile application.

#### **5.4.5. Social Influences**

Social influence refers to pregnant women influence on each other that shapes their attitudes or actions concerning adopting momConnect. The study found that some of the participants use the application as it gave them a social status within their peers and communities or encouraged by their family members. Social influence proved to have a positive impact on the adoption of momConnect at the RCHC.

#### **5.4.6. Organisational Support**

This study found that organisational support is vital for the adoption of momConnect at the RCHC. The researcher found that there is minimal support from the facility management in emphasising the adoption of the mobile application. The study found that developing a momConnect strategy is the first important issue on the successful adoption of momConnect. The research further established that if a strategy is considered early, it ensures implementing a momConnect that is relevant, useful, and adaptable. There are no policies in place that enforce the nursing staff to regularly train and encourage pregnant women to use the mobile application at the RCHC. This posed a negative impact on the adoption of the mobile application at RCHC. Most of the participant complained that the nursing staff do not offer training sessions after registering pregnant women to use the application. Therefore, this study suggests that the management at the RCHC must provide organisational support which includes developing a

momConnect strategy, providing training and refresher training when necessary and recognising momConnect users.

#### **5.4.7. Trust**

In this research, trust refers to pregnant women's confidence in using the mobile application in utmost good faith. The results of the study indicated that trust influenced the momConnect adoption to consume the content or information provided by the application. In this study there two dimensions of trust indicated: trusting the mobile application confidentiality and trusting the mobile application capability. It was found that most of the pregnant women had issues with trusting the information of the mobile application, which negatively affected its adoption. In support of this study findings, Wu, Zhao, Zhu, Tan, & Zheng, (2011) among many external variables incorporated into TAM, trust is an important factor that influences the user's online behaviour, especially in the e-commerce context. However, some of the participants found to be a motivator, not a barrier.

#### **5.5. Conclusions**

This section put forward the conclusions of the research study based on the research findings. The study focused on seven main themes, that is (i) people's traits; (ii) technological attributes; (iii) social influence; (iv) trust; (iv) relevance; (vi) organisational support and (vii) organisational practices emerge from the qualitative study on the factors affecting adoption of mHealth applications. The study used a case of momConnect and the RCHC. The study confirmed the conceptual framework presented in chapter 2 that there are users or pregnant mothers related attributes which affect the adoption of momConnect which are people's traits, social influence, trust, and the relevance of mom connect.

##### ***5.5.1. Conclusions Based on the Conceptual Framework***

The organisational related factors that affected the adoption of momConnect include organisational practices and organisational support. There was, however, another inherent momConnect related factors which emerge from the themes that are the technological attributes. Rectification of negative issues surrounding the factors that affect the adoption of momConnect to enhance increased adoption of the application.

The health institution's policy about the use of momConnect and their rules take precedence over the attitudes and inclinations of nursing staff. The researcher argued based on the field observations that, both the decisions which inform rules that cover the use of momConnect and the abilities of pregnant women together determine the degree to which optimal use is made of



the mobile application. Although pregnant women usually have personal goals which need to be aligned with the rules of the health facility in which they are registered, the personal goals of pregnant women inevitably exert considerable influence upon the degree to which momConnect is utilised optimally with the facility. As a pregnant woman wants to excel and use the application, and since the facility provides training and momConnect tool, the personal goal of the pregnant woman become a motivating factor to use the mobile application that the facility makes available through the NDoH.

The pregnant women set personal goals and target to improve maternal health and the desire to succeed and be recognised as organised mothers provide personal incentive and intention to use technology, that is momConnect mobile application. The intention is what improves the attitude towards the use of momConnect, and the attitude is what influence actual behaviour and the actual use of momConnect mobile application.

This study concluded that how a system or momConnect is used may be determined by the policies at the RCHC and not the pregnant women's intention. Therefore, the perceptions of pregnant women of the usefulness of the momConnect and the ease with which it can be adopted are likely to be formed once pregnant women have familiarised themselves with momConnect and their previous experiences in using the mobile application.

## **5.6. Recommendations**

### ***5.6.1. Management Involvement***

Management involvement is very important in the successful adoption of the mobile application at the RCHC. Some of the participants from the nurse's FGD indicated that there is no strategy or policies implemented at the facility as far as momConnect adoption is concerned. The management must develop and create a momConnect strategy and policies which will enforce the nurses to be more involved in the roll-out of the mobile application.

### ***5.6.2. Collaboration***

There must be an effective collaboration between the nurses and pregnant when to ensure successful adoption of momConnect mobile application at the RCHC. The study found that there is no effective collaboration at the facility based on the participants from both pregnant women and nurses. Most of the pregnant women participants complained that there is no follow-up on how they were coping with the application after registration. Even some nurse from the FGD mentioned that they do not spend time to do follow-ups on pregnant women if

they are experiencing any challenges with the application. The collaboration will increase efficiency and will positively increase the adoption of momConnect at the RCHC.

