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# Towards an understanding of post-adoption usage behaviours in the context of m-health pregnancy support applications

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Research report submitted to the School of Economic and Business Sciences, University of the Witwatersrand in partial fulfilment of the requirements for the degree of Master of Commerce (Information Systems) by coursework and research.

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# ABSTRACT

Mobile health applications are fast becoming an influential source of information for pregnant women. Studies have shown that pregnant women download 3 such apps on average on their cellphones. These mobile technologies have been shown to help women monitor their progress during their pregnancy and personalise healthcare to suit their needs.

To date, llimited research has been directed towards understanding usage behaviours with these apps. Various authors have argued that there is a need to expand the scope of research from simple usage behaviour to deeper levels as technology becomes more sophisticated and easily available. M-health technologies are increasingly becoming more varied and sophisticated and as such this study aims to explore post-adoption usage specifically of mobile health pregnancy applications in the South African context.

This study specifically looked at post adoption usage behaviours and used Hsieh and Zmud's (2006) framework as a basis of understanding these behaviours. The potential influences on these behaviours were sourced from various studies done on pregnant women usage of ICT in general. These influences were then investigated to see whether they were relevant in the context of m-health pregnancy support applications. The primary method of data collection was open ended semi structured interviews with twelve pregnant women. Data analysis was done using the iterative model for qualitative data analysis proposed by Miles and Huberman (1994).

The findings revealed that pregnant women displayed post adoption usage behaviours of routine use and IS continuance. With regards to the infusion stage, the study found that pregnant women engaged in the first set of post adoption usage behaviours i.e. extended usage and deep usage. They did not engage in second stage behaviours namely emergent use, feature extension or intention to explore behaviours. The influences identified in the literature were found to be relevant in the context of m-health applications and additional influences such as cost of seeing gynaecologist, number of features on the app and social structures were found to have an influence on usage of the apps.

This study provides unique insights into the views of pregnant women's experiences with m-health apps. Specifically, by using interpretive research it uncovers the subjective meanings around post adoption usage behaviours, understanding how pregnant women engage in these behaviours and subsequently how these behaviours are sustained during their pregnancy. The study recognises m-health pregnancy support apps as important tools in the pregnancy journey. It highlights how pregnant women value these apps and view them as huge information sources, reassurance and comfort during their pregnancy. It is argued that medical professionals cannot distance themselves away from these apps and need to work in conjunction with them to provide robust maternity care to their patients.

Theoretically, this study adds to our understanding of post adoption usage behaviours specifically in the context of m-health pregnancy apps. Limited studies have been done in this field specifically in the South African context and the study provides a foundation for further research. Further research can be done to understand how these apps are changing the relationship between pregnant women and medical professionals and furthermore, whether the information received from these apps is reliable and credible.

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## 1. Introduction

Mobile devices and connections in 2016 grew to 8.0 billion compared to 7.6 billion in 2015 (Cisco Visual Networking Index, 2017). This plethora of mobile devices is transforming communications, commerce and the health care industry amongst other fields (West, 2012). Within the health care industry specifically, these devices are allowing quick access to information, monitoring of patient's medical conditions and raising health awareness. Above all, they are empowering patients over their own health by providing them with information and feedback mechanisms on their health (West, 2012)

Over the past few years there has been an increase in the number of pregnant women using mobile applications to monitor and support their pregnancy (Bert, Passi, Scaioli, Gualano, & Siliquini, 2016). Such apps are available on smartphones which are highly portable and provide real time on demand communication (Maged et al., 2014). With mobile apps specifically, users can record details of their health and get feedback. They are able to get social support from like-minded individuals and share information via social networks (Maged et al., 2014).

Such innovations are changing the health care landscape which presents both opportunities and challenges for health care practitioners and users (Lagan, Sinclair & Kernohan, 2011). The aim of this study was to explore the experiences of pregnant women to try to understand usage of these apps and the influences behind this usage. The study specifically focused on post-adoption usage behaviours as various authors have argued that there is a need to expand the scope of research from simple usage behaviour to deeper levels as technology becomes more sophisticated and easily available (Jasperson, Carter & Zmud, 2005; Hsieh & Zmud, 2006; Hsieh & Wang, 2007).

This chapter is organised as follows: It will first give a background to the study explaining how mobile apps are fast becoming popular technology tools for pregnant women. The chapter will then look at the statement of the problem highlighting why this area is necessary to do research into. The research question and objectives will then be discussed followed by a discussion on the summary of the research report.

### 1.1 Background

Consumer health applications (apps) provide a platform for consumers to monitor their health without dealing directly with healthcare professionals. These apps can be found on electronic devices such as smartphones, tablets and watches (Handel, 2011). They are emerging as popular choices amongst consumers as they provide information that can help them monitor and manage their healthcare real-time. Handel (2011) argues that these apps are changing medical care landscape and allowing more patient self-management care.

Mobile technology in the form of smartphones is widely used for these apps. Gartner (2014) predicts that more than 268 billion mobile apps will be downloaded by 2017. This surge in downloads will make apps one of the most popular computing tools for users across the globe (Gartner, 2014). In Sub Saharan Africa, specifically, South Africa leads in app downloads with 34% of phone users making downloads from app stores (Geopoll & World Wide Worx, 2015).

Maged et al. (2014) refer to this increase in mobile usage as a mobile revolution and argue that this revolution is offering a huge platform to provide medical support for people. Health mobile applications are becoming an influential source of information for pregnant women (West et al., 2012; Tripp et al., 2013). Pregnancy is a condition characterized by the need for continuous care and regular medical checks and as such women tend to look for digital help to manage their status (Bert et al., 2016). These mobile technologies have been shown to help women monitor their progress during their pregnancy and personalise healthcare to suit their needs (Bert et al., 2016).

Studies have shown that women are taking the lead when it comes to smartphone technology, more evidently when it comes to using health applications (Derbyshire & Dancey, 2013). Certain phases in women's lives such as pregnancy influence the level of phone usage. For example, in one survey of 203 pregnant women, 94% reported that they had a smartphone and had downloaded on average 3 pregnancy apps (Petrie, 2013 as cited in Derbyshire & Dancey, 2013).

Further international studies done in Italy, Canada, Australia and the UK have shown that almost 97% of pregnant women use the Internet to obtain information on pregnancy and 83% use this information to make decisions. 92% want to add on to the information received from health professionals (Bert et al., 2013; Lagan, Sinclair & Kernohan, 2010). Another study done in Sweden reported that 91 % of women have access to the Internet and 84% use it to search for information especially during the early stages of pregnancy (Larsson, 2009). The next sections shall discuss the problem statement, research question and objectives as well as contributions to theory and practice.

### 1.2 Statement of Problem

According to Bert et al. (2016) there are several studies focusing on e-Health and m-Health in general but **no specific research on pregnancy related mobile support apps available on the market has been published.** In addition to this, information on pregnancy m-health app usage is limited. Most research on m-health apps have focused on exercise, weight loss and nutrition (Azar et al., 2013; Boulos et al., 2014; Pagoto et al., 2013; Laing et al., 2014; Conroy, Yang & Maher, 2014). Furthermore, Dennison, Morrison, Conway and Yardley (2013) argue that there is **little in depth, qualitative research that has been done which allows users to describe their experiences, views, and usage patterns with m-health applications**. Helander, Kaipainen, Korhonen and Wansink (2014) agree with this notion and argue that little research exists about usage behaviours of health-promoting apps. This research aims to fulfil these gaps by specifically looking at the m-health pregnancy support apps.

Within the information systems area, there is a specific emphasis on adoption and initial usage of information systems (Venkatesh, Morris, Davis, & Davis, 2003). In fact, Jasperson, et al., (2005) argue that IT adoption studies are one of the richest and most mature streams in the field of information systems research. **Various authors have argued that there is a need to expand the scope of research from simple usage behaviour to deeper levels as technology becomes more sophisticated and easily available** (Jasperson et al., 2005; Hsieh & Zmud, 2006; Hsieh & Wang, 2007). Moreover, the long-term viability of technological innovations depends on continued usage from users (Cho, Cheng & Hung, 2009).

Hsieh & Zmud (2006) argue that the complexities of today's information systems allow individual users to use systems at different levels of sophistication and therefore there requires more research in this area. **M-health technologies are increasingly becoming more varied and sophisticated and as such this study aims to explore post-adoption usage specifically of mobile health pregnancy applications in the South African context**. Studies have looked at adoption and acceptance of apps in general as well as m-health apps in general (Mohamed, Tawfik, Al-Jumeily & Norton, 2011; Yang, 2013). Few studies have looked at factors beyond adoption (post-adoption behaviours) such as IS continuance, routine use, extended usage, deep use and emergent usage in the specific context of m-health pregnancy applications. The study therefore attempts to fill this contextual gap in the literature.

### 1.3 Research Question and Objectives

The research question for this study is:

- What influences post-adoption usage behaviours in the context of m-health pregnancy support applications?

The research objectives are:

- Explore each post-adoption usage behaviour in line with m-health pregnancy applications (Routine use, IS continuance, extended use, deep use, emergent use, feature extension, intention to explore, innovating with the application and integrative use)
- Explore the influences around post-adoption usage of m-health pregnancy applications.

### 1.4 Structure of the Research Report

**Structure of Research Report**

The rest of the research report is structured as follows:

- *Chapter 2 – Literature Review*

  This chapter opens with a discussion on usage of ICT by pregnant women. This covers both Internet and mobile sources. It then discusses the characteristics of women who use m-health pregnancy support apps or Internet for information on their pregnancy. Drawing on current literature, it provides information on commonly used apps and the features of these apps. The chapter then discusses the various usage behaviours at post adoption stage and presents a framework illustrating these behaviours. The chapter then concludes with a discussion around the influences on these post adoption usage behaviours in the context of m-health pregnancy support apps.

- *Chapter 3 – Research Design*

  This chapter outlines the research philosophy under which this study is conducted. It discusses the research method and the case study technique that was used to carry out the research. It further discusses the data collection and data analysis techniques used in the study. The chapter them moves to a discussion around the rigour that was built into the research to make it credible. It concludes by summarising the steps taken to ensure that the research was done ethically.

- *Chapter 4 – Results and Analysis*

  This chapter provides the demographics of the respondents and reports on the findings for each post adoption usage behaviour in line with pregnancy support apps. The chapter then reports on the findings around the influences on such behaviours and reports on any relationships between the influences.

- *Chapter 5 – Discussion*

  This chapter provides a discussion around each of the post adoption usage behaviours and how it links to previous literature. It also discusses the influences on such behaviours and how they link back to previous literature.

- *Chapter 6 – Conclusion*

  The last chapter provides the conclusion to the study which includes a review of the findings and analysis. These are discussed in relation to the research question and objectives. A discussion of the contributions of the study and limitations of the study follows. The chapter then concludes with potential future research directions.

## 2. Literature Review

This chapter is organised as follows: firstly, it discusses literature on how pregnant women use ICT to obtain information. It then moves on to discuss the characteristics of women who use m-health pregnancy support apps. Drawing on current literature, it discusses commonly used apps and the features of these apps. The chapter then discusses the various usage behaviours at post adoption stage and in doing so, presents a framework illustrating these behaviours. The chapter concludes with a discussion around the influences on these post adoption usage behaviours.

### 2.1 Usage of ICT by pregnant women

Pregnant women are more likely to seek health information as the condition itself requires continuous care and regular medical check-ups (Bert et al, 2016). According to Kavlak, Atan, Gulec, Ozturk, and Atay (2012), pregnant women require assurance that their pregnancy is progressing within the right milestones and as such they seek information. This need is over and above the information they receive from their check-ups with medical professionals. Kavlak et al. (2012) argue that women need access to evidence-based information to make informed choices in pregnancy. The next paragraphs discuss previous studies on how pregnant women use the internet and mobile phones to access pregnancy related information. This is done with a view to relate this information to the current study as some of their usage behaviour may be similar in the m-health app context.

Previous studies have shown that the Internet is gaining popularity with pregnant women. Specifically, the various online forums that allow pregnant women to support and guide each other are gaining momentum. (Larsson 2009; Lagan et al., 2010; Cohen & Raymond 2011). The next paragraphs shall highlight some previous studies done on how pregnant women are using ICT during their pregnancies.

Larsson (2009) investigated how pregnant Swedish women used the Internet to find information about their pregnancy. They also investigated the perceptions around the quality of information and whether this information was shared with the medical professionals the pregnant women visited during their pregnancy (Larsson, 2009). Their study revealed that 84% of women used the Internet to source information about their pregnancy. Specifically, pregnant women looked for fetal development information i.e. whether the baby was growing within the right stages (Larsson, 2009).

Lagan et al. (2010) explored how pregnant women use the Internet for the purposes of information and how this affected their decision making. They found that 97% of women used search engines such as Google to access pregnancy relation information. In addition to this, the women used the Internet to network with other pregnant women, to gain support from other pregnant women and to buy pregnancy related goods online (Lagan et al., 2010).

In another study, Lagan et al. (2011) explored the impact of the Internet on decision-making in pregnancy. They found that women use information from the Internet to make decisions, specifically,

they use the Internet to validate information and share experiences. Overall the women reported feeling empowered and assisted in their decision-making processes (Lagan et al., 2011).

Cohen and Raymond (2011) observed online pregnancy forums to see how pregnant women interact with each other and what they sought on these forums. They found that pregnant women used the forums to ask questions, see whether what they were going through were normal experiences and most importantly as a sounding board where they could vent their frustrations and receive some comfort (Cohen & Raymond, 2011).

Kavlak et al. (2012) investigated how pregnant women in Turkey obtained information from the Internet concerning their pregnancy. They also sought to investigate which topics they most frequently searched for on the Internet, and how much of this information the pregnant women shared with their medical professionals i.e. midwives, nurses or doctors. The most frequently searched topics on the Internet were on the stages of birth and pain in birth. This was followed by information on fetal development and information on nutrition in pregnancy (Kavlak et al. 2012).

Weston and Anderson (2014) explored the perceived value of Internet use in pregnancy not only from pregnant women but from midwives and those women who had already given birth. Overall all three groups agreed that the Internet provides a good source of information. They found that pregnant women were more receptive to the information than midwives (Weston & Anderson, 2014).

The studies mentioned above all highlight how pregnant women are using the Internet for information, decision making and online support. The studies highlight how much research has been done in this arena. Table 1 summarises these studies and other studies done in the same area. The table provides detail on the specific context in which the studies were conducted in. Only one study was identified in the South African context. This study focused on the use of mobile phones as an intervention for pregnant women in rural communities in South Africa. Specifically, the study sought to improve general awareness of pregnancy danger signs amongst these women (Coleman, 2014). Although not app related, the study sought to use mobile phones to provide awareness on any danger signs for pregnant women.

As can be seen, research on specific m-health pregnancy applications is limited. Rodger et al. (2013) looked at the usage of Internet and mobile phones amongst pregnant women in South Australia. They conducted qualitative interviews with 35 pregnant women and found that 40% of the women used apps on their cellphone. Some pregnant women found the apps as beneficial during their pregnancy as other forms of health communication (Rodger et al., 2013).

Research on ICT usage amongst pregnant women has focused on the Internet as a primary source of information. Relatively few studies have been done on -m-health pregnancy apps specifically within the

South African context. This study aims to fill this gap by focusing on m-health pregnancy apps and how women engage in post adoption usage behaviors with these apps. The next section of the literature review shall turn to characteristics of women who use m-health pregnancy related applications.

| Authors | Study | Country | Pregnancy information source(s) |
|---|---|---|---|
| Romano, A. N. (2007) | A changing landscape: implications of pregnant women's Internet use for childbirth educators | United States | Internet |
| Ley, B. (2007) | Vive les roses!: the architecture of commitment in an online pregnancy and mothering group' | United States<br>Canada<br>Mexico<br>United Kingdom<br>France<br>New Zealand | Internet |
| Larsson (2009) | A descriptive study of the use of the Internet by women seeking pregnancy-related information | Sweden | Internet |
| Lagan, Sinclair & Kernohan (2010) | Internet Use in Pregnancy Informs Women's Decision Making: A Web-Based Survey | Respondents came from 24 different countries with the largest numbers coming from:Australia<br>New Zealand<br>Canada<br>United Kingdom<br>United States | Internet |
| Cohen & Raymond (2011) | How the Internet is giving birth to a new social order: Usage of online Internet forums for pregnancy support | United States | Internet |
| Lagan, Sinclair & Kernohan (2011) | What Is the Impact of the Internet on Decision-Making in Pregnancy? A Global Study | Australia, New Zealand, Canada, United Kingdom, United States | Internet |

| Authors | Study | Country | Pregnancy information source(s) |
|---|---|---|---|
| Kavlak, et al. (2012) | Pregnant women's use of the Internet in relation to their pregnancy | Turkey | Internet |
| Evans, Wallace & Snider (2012) | Pilot evaluation of the text4baby mobile health program | United States | Mobile Phones |
| Rodger et al. (2013) | Pregnant women's use of information and communications technologies to access pregnancy-related health information in South Australia. | Australia | Mobile Phones<br>Internet |
| Tripp et al. (2013) | An emerging model of maternity care: Smartphone, midwife, doctor? | Australia | Smartphone apps |
| Weston & Anderson (2014) | Internet use in pregnancy | United Kingdom | Internet |
| Coleman (2014) | The Use of ICT Tools (Mobile Phones) to Improve Awareness of Pregnancy Danger Signs among Pregnant Women in Rural Communities of South Africa | South Africa | Mobile Phones |
| Bert et al. (2016) | There comes a baby! What should I do? Smartphones' pregnancy-related applications:<br>A web-based overview | Italy | Smartphone apps |
| Jayaseelan & Pichandy (2016) | Uses of Information and Communication Technology among Women during Pregnancy | India | Internet |

Table 1: Previous studies on usage of ICT by Pregnant women

### 2.2 Characteristics of women who use m-health applications

Several studies have attempted to provide demographic characteristics around the average user of smartphones. This section highlights these various characteristics. Bert et al. (2016) argue that most smartphones users are women who are highly educated. They argue that these women live in urban areas and have an income that can be classified as satisfying. Kavlak et al. (2012) found that there were four distinguishing characteristics of pregnant women who turn to the Internet for information. These characteristics included women who are having their first child; women who are employed; women who have are highly educated; and women who are between the ages of 25 and 34.