### ***5.6.3. Training***

The training was found to be another challenge that is affecting the adoption of the application. The management must emphasize the training of nurses, especially on how to use the application so that they will be able to train pregnant women. There must be a policy in place for training and refresher training when necessary as other participants indicated it.

### ***5.6.4. momConnect Content***

In this study momConnect's content was found to be influential on the adoption of momConnect by pregnant women. Some of the participants mentioned that the information or content of momConnect is outdated or irrelevant at times. This harmed the adoption of the mobile application because it frustrated and demotivated them to use the application. However, some found the information to be useful but also mentioned that they would be happier if the content is provided in real-time rather than receiving later with the delays they are experiencing. The study found the delays in receiving pregnancy information which at times takes days. Therefore, the mobile application's content must be improved to reduce the frustrations pregnant women are experiencing. Also, the information must be readily available when pregnant women need it. Improving the content and reduce delays will make momConnect content relevant and fit for their daily needs as pregnant women.

### ***5.6.5. Nursing Staff Workload and Routines***

The nature of the workforce proved to be an influential factor in the adoption of momConnect. The training was not provided to pregnant women based on the workload and routines amongst the nursing staff. The facility management must ensure rotations on nursing staff working on momConnect to reduce levels of boredom, which negatively affected the adoption of the mobile application. The superiors at the health facility must make sure workloads are distributed equally, rather leaving one nurse at a time to be responsible with momConnect. This will relieve pressure on nursing staff and give them time to concentrate on momConnect training and encouraging the uptake of the mobile application.

### ***5.6.6. momConnect Technological Capabilities***

The mobile application must improve on its technological capabilities. Technological capabilities of the mobile application have more influence on its adoption. Some users complained about the user interface of the application that is not interactive. Improving the

user interface will motivate pregnant mothers to use the application, which will positively impact the adoption of the application. The application must be improved so that it will be easy for users to navigate and find the required information without difficulties.

#### ***5.6.7. momConnect Application Awareness***

Awareness is very important for the adoption of momConnect at the facility. The study found that some of the participants knew about the application through their friends and relatives. Also, some participants only knew about momConnect mobile application during that last stages of pregnancies, which is not supposed to be the case. This shows that pregnant women at the facility are not fully informed about the mobile application. Therefore, momConnect awareness must be improved or increased through the introduction of awareness campaigns, posters, and word of mouth at the facility. This will have a positive impact on the adoption of the mobile application since pregnant women will be fully aware of momConnect.

#### **5.7. Limitations**

Every study is subject to limitations, and this study is no exception, and it has the following limitations.

Qualitative research was used in this study to investigate and have a better understanding of the research phenomenon and all the issue associated with its complexity. In most cases, using qualitative research is often criticised for its use of small and less representative samples whose results or outcomes are not generalisable. A small sample was used in this study, and the results are unique to the twelve participants used in this study, and yet, these results or outcomes might apply to other health facilities with similar settings. The researcher, however, presented throughout and in-depth questions to establish perspectives of two cohorts of the participant.

Another limitation was the use of semi-structured interviews. In this qualitative study, the data collected from semi-structured interviews are based on participant' accounts: thus, why they are treated as perceptions. Therefore, despite this limitation, the findings showed similarities in its participants, which suggests the credibility of its participants since the data was collected from several participants.

Time to conduct this researcher was limited since the researcher was a part-time student. Furthermore, the progression of this research was hindered by the participation of some of the participants. Some of the participants found the research to be unbeneficial to them, and they would not respond to some question complaining that their time was being wasted.

The language barrier was also another limitation. Two participants highlighted at the end that they preferred the interviews to have been done in their home language. They failed to provide enough information because they were not able to express their views in English.

### **5.8. Future Research**

The study poses several opportunities for future research in the area. Future studies would possibly investigate factors affecting the adoption of momConnect on a wider geographical area, for example, all the facilities in the Southern Peninsula of the Western Cape. This will help identify more factors other than those already identified at the RCHC and examine their effects on the adoption of momConnect. This will also help enhance and build a better application.

### **5.9. Declaration of Interest**

This research was done in utmost good faith, and the researcher has no interest in any entities at the RCHC. There was no financial benefits or advantages attained by the researcher in conducting this research. The research was conducted solely for educational purpose to fulfil the requirements of his master's degree at the UWC. The researcher covered the costs associated with this research.

### **5.10 Relevance Statement**

The exploration and understanding of the factors affecting the adoption of momConnect could help improve its adoption rate at the RCHC. It could highlight useful insights and information that could help the management at the facility come up with a strategy and policies that will accelerate the adoption of the momConnect mobile application. The useful information based on the adoption of the application at the RCHC can be used by the NDoH, to understand the factors that might hinder its adoption at other facilities around the country.

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## APPENDICES

### APPENDIX 1: INTERVIEW SCHEDULE

FACULTY OF ECONOMIC AND MANAGEMENT SCIENCES

Department of Information Systems

#### Interview Questions for pregnant women

| Themes                 | Sub-theme   | Questions  |
|------------------------|-------------|--|
| Perceived Usefulness   | Usefulness  | <ol style="list-style-type: none"> <li>1. Do you momConnect</li> <li>2. If no, what are the reasons for not using momConnect</li> <li>3. Is momConnect performing what it is meant for?</li> <li>4. How well does momConnect fit in your daily routine as a pregnant woman?</li> <li>5. Do you think momConnect helps you maintain your health and of your unborn baby?</li> <li>6. Does momConnect compatible with any phone you have tried to access with?</li> <li>7. Is connecting to momConnect slow or fast?</li> </ol>  |
| Perceived ease of use  | Ease of use | <ol style="list-style-type: none"> <li>1. Is momConnect user friendly</li> <li>2. Are there any challenges using momConnect?</li> <li>3. If any, could you please elaborate on those challenges?</li> <li>4. What is the likely cause of challenges faced in using momConnect?</li> <li>5. How have these challenges affected your daily life as a pregnant woman?</li> <li>6. What measures do you take neutralise mom Connect challenges?</li> <li>7. What are the experiences of receiving information on a mobile phone through momConnect compared to having the information explained to you by the nurses?</li> <li>8. Do you believe that you can improve the health and well-being of your unborn child using momConnect</li> </ol> |
| Attitude towards using | Attitude    | <ol style="list-style-type: none"> <li>1. On average, how often do you use mobile phones?</li> <li>2. Roughly, how long have you been using mobile phones?</li> <li>3. How long do you spend each week using your mobile phone?</li> </ol>   |

|                              |           |   |
|------------------------------|-----------|---|
|                              |           | <ol style="list-style-type: none"> <li>4. Is there any degree of fear you face when using your mobile phone?</li> <li>5. How often are you encouraged to use momConnect by the nursing staff</li> <li>6. Have you ever received training on how to use momConnect from the nursing staff?</li> <li>7. Is momConnect adequate for your needs</li> <li>8. Would you appreciate refresher training on how to use momConnect?</li> <li>9. What are the common failures which hinder you from accessing the information on momConnect?</li> <li>10. When experiencing errors of failures on momConnect who helps you fix them?</li> <li>11. Do you have a negative or positive feeling using momConnect?</li> <li>12. Was the use of momConnect formally communicated to you by the clinical staff?</li> <li>13. If NO, how did you know about momConnect</li> <li>14. Do you think the information on momConnect if helpful and useful</li> </ol> |
| Behavioural intention to use | Intention | <ol style="list-style-type: none"> <li>1. What was your initial reaction when you started using momConnect?</li> <li>2. Have you stopped or you are still using it?</li> <li>3. If you stopped, what was the reason for you stopping?</li> <li>4. Are worried about making errors when using momConnect</li> <li>5. Do you feel confident about your abilities using momConnect?</li> <li>6. Is the adoption of momConnect mandatory in this facility?</li> <li>7. Do people who are important to you think that you should or should not use momConnect</li> <li>8. Does using momConnect enhance your status in your social system as a pregnant woman?</li> </ol>  |
| Actual system use            | Use       | <ol style="list-style-type: none"> <li>1. Do you know momConnect and what it does?</li> <li>2. When did you start using momConnect?</li> <li>3. How do you feel when using momConnect?</li> <li>4. Do you think the information on momConnect is useful?</li> <li>5. Do you have any concerns about momConnect?</li> <li>6. Does momConnect increase your data or airtime costs?</li> <li>7. What is the worst thing about momConnect?</li> <li>8. Are happy with the current functions of momConnect?</li> <li>9. What function or information do you think must be provided by momConnect?</li> <li>10. Do you have any trust issues with momConnect?</li> <li>11. If yes, what are those trust issues?</li> </ol>  |

|  |  |  |
|--|--|--|
|  |  | <p>12. Do you enjoy using momConnect?</p> <p>13. What is your overall impression of momConnect?</p> <p>14. What are the best features of momConnect?</p> <p>15. What if any are the worst features of momConnect?</p> <p>16. How could it be better?</p> |
|--|--|--|