Kavlak et al. (2012) argue that education and work status have a huge influence on Internet use as women who have these characteristics want to acquire a lot of information. They further argue that in general people who have a higher educational background use health related websites more effectively. Such individuals are more discerning about the information and question the reliability of the information obtained. (Kavlak et al. 2012).

Evans, Wallace and Snider (2012) found a correlation between women with higher levels of education and usage of mobile pregnancy applications. They investigated the use of 'e-health' (electronically mediated health information) and 'm-health' (mobile-mediated health information). Their findings revealed that women who were educated were likely to use information on these platforms than those who were not educated. Similarly, Powell, Inglis, Ronnie and Large (2011) found that being highly educated, young and female were characteristics associated with users seeking health information online.

Larsson (2009) found that pregnant women in Sweden who rated information from the Internet as reliable and correct were those who had a high education level. Diaz et al. (2002) found that in general people who use the Internet in the USA are under the age of 60 and are college graduates earning an annual income of over $50 000. These authors argue that Internet is now available to low and middle-income groups as it is growing at an unprecedented rate (Diaz et al., 2002).

Most recently the research done by the Pew Research Institute in 2016, found that millennials (18 to 34) are more likely to use the internet and smartphones compared to those people 35 years and older. In South Africa specifically, 46% of people aged 18 to 34 own a smartphone as compared to 30% of people aged 35 plus. The research also found that there are gender gaps in technology use specifically in Africa. Men are more likely than women to use the internet in emerging nations (Poushter, 2016).

The characteristics of women who use m-health pregnancy related applications are summarized in Table 2 below. The next section shall delve into the features of m-health pregnancy applications.

| Authors | Characteristics identified | Context of Study |
|---|---|---|
| Bert et al., (2016) | • Higher Education Level<br>• Living in urban / suburban areas<br>• Satisfying average income | Smartphone apps for pregnant women |
| Evans, Wallace & Snider (2012) | • Higher Education Levels | text4baby mobile health program |
| Powell et al., (2011) | • Higher Education Levels<br>• Age | Health related Internet usage |
| Larsson (2009) | • Higher Education levels | Pregnant women usage of Internet |
| Kavlak et al., (2012) | • Higher Education levels<br>• First pregnancy<br>• Work status | Pregnant women usage of Internet |
| Diaz et al., (2002) | • Higher Education levels<br>• Annual income of over $50.000 | Health related Internet usage |

Table 2: Characteristics of women who use mobile apps or Internet for health information

### 2.3 Features of M-health pregnancy applications

A search on mobile platforms Apple (iTunes) and Android (Google Play) in 2013, revealed that each platform had 1059 and 497 pregnancy related apps respectively (Tripp et al., 2013). Out of the pregnancy apps that were surveyed on Apple and Android, 40% of the apps were informative, 13% interactive, 19% had features of a medical tool and 11% were linked to social media apps (Tripp et al., 2013). By far the most popular pregnancy apps were those with interactive features.

A further search was done by Bert et al. (2016) on the internet to see which were the most mentioned pregnancy-related applications developed in the recent years for smartphones and tablets. The search revealed 11 popular apps with ‘’BabyCenter my Pregnancy Today’’ being the most popular app. This was followed by ‘’Baby Bump, ‘’Pregnancy Sprout’’ and ‘’I’m Expecting’’ apps. The features of these apps will be detailed in the next paragraphs (Bert et al., 2016).

‘BabyCenter’ was developed in 2010 and offers features such as a countdown to due date; a checklist with advice on how to take care of oneself during pregnancy; videos of how a baby develops during pregnancy and the different periods of gestation (Bert et al., 2016). The user must provide an email address and create a profile before accessing the app contents. A blog is also available and is grouped according to what term the pregnant women are in. The app provides a privacy policy section providing information about personal data collection and usage. Additionally, they have a Medical Advisory Board

meaning they are linked to doctors and experts who provide advice with regards to content on the app (Bert et al., 2016)

'Baby Bump' was developed in 2009 and offers tools such countdown (to calculate the due date), pictures of how the fetus should be looking at depending on gestation period and a diary where the mother to be can jot down their feelings. The app also offers a forum to exchange opinions and experiences with other moms to be (Bert et al., 2016). Should a pregnant woman want more features, they have an upgrade version where they can access features such as a kick counter and a contraction tracker. Terms of use and a privacy policy section is included to inform the user how their data and personal information is protected. This app is not linked to an Medical advisory board (Bert et al., 2016)

'Pregnancy Sprout' is an application that offers tools such as a weight tracker, a kick counter, a pregnancy checklist and a timeline. It was developed in 2010 and It also offers a 3D weekly image of the fetus as well as a contraction timer. The mother to be is able to note list of questions that they may have for their doctor (Bert et al., 2016). ''I'm Expecting'' was developed in 2010 and allows the user to record symptoms and get tips on how to alleviate them. It allows users to track weight gain, connect with the doctor in order to get information and book appointments. Both these apps are not linked to any Medical Advisory Board (Bert et al., 2016).

The various pregnancy app features below are depicted in Figure 1 below as an example.




Figure 1: Example of pregnancy support app features

Having discussed m-health pregnancy apps, characteristics of users and features of such aps, the report shall move on to discuss various post-adoption IS usage behaviors.

### 2.4 Post-adoption usage behaviours defined

Cooper and Zmud (1990) introduced a six-stage model of IS implementation process namely initiation, adoption, adaptation, acceptance, routinization and infusion. Hsieh and Zmud (2006) subsequently mapped various usage behaviours into the different categories (See Figure 2 – mapping of post adoptive usage behaviours to IS implementation phases). These scholars argue that it is at the last two stages, namely routinization and infusion where users start to engage in various post adoption usage behaviours.

Saeed and Abdinnour-Helm (2013) define post adoption IS usage behaviours as ‘‘the interaction that a user develops with an IS in performing and managing his/her work after initial adoption of the IS.’’ (p. 223). Post adoption usage behaviours in this model are defined in an organisational setting. In the context of this study, the post adoption usage behaviours shall be applied at an individual level. They are defined as the various usage patterns pregnant women display when interacting with pregnancy support mobile applications.

At the post-adoption stage, the IS is infused with the organisation and becomes an integral part of the work systems (Saeed and Abdinnour-Helm, 2008). Users use the IS in different contexts thereby adding value to an organisation. With regards to this study, it can be argued that at the post adoption stage, m-health pregnancy support apps become an integral way of how pregnant women look after themselves during their pregnancy. They use the apps in various ways adding value to their pregnancy journey and overall health.

The mapping of post adoption usage behaviours to the IS implementation phases framework (Figure 2) will be used as a basis of understanding post adoption usage behaviours in this study. The initiation, adoption, adaptation and acceptance stages are not relevant for this study as they refer to IS adoption and initial usage. The focus of this study shall be on these last two stages – routinization and infusion.

Routinization describes the state where system use becomes an everyday routine. The user does not view the system as something that is unusual or different (Hsieh & Zmud, 2006). Individuals begin to use the technology repetitively to support their daily tasks. Additionally, users begin to use the various features that IS has to offer (Saeed & Abdinnour-Helm, 2013). Using the technology becomes a habit and they have an intention to continue using the IS (Bhattercherjee, 2001). The two behaviours displayed at routinization stage are IS continuance and routinized / habitual use.

The infusion stage refers to individuals integrating the system into their work environment and using the system to its full capabilities (Cooper and Zmud 1990; Saga and Zmud 1993). Users begin to experiment at this stage as the technology is embedded in their organisation. (Cooper & Zmud 1990; Saga & Zmud, 1993; Saeed & Abdinnour-Helm, 2013). The various behaviours at the Infusion stage include extended use, deep usage, emergent usage, feature extension, intention to explore and trying to innovate with IT.

The next sections will describe each of these behaviours and in doing so will give examples of past literature studies.

The maping of post adoption usage behaviours to IS implementation phases is depicted below. Hsieh and Zmud (2006) argue that the six-stage model of IS implementation does not imply that individuals will go through the stages in sequential order. Some stages may occur in parallel with each other.

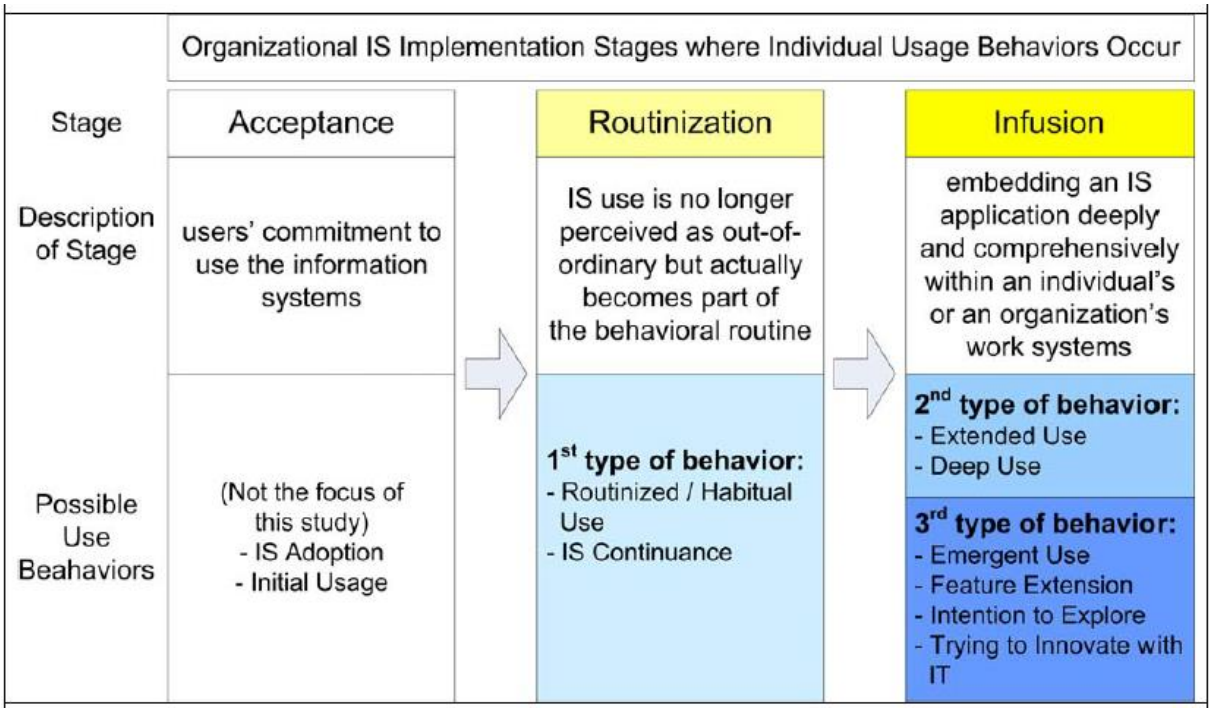



Figure 2: Mapping of post-adoption use behaviours to IS Implementation stages (Hsieh & Zmud, 2006)

**Post adoption usage behaviours at Routinisation Stage**

**i. Routinized / Habitual Use**

Routinization describes the state where system use becomes an everyday routine. The user does not view the system as something that is unusual or different (Hsieh & Zmud, 2006). Individuals begin to use the technology repetitively to support their daily tasks. Additionally, users begin to use the various features that IS has to offer (Saeed & Abdinnour-Helm, 2013). Using the technology becomes a habit and they have an intention to continue using the IS (Bhattercherjee, 2001).

**ii. IS Continuance**

IS continuance refers to users behaviour to continue using the system (Bhattercherjee, 2001). Continued usage of a technology would mean continuously using the technology on a regular or adhoc basis. For example, users who book hotels through online reservation websites but do not visit those websites are still regarded as users who use the IS regularly (Cho et al., 2009).

Continued IS use is influenced by various factors as found by Bhattercherjee (2001). This scholar developed the IS Continuance model to explain individual use behaviour after users have passed through the initial usage. Battacherjee (2001) argued that after initial usage, the individual's perception of the system changes. This scholar argues that personal factors such as satisfaction and perceived system usefulness will have an influence on user's intention to continue using the system. Confirmation of expectation, i.e. whether the user's expectations of the system were met or confirmed, directly impacts both perceived usefulness and satisfaction. The model also posits that perceived usefulness directly influences satisfaction (Battacherjee, 2001).

**Post adoption usage behaviours at Infusion Stage**

**iii. Extended usage and Deep usage**

Extended use refers to both the frequency - how often the technology is used, and breadth of the IS - the different features of the technology used by the individual (Abdinnour-Helm & Saeed, 2006). For example, in the context of a student information system, the different features of the technology can refer to students using the system to register for class, view grades, submit papers and participate in student online forums etc. Frequency would relate to the number of times they use such features (Abdinnour-Helm & Saeed, 2006).

Saga and Zmud, (1994 cited in Hsieh & Zmud, 2006) define extended use as "how users apply more of the technology's features in order to accommodate a more comprehensive set of work tasks'' (pg5). After IS become available to users, they interact with the various features that the IS has to offer and develop different patterns of use. The more the users interact with the different features of the technology the more they begin to display extended usage behaviours (Abdinnour-Helm & Saeed, 2006).

In a further paper, Hsieh & Wang (2007) refer to extended use as how an individual uses IS features to support and assist them in their work or tasks they have to carry out. These tasks can be existing tasks or an array of different comprehensive tasks. Schwarz (2003) proposed a similar concept to extended usage namely deep usage which is defined as the extent of use of different features of an IS. These two concepts relate to using more features of an IS to support a more complete array of tasks (Schwarz, 2003).

In a later paper, Saeed and Abdinnour-Helm (2013) argue for the term 'expanded usage' which is defined similarly to extended usage. They define expanded usage as the extent to which users are using the different features of the IS. For example, usage is the number of times executives use IS to make decisions and extent is them accessing different reports and records (Leidner & Elam 1993; Deveraja & Kohli, 2003 as cited in Saeed & Abinnour-Helm, 2013). In the context of m-health pregnancy support applications it can be argued that extended usage can refer to how often pregnant women use the apps

and how many of the features such as weight tracker, pregnancy checklist, online forum etc. that they use.

Saga and Zmud (1993) argue that extended use occurs after routine use. As users become familiar with the system and begin to use it habitually, they will find new ways to support their tasks and being to apply more features to support the tasks. They move from a routinized state into a more infused state where they display behaviours such as extended usage (Saga and Zmud, 1993).

### iv. Emergent use

Emergent use refers to "using the technology in ways not recognized prior to its implementation within the work context or not feasible until after enhanced functionalities are identified and developed" (Saga and Zmud, 1994 as cited in Hsieh & Zmud, 2006 pg 5.). Wang and Hsieh (2006) state that emergent use refers to using a technology in new ways to support an individual's tasks. These authors argue that emergent use, feature extension, intention to explore and trying to innovate with IT all have the central theme of using the system innovatively. Extended use affects emergent use because the more the user engages with the technology, the more they understand what the technology is capable of (Wang & Hsieh, 2006). This then provides a solid base for them to start being creative and innovative with the system (Wang & Hsieh, 2006).

### v. Feature Extension

Jasperson et al. (2005) define post-adoptive behaviours in the context of exploring with different features the technology has to offer. They argue that after an individual, has begun to use the technology, an awareness of the potential uses of the different features starts growing. An individual then actively chooses to explore and experiment with the different features available (Jasperson et al., 2005).

Feature extension specifically relates to the way in which users discover ways to apply features in a way that was not originally intended (Jasperson et al., 2005). For example, a user of online banking system can choose to transfer money across their different accounts using a specific functionality. They can expand beyond the scope of this and use the functionality to start budgeting, a service that was not originally intended for that purpose (Saeed & Abdinnour-Helm, 2013).

Jasperson et al. (2005) argue that a feature centric view of technology is valuable as it is the specific features in technology that influence and determine work outcomes. Features reflect the core of the technology and, collectively, its identity. Examining individual post-adoptive behaviour at a feature level of analysis increases understanding of how and why individuals use different features and what value they extract from such features (Jasperson et al., 2005).

### vi. Intention to explore

Intention to explore refers to individuals' intent to find new ways of applying IT to their work (Nambisan, Agarwal & Tanniru, 1999). Depending on the perceived value and benefits they think they will get from using the system, users begin to explore to see how the IS can best support their work (Nambisan et al. 1999). They begin to make an active effort to find new ways to use the IS (Abdinnour-Helm & Saeed, 2006). This often results in innovative ways of using an information system which is similar to trying to innovate with IT. Saeed and Abdinnour-Helm (2013) use the example of online brokering where users have the ability to conduct online trade. Exploratory usage would entail the users using the information for uses other than online trading for example tax preparation and the assistance of investment goals (Saeed and Abdinnour-Helm, 2013).

### vii. Trying to Innovate with IT

Ahuja and Thatcher (2005) introduced a similar concept to intention to explore namely 'trying to innovate with IT'. This refers to users finding different and innovative ways of using an information system (Ahuja & Thatcher, 2005). As users become more confident and accustomed to an IS they begin to find new ways of using the technology and ultimately discover innovative uses. For example, users discover new features in email / spreadsheets to make their jobs more efficient (Ahuja & Thatcher, 2005).

### viii. Integrative use

Integrative use is not depicted as a post adoption usage behaviour in the framework by Hsieh and Zmud (2006) – Figure 2, but has been found to be one by Abdinnour-Helm and Saeed (2006). These authors argue that integrative use involves how well assimilated the Information System is into the work practices of the user (Abdinnour-Helm and Saeed, 2006). Users begin to see the IS as an integral part of their work and how they accomplish it. Integrative use is defined as the extent to which the users effectively integrate the IS into their work systems (Abdinnour-Helm and Saeed, 2006).