### Interview Question for nurses

| Themes                           | Sub-theme   | Questions  |
|----------------------------------|-------------|--|
| 1. Perceived Usefulness          | Usefulness  | <p>1. Do you think momConnect provides useful information to pregnant women</p> <p>2. If yes/no, why?</p> <p>3. Do your superiors encourage you always to tell pregnant women to register on momConnect?</p>                                       |
| 9. Perceived ease of use         | Ease of use | <p>1. Do pregnant women at time complain about momConnect</p> <p>2. If Yes, what do they complain about</p> <p>3. Do you find momConnect to be user friendly and easier for pregnant women to use?</p> <p>4. If no to the above question, why?</p> |
| 10. Attitude towards using       | Attitude    | <p>1. If you have ever used momConnect, would you recommend another pregnant woman to use?</p> <p>2. If yes/no to the above question, why?</p>   |
| 11. Behavioural intention to use | Intention   | <p>1. Do pregnant women at times bother you with questions related to momConnect</p>   |
| 12. Actual system use            | Use         | <p>1. Do you know a mobile application called momConnect?</p> <p>2. Have you ever used momConnect before?</p> <p>3. If yes, have you ever experienced problems with momConnect</p> <p>4. If yes, what were the problems</p>                        |

.....  
Name of Research Participant

.....  
Date

.....  
Signature

.....  
Name of the researcher

.....  
Date

.....  
Signature

Participants will receive a copy of the signed consent and information sheet. A copy of this will be filed and kept in a secure location for research purposes only

|  |   |   |
|--|---|---|
| <b>Researcher:</b><br>Tendayi Mutangadura<br>Department of Information Systems<br>Faculty of Economic and Management Sciences<br>The University of the Western Cape,<br>Robert Sobukwe Road,<br>Bellville<br>Contact no: 0731358652<br>Email:<br>tendayi.mutangadura@jembi.org | <b>Supervisor:</b><br>Prof Mmaki E. Jantjies<br>Department of Information Systems<br>Faculty of Economic and Management Sciences<br>The University of the Western Cape,<br>Robert Sobukwe Road,<br>Bellville<br>Contact no: +27 21 959 3249<br>Email: mjantjies@uwc.ac.za | <b>HOD:</b><br>Prof O Jokokonya<br>Department of Information Systems<br>Faculty of Economic and Management Sciences<br>The University of the Western Cape,<br>Robert Sobukwe Road,<br>Bellville<br>Contact no: +27 21 959 1610<br>Email: ojokonya@uwc.ac.za |
|--|---|---|

## **APPENDIX 2: ETHICS CLEARANCE**

**Ethical clearance from University of the Western Cape**





OFFICE OF THE DIRECTOR: RESEARCH  
RESEARCH AND INNOVATION DIVISION

Private Bag X17, Bellville 7535  
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[www.uwc.ac.za](http://www.uwc.ac.za)

12 August 2019

Mr T Mutangadura  
Information Systems  
**Faculty of Economics and Management Sciences**

**Ethics Reference Number:** BM19/6/10

**Project Title:** Factors affecting the adoption of momConnect mobile application for pregnant women at Retreat Community Health Centre.

**Approval Period:** 12 August 2019 – 12 August 2020

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

**Please remember to submit a progress report in good time for annual renewal.**

The Committee must be informed of any serious adverse event and/or termination of the study.

A handwritten signature in black ink that reads 'Josias'.

*Ms Patricia Josias  
Research Ethics Committee Officer  
University of the Western Cape*

**BMREC REGISTRATION NUMBER -130416-050**

<http://etd.uwc.ac.za/>

## **APPENDIX 3: ETHICS CLEARANCE**

### **Ethical clearance from the Department of Health**



Western Cape  
Government

Health

**STRATEGY & HEALTH SUPPORT**

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[www.capegateway.gov.za](http://www.capegateway.gov.za)

REFERENCE: WC\_201908\_017

ENQUIRIES: Dr Sabela Petros

**Private Bag X17  
Bellville 7535  
South Africa**

For attention: MR Tendayi Mutangadura

**Re: Factors affecting the adoption of momConnect mobile application for pregnant women at Retreat Community Health Centre**

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact the following people to assist you with any further enquiries in accessing the following sites:

**Retreat CHC**

**Susan Meyer**

**021 713 9800**

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator ([Health.Research@westerncape.gov.za](mailto:Health.Research@westerncape.gov.za)).
3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator ([Health.Research@westerncape.gov.za](mailto:Health.Research@westerncape.gov.za)).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely

**DRM MOODLEY**

**DIRECTOR: HEALTH IMPACT ASSESSMENT**

**DATE:**

**CC**

Dr Melvin Moodley  
Director: Health Impact Assessment  
11 NOV 2019

<http://etd.uwc.ac.za/>