An example of integrative usage is where a user utilises an online brokerage platform for trading i.e. buying and selling shares. The user sees this online brokerage platform not only for trading but also very integral to monitoring share prices, identifying good stocks to buy and ultimately making a profit from the trading (Abdinnour-Helm & Saeed, 2006). These authors argue that integrative usage captures the utilisation of technology by a user to perform a process end to end i.e. from initiation to completion.

Table 3 summarises each post adoption usage behaviour and gives the definition that will be applied in this study.

| Post adoption usage Behaviour | Definition |
|---|---|
| **Routinized Stage** | |
| 1. Routinized / Habitual Use | The state where system use is no longer perceived as out-of-ordinary but becomes part of an individual's behavioural routine / habit (Hsieh & Zmud, 2006). |
| 2. IS Continuance | Refers to users' behaviour to continue using the system (Bhattercherjee, 2001). |
| **Infusion Stage** | |
| 3. Extended / Deep Usage | Extended use refers to both the frequency (how often the technology is used) and breadth of the IS (the different features of the technology used by the individual). Also refers to the extent to which users apply the technology features to support task performance (Abdinnour-Helm & Saeed, 2006). |
| 4. Emergent Usage | Refers to using the technology in ways not recognized prior to its implementation or not feasible until after enhanced functionalities are identified and developed (Hsieh & Zmud, 2006) |
| 5. Feature Extension | Relates to the way in which users discover ways to apply features in a way that was not originally intended to (Jasperson et al., 2005) |
| 6. Intention to Explore | Refers to a user's willingness and determination to find new ways of applying IT to work tasks (Nambisan et al. 1999) |
| 7. Trying to innovate with IT | Refers to users finding different and innovative ways of using an information system such as discovering new features. (Ahuja and Thatcher, 2005) |
| 8. Integrative usage | Defined as the extent to which the users are able to effectively integrate the IS into their work systems (Abdinnour-Helm and Saeed, 2006). |

Table 3: Definition of post adoption usage behaviours

## 2.5 Influences on post adoption usage behaviours in the context of m-health pregnancy support applications.

This section of the report shall draw on several studies to discuss the influences on post adoption usage behaviours in the context of m-health pregnancy support apps. Specifically, it shall draw on the following studies: studies done on usage of m-health pregnancy apps; studies done on usage of Internet by pregnant women; studies done on usage of health apps in general. The section will then conclude with a consolidated view of the influences which will then be used as a guideline for investigation into the various influences in the context of this study.

### (i) Cultural diversity and language

'My Pyramid for Moms' is an online nutrition tool developed in the USA for pregnant women. It factors in balanced nutrition, healthful dietary habits and proper weight management for pregnant women (Sheih & Carter, 2011). Zoellner, Bounds, Connell, Yadrick, and Crook (2010, as cited in Sheih and Carter, 2011) found that linguistic and cultural diversity had an impact on how pregnant women interacted with the tool. Specifically, they interviewed pregnant African American adults living in the Mississippi Delta region. They found that individual-level factors (disliked food items, preference, tradition or customs) rather than environmental-level factors (cost, lack of availability) were more frequently mentioned by the study participants as the reasons why they did not conform to the MyPyramid nutrition recommendations (Sheih & Carter, 2011). These studies suggest that different populations use online tools in diverse ways.

Alnasser, Alkhalifa, Sathiaseelan, and Marais (2015) examined what overweight women want from an app in Saudi Arabia. The results showed that the women overwhelmingly indicated that they would prefer an Arabic app. The women stated that they had difficulties relating to international apps because of language, social and cultural context. The majority of women who had tried international diet apps discontinued using them as they could not relate to the food and exercise regimes being put forward by the apps. The women stated that some of the food they were not allowed to eat in their culture and they were unable to walk as per the app recommendations because they were situated in very hot conditions (Alnasser et al., 2015). This study also illustrates how culture and language impacts usage of apps in general.

### (ii) Online Support

Romano (2007) argues that pregnant women seek support, validation and encouragement from communities around them. Women used to be primarily home-based and as such had a sense of community with other women and children. However, society has shifted to women from women being home-based to being in the workforce. This erodes the support and sense of community that women once had. As such, women are now turning to online communities where they can share experiences, ask questions and get information (Romano, 2007).

These online communities allow for women to come together over a theme such as pregnancy and share experiences such as pregnancy complications and symptoms (Romano, 2007). Pregnant women are able to seek support and go through experiences with other group members. Ley (2007) argues that these online support groups offer a therapeutic space for pregnant women. Cohen and Raymond (2011) argue that online forums play a central role in pregnant women's lives as they receive emotional support, information about their pregnancy and most importantly shared experiences with other people in the same condition. Cohen and Raymond (2011) further argue that pregnant women seek a yardstick for the symptoms they go through during their pregnancy and are reassured when they share experiences with other pregnant women.

Similarly, Lagan et al., (2011) argue that online forums help pregnant women gather in a virtual landscape where they can share experiences, ask questions, or provide emotional support. The women in their study showed that pregnant women used online forums to lean on each other and provide support to each other (Lagan et al., 2011). The majority of pregnant women indicated they were able to share their experience on the forums and able to get a sense of what was normal or not when they interacted with other pregnant women. This made them feel reassured as they were able to confirm that the symptoms they were experiencing were normal during pregnancy (Lagan et al., 2011).

However, Weston and Anderson (2014) found that a negative view of discussion or online forums was portrayed in their study of how pregnant women used the Internet. They found that some women felt peer-pressured and it can become competitive on the forums. For example, some pregnant women forums discussed what baby products they were buying for their babies and some felt a need to get those products as they felt left out (Weston and Anderson (2014).

(iii) **Privacy**

Dennison et al. (2013) looked at usage of smartphone apps to change health behavior. They found that participants did not use app features where their information could be shared on social media sites such as Facebook. Participants voiced that they did not feel comfortable sharing their personal information on public platforms. A major concern raised was the app accessing their GPS to find out about their location. Most participants did not trust that the apps would keep their health data private and above all secure from third parties (Dennison et al., 2013). This study highlights how some people doubt that their information is private and secure on smartphones. This influence will be investigated in this study to see whether it is applicable in the context of m-health pregnancy support apps.

Lagan et al. (2011) found that anonymity encouraged pregnant women to participate in the forums. Pregnant women felt free to ask questions and receive support as they were not known on the forums. This was particularly true when they wanted confidential advice (Lagan et al., 2011).

### (iv) Level of doctor support and infrequency of antenatal visits

Lagan et al. (2011) found that most pregnant women who searched for information online did so because health professionals did not give them sufficient information. The respondents in their study indicated that health professionals did not have time to explain in detail the things that mattered to them. Additionally, some respondents felt that their doctors were too busy and they used the appointments as tick box exercises rather than discussion around their pregnancy. They reported that 48.6 % reported dissatisfaction with the information that they received from their doctors and 46.5 % reported a lack of opportunity and time to ask questions (Lagan et al., 2011).

Similarly related to level of doctor support is the infrequency of antenatal visits. Antenatal visits are conducted during certain periods of the pregnancy to ensure that both the baby and mother are doing well. This appeared to have an influence on Internet usage amongst pregnant women (Lagan et al., 2010). These scholars found that where the respondents had to wait for a long time in-between their appointments, they turned to the Internet a lot. Where women had concerns during the time between their gynaecologist visits, they turned to the Internet for support, reassurance or information (Lagan, et al., 2011)

### (v) Convenience

In their study to explore young adults' perspectives on apps relating to health behavior change, Dennison et al., (2013) found that participants rated apps highly for convenience and efficiency. Participants noted that they were able to access a wealth of information quickly as they always had their phones with them and they could access information 'on the go'. However, participants noted that where the apps did not integrate well with their phones, for example draining battery power or taking up memory space they did not continue using them. Additionally, they did not have patience for those that were time consuming to set up and interact with (Dennison et al., 2013).

Lagan et al., 2011) found that pregnant women specifically valued the ability to go online at anytime and anywhere. They commented that the Internet was fast and immediate and therefore they did not have to wait to schedule a doctor's appointment or for the doctor to return their calls. The women also noted that they used the Internet for a lot of activities ranging from shopping to studying so they naturally used it for their pregnancy (Lagan et al., 2011).

In general smartphones are providing a platform for individuals to access information real-time and are growing at an unprecedented rate (West, 2012). In Sub Saharan Africa, South Africa leads in app downloads with 34% of phone users making downloads from app stores (Geopoll and World Wide Worx, 2015).

### (vi) Quality and reliability of Information

In their study on the perceived value of the Internet amongst pregnant women and midwifes, Weston and Anderson (2014) found that pregnant women valued the information they received from the Internet and therefore used it as an information source. Similarly, Larsson (2009) and Kavlak et al. (2012) found that women trusted the information they received from the Internet and rated it as accurate, factual and reliable.

Lagan et al. (2011) found that pregnant women preferred sites that had a stamp of approval from health authorities or well-known medical or academic institutions. They found that pregnant women trusted these supported sites. Similarly, Kavlak et al. (2012) found that the criteria with which pregnant women evaluated the information they found on the Internet included whether the writer of the information was a health professional. Additionally, whether the site they used was commonly used by other pregnant women. Larsson (2009) also found that most pregnant women examined the reliability of the Internet site by looking at whether the information given was consistent with other sites.

In their study examining the effects of information system characteristics and perceived usefulness on post adoption usage of information systems, Saeed & Abdinnour-Helm (2008) found a direct impact of information quality on extended usage. Specifically, they found that the quality of the information influences a user's perception of the value of the IS and subsequently drives extended usage. If the quality of information is perceived as valuable, a user will continue using the system. If the quality of information is perceived as not useful, the user will not use the system (Saeed & Abdinnour-Helm, 2008). This was found true in a later study by Lagan et al. (2011) who found that some pregnant women said the information they get from the websites causes stress and anxiety. This is especially true when they were looking at complications relating to their pregnancy. The information presented on the sites tended to present the worst case scenarios and some women in the study reported that they stayed away from such information as it caused them discomfort (Lagan et al., 2011).

### (vii) Perceived usefulness

According to Saeed and Abdinnour-Helm (2008) an information system that provides high quality information will be regarded as useful because it helps the user in making sound decisions and improves their work performance. Lagan et al. (2010) found that pregnant women access the Internet for information and control over decisions affecting their pregnancy. Half of the women in their study used the Internet during their pregnancy to either confirm current knowledge or reinforce a decision they had made. Additionally they also used the Internet when information they received from their health care professional was vague. In a further study in 2011**,** Lagan et al. found that the Internet provided pregnant women with information on options and consequences with regards to their pregnancy. It therefore gave them a better understanding of the choices available to them (Lagan et al., 2011)

In their study of employees' extended use of complex information systems, Wang and Hsieh (2006) found that employees are more likely to try more features and explore how to use an IS when they perceive the system as useful and able to assist them in their work. As such these employees engage in extended usage behaviours as they believe that the system can enhance their job performance. Wang and Hsieh (2006) argue that when individuals value a system and its usefulness, they will become enthusiastic about using the system as they know they will derive benefits from it.

Bhattercherjee (2001) developed the IS continuance model, which posits that there are three main factors that drive an individual's intention to continue using a system. These factors are perceived usefulness, confirmation of expectation, and satisfaction. The model posits that perceived usefulness directly influences IS continuance intention. If users are convinced that the system supports their daily tasks they will extend usage and begin to experiment how to use the system (Bhattercherjee, 2001).

Similarly, Saeed and Abdinnour-Helm (2008) examined the effects of information systems characteristics and perceived usefulness on post adoption usage behaviours. They found a strong linkage between IS usefulness and exploratory usage. According to these authors one probable reason for this is that once a user becomes proficient they can begin to discover new ways of doing things. They argue that users will start exploring how to use the technology in addition to expanding the frequency of use of the features of the IS currently in use (Saeed & Abdinnour-Helm, 2008).

**(viii) Ease of Use**

Technology Acceptance Model (TAM) posits ease of use as the extent to which an individual believes that using a system will be free of effort (Venkatesh & Davis, 2000). The model argues that perceived ease of use, and perceived usefulness are important factors in explaining system usage. Ease of use characteristics include amongst other things how easy it is to navigate the system; how easy it is to access various functions in the system; how intuitive the system is; how user friendly the system is; and if the system is clear and easily understandable (Legris, Ingham & Collerette, 2003). This influence will be investigated in the context of this study as previous research has shown that ease of use contributes to technology usage (Legris, Ingham & Collerette, 2003).

The Theory of Planned Behaviour (the TPB) may be also used to explain usage behaviours in the context of IS systems. This theory argues that individual's intentions to perform different kinds of behaviours can be predicted from various factors including attitudes, subjective norms, and perceived behavioural control (Venkatesh, Brown, Maruping, & Bala, 2008). Perceived behavioural control is the sum of a sense of users being in control over a behaviour and how they perceive it is difficult or easy to perform the behaviour (Venkatesh, et al., 2008).

Figure 2 summarises the above eight influences on post adoption usage behaviours in the context of m-health pregnancy support apps. It shall be used as a guide for the interview questions.

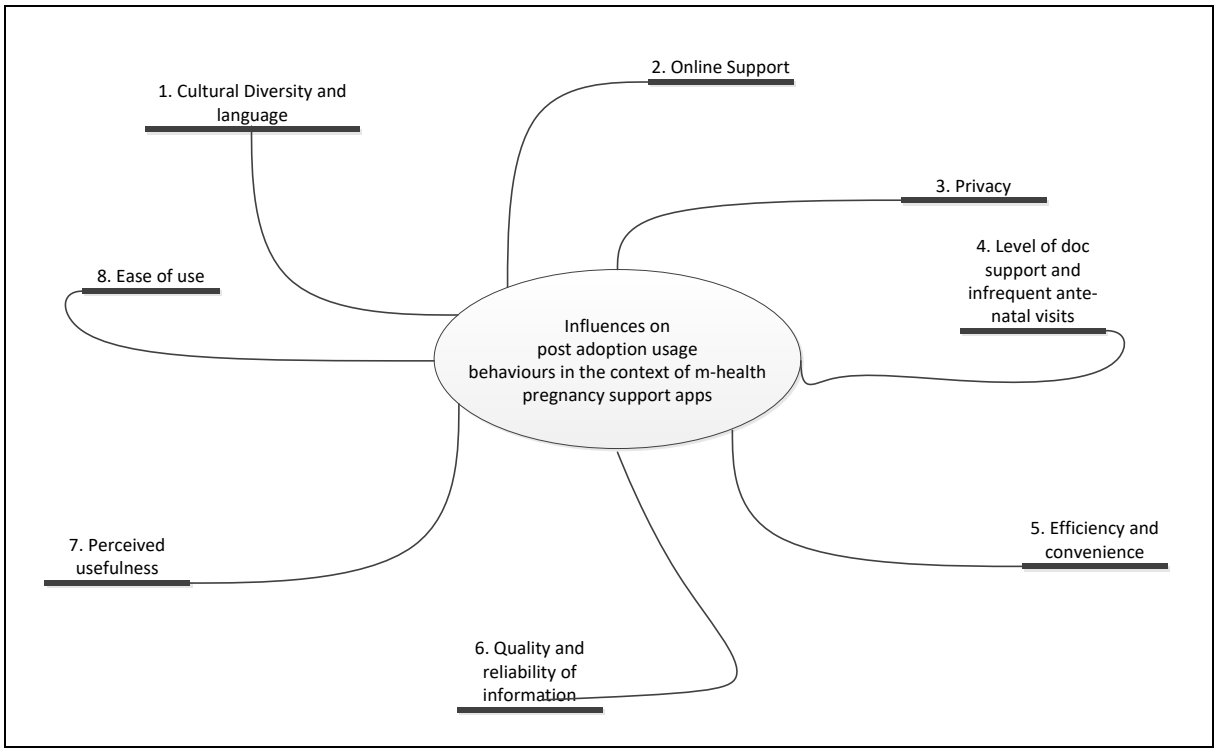



Figure 3: Influences on post adoption usage behaviours derived from literature

## 3. Research Design

This chapter provides detail around how the research was designed. The chapter begins with a discussion around the research philosophy that was followed. It then moves on to discuss the research approach and the research method taken for the study. The chapter then details the data collection technique used in the study and describes how Miles and Huberman's (1994) iterative process for qualitative data analysis was applied to analyse the data. The chapter then discusses the steps to ensure rigour when conducting the study and discusses the ethical considerations taken into account. The chapter then concludes with a summary of the chapter.

### 3.1 Research Philosophy

According to Orlikowski and Baroudi (1991), within information systems research there are a range of philosophical lenses available to study information systems phenomena. These philosophical lenses are positivist, interpretivist and critical. This section of the report shall discuss each of these lenses and in doing so will discuss why the interpretivist lens was best suited for this study.

Studies that adopt a positivist lens involve testing theory with an aim to increase predictive understanding of the phenomena (Orlikowski & Baroudi, 1991). These studies usually hold formal propositions, independent and dependent variables which can be tested and formulation of hypotheses. The results from these studies are usually generalised to a stated population. Information systems researchers adopting a positivist philosophy assume that an objective physical and social world exists that can be measured and classified (Orlikowski & Baroudi, 1991). The role of the researcher is to uncover this objective physical and social reality by devising precise measures that will detect and gauge those dimensions. This is usually done by explicitly defining research constructs which are then measured with a research instrument (Orlikowski & Baroudi, 1991).

Studies that adopt an interpretive lens involve trying to understand meanings behind certain phenomena (Walsham, 2006) This philosophy is based on the social construction of reality i.e. how people create and understand their own interpretation of the world (Walsham, 2006). Interpretive research is based on the perspectives of the respondents involved and relies on the fact that assumptions are not objective rather they are subjective as each person is shaped by human experiences and social contexts. Social context refers to the beliefs, culture and values of people (Walsham, 2006). This contrasts with the positivist philosophy that assumes objective techniques such as standardized measures can be used for research (Bhattercherjee, 2012).

Studies that adopt a critical lens are interested in critiquing existing social systems and revealing any contradictions and conflicts (Orlikowski & Baroudi, 1991). They aim to uncover deep-seated and structural contradictions within social systems and challenge the status quo when it comes to these systems. The end result is that such studies believe they can help to overcome oppressive social relations (Orlikowski & Baroudi, 1991)

Having analysed these three philosophical lenses, it was decided to use the interpretive philosophy lens. This philosophy was seen suitable for the following reasons:

- Although quantified evidence can be powerful, it can fail to reveal understanding behind certain experiences (Walsham, 1995). This study aims to explore in-depth pregnant women's experiences and perceptions of using the m-health pregnancy applications.
- It is fit for exploring hidden reasons behind complex and interrelated social processes (Bhattercherjee, 2012, Walsham 1995). It can be argued that pregnancy in itself is a unique condition and is complex. To understand the complexity and interrelated social processes around it, an interpretive approach will be fitting as the researcher can uncover meanings.
- Interpretive studies generally attempt to understand phenomena through the meanings that people assign to them (Walsham 1995). This study is interested in understanding the subjective meanings around post adoption usage behaviours, understanding how pregnant women engage in these behaviours and subsequently how these behaviours are sustained during their pregnancy. Interpretive studies aim to uncover this subjective reality with the intention of understanding how and why people view the social world in a particular way.

The positivist philosophy was considered unsuitable as the aim of the study to gain a deep understanding of why pregnant women engage in post adoption usage behaviours in the context of m-health pregnancy applications. Additionally, the study seeks to gain an understanding around the influences on these behaviours. The critical philosophy was also considered unsuitable for this study as the researcher is not interested in critiquing existing social systems and revealing any contradictions and conflicts.

Having discussed the research philosophy that will be adopted for this study, this section shall move on to discuss the research approach.

### 3.2 Research Approach

Interpretive studies lend themselves to qualitative approaches whereby researchers explore the how and why questions surrounding a particular phenomenon (Walshman, 1995). The research approach employed by qualitative researchers is usually inductive meaning that theory is developed based on the data they have collected. Deductive reasoning is concerned with testing or confirming hypothesis whilst inductive reasoning is more open-ended and exploratory (Bhattercherjee, 2012). Qualitative researchers usually do not have hypotheses stated upfront like quantitative researchers, however, they can be guided by a theory which acts as a framework for their study (Orlikowski & Baroudi, 1991).

This study was guided by an existing framework namely Hsieh and Zmud's (2006) mapping of post-adoption use behaviours to IS Implementation stages. This framework assisted the researcher in categorising the various post adoption usage behaviours. Furthermore, the influences on post adoption usage behaviours were sourced from various literature on general ICT usage amongst pregnant women.

These influences were used to see if they were relevant in the context of m-health pregnancy support applications.

Based on this, it can be argued that the study was partly deductive and inductive. The study was partly deductive, as it used an existing framework to explore the different post-adoption usage patterns. Additionally, it used existing literature as a guide for understanding the influences around such behaviours. The study is partly inductive, as the researcher will be open to concepts that emerge from the data that may not be in the framework or the literature guiding the research.

Miles and Huberman (1994) term this partly deductive and inductive approach as the middle range approach. Patton and Cochran (2002) extend further on this middle range approach and argue that this process uses inductive reasoning where themes emerge from the data but also involves deductive reasoning where concepts are drawn from theory and previous studies. These authors argue that this method is very useful for qualitative research as it can uncover a lot of meanings and viewpoints (Patton & Cochran, 2002).

This chapter shall now move to discuss the research method employed in the study.

### 3.3 Research Method

There are four types of research methods that can be used in qualitative research. These are action research, case study research, ethnography and grounded theory (Myers & Avison 1997). This section shall briefly discuss each of these methods to show how the researcher arrived at a decision on the method to take.

Action research involves a researcher becoming a participant in the study for example a participant in the implementation of a system. The researcher is not merely an observer but they fully participate in the research. They also simultaneously evaluate a certain intervention technique. (Benbast, Goldstein & Mead, 1987; Myers & Avison,1997; Runeson & Host, 2009). Ethnographic research involves a researcher fully immersing themselves in the lives of the people they study. The researcher here aims to experience the phenomena studied to understand the social and cultural context (Myers & Avison, 1997).

Grounded theory on the other hand, is a research method that seeks to develop theory that is grounded in data. It is an inductive approach that allows theory to be developed and requires continuous interplay between data collection and analysis. The researcher must adopt a systematic method to gathering and analysing the data (Myers & Avison, 1997). Case study is another research method that can be used in qualitative research to try to understand, or interpret, phenomena in terms of the subjective meanings people bring to them. Yin (1994) specifically states that a case study is defined as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the

boundaries between phenomenon and context are not clearly evident" (Yin 1994, p.13). According to Myers & Avison (1997) case study research is the most common qualitative method used in information systems. Case studies are used for exploratory purposes where researchers are interested in finding out what is happening, seeking new insights and generating ideas and hypothesis for new research (Runeson & Host, 2009).

Having analysed each of the four research methods, it was decided that the case study method was most appropriate for this research. The following sections justify why the case study research was considered applicable for this study.

**Context**

According to Darke, Shanks, & Broadbent (1998) case study research is appropriate where:

- A contemporary phenomenon is studied in its natural context.

Gartner (2014) predicted that apps are fast becoming the most popular computing tools for users across the globe. This study aims to investigate the influences around post adoption usage behaviours of these apps. It specifically looks at m-health pregnancy support apps which are fast becoming popular amongst pregnant women (Bert et al., 2016).

- Where existing knowledge is limited

According to Darke et al. (1998), in the context of interpretive research, case study research has often been associated with description and exploration of areas where existing knowledge about post-adoption usage is also limited. In line with this, this study explores the influences around post adoption usage behaviours in the context of m-health pregnancy applications. There has been a rise in the adoption of m-health pregnancy apps and research in this field is still limited. This study aims to contribute to this limited knowledge.

- Where research and theory are at their early formative years

Dennison et al., (2013) argue that there is little in depth, qualitative research that has been done which allows users to describe their experiences, views, and usage patterns with m-health applications. Helander et al. (2014) agree with this notion and argue that little research exists about usage behaviours of health-promoting apps. This research aims to fil these gaps by specifically looking at m-health pregnancy support apps.

**Holistic Case Study versus Embedded Case Study**

Runeson and Host (2009) put forth two types of case studies namely holistic case study and embedded case study. Holistic case studies are studies where the case is studied as a whole. Embedded case studies contain multiple units of analysis which are studied within a case. Single cases allow researchers to investigate a phenomenon in depth whereas multiple case studies allow cross-case analysis and comparison. They also allow for greater understanding as there are comparisons (Darke et al., 1998).

According to Runeson and Host (2009), the decision on whether to define a case as whole or embedded depends on what the researcher defines as the context and research goals. These authors give an example of two projects which are studied in two different companies in two different application domains, both using agile practices. The project can be seen as an embedded case study if the context is software companies and the research goal agile practices (Runeson & Host, 2009). Each company will therefore be a unit of analysis in the embedded case study. On the other hand, if the context is the specific company or application domain, then each will be a separate holistic case. Refer to Figure 4 for an illustrative diagram on holistic case study versus embedded case study (Runeson & Host, 2009)

In light of this, this study took the embedded case study design where the context was described as influences on post adoption usage behaviours of m-health applications. Each pregnant woman constituted a unit of analysis and analysis was done to assess similarities and differences across the units of analysis. According to Dark et al. (1998), a unit of analysis be an individual, a group or an organisation. In this case, it is each pregnant woman to be interviewed.

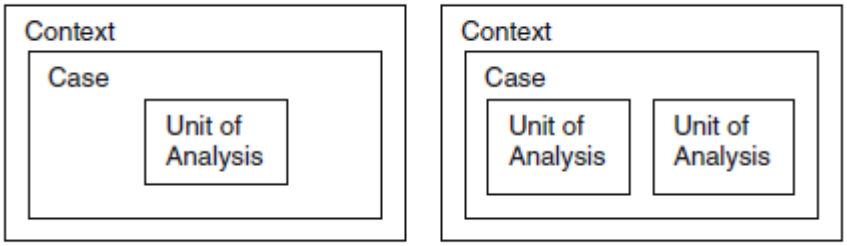



Figure 4: Holistic Case Study versus Embedded Case Study (Runeson & Host, 2009)

Having discussed the case study as the primary research method, this section shall move on to discuss the data collection method employed in the study.

### 3.4 Data Collection

According to Benbasat et al. (1987) there are various methods of data collection researchers can apply when using case studies. A researcher can choose to employ a single method or multiple methods. Yin (1994) identifies several methods that can be applied to interpretive research specifically case studies. These include analysis of existing documentation, analysis of records, interviews, direct observations and physical artefacts. Ultimately the researcher should choose the method that will enable them to get a richer understanding of the phenomena at hand (Benbasat, et al, 1987).

Yin (994) argues that interviews are crucial sources of information for case study research. They are the main data source for interpretive case studies as researchers can assess respondents views and interpretations over a specific phenomena (Walshman, 1995). Myers and Newman (2007) further state

that there are various types of qualitative interviews ranging from structured interview, to unstructured or semi-structured interview and finally group interview. Again the chosen interview choice depends on which one will assist the researcher in getting a richer understanding of the phenomena at hand (Myers & Newman, 2007).

This research collected data using open ended semi-structured interviews. According to Darke et al., 1998), an open-ended interview allows for respondents to share their views and experiences as well as to reflect on events and actions. Furthermore it allows for the respondents to give their insights into these occurrences. Based on this, this technique was chosen for the following reasons:

- It allowed the respondents to express their views in an unrestrictred manner as the questions were semi structured and allowed for open ended responses.
- It allowed the respondents to give insights into their usage patterns
- It allowed the respondents to reflect on their actions when using m-health apps
- It allowed for the researcher to probe areas that she thought were interesting.

A set of semi-structured questions was designed to guide the interview process -refer to Appendix A. The questions were based on the literature discussed in Chapter two.

- The first part of the questions dealt with the demographic profile of the respondents. Demographic questions such as age, living area and education level amongst others were asked. The demographic questions were guided by the literature on characteristics of pregnant women who use the Internet/ mobile phones to source information ( See Table 2).
- The next part of the interview focused on post adoption usage behaviours using the framework provided by Hsieh and Zmud (2006) - Figure 2: Mapping of post-adoption use behaviours to IS Implementation stages.
- The researcher asked the respondents about influences on their behaviours as they discussed each post adoption usage behaviours. Refer to Figure 3 - Influences on post adoption usage behaviours derived from literature.

Twelve pregnant women were interviewed in total and the researcher relied on the snowballing technique whereby at the end each interview, they asked the respondent if they knew other pregnant women they could interview. Crouch & McKenzie (2006) argue that including less than twenty respondents in a qualitative study assists the researcher in maintaining a close relationship with the information and thus improve the open and frank exchange of information. Guest et al. (2006) further argue that data saturation usually occurs within the first twelve interviews where the same themes keep on coming up. They argue that very few new themes are likely to emerge after twelve interviews.

The interviews were audio recorded and transcribed verbatim. According to Darke et al., (1998) audio recording of interviews provides complete description of the interviewees' responses and comments. Furthermore it allows the researcher to play back any areas they may have missed when taking notes.

From there on data analysis was conducted. This will be discussed in the next section (Section 3.5) in detail.

### 3.5 Data Analysis

According to Alhojailan (2012), for any study that seeks to uncover interpretation and meaning, thematic analysis is appropriate for the following reasons:

- It provides the researcher with a systematic way of working through and analysing the data by coding and categorising the data logically into themes.
- The researcher can analyse the frequency of the theme which will allow more accuracy thereby giving the research deeper insights.
- The nature of qualitative research is that it is diverse and requires understanding of each data element. Thematic analysis allows for a researcher to understand the phenomenon at hand in more detail.
- Thematic Analysis allows the researcher to determine precisely the relationships between concepts and compare them with the replicated data.
- It allows linking between the various concepts and opinions of the subjects.

Based on this, this research adopted thematic analysis as an analytical tool. Specifically, this study used the iterative model for qualitative data analysis by Miles and Huberman (1994) in order to do thematic analysis – refer to Figure 5. Miles and Huberman (1994) argue that the process of analysing data is ongoing and iterative rather than a linear process. They argue that the researcher must employ certain methods to analyse the data namely data reduction, data display and verifying and drawing conclusions. The next paragraphs shall discuss each of these methods and how they were applied to this study.

- *Data Reduction*

Miles and Huberman (1994) argue that after data collection, the researcher must employ data reduction which refers to selecting and simplifying the data into themes, codes and sub codes. With reference to this study, the initial coding stage entailed the researcher attaching labels to various text segments in the transcribed interviews. Refer to Appendix B for examples of initial codes generated. Those labels were based on text that answered the research questions i.e. post adoption usage behaviours and influences around these. From there the analysis progressed iteratively to a set of themes that could be related back to the research questions and previous literature. The data was then compared with the emerging theme labels and further refined by merging and removing redundant themes. An analysis was also done between the various themes to see if there were any relationships.

- *Data Display*

Miles and Huberman (1994) argue that from data reduction, the researcher must present the data in a way that relationships can be seen. Data display is described by Miles & Huberman (1994) as, “An organised, compressed, assembly of information that permits conclusion drawing and action” (p. 11).

The advantages of data display are that it gives a clear picture of the research; it avoids ambiguity with the data; and finally, it allows related concepts to show clearly (Miles & Huberman, 1994). Data display methods include highlighting narrative text and quotations, tabulating differences and similarities, graphs etc. (Miles & Huberman 1994; Yin 1994). To make it easier, the data was put into an excel spreadsheet containing the themes, links to data and the codes assigned. This made it easier to read the data and categorise it.

- *Verify and draw conclusions*

The third step according to the iterative model for analysing data comprises of drawing conclusions from the data (Miles & Huberman, 1994). The data was then linked back to the original raw data to ensure that most of it had been categorised. From there on, a reflection was done on the research questions and conclusions were drawn to see how the data answered the questions.

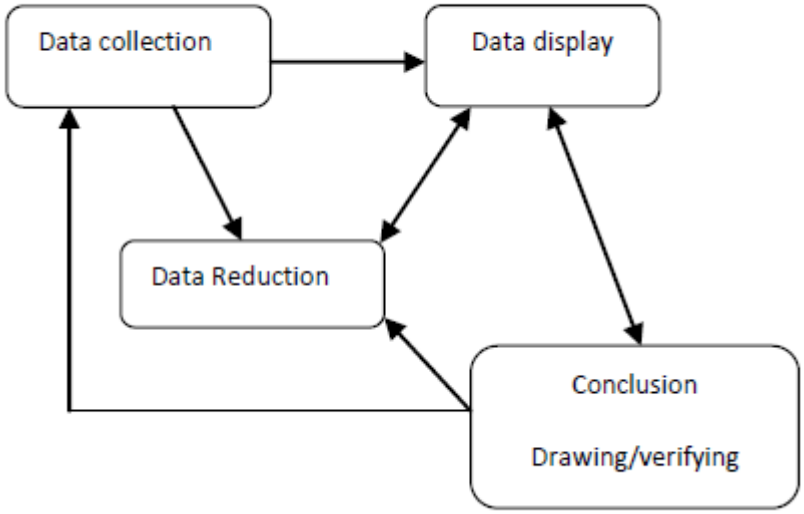



Figure 5: Iterative model for qualitative data analysis (Miles & Huberman, 1994)

### 3.6 Rigor in Interpretive Research

Long and Johnson (2000) argue that traditionally rigour has been concerned with the concepts of reliability and validity. These two concepts are well used and established in the positivist paradigm, however their use in qualitative research has been questioned. In positivist research, reliability is concerned with the ability of the instrument to measure consistently whilst validity is concerned with the extent to which the instrument measures what it is supposed to measure (Long & Johnson, 2000). Applying these two concepts to interpretive research can be done as follows:

*Reliability in qualitative studies*

Brink (1991, as cited in Long & Johnson, 2000) argues that reliability in qualitative studies can be measured using three specific tests depending on the type of qualitative study. The first of these tests

is *stability* which is gained by asking respondents identical questions at different times. This is to gauge whether the answers given are consistent. The second test is *consistency* which refers to the integrity of issues in an interview displayed by respondents' consistency in answering questions. The third test is *equivalence* which refers to using alternative forms of a question with the same meaning during a single interview, or having two researchers observe a specific phenomenon (Brink 1991, as cited in Long & Johnson, 2000)

*Validity in qualitative studies*

Validity in qualitative studies refers to matching what is reported by the respondents to the phenomenon at hand (Long & Johnson, 2000). Interpretive research is based on the perspectives of the respondents involved. It relies on the fact that assumptions are not objective, rather they are subjective as each person is shaped by human experiences and social context (Walshman, 1995). Unlike positivism where certain criteria are applied and the instrument is validated to ensure that it measures what it is supposed to measure, with qualitative research, results are adequate if analytic interpretations accurately reflect the phenomena that researchers claim to represent (Hall & Stevens 1991 as cited in Long & Johnson, 2000).

Darke et al. (1998) argue that it is critical that the researcher establishes credibility to the reader by describing in detail what methods they took to ensure reliability and validity. Furthermore, it is essential that they describe in detail how the results were arrived at i.e. data analysis (Darke et al., 1998). The next sections will discuss the methods employed by the researcher to ensure that there was rigour in the study.

- **Interviews**

According to Myers and Newman (2007) the interview is a socially constructed event and can be subject to various pitfalls and problems ranging from ambiguity of language, to hawthorne effects, to lack of time. In order to minmise these pitfalls during the interview process, the researcher followed Myers and Newman's (2007) guidelines for conducting interviews in IS research. These authors explicitly stated seven guidelines which are highlighted in the table below and each of these is then referenced as to how it was applied to this study.

| | Interview Guideline | How it was applied to this study. |
|---|---|---|
| 1 | *Situating the researcher as an actor*.<br>Myers and Newman (2007), argue that the researcher must situate themselves and the interviewee as they start the interview. The researcher must state who they are, what role they playing, background, experience etc. This information is useful for readers when assessing the validity of the findings. | The researcher introduced themselves and gave the respondents a brief background on why the study was being conducting. In doing so they mentioned their experience and the role they were playing. |
| 2 | *Minimise social dissonance.*<br>Myers and Newman (2007) argue that in order to minimise social dissonance i.e. anything that may lead to the respondent feeling uncomfortable, the researcher must play the part which involves managing first impressions, dressing appropriately and using the appropriate jargon. This will ultimately ensure that the respondents feel comfortable in disclosing information. | To make the respondent feel at ease the researcher chatted to them briefly on how the pregnancy was going to date and how they were feeling in general. This was made to ''break the ice'' and to help the respondents feel at ease. The researcher used the appropriate jargon as they had used m-health pregnancy support apps themselves prior to conducting the interviews. |
| 3 | *Represent various "voices"*.<br>Myers & Newman, 2007 argue that in qualitative research, it is necessary to interview a variety of people from an organisation so as to avoid elite bias. Miles and Huberman (1994) describe elite bias as ''Overweighting data from articulate, well-informed, usually high-status participants and underrepresenting data from less articulate, lower status ones.'' (p.294) | This specific guideline could not be applied to the study as the study was not in an organisation setting and furthermore, the study relied on the respondents having certain criteria (Table 2). Furthermore, this research made use of snowball sampling leading to higher educated people. |
| 4 | *Everyone is an interpreter.*<br>This guideline is concerned with the fact that researchers must sensitise themselves to the way the respondents interpret the world. Additionally, to the way the researcher themselves interpret their world. This guideline is to sensitize the researchers that everyone is entitled to their own views (Myers & Newman, 2007) | This study aimed to get an in-depth account of how respondents use m-health pregnancy support apps and the influences around them. The researcher sensitised themselves to the fact that each respondent views the world in their own light and as such will have different thought processes from each other. |
| 5 | *Use Mirroring in questions and answers.*<br>Mirroring involves taking the respondents answers and constructing a subsequent question or comment. This allows the researcher to focus on the subject's world and uses their language rather than the researchers. This involves listening, prompting, encouraging, and directing the conversation (Myers & Newman, 2007) | The researcher had open ended questions which allowed the respondent to comment in depth. Where confirmation was needed, the respondent would reword the respondent's answers and ask a question. |

| | Interview Guideline | How it was applied to this study. |
|---|---|---|
| 6 | *Flexibility*<br>Semi structured interviews require flexibility, improvising and openness (Myers & Newman, 2007). As such the researcher, must ensure that they listen to the respondent and explore interesting lines of research although they may deviate from the set script in front of them (Myers & Newman, 2007). | Although the researcher had questions they had noted down to ask as part of the interview, they allowed for flexibility where the respondent(s) touched on a particular subject that was later on in the script. The researcher went along with the interview and once the respondent was done went back to the interview script from where they had left off. |
| 7 | *Confidentiality of disclosures*<br>This refers to keeping transcripts and information confidential and secure. It also involves giving feedback to respondents and checking with them about factual matters (Myers & Newman, 2007) | The researcher assured the respondents that their information would be used solely for research purposes and their responses would be anonymous in the final report. |

Table 4: Application of Myers and Newman (2007) guidelines for interviews in interpretive research

In addition to the above, the researcher considered Guba's (1981) constructs to ensure that the study was trustworthy. These constructs include credibility, transferability, dependability and conformability. Shenton (2004) argues that Guba's constructs have been cited by many qualitative authors and provide a solid base for qualitative researchers seeking to make their studies trustworthy. The next paragraphs shall outline at a high level how these constructs were applied. For full details on how the researcher applied some of these constructs refer to Appendix C – Rigour in qualitative research.

According to Merriam (1998 as cited in Shenton, 2004), credibility deals with the question, 'How congruent are the findings with reality?'. Methods to ensure credibility in qualitative research include adopting research methods that have been well established and employed this area. This study utilised Miles and Huberman's (1994) iterative model of data analysis to ensure that the data analysis process was robust. Other methods include ensuring that frequent debriefing sessions between the researcher and superiors happen during the research period (Shenton, 2004). This author argues that bringing in viewpoints of other people to the study allows the researcher to discuss alternative approaches. It also provides a soundboard for the researcher to test their ideas and interpretations (Shenton, 2004). The researcher in this study worked closely with the supervisor to analyse the data and discuss interpretations.

Transferability in interpretative research refers to the extent to which the findings can be generalized to another context (Shenton, 2004). The study could allow for some level of transferability since pregnancy has many common concerns across contexts and the apps are used by educated women. It can be

argued that the results are likely to transfer, at least to some degree to other pregnant educated women in similar context say in other African cities.

Dependability entails providing adequate details about the area of study and research methods used so that if the study was to be repeated similar results would be obtained (Shenton, 2004). This implies that the researcher must disclose in full the processes they used to do the research i.e. research design (Shenton, 2004). This chapter has detailed the research approach, data collection and data analysis methods used for the study. This allows for readers to understand the report and the methods employed in the research.

The concept of confirmability is concerned with the extent to which the qualitative investigator is objective during the data collection process (Shenton, 2004). The researcher must ensure that the findings from the study are based on the experiences and viewpoints of the respondents rather than their own viewpoints (Shenton, 2004). This can be done by using methods such as triangulation or audit trail. Triangulation involves looking at multiple sources of data for example i.e. not just interviewing respondents but also doing document analysis or observations (Shenton, 2004). Audit trail involves ensuring that the research is documented step by step so that an observer or reader will be able to follow the methods logically (Shenton, 2004). This study made sure that there are verbatim transcriptions of interviews, accurate records of contacts and interviews, and clear notes on theoretical and methodological decisions

Having discussed the rigour employed in this study to make it credible, this chapter shall turn to look at ethical considerations considered for this study.

### 3.7 Ethical Considerations

According to Myers and Newman (2007) it is important for researchers to maintain ethical standards when conducting interviews. These ethical standards include:

- Permissions

This permission is two-fold. Researchers conducting interviews must seek permissions from the appropriate ethics approval board (Myers & Newman, 2007). Researchers also need to seek permission from the interviewees who will be involved in the research (Myers & Newman, 2007). This study received ethics approval on 25 August 2016 from the School of Economics and Business Sciences, Wits. The protocol number assigned was CINFO/1130 (Refer to Appendix D – Ethics Approval Form). Each respondent was required to sign a participant consent form to say they consented to the research.

- Respect:

This refers to treating people with respect during the interview and respecting their time and knowledge (Myers & Newman, 2007). The researcher conducted themselves appropriately during each interview

respecting the participants time that they had given up for the research. Participation was entirely voluntary and no incentives were given to the respondents to participate in the research. Additionally, the researcher maintained an open mind and respected the views / experiences of each respondent.

- Fulfilling commitments to individuals:

This refers to keeping participants details confidential and all recorded material and transcripts private (Myers & Newman, 2007). Participants' details were not published as part of the report and all participant's details remained anonymous. This was specified on the consent form. Participants were also informed that the interviews were being recorded and that the information would only be used for academic purposes.

### 3.8 Summary of Research Design

This last section represents a summary of what was discussed in Chapter 3. This has been summarised in Table 5 below.

| Research Design | Angle taken |
|---|---|
| Research Philosophy | - Interpretive |
| Research Approach | - Qualitative |
| Research Method | - Embedded case study design |
| Data Collection | - Semi-structured interviews |
| Data Analysis | - Thematic Analysis using Miles and Huberman (1994) model as a guideline |
| Rigour in Interpretive Research | - Application of Myers and Newman (2007) guidelines for interviews in interpretive research<br>- Application of Guba's (1981) constructs to ensure that the study was trustworthy |
| Ethical Considerations | - Permissions<br>- Respect<br>- Fulfilling commitments to individuals |

Table 5: Summary of Research Design

## 4. Data Analysis and Results

This chapter of the report shall be structured as follows. The respondent's demographic profiles will be discussed first. Secondly the report will report on the findings for each post adoption usage behaviour in line with pregnancy support apps. Finally, the findings around the influences on these behaviours will be reported on.

### 4.1 Respondent demographic profiles

In line with the characteristics described in Chapter 2, section 2.2 on pregnant women who use m-health pregnancy support apps or Internet for health information, the respondents were asked demographic questions on the following: age; living area; education level; work status; number of children and income category. In addition to the demographics suggested by the literature, the respondents were also asked how far they were in their pregnancy as this could have influenced their post adoption behaviours with the apps. They were also asked about the apps they have downloaded to get an idea on which apps are common. Finally, they were asked about their primary language as cultural diversity was found to be a potential influence on post adoption behaviours in the literature review. The full results of the above are disclosed in Appendix E – Respondents Demographics Profile. This section of the paper gives an overview of the respondent's demographic profiles.

**Age:**

Twelve pregnant women were interviewed and their age ranged from age 25 to 36 years. The median age was 31 years. All respondents used smartphones and had downloaded on average 1 pregnancy support app. This finding is consistent with the characteristic mentioned by Kavlak et al. (2012) who found that most pregnant women who are between the ages of 25 and 34 frequently use the Internet to obtain information.

**Living Area:**

Bert et al. (2016) argue that most smartphones users live in urban and suburban areas. Most respondents indicated that they resided in urban areas in Johannesburg with two respondents residing in Cape Town and East London. Johannesburg is considered the economic hub not only for South Africa but for Southern Africa. It is highly urbanised and continues to grow at an unprecedented rate (Odendaal, 2006).

**Education Level:**

From the literature review, high level of education was found to be a major characteristic of pregnant women who use the Internet or smartphones (Bert et al., 2016; Evans, Wallace et al., 2012; Powell et al., 2011; Larsson, 2009; Kavlak et al., 2012; Diaz et al., 2002). In this study, nine respondents stated that they held postgraduate qualifications with two of them holding Masters degrees. Two respondents had undergraduate degrees and one held a diploma. It is important to note that this study relied on

snowballing technique (refer to Chapter 3) and as such the similarity of this demographic profile across the respondents could be a consequence of this technique.

**Work status and number of children:**

Kavlak et al. (2012) found that first time pregnant women who work used the Internet more frequently to obtain information on their pregnancy. In this study, seven women were pregnant with their first child and all of seven of these women stated they were employed. They had all downloaded apps to monitor their pregnancy and source information. Out of the remaining 5 respondents who previously had children, only one stated that they were unemployed.

**Income category:**

Bert et al. (2016) state that majority of smartphone users have a satisfying average income. Most of the respondents reported a satisfactory average income. Only three stated that their income was not satisfactory. One of these women had stated that she was unemployed hence she had no income.

**Pregnancy Term**

With regards to the term in their pregnancy, one respondent was full term (had already given birth), four respondents stated that they were in their final trimester; six respondents were in their second trimester and one respondent in her first trimester. A follow up interview was done 2 months later, with the one respondent who was in her first trimester.

**Apps downloaded**

All respondents used smartphones with Iphone and Samsung being popular. The remaining respondents used Sony, Huawei and LG respectively. Baby Centre was the most popular downloaded app. Respondents reported they downloaded this app as it was the app that came up first when they searched for pregnancy apps. This finding is consistent with Bert et al. (2016) who found that Baby Centre was the most mentioned pregnancy-related application. Other apps downloaded by the respondents included Baby Bump, What To Expect, Baby Kicks, Lullaby, Pinterest, Lullaby Music, Prenatal Lullabies, Ovia and PC (Period Calendar).

**Primary Language**

Seven respondents stated that their primary language was English. The remaining five respondents stated that their native/home languages were Setswana, Shona, Ndebele, Zulu and Pedi. All respondents spoke English regardless of their native/home language.

### 4.2 Findings on Post adoption usage behaviours

The mapping of post adoption usage behaviours to IS implementation phases framework (Figure 2) was used as a basis of understanding post adoption usage behaviours in this study. Specifically, this study focused on the behaviours displayed in the routinisation stage and infusion stage. The various

behaviours displayed at the routinisation stage represent be routine use and IS continuance. The behaviours in the infusion stage include extended usage, deep usage, emergent usage, feature extension, intention to explore and innovating with IT. Integrative usage was another behaviour not depicted on the framework but investigated as part of this study. This section shall report on the findings around each of these post adoption usage behaviour.

### Routinisation Stage

**Routinized / Habitual Use**

To ensure the respondents were routinized and were past the acceptance phase, they were asked how long they were using the apps. Most respondents stated they had been using their apps from the first trimester to current date.

- *'I actually downloaded the app the week I thought I was pregnant. I just chose the app that had the most downloads on google play so that I would feel comfortable as lots of people were using it'* <R12>
- *'I have been using all the apps since I knew I was pregnant. My friends told me about these apps… so I went and downloaded them as soon as I found out I was pregnant.' <R5>*

Out of the five respondents who had stated they had children before, four of them said they had been using the apps since their first child.

- '*I have been using Baby Centre since 2011 – a friend told me about it back then when I was pregnant.*' <R4>
- *'I discovered Baby Centre with my first child. This is my third child so it has been my best friend when I am pregnant. I had my first child 9 years ago, so back then I was on their website.'* <R10>

A follow up interview was conducted with the one respondent who was in her first trimester to ensure she was routinized. When the initial interview was conducted, she was 2,5 months pregnant. A follow up interview was done with her when she was 4 months pregnant.

- *'I downloaded Baby Centre after our initial interview and I am so in love with it. It's the best thing in the world...'* <R8>

**IS Continuance**

Most respondents indicated that they had used the apps continuously from the time they downloaded it. It was found that perceived usefulness did influence their intention to continue using the app. For example, with this respondent they felt that they the app was useful as they could relate to the information they received from it:

- '… *I fell in love with the app and I can relate to what they will be speaking to and I have experienced some of the things they will be telling me like expect this at this time*…' <R4>

Another respondent highlighted the extent of features available on the app as being useful therefore she continued using the app:

- *'…there are forums. I also go to see what the baby looks like at a specific point in time – size of baby, how far the baby has developed, how my body is reacting and also trying to search for diet tips as well. There is also a tool to calculate my due date and a checklist that tells me what I should be doing on a daily basis.'* <R7>

The influence of perceived usefulness will be detailed in greater detail in section 4.3 where we discuss influences on post adoption usage behaviours.

**Infusion Stage**

**Extended Use and Deep Use**

With regards to frequency of usage, respondents reported that they used the apps quite often on a daily basis.

- *'..I use it more than 20 times a day on average – I read a lot of articles.'* <R2>
- *'I used Baby Bump and What To Expect lots of times in the first trimester – I check the app about 5 times a day..<R3>*

Some respondents stated that they used it weekly

- *'I use it for my weekly markets to keep up with my weekly updates. I check the app every Sunday to see how the baby is progressing and if I am up to date with the tests, my body etc…'* <R1>

Respondents reported on spending on average about 20 mins on the app as they were exposed to a lot of information:

- *'When I am on Pinterest, I spend approximately every 20 mins to 30 mins or even an hour because it shows me a lot of things I don't even know about.'* <R5>
- *I am usually on the app for 20 minutes. Normally I go onto the portal to see what other women are going through and to see if what I am experiencing is normal or not."*

It was found that those women who previously had children, did not use the apps frequently. However, they did state that with their first child they used the apps more frequently:

- *'This is my second child so I am not as obsessed with it as I was with my first child. With my first child, I went in daily for the updates – I checked everything from food to exercise to how my face was changing with the pregnancy. Now with the second child I go in every now and then and don't bother with the daily updates. I spend 5 minutes or even less on the apps. I kind of like know what is going on since this is my second child.'* <R6>

Additionally, it was found that depending on what stage the women were in their pregnancy, they used the apps more or less frequently. For example, one respondent stated in their first trimester they used

a certain app more than later on in their pregnancy. They stated that they downloaded a kick app later on in their pregnancy as the baby had now progressed and they wanted to see if the baby was kicking:

- '*I used What To Expect lots of times in the first trimester – 5 times a day or so. Baby kicks I use it daily now because I am later on in my pregnancy. All of the other ones I now check on a weekly basis.'* <R3>

With regards to breadth of the IS i.e. the different features of the technology used, most respondents commented they used quite a number of features on the apps.

- *'There are videos that show the baby and there is a blog where I can blog with other moms. It also calculates my due date – it tells me my due date and it counts down for me. It tells me that the baby is the size of something – they liken the baby to a size of a fruit… <R12>*

Extended Usage was also defined as the extent to which users apply the technology features to support task performance (Saga & Zmud, 1993; Schwarz, 2003). It was found that the women did use the information received from the apps to make decisions with regards to their pregnancy especially around concerning symptoms experienced.

- '..*Recently for example I contaminated a respiratory infection from my daughter and I just relaxed at home thinking that it is just a flu. But I then read on Baby Center which told me if you get these symptoms like temperature etc. it can result in pneumonia for the baby etc. so seek attention immediately etc. I then went immediately to the gynaecologist.. If it wasn't for Baby Centre, I would have just sat at home and did my panado, ginger and lemon concoction which would not have been good. It gave me guidance*…' <R4>

**Emergent Use**

As stated in chapter 2, Emergent use refers to "using the technology in ways not recognized prior to its implementation within the work context or not feasible until after enhanced functionalities are identified and developed" (Saga & Zmud, 1994 as cited in Hsieh & Zmud, 2006 pg 5.).

When asked whether they used the apps any differently from the current functionality, the respondents commented that they just used the apps the way they were meant to be used:

- *'I use it as per the prescribed instructions.* <R1>
- *'I just generally use what is there*. <R2>

**Feature Extension**

Feature extension specifically relates to the way in which users discover ways to apply features in a way that was not originally intended to (Jasperson et al. 2005). When asked in what new ways they use the apps, the respondents stated that they use the apps as prescribed and most indicated they used it as an information source.

**Intention to explore and Trying to innovate with IT**

The same was said for intention to explore and trying to innovate with IT. Users stated that they did not engage in these innovative behaviours with the apps. One respondent commented that the apps are inflexible for one to try out innovative ways of doing things:

- *'Baby Centre is kind of rigid. The information is different week by week. You can't really find new ways of doing other things or being exposed. <R5>*

**Integrative use**

Integrative use is defined as how well assimilated the Information System is into the work practices of the user (Abdinnour-Helm & Saeed, 2006). IS becomes an integral component of how users perform their tasks and view IS as critical in accomplishing their tasks. Integrative use was seen to be quite relevant in this context. Many respondents commented that the app had become an integral part of the way they took care of themselves during their pregnancy. The key theme being the information received from the app was what helped them during their pregnancy.

- '*…it gave me tips and where I didn't know something or needed to find out information I was able to access the app and get more information.'* <R9>
- '*The app is very beneficial, informative and educational*.' <R5>

Some commented that it would be difficult to cope without the apps:

- *'I would have so many questions every day and no answers. I would be calling my gynaecologist 2000 times a day. I would be worrying about every single thing. The app gives me some level of comfort especially the forums.'* <R7>
- '*I would have been on Google a lot more – sourcing information and I cant talk to anyone about what I am going through and you can't call your doctor every time so I think I will be on Google. My cell phone would be my preferred choice*' <R1>
- *'I would have used Google extensively. I would not have coped without technology though. I would have used the Internet definitely'* <R2>

Most commented on how the app had become their best friend showing more than a cognitive connection, they are not just informed, but also comforted by the information.

- '*The app has become my close confidant during my pregnancy as I can check things I am uncertain about'* <R3>
- *'…The app calms me down and comforts me and keeps me on track.*.' <R4>
- '*The app reassures me when I am experiencing or feeling something in my pregnancy'* <R5>
- '*I discovered Baby Centre with my first child. This is my third child so it has been my best friend whenever I am pregnant. If I am pregnant again I will always go back to Baby Centre.*' <R10>

Some said that the app was integral but they also rely on other sources of information from their gynaecologist and family.

- *'Yes I think I can cope without the app. Right now I am not addicted because I have supplementary material… I also have my mom to ask questions so I am reliant on her..'* <R8>

Additionally, those who had children previously commented that the app was not integral:

- '*It's the second-time pregnancy and some of the advice is not really relevant'* <R6>

### 4.3 Findings on the influences on post adoption usage behaviours

The literature review revealed various factors that influenced pregnant women usage of ICT in general. These factors ranged from cultural diversity and language; online support; privacy; level of doctor support and infrequency of ante-natal visits; convenience; quality and reliability of information; perceived usefulness and ease of ease. These factors were then explored in this study to see if were relevant in the context of m-health pregnancy support apps. This section shall report on the findings.

#### Cultural diversity and language

In line with previous literature, cultural diversity was identified in this study as having an influence on post adoption usage behaviours. Respondents commented on the fact that although the information they received from the apps was useful, there were some features that they could not relate to. These features included list of foods, shopping advice, baby measurement scales and even advice given on the online forums.

List of foods:

- *'…There is another app I could not relate to – it's called Baby Food. I couldn't relate as much as the food is quite different to what we eat here. The food was too western and I couldn't really relate much to this...'* <R8>

Shopping advice:

- '… *when it comes to shopping advice you can't find anything of the things they want you to buy in South Africa*...' <R2>
-

Baby measurement scales:

- '…*The other hiccup is its American, the measurements are in pounds and stuff like that. Sometimes there are times I can read everything and it makes 100% sense and some things where if I need to understand this I have to go and check the metric system and to measure and to convert yeah. The only thing I would like them to change is the metric system to change to kg's and cm's instead of pounds and inches*…' <R12>

Advice given on the online forums:

- '…*Sometimes there are mothers who will give you advice and they are in different countries so I try and be a little careful*.'<R12>

- '…*Don't use the forums and the blogs as they are UK and US based*…' <R3>

One respondent even attributed culture as a reason why they did not use the social media functionality on the app:

- '…*It is not in my culture to share my pregnancy on social media – it's like only black and Indians follow it. White and coloureds don't have the culture*…' <R1>

Another respondent commented on how she thought the apps were not really African:

- *'…The apps are informative but for me I am very conscious about African content. I found that they are not really African…I just felt like because I am black I could not identify with the pictures etc. I felt that the content is not relevant to an African audience. Not that there shouldn't be any white people or whatever, I feel that it should be diversified. Maybe it is the reality of the US and UK but it's not really for us African. Also, their sales and adverts are not relevant to us here in Africa.' <R11>*

This same respondent felt strongly that there should be an app for African women:

- *'…I thought you were trying to develop an app for African women with African content and African features. You really need to develop something along those lines. Even for the less educated people – you can develop apps in local languages – things Europeans are ignorant of…' <R11>*

**Online Support**

Online support was found to influence post adoption usage behaviours in this context. Respondents commented on the fact that the group chat facility offered on the mobile apps helped them during their pregnancy as it was comforting to know they are not going through the experience alone

- *'…I can meet with some people that have the same due date and we can share our experiences together. I found I can meet with people in the same trimester as me' <R5>*
- *'…its so relatable and you don't feel like you are weird or you are the only one going through a certain experience. I can go onto the forums to see what other women are going through and to see if what I am experiencing is normal or not…' <R8>*

One woman even gave an example of how the forums assisted her with some symptoms:

- *'…Every now and then I go into the forums to see what people are saying. So for example in my first trimester, I suffered extreme nausea so I went in to check in the forums and see if there were other people experiencing the same condition as me and what advice and suggestions they have…'<R6>*

In addition to this one mom stated that the articles the apps provided were too theoretical so the forums provided a real look into what other moms were experiencing

- *'…It's another thing for someone to tell you that they are going through. The articles are sometimes theoretical but when you go to the forums its real as other mothers share their experiences. The articles are academic and you wonder if you are on the right track. Then when you go to the forums you see that other moms are experiencing different symptoms from the articles*.' <R7>

One woman did however find the forums restrictive on what could be commented on:

- *'…I also found the forums are very restrictive on what you can comment or ask so if someone has asked a question you cannot ask again. They get a bit irate if you ask the same question which put me off.' <R2>*

What was interesting to note was that although the respondents found the forums useful, they did not participate in the forums themselves. They used the forums more as an information source. Reasons attributed to why they were not active on the forums included the fact they were not big on social media:

- '*I am not an interactive social media person even on Facebook. I read what other people write*.' <R2>
- ''*I am not a group chatter so I haven't really - even in WhatsApp groups I am not active. I prefer just to read other people's comments and see how they relate to what I am going through.''* <R8>
- *''I don't comment, I read a lot to see what others are going through and try and see if I can relate to the information.''* <R4>
- *I just go and read information there but don't comment* <R7>

**Privacy**

Some respondents did not know how private the forums were and thus they stated that they did not take part in the forums:

- ''*I don't use the groups as I didn't know how private that was. This app has groups but I am not on them*.'' <R1>

For some respondents privacy was not an issue as they felt that they did not input any information into the app so it would not be able to source their personal information.

- ''*I have not created a profile, I'm a viewer / observer only*.'' <R2>

**Level of doctor support and infrequency of antenatal visits**

In terms of doctor support, respondents commented that their doctors supported them throughout their pregnancy and they used the app(s) in conjunction with the doctor's advice.

- *' I went to the gynaecologist every 4 weeks so the gynaecologist would tell me not to worry etc.. It depends on what type of gynaecologist you have because we have a good relationship. My*

*gynaecologist is just a call away and I can call him at any time even at midnight so he was there for me..'* <R9>

- '*I use the information from the app and gynaecologist together. I tell my gynaecologist that on my app it says the baby must be about 33cms and then he is like yes let's measure yes he is 32cms. I feel like I share the information I found out with him*.' <R12>

Some information the respondents received from the gynaecologist also made them use apps to a lesser extent. One respondent reported on how the gynaecologist told them phones affect their baby so they have not been using the app(s) fully.

- *'…my gynae advised me – there is a new study that happens when you spend too much time on the phone it affects your baby so that is the reason why I am not too much on my phone. My gynae advised me and cautioned me about it. I was very interested in the baby heart beat app and my gynae said it's not good to have mobile phones around pregnancies so I haven't downloaded much…'* <R8>

The length of time in between gynaecologist visits appeared to influence respondent's post adoption usage behaviours with the apps. The longer the time between gynaecologist visits, the more the respondents consulted the apps for information.

- *Because I only check with Dr xyz every 6 weeks I kind of like use the app to make sure I am up to date and I'm up to scratch. Every 6 weeks I'm freaking out in between because I don't know and can't hear any movements so is baby okay? is baby okay?* <R1>
- *During the 4 week period, I do a lot of reading. Its things you don't really discuss with other people that are in the articles. I am paranoid, I Google every symptom!* <R2>

One respondent stated that the app provided assurance especially when confronted with unusual symptoms in between gynaecologist visits.

- *'…In between the gynaecologist visits I actually go onto Baby Centre to check for information if I have any concerning symptoms hence I am saying it is my best friend. For example about 2 weeks ago, my feet were swollen so before I even went to the doctor, I went onto Baby Centre to read up on the swelling and what could be causing this.. They give you a list of other things to look out for which may or may not be good signs. Baby Centre confirmed and reassured me that I don't need to go to my gynaecologist because it gave me good information…' <R10>*

Linked with this influence was the cost of seeing gynaecologist which was not found as an influence in the literature review section. Two respondents reported that it was quite expensive to see a gynaecologist so they first consult the app to see if its serious then only then do they go to the gynaecologist.

- '…*It's also very expensive to see the gynaecologist frequently so the app supplements this and I am able to see where I can go and see the gynaecologist when things are serious… <R4>'*

- *'…Maybe it could have cost me a lot of money running to the doctor and paying for every symptom as you just don't know. So this is saving me costs as I check on the Baby Centre first before I even go to the doctor. Baby Centre tells me whether it's normal and I don't need to go to the gynaecologist…' <R10>*

**Convenience**

Respondents mentioned that we live in an information world where information is easy to access on smartphones and thus they could check on their phones at any time. This factor influenced post adoption usage behaviours of mobile pregnancy support apps.

- *''…I don't know how our mothers in the previous generation did it. We are in an information age so there is so much information we can read up on now…' <R5>*
- *''We are living in an information age and I think information's the most crucial thing today than ever in time. The fact that now we have smartphones where we are not limited anymore. <R10>*
- *I don't know how the olden day women did it as you don't know the progress of your baby. They probably read books and pamphlets.* <R1>

The fact that mobile apps are easily accessible via their phones and they have their phones on them all the time means respondents can check the app frequently during the day. Convenience contributes to post adoption usage behaviours of m-health pregnancy support apps.

- ***'…****The usage of the apps for me is an everyday thing. Before I go to bed, I'm on my phone. When I wake up and I'm lazy, I go to my phone. Especially every week when it's a new week I go and check to make sure everything is ok…'<R5>*
- ***'…*** *It's convenient, easy and on the go. For example, my week they always end on Sundays so that email comes every Sunday evening. Sometimes I busy cooking at home or busy with home chores but Monday morning when my husband is driving I say let me catch up now and it's very convenient…' <R10>*

**Quality and reliability of Information**

Respondents mainly cited their reasons for continued usage of apps to the quality of information they received from the apps.

- '*The quality of information is good because when you have questions you can go and search and see what other people are saying or what Baby Centre themselves are saying.'* <R9>
- '*I feel its expert opinion such that when I go to the doctor some of the things I really don't have to bother myself to ask her as I have been informed by Baby Centre. It really equips me.*' <R10>
- '*For me the apps provide an information platform for me to read and keep up to date with what is going on in my body*.' <R6>

Respondents also stated that they received quite a variety of information from the apps:

- *'…Pinterest has a wide spectrum of stuff – it tells me things from my food to the diet, exercises. It also talks about Baby names constantly, sleeping positions – virtually everything. It's like a search engine that has combined everything so you can find most information on this app…' <R5>*

With regards to reliability a few stated that they did not check whether the app was linked to a Medical Advisory board or doctors:

- '*I guess I just went for the app because I had used Baby Centre before via the Internet with my first baby. I didn't really check to see whether it was linked to that.*' <R9>

One respondent did state she checked whether the app was linked to doctors:

- '*Yes, I remember I checked whether Baby Center was linked to doctors. With Baby Centre, there are interactions with doctors – I don't know if they are genuine doctors but there are doctors that you interact with. You know when you feel like you are dealing with a doctor it feels more legitimate, more comfortable and more confident. I don't know who designed the app but I like how easy it was to use*.' <R12>

Still related to quality and reliability of information, some respondents felt that the information that was provided sometimes was information overload.

- ***'…** So sometimes its information overload so I would survive without the app. It's a nice to have. It's not an essential thing that is why I don't read through everything they send through to me. Like Ovia sends things every day or every hour. So when you look through it's like a lot of information…' <R10>*
- ***'…** The app helped me. My number one thing is I stick to my gynaecologist. Sometimes if I am not feeling well or something I check what these symptoms mean and sometimes I get too many responses – too many and its so overwhelming – too many people commenting. Sometimes it's best to get an individual opinion so I go to my gynaecologist to confirm…' <R12>*

Some respondents also felt that some information provided by the app was negative to an extent that they would stop reading.

- *'…The test section on the app - I start to read and if I feel that it's too negative I stop to read as it is very scary. If the test is too much about negative and you don't want the fear to sit in you. You want to hope for the best for the baby. I just read what the test is for and I stop reading. I don't want to hear all the negative things they want to say. If you look at the genetic testing etc. you look at it and say no that's fine…' <R1>*
- *'…I never look at symptoms etc. as they are too negative for me...'R12>*

**Perceived usefulness**

Perceived usefulness was found to play a role in facilitating post adoption IS usage in this study. Respondents who found the mobile apps to be useful indicated that they were able to look up a vast number of things on the apps relating to their pregnancy and their overall health.

- *'…I can check for anything on the app. I can check for people who are giving birth the same time as me, I can check my diet, I can check if I am feeling sick – I can check virtually anything. I just put whatever I want and then I search for it and usually I find most of it. Even shopping – what it shop - it tells me what to shop for…' <R12>*

Other respondents commented on the fact that they were able to utilise a lot of features on the apps:

- *'…I utilise the food part quite a lot – I wanted to shift from my normal selfish eating to the vitamins that I need. I also do a lot of exercises as I want my labour to be as quick as possible. There are also things that you shouldn't do and things you should watch out for. I read these quite a lot…' <R5>*

Respondents stated that the information they get from the apps helps them make decisions with regards to their pregnancy. Respondents commented that the app assisted them when they were experiencing new symptoms and therefore they did not panic or immediately call their gynaecologist.

- *'At the beginning of this week I had low blood pressure and I was feeling week. At the beginning of the weak I read that there is a lot of blood happening with the baby. So, I was not concerned as about it.'* <R11>

In the literature review, it was found that perceived usefulness impacts extended usage. This notion is validated in this study where some respondents commented that they found the system valuable and were therefore able to use a wide variety of features:

- *'…I utilise all the features fully. I am interested in everything I find and I don't want to do anything wrong and there are things that are education in a way. They do add value to me and so I definitely go through all the features like food, diet, exercise…' <R5>*

**Ease of Use**

It was found that the easier it was to use the apps, the more the users engaged with the apps and displayed behaviours such as IS continuance and routine use.

- *'…There is nothing tricky about this app. Here are the articles that pop up randomly. When you first register the app, they ask you for your due date. You must register and put in your email address…' <R1>*
- *'..Yes the app is easy to browse and look at different things. The way they have made these things is for an average person who is not very technical to be able to use it so yes I would say it's easy to use...*' <R9>

One respondent commented that there was an app they could not figure out how to use it.

- '…*Pregnancy Plus and Baby Centre and Pin –interest is quite easy to navigate. The other app that is just written Pregnancy I cannot figure it out. It has footsteps on it and it's so impossible to get the information from it. It's a green app. On Pinterest you join a specific group so I joined the Pregnancy app*…' <R5>

**Other influences found in this study:**

**Number of features on the app**

The following features were the common features highlighted by all respondents:

- Tool that calculates due date / Timeline that does countdown
- Baby growth and measurements
- Diet for mother - meal plan, tips on cooking, recipes, weight
- Symptoms
- Newsletter
- Pictures of the baby in the womb – and videos of baby
- Forums
- Baby Names
- Sleeping Positions
- Exercises

In this context, it can be argued that these features determine post adoption usage behaviours specifically extended usage i.e. how much the users will use the mobile apps. The more number of features on the apps, the more the users engaged with the app. All respondents commented that the apps they were using gave them a lot of features.:

- *'…'It's like a search engine that has combined everything so you can find most information on this app" <R5>*
- *'…its a one stop shop for all things baby…' <R8>*

**Social Structures**

Various social structures were found to influence post adoption usage behaviours. For example, information respondents received from their family seems to contribute to post adoption usage of the app.

- '…*My mom says we should not rely too much on apps so I don't use it often*…'
- *'... Also I have my mom to ask questions so I am also reliant on her.'* <R8>

Another user commented on how both her and husband check the app together:

- *'…both my husband and I check it. He has the app on his phone too. Both of us check it on. He has it on his cell phone and he is on it every-day and tells me about the articles that he reads.*

*He is always telling me what is going on with my body – you should interview him and he knows a lot'*

Additionally, how close or far a respondent was from their family influenced how they interacted with the apps:

- '*I am here away in Cape Town nearly 1000kms plus away from my mom so I can't call my mom every time to ask her about what I am going through. The app from Baby Centre has helped by answering most of the questions I have. This app has been very good to me.* <R4>

### 4.4 Relationships between the influences

As data analysis was done iteratively, it was found that some influences were related to each other. This section shall briefly discuss the relationships that were observed between the various influences.

**Cultural diversity and online support**

Some respondents commented on the fact that there was a lack of African content in the apps. This influence seems to be related to online support. It seems like these respondents did not participate on forums online and were cautious about what the moms in the forums had to say as they were not African/local.

- '*I don't really interact on the blogs and see their experiences. I have noted that they are so different and I do read it but I don't like going there a lot*…'<R5>

**Perceived usefulness and quality of information**

Some respondents affirmed that the app supports them during the period they do not see their gynaecologist. They could get information from the app during this period that guided them and helped them thereby confirming the usefulness /quality of the information they got from the apps.

- '…*I am able to check up on various issues when I am waiting on my next gynaecologist appointment. If it is serious, I will definitely call the gynaecologist but first I consult the app to see if there is anything I am experiencing*…' <R3>

Additionally, it was found that respondents trust the information enough to supplement their gynaecologist visits or cut down on their gynaecologist visits based on information they get from the app. This links quality of information, perceived usefulness and cost of seeing gynaecologist.

**Quality of information and Number of features**

Quality of information seems to be linked to the number of features on the app. Seems like the more the number of features / information on the app, the more valuable the respondents found the app to be. Respondents reported they are able to access a whole host of information which assists them during their pregnancy journey.

## 5. Discussion of the findings

This chapter presents a discussion on the findings of the study and in doing so draws on the literature review to make comparisons with other findings. The chapter will first discuss the findings around the post adoption usage behaviours. It will then move on to discuss the findings around the influences on these behaviours.

### Post adoption usage behaviours in the context of m-health pregnancy support apps

The mapping of post adoption usage behaviours to IS implementation phases (Figure 2) was used as a basis in this study to categorise and understand various post adoption usage behaviours. The two-post adoption usage behaviours for the routinization stage were routine use and IS continuance (Hsieh & Zmud, 2006). This study found that pregnancy support apps had become part of respondents' pregnancy journey and thus they engaged in routine use and IS continuance behaviours. The apps were used to source various information about the user's pregnancy and ensure they were reaching important milestones. Using the app frequently for information to check on their baby's progress had become a habit for the respondents. This finding is consistent with Larsson (2009) who found that 84% of women used the Internet as a source of information on their pregnancy and the most frequently researched topics were fetal development and the stages of birth.

With regards to the infusion stage, this study found that pregnant women engaged in the first set of post adoption usage behaviours i.e. extended usage and deep usage. Pregnancy support apps were used frequently to monitor progress and to access information on their pregnancy. It was found that pregnant women used the information they received from the apps to make decisions about their pregnancy. This finding is similar to that of Lagan et al. (2011) who found that the Internet is having a noticeable impact on women's decision making in regards to all aspects of their pregnancy specifically in assisted decision making and validating information. Hsieh & Wang (2007) argue that extended use involves using more of the technology's features to support an individual's task performance. In this context, extended usage involved using the information from the apps to make decisions on whether their symptoms were normal or out of the ordinary and whether they should contact their doctor.

An interesting finding is that pregnant women did not engage in second stage behaviours depicted at the infusion level, namely emergent use, feature extension, innovating with IS or intention to explore behaviours. When asked why, some responded that the apps were inflexible and some simply stated they used the apps as per what was prescribed. One possible reason for this could be that pregnant women access the apps primarily for information and to a lesser extent the interactive functionality. Pregnancy is a condition that requires continuous care and as such women feel a strong need for information in addition to their check-ups (Kavlak et al., 2012; Bert et al., 2016). Another reason could be attributed to the model not being applicable to these sort of m-health pregnancy apps or the model not being applicable to individual behaviours in a non-organisational setting.

Integrative use is not depicted as a post adoption usage behaviour in the framework by Hsieh and Zmud (2006) – Figure 2, but was found to be a post adoption usage behaviour by Abdinnour-Helm and Saeed (2006). This study found that this behaviour was prominent amongst pregnant women with them reporting that the apps had become an integral component of how they took care of themselves during their pregnancy. It can be argued that Integrative usage is more prominent at an individual level than in an organisation setting. Pregnant women commented on how the app(s) had become their 'best friend' / 'close confidant' and how it would be difficult to cope without the apps. These emotive responses reveal more than a cognitive connection as it shows that respondents were not merely informed but also comforted by the information. This finding is consistent to Jayaseelan and Pichandy (2016) who argue that there is a growing reliance on the technology by pregnant women.

**Influences on post adoption usage behaviours**

Cultural diversity was identified in this study as having an influence on post adoption usage behaviours in the context of m-health pregnancy apps. This is consistent with the findings of Zoellner, Bounds, Connell, Yadrick, and Crook (2010) as cited in Sheih and Carter (2011) who found individual-level factors like food items, preference, tradition or customs impacted how pregnant women interacted with online pregnancy tools. Similarly, in this study pregnant women felt that food, shopping advice, baby measurement scales and some advice given on the online forums did not align to the South African context. These women called for apps with more African context and apps that considered racial ethnicity. It is interesting to note that language was not seen as an influence on post adoption usage behaviors as most of the women were highly educated and proficient in English.

Online support was found to influence post adoption usage behaviours in this context specifically routine use. It was found that pregnant women felt they could relate to other mothers on the forum and they could use the forums to see if what they were going through was normal. These findings are consistent with past literature which has shown that these forums allow for pregnant women to share experiences such as pregnancy complications and symptoms, and receive emotional support from others (Romano, 2007; Cohen & Raymond, 2011; Lagan et al., 2011). Pregnant women looked to the online forums to see if the symptoms they were experiencing were normal or out of the ordinary.

Interestingly, pregnant women in this study preferred to remain anonymous and just read the information shared by other moms rather than participate in the forums. This contrasts with what Lagan et al. (2011) found that the anonymity actually encouraged pregnant women to participate to ask questions and receive support, without fear of identification. In this study, pregnant women just preferred to read the information posted by others on the app.

The length of time in between gynaecologist visits was found to be an influence on how pregnant women interacted with the apps. The longer the time between the appointments, the more the respondents consulted the apps for information. Where women had concerns during the time between their

gynaecologist visits, they turned to the apps for support, reassurance or information. This finding is similar to that of Lagan et al. (2010) who found that the infrequency of antenatal visits and time constraints at appointments appeared to have an influence on Internet use to meet information needs between appointments. Respondents used the Internet for support whilst they waited on their next visit to the gynaecologist.

Still on the subject of gynaecologist visits, pregnant women in this study stated that they had a good relationship with their gynaecologist and could ask about or validate the information received from the apps with their gynaecologist. In contrast to this, Lagan et al. (2011) found that most pregnant women who searched for information online did so because health professionals did not give them sufficient information.

An interesting finding in this study, was that the cost of seeing the gynaecologist or doctor influenced post adoption usage behaviours. Specifically, some pregnant women in this study reported that it is costly to see the gynaecologist so the app supplemented this. They stated that they only go to see the gynaecologist where it was quite serious. This was not identified in the literature review as an influence. In evaluating smartphone apps for pregnant women, Bert et al. (2016) argue that these tools should not substitute for gynaecologist advice and they should be used together with medical check-ups and advice. They argue that the attractiveness of the app's content and its technical features can lead to women believing the app more than their doctor and ultimately lead to a reduction of humanization i.e. the relationship between the pregnant women and their doctor (Bert et al., 2016).

In line with past literature, convenience was found to be an influence on post adoption usage behaviours in this study. Pregnant women stated that we live in an information world where information is easy to access on smartphones and thus they could check on their phones at any time. Additionally, they stated that they have their phones with them all the time and they therefore accessed the apps frequently during the day. This is consistent with the findings of Jayaseelan and Pichandy (2016) who found that the Internet offers faster access and more updates more quickly to pregnant women than traditional methods such as print material. This finding is also similar to that of Lagan et al. (2011) who found that pregnant women specifically valued the ability to go online at anytime and anywhere. They commented that the Internet was fast and immediate. In general smartphones are providing a platform for individuals to access information real-time and are growing at an unprecedented rate. (Geopoll & World Wide Worx, 2015).

Quality and reliability of information was also found to be an influence on post-adoption usage behaviours. With regards to quality, pregnant women cited their reasons for continued usage of the apps as due to the quality of information they received from the apps. This is consistent with the findings of Weston and Anderson (2014) who found that pregnant women valued the information they received from the Internet and therefore used it as an information source.

With regards to reliability, most of the pregnant women in this study stated that they found the information reliable regardless of whether it was linked to a Medical advisory board or not. This is similar to Kavlak et al. (2012) who found that women perceived the information on the Internet to be largely correct and reliable. This finding is also similar to Larsson (2009) who argued that women with a high level of education rated information on the Internet as reliable and correct. Lagan et al. (2010) argue that such a finding means that pregnant women view themselves as expert users and are therefore susceptible to believing information that is wrong. This information may influence the way they take care of themselves during pregnancy which may have adverse effects on themselves or their baby.

In contrast to this, Kavlak et al. (2012) found that the criteria which pregnant women used to evaluate the information they found on the Internet included whether the writer of the information was a health professional. Only one pregnant woman in this study stated that they looked to see whether the site was credible citing reasons such as it made them feel more comfortable and confident with the app.

Still related to quality and reliability of information, some respondents felt that the information that was provided sometimes was information overload or sometimes the information provided by the app was negative to an extent that they would stop reading. This was so when it came to complications with the baby or any tests that need to be done. Similarly, Lagan et al. (2011) found that some respondents said the information they get from the websites causes stress and anxiety. This is especially true when they were looking at complications relating to their pregnancy. Some women in the study reported they stayed away from such information as it caused them discomfort.

Perceived usefulness was found to play a role in facilitating post adoption IS usage in this study. Pregnant women reported that they were able to look up a vast amount of information on the apps relating to their pregnancy and their overall health. This information ranged from food to eat, to exercises, to key milestones that the baby should be reaching. Pregnant women also reported that the information they get from the apps helps them make decisions with regards to their pregnancy. For example, when they were experiencing new symptoms they used the forums and information first before contacting their doctors. Similarly, Lagan et al., (2010) found that pregnant women access the Internet for information and control over decisions affecting their pregnancy.

In the literature review, it was found that perceived usefulness impacts extended usage (Bhattercherjee, 2001). Information quality is positively related to IS usefulness. The greater the quality of information the more the users perceive the system to be useful (Bhattercherjee, 2001; Saeed & Abdinnour-Helm, 2008). This was found true in this study – most of the respondents commented that they could access quality information not only about their baby but for themselves. They therefore engaged with the app by reading the information and participating in the forums.

Bhattercherjee (2001) found that if users are convinced that the IS effectively supports their work at the post adoption stage, they not only extend its usage but also experiment with how to apply the IS in novel settings (Bhattercherjee, 2001). Similarly, Saeed and Abdinnour-Helm (2008) found a strong linkage between IS usefulness and exploratory usage. This was not found in this context. Most pregnant women commented on using the apps as they were with no creative ways.

Ease of use was found to also impact post adoption usage behaviours specifically IS continuance and routine use. The easier it was to use the apps, the more the pregnant women engaged with the apps. This is in line with the theory of planned behaviour as well as TAM discussed in the literature review. The theory of planned behaviour posits that perceived behavioural control is the sum of a sense of users being in control over a behaviour and how they perceive it is difficult or easy to perform the behaviour (Venkatesh et al., 2008). In this study perceived behavioural control came from pregnant women feeling that they were in control of using the mobile apps and ease of use of the mobile apps. Ease of use in TAM is defined as the extent to which an individual believes that using a system will be free of effort (Venkatesh & Davis, 2000). Pregnant women in this study commented that the apps were easy to use and continued engaging with the apps.

Other influences found to influence post adoption usage behaviours in the context of this study were number of features and social structures. These were not identified previously in the literature. Most women mentioned the number of features available on the apps and how they enjoyed the variety of information they received from the features. This led them to interact more with the app and read more information. Common features included a tool that calculates due date, baby growth and measurements, forums and newsletters that were sent out.

Social structures related to the support pregnant woman had from people around them and how this led them to either interact more with the app or not. Mothers were seen as critical support and played a role in interacting with the app. One lady commented that her mother said she must not rely too much on the app and another stated that she lived far away from her mom so the app became her guidance. Another source of support was a pregnant women's husband. One lady commented on how her husband even used the app more frequently than she did and encouraged her to use the app. This shows that social structures can influence the way pregnant women interact with the apps.

## 6. Conclusion

This chapter starts by providing a high-level summary of the research and main findings. In doing so, the chapter reflects on the research questions. From there on, the chapter proceeds to discuss the theoretical and practical contributions of the study. The chapter then discusses the limitations and concludes with suggestions for future research.

### 6.1 Summary of Research

The aim of this study was to explore the experiences of pregnant women using m-health pregnancy applications. Specifically, the study sought answer this research question:

- What influences post-adoption usage behaviours in the context of m-health pregnancy support applications?

The research objectives put forth at the beginning of the study were to:

- Explore each post-adoption usage behaviour in line with m-health pregnancy applications (Routine use, IS continuance, extended use, deep use, emergent use, feature extension, intention to explore, innovating with the application and integrative use)
- Explore the influences around post-adoption usage of m-health pregnancy applications.

Chapter 1 started off by introducing the research and giving a background, which motivated the interest in the research. It then proceeded to provide evidence of why the research was necessary. This was done through highlighting various statements of the problem which showed that limited research has been done to explore pregnant women's usage of m-health pregnancy support apps. Furthermore, it is an area that is gaining much interest from pregnant women. The study specifically focused on post adoption usage behaviours as it is an area that has received little attention in the context of m-health applications.

Chapter 2 then proceeded to give a literature review. It started off by discussing previous research done on ICT usage during pregnancy which revealed relatively few studies done in the South African context. The chapter then discussed the characteristics of women who use m-health pregnancy apps and proceeded to discuss the features of common apps. The mapping of post adoption usage behaviours to IS implementation phases framework (Figure 2) was used as a basis of understanding post adoption usage behaviours in this study. Each behaviour was discussed and a summary definition given for each behaviour. The literature review then moved on to discuss the influences around the behaviours. These influences were sourced from various literature on general ICT usage amongst pregnant women.

Chapter 3 discussed in detail the research design employed in this study. The philosophical lens employed for this study was the interpretive lens as the study aimed to to explore in-depth pregnant women's experiences and perceptions of using the m-health pregnancy applications. The study used the middle range research approach which involved both inductive and deductive reasoning. Such an

approach allowed the researcher to be open to themes emerging from the data as well as to draw concepts from theory and previous studies.

The research method employed was case study research specifically the embedded case study design where the context was described as influences on post adoption usage behaviours of m-health applications. Each pregnant woman then constituted a unit of analysis within the context. Data collection was done using open ended semi-structured interviews and data analysis was done using thematic data analysis. In order to ensure that the study had rigour, the researcher employed Myers and Newmans (2007) guidelines to conducting interviews as well as Guba's (1981) constructs to ensure that the study was trustworthy. Ethical approval was obtained from the Wits School of Economics and Business Sciences.

Chapter 4 provided an account of the findings and analysis. The chapter began by discussing the demographic profiles of the 12 pregnant women that were interviewed. The chapter then reported on each post adoption usage behaviour and the findings around each. The findings revealed that pregnant women displayed post adoption usage behaviours of routine use and IS continuance. With regards to the infusion stage, the study found that pregnant women engaged in the first set of post adoption usage behaviours i.e. extended usage and deep usage. They did not however engage in second stage behaviours namely emergent use, feature extension or intention to explore behaviours. Respondents commented that the apps were integral to their pregnancy journey a sign of integrative usage.

The findings around the influences on post adoption usage behaviours in the context of m-health pregnancy support applications were also reported in Chapter 4. The influences identified in the literature were found to be relevant in the context of m-health applications and additional influences such as cost of seeing gynaecologist, number of features on the app and social structures were found to be relevant in this study. The chapter then concluded by discussing at a high level the relationships between the various influences.

Chapter 5 then provided a discussion section where the findings were linked back to previous literature to see if there were any consistencies or contradictions between the findings. Post adoption usage behaviours and influences around these were discussed and compared to previous literature.

Having given a summary of the research, this study answered the research question specifically: What influences post-adoption usage behaviours in the context of m-health pregnancy support applications?

- This research found that specific post adoption behaviours in the context of m-health pregnancy applications include routine usage, IS continuance, extended usage, deep usage and integrative usage.
- This research found that influences around these post adoption usage behaviours include: Cultural diversity; Online support; Privacy; Level of doctor support and infrequency of

gynaecologist visits; Convenience; Quality and reliability of information; Perceived usefulness; Ease of use; Social structures; Number of features on the apps.

### 6.2 Contributions of the study

This section discusses the theoretical contributions and practical contributions of this study.

#### Theoretical contributions

- Limited research

The study has theoretical implications for academics as limited studies have been done on m-health pregnancy apps. As mentioned in the literature review, most studies on m-health apps have focused on exercise, weight loss and nutrition. The information reviewed on ICT usage during pregnancy focused on how pregnant women are using the Internet to source information (Refer to Table 1). Most of the studies reviewed were done in other countries and not within the South African context. This study filled these gaps by focusing on m-health pregnancy apps and specifically within the South African context.

- Understanding of post adoption usage behaviours

Compared to the well-established stream of IS adoption and initial usage research, understanding of IS behaviours post-adoption is still very limited (Jasperson et al., 2005). This is especially true in the field of m-health applications as these are new technologies. Using Hsieh and Zmud's (2006) framework which maps post adoption usage behaviours to IS implementation stages, this study attempted to explain how each post adoption usage behaviour manifests in the context of m-health applications. The study showed that in the context of m-health pregnancy applications, users display behaviours such as routine usage, IS continuance, extended usage and deep usage.

- Understanding of influences behind post adoption usage

This research report attempted to understand the various influences surrounding post adoption usage behaviours in the context of m-health pregnancy apps. Influences found in the literature were found to be relevant in this context and additional behaviours were also found i.e. cost of seeing gynaecologist, number of features and social structures. The various influences provide a foundation whereby future researchers can take these influences and measure the extent of those influences on post adoption usage behaviours in this specific context.

- Understanding meanings around pregnant women's use of m-health apps

It has been argued that few qualitative research studies have been done to understand user experiences and patterns with m-health apps (Dennison et al., 2013). This report fills this gap by providing unique insights into the views of pregnant women's experiences with m-health apps. Specifically, by using interpretive research it uncovers the subjective meanings around post adoption usage behaviours, understanding how pregnant women engage in these behaviours and how these behaviours are subsequently sustained during their pregnancy.

**Practical contributions**

- Recognition of m-health pregnancy support apps as important tools in the pregnancy journey

This study has shown that women value and rely on these apps during their pregnancy journey. M-health pregnancy support apps are increasingly becoming a support structure for them during their pregnancy. It can be argued that medical professionals cannot distance themselves from these new information sources and need to work in conjunction with them.

As seen from this study, pregnant women reported information overload or accessing negative information. There is a risk that they can download apps that contain misleading or conflicting information as most of them stated they do not check whether the apps are linked to doctors or Medical Advisory boards. This highlights that medical practitioners must be prepared to assist pregnant women in evaluating information from these new sources. It can be argued that they need to understand what kind of information their patients are receiving from these apps and to a certain extent they need to look at the apps themselves to evaluate the information and credibility.

- Integration of m-health pregnancy support apps in maternity care programmes

This study has shown that m-health pregnancy support applications affect maternity care i.e. how women take care of themselves during the duration of their pregnancy. For example, women reported looking at online forums when they had worrying symptoms and also choosing foods to eat based on advice they were given on the apps. Most importantly, some women used the information to make decisions on their pregnancy. It is therefore important for medical practitioners to consider integrating these apps when developing maternity care programmes. In particular, medical professionals need to understand which features pregnant women deem important on these apps and what information they are looking for on these apps. This may assist medical practitioners in planning robust maternity care programmes for pregnant women. Maternity care programmes for pregnant women need to consider usage of technology and in particular these apps as they are easily available on smartphones.

- Understanding of the factors that influence post adoption behaviours in this context

This study explored influences on post adoption usage behaviours in the context of m-health pregnancy support apps. Medical professionals may refer to these influences in order to see how they can best assist or support their patients. For example, level of doctor support and infrequency of antenatal visits were found to have an influence on post adoption usage behaviours. Respondents commented on how they turned to the apps in between their gynaecologist visits. Medical professionals can use this finding to guide their patients to credible apps which can be used as additional support during their pregnancy.

- Development of m-health pregnancy support apps

Yang (2013) argues that the arena of mobile apps is very competitive and developers find their apps surrounded by thousands of other apps in virtual stores. This is particularly true with m-health pregnancy support apps. It is therefore vital for developers or designers of such apps to have product differentiation

in order to gain a competitive advantage. In order to do this, they need to understand the user experience on the apps. This study can potentially be used by developers to better understand the factors that motivate routine use or continued usage of these apps. They can potentially build in features that will make their apps user friendly and attractive thereby adding to the competitiveness of their apps.

### 6.3 Limitations of the study

- One data collection method used for the study

Only one data collection method was used to collect data for this study namely open-ended semi structured interviews. Although this is considered adequate for qualitative research, it can be argued that this study could have used observation as another technique to collect data. This is specifically true for the 2nd stage infusion behaviours which users said they do not perform i.e. emergent use, feature extension, intention to explore and trying to innovate with IT. Observations may be a better data collection technique than interviews because people are not always aware of doing things slightly differently. For example, if they have to work around something, this then becomes routine and they are not aware they are differing from the prescribed process anymore.

- Mapping of post-adoption use behaviours to IS Implementation stages

This study used Hsieh and Zmud (2006) framework to understand the post adoption usage behaviours. They specifically categorised the behaviours into different IS implementation stages. Whilst the model was a good base to understand the post adoption usage behaviours, it can be argued that it may not have catered for all post adoption usage behaviours. For example, integrative usage was found in the literature but was not depicted on the model. Integrative usage was therefore added to the study.

- Cross sectional design versus longitudinal design

The research was conducted at a particular point in the respondent's pregnancy i.e. cross sectional design. It can be argued that a longitudinal design whereby the respondents are interviewed at the beginning or end of each of their trimesters would produce greater insights into their usage behaviours and the various influences surrounding them. Such a study would also allow for comparisons to be made between the different timeframes. In this study, only one respondent had a follow up interview as she was still in her first trimester when the initial interview took place.

### 6.4 Suggestions for Future Research

This section shall highlights suggestions for future research based on the findings of the study. Each suggestion will be linked back to the findings of the study.

- Exploring the relationship between gynaecologist / doctor and pregnant patients

Some women in this study had reported the cost of seeing their gynaecologist as an influence in utilising their apps. They reported that the app supplements some of their visits to the gynaecologist. Further studies therefore can be done to explore how these apps are affecting the relationship between pregnant

women and their gynaecologist/ doctors. Exploration would entail understanding whether these apps are strengthening or weakening the relationship a concept Bert et al. (2016) refer to as the reduction of humanization between the pregnant women and the health care system.

- Development of a m-health pregnancy support app that is culturally sensitive

The results of the study revealed that users of m-health pregnancy support apps require culturally sensitive information such as locally available foods, shopping advice that is local and measurement scales they can understand. Pregnant women are seeking advice that is specific to their culture and customs. They also seemed to want to interact with people who are from the same cultural background as them. Further studies can be done to explore exactly what South African pregnant women would like in an m-health pregnancy support app and even progressing further to developing a prototype app for pregnant South African women.

- Assessing the quality of m-health apps

Most of the women in the study commented that they did not check whether the apps were linked to a Medical Advisory board or not. They seemed to trust the information as it is from the apps. Further studies can be done to see how reliable and trustworthy this information is against specific healthcare criteria. It is proposed that people working in the healthcare industry devise certain measurements or criteria on which to assess the apps (Bert et al. 2016). This can then guide pregnant women to choose apps that are recommended by the healthcare industry.

- Exploring the long-term effects of using m-health apps to make decisions

This study found that information received from the apps helped some women make decisions on their pregnancy. Further studies can be done to see what the long term effects of these decisions are on their overall health and baby. For example, women who had symptoms and did not go to the doctor due to information received on the apps – did they experience any consequences in the long run or did the information they receive assist them and no further symptoms were observed.

- Assessing the strength of relationships

Further research can be done to measure how strong the influences are on post adoption usage behaviours and how strong the relationships are between the influences. This would have to be done through a quantitative study and the findings can then be applied to a greater set of the population.

## Appendices

### Appendix A – Open ended semi structured interview questions

| Overview | Guiding questions | Link to literature |
|---|---|---|
| The first part of the interview asked respondents to answer demographic details and socio-economic details so as to obtain user profiles. | Can you please tell me about your age, where you live, what your education level is?<br>Please let me know if you are employed and whether your income is satisfactory?<br>Please tell me what your primary language is?<br>What term are you currently in? | Characteristics of women who use m-health pregnancy apps or Internet for health information (Chapter 2.2) |
| This section will find out more information about the smartphone used and applications the respondents download and use. | What smartphone do you use and which pregnancy app(s) you have downloaded? | Several studies have been conducted that show that women are adopting smartphones and apps. For example Petrie, 2013 as cited in Derbyshire & Dancey, 2013 conducted a survey with 203 pregnant women where they found that 94% reported downloaded on average 3 pregnancy apps. |
| The next section will delve into post-adoption usage stages of routinization and infusion. | Which of these apps do you interact with frequently?<br>How long have you been using the app(s) for? | Routinization is defined as the stage where IS usage becomes part of behavioural routine. Infusion is embedding the IS deeply into ones work routine (Cooper & Zmud, 1990). |
| Extended Usage / Deep Usage / Expanded Usage | How many times a day do you access the app and its different features? How long do you spend on average on the app? (Volume)<br>How many features on average do you use on the app and can you name these features for me? (Diversity)<br>Would you say you utilise each of these features fully? (Breadth and Depth)<br>Which feature do you mostly use and why? (Depth) | Extended / Deep or Expanded Usage captures the following attributes – Volume, Diversity, Breadth, Depth<br>Abdinnour-Helm & Saeed (2006) |

| Overview | Guiding questions | Link to literature |
|---|---|---|
| Emergent Usage / Feature Extension | Have you used the features differently from what they were actually intended to do? | Emergent use refers to using the technology in ways not recognized prior to its implementation within the work context or not feasible until after enhanced functionalities are identified and developed (Saga and Zmud, 1994).<br>Feature extension relates to the way in which users discover ways to apply features that go beyond the uses delineated by the application's designers or implementers (Jasperson et al. 2005) |
| Intention to Explore / Trying to innovate with IT | Have you found new ways of using some of these features or the app in general? | As users interact more with IS they find new ways of using the IS in their work environment (Nambisan et al. 1999 & Ahuja & Thatcher, 2006). |
| Integrative Usage | Does this app support you during your pregnancy journey? How specifically?<br><br>Would you say the app has become an integral part of how you take care of yourself during pregnancy?<br><br>Would you be able to cope with your pregnancy without this app? | The extent to which the users are able to effectively integrate the IS into their work environment. Users view IS as critical in task accomplishment.<br>Also refers to depth and diversity similar to extended usage.<br>(Abdinnour-Helm and Saeed, 2006) |
| Influences around post adoption usage behaviours: | Cultural diversity:<br>Are you able to identify with the app in terms of what it tells you? Food advice? Language? Social? Cultural Context? | |
| | Online Support:<br>How do you find the forums / groups and do you partake in the groups? | |
| | Privacy:<br>Do you feel your information is safe on the app? | |

| | |
|---|---|
| Influences around post adoption usage behaviours: | Level of doctor support and infrequency of antenatal visits:<br>How is your relationship with your doctor? Are they always available to answer your questions and how often do you see the gynae? |
| | Convenience:<br>How do you find the app in terms of convenience? |
| | Information:<br>How is the quality of information on the app and do you rely on it and trust it? |
| | Perceived usefulness:<br>Have you used anything on the app to help you with your pregnancy? |
| | Ease of use:<br>How easy is it to navigate the app? Is the app clear and understandable? |

**Appendix B - Table of Initial Codes generated**

| Main Theme | Sub Theme | Coding |
|---|---|---|
| Routinisation | Routinized Habitual / Use | R_HAB |
| | IS Continuance | R_CONT |
| Infusion | Extended Usage | I_EXT |
| | Deep Usage | I_DEEP |
| | Integrative Usage | I_INTE |
| Information | Quality of Information | INFO_QUAL |
| | Relevance of Information | INFO_REL |
| | Negative Information | INFO_NEG |
| | Information overload | INFO_OVE |
| Gynaecologist | Cost of seeing gynaecologist | GYN_COS |
| | Level of gynaecologist support | GYN_SUP |
| | Length of time in between gynaecologist visits | GYN_TIME |
| Social Relations / Structures | Moms advice | SR_MOM |
| | Husband support | SR_HUS |
| | Number of children respondent has | SR_CHI |
| | Distance from family | SR_DIS |
| Privacy | Social Media Usage | PR_SM |
| | Anonymity | PR_ANON |
| Cultural Diversity | List of foods | CUL_FOOD |
| | Shopping Advice | CUL_SHOP |
| | Baby measurement scales | CUL_SCALE |
| | Lack of African content | CUL_AFRI |
| Online Support | Symptoms | OS_SYMP |
| | Relationships | OS_REL |
| | Anonymity | OS_ANON |
| Ease of use | Behavioural Control | EU_BC |
| | Effort | EU_EFF |
| Perceived usefulness | Assist in decision making | PU_DM |
| | Range of features accessed | PU_FEA |
| Convenience | Accessibility | CON_ACC |
| | On the go | CON_OTG |

**Appendix C – Rigour in qualitative research**

| Provisions that a qualitative researcher may employ to make their study trustworthy (Shenton, 2004) | Applied to this study | Detail |
|---|---|---|
| Adoption of research methods well established both in qualitative investigation in general and in information science in particular. | Yes | This study utilised well known research methods such as the Miles and Huberman (1994) iterative methods for data collection. |
| Development of an early familiarity with the culture of participating organisations before the first data collection dialogues take place. | No | This study was not done in an organisation setting. |
| Random sampling of individuals to serve as informants. | No | This study used purposive sampling (Refer to Table 2 for specific characteristics used to guide the respondent profiles). |
| Triangulation. Triangulation may involve the use of different methods, especially observation, focus groups and individual interviews, which form the major data collection strategies for much qualitative research | No | This study only employed interviews as a data collection method. |
| Tactics to help ensure honesty in informants when contributing data. For example, participants, should be encouraged to be frank from the outset of each session, with the researcher aiming to establish a rapport in the opening of the interview. | Yes | The researcher informed the respondents upfront of the objectives of the study and employed certain techniques when conducting the interview. Refer to Table 4. |
| Iterative questioning. This includes probing data and iterative questioning, in which the researcher returns to matters previously raised by an informant and extracts related data through rephrased questions | Yes | Iterative questioning was used during the interview process to probe as well as to confirm findings. Refer to Table 4. |
| Frequent debriefing sessions between the researcher and his or her superiors, such as a project director or steering group. | Yes | The researcher worked closely with their supervisor to validate findings and confirm lines of thinking. |
| Peer scrutiny of the research project. | Yes | Peer reviews were done by researchers who have engaged in writing research reports. |
| The researcher's "reflective commentary". The researcher should seek to evaluate the research as it happens. This may be done through a reflective commentary, part of which may be devoted to the effectiveness of the techniques that have been employed | Yes | The researcher refined the semi-structured questions after each interview as they were exposed to more information. |

| Provisions that a qualitative researcher may employ to make their study trustworthy (Shenton, 2004) | Applied to this study | Detail |
|---|---|---|
| Thick description of the phenomenon under scrutiny. This helps to convey the actual situations that have been investigated and, to an extent, the contexts that surround them. | Yes | The researcher provided detailed information on m-health pregnancy support apps in the literature review. Chapter 2. |
| Examination of previous research findings to assess the degree to which the project's results are congruent with those of past studies. | Yes | Table 1 outlined the various studies done on ICT usage by pregnant women. These studies were then compared to the findings in Chapter 5 - Discussion section. |

## Appendix D - Ethics Approval

**Faculty of Commerce, Law and Management**
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**CLEARANCE CERTIFICATE** **PROTOCOL NUMBER: CINFO/1130**

**PROJECT: POST- ADOPTION USAGE BEHAVIOURS IN M-HEALTH PREGNANCY SUPPORT APPLICATIONS: A SOUTH AFRICAN STUDY**

**INVESTIGATOR:** Tendai Chakabuda

**STUDENT NUMBER:** **827205**

**SCHOOL:** SEBS

**DATE CONSIDERED:** 25 August 2016

**DECISION OF THE ETHICS COMMITTEE:** Approved

**NOTE**

Unless otherwise specified this ethics clearance is valid for 1 year and may be renewed upon application. Please remember to include the protocol number above to your participation letter.

**DATE: 06/09/2016** **CHAIRPERSON: Jean-Marie Bancilhon**

pp.

cc: Supervisor:

Dr Emma Coleman

**Appendix E - Respondents Demographic Data**

| Respondent | Age | Living Area | Education Level | Income Category | Work Status | Primary Language |
|---|---|---|---|---|---|---|
| R1 | 33 | Lombardy East, Johannesburg | Postgraduate – Honours | Satisfying average income | Employed | English |
| R2 | 27 | Midrand, Johannesburg | Postgraduate - Honours | Not satisfying average income | Employed | Setswana |
| R3 | 32 | Johannesburg | Undergraduate - BSc | Satisfying average income | Employed | English |
| R4 | 31 | Cape Town | Diploma | Satisfying average income | Employed | Shona / Ndebele |
| R5 | 30 | East London, Eastern Cape | Postgraduate - Masters | Not satisfying average income | Employed | Shona / English |
| R6 | 32 | Fourways, Johannesburg | Postgraduate - Masters | Satisfying average income | Employed | English |
| R7 | 29 | Randburg, Johannesburg | Undergraduate - BSc | Satisfying average income | Employed | English |
| R8 | 25 | Randburg, Johannesburg | Postgraduate - Honours | Satisfying average income | Employed | Pedi |
| R9 | 32 | Midrand, Johannesburg | Postgraduate - Honours | Satisfying average income | Employed | English |
| R10 | 36 | Brakpan, Johannesburg | Postgraduate - Honours | Satisfying average income | Employed | Zulu |
| R11 | 28 | Ferndale, Johanesburg | Postgraduate - Honours | Not satisfying average income | Not employed | English, Northern Sotho |
| R12 | 33 | Bryanston, Johannesburg | Postgraduate - Honours | Satisfying average income | Employed | English |

**Respondent demographic profiles continued…**

| Respondent | Pregnancy Term | First child? | Smartphone Used | Apps downloaded |
|---|---|---|---|---|
| R1 | Third trimester - 34 weeks | Y | Samsung S5 mini | Baby Bump, What to Expect |
| R2 | Second trimester - 16 weeks | Y | LG G4 | What to Expect |
| R3 | Third trimester - 30 weeks | Y | Iphone | Baby Bump, Baby Centre, Baby Kicks, What to Expect |
| R4 | Second trimester - 21 weeks | N | Nokia Lumia | Baby Centre |
| R5 | Second trimester - 22 weeks | Y | Samsung Note 4 | Lullaby music, Baby Centre, What to Expect, Prenatal Lullabies, Pregnancy Plus, Pregnancy, Pinterest |
| R6 | Second trimester - 24 weeks | N | Iphone 6 | Baby Bump, Ova Pregnancy |
| R7 | Second trimester - 20 weeks | Y | Samsung | Baby Centre |
| R8 | First trimester - 11 weeks | Y | Iphone 5 | Period Calendar, Baby Centre |
| R9 | Full term | N | Iphone | Baby Centre |
| R10 | Third trimester - 30 weeks | N | Hauwei | Baby Centre |
| R11 | Second trimester - 20 weeks | N | Samsung / Hauwei | Baby Centre, What to Expect, Ovia |
| R12 | Third trimester - 40 weeks | Y | Sony Experia | Baby Centre |

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