FACTORS IMPACTING TABLET PC USAGE IN LOW-INCOME COMMUNITIES

By:

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Submitted in fulfilment of the requirements for the degree of
Magister Technologiae: Information Technology
in the

Faculty of Engineering, the Built Environment and Information Technology

to be awarded at the

Nelson Mandela Metropolitan University

December 2013

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DECLARATION AND COPYRIGHT

I, Natalie Meiring declare that:

- This dissertation, entitled *Factors impacting on tablet PC usage in low-income communities*, is my own original work.
- All sources used have been acknowledged.
- This dissertation has not previously been submitted in full or partial fulfilment of the requirements for an equivalent or higher qualification at any other recognised education institute.

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ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to the following:

- My supervisor, Prof. D. Van Greunen: for the constant support, motivation and guidance in the completion of this research. I have felt very honoured to have her as my supervisor;

- The NMMU Department of Research Capacity Development for their financial support.

- My loving family. Dad, mom and James for their constant love and support, all of which contributed to the completion of my research.

ABSTRACT

The purpose of this research was to identify factors that impact on tablet PC usage in low-income communities. In order to determine and identify these factors a main research question and sub-research questions were formulated.

The primary research question of this study was "What factors impact on tablet PC usage in low-income communities?" This main research question was answered by creating three sub-research questions followed by triangulating the results from these questions. The first sub-research question was aimed at determining whether prior exposure to touch screen technology impacts the user experience. In order to reach this objective an extensive literature review was conducted on the tablet PC landscape in South Africa. This literature review, coupled with the case study helped answer this first research question.

The second sub-research question was concerned with determining whether existing user experience guidelines are relevant to South African users. A thorough literature review was conducted on user experience guidelines and related studies. This literature review, together with the results from the case study helped answer this second research question.

The third sub-research question involved identifying specific factors which help improve the user experience of tablet PC users in a specific context. This research question was addressed in the case study.

Each sub-research question provided results which were analysed in order to answer the main research question. The factors which impact on tablet PC usage were thus identified and recommendations were proposed.

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Abbreviations

UCD	User centred design
UI	User interface
UX	User experience
PC	Personal computer
BRICS	Brazil, Russia, India, China, South Africa
ICT	Information and communications technology infrastructure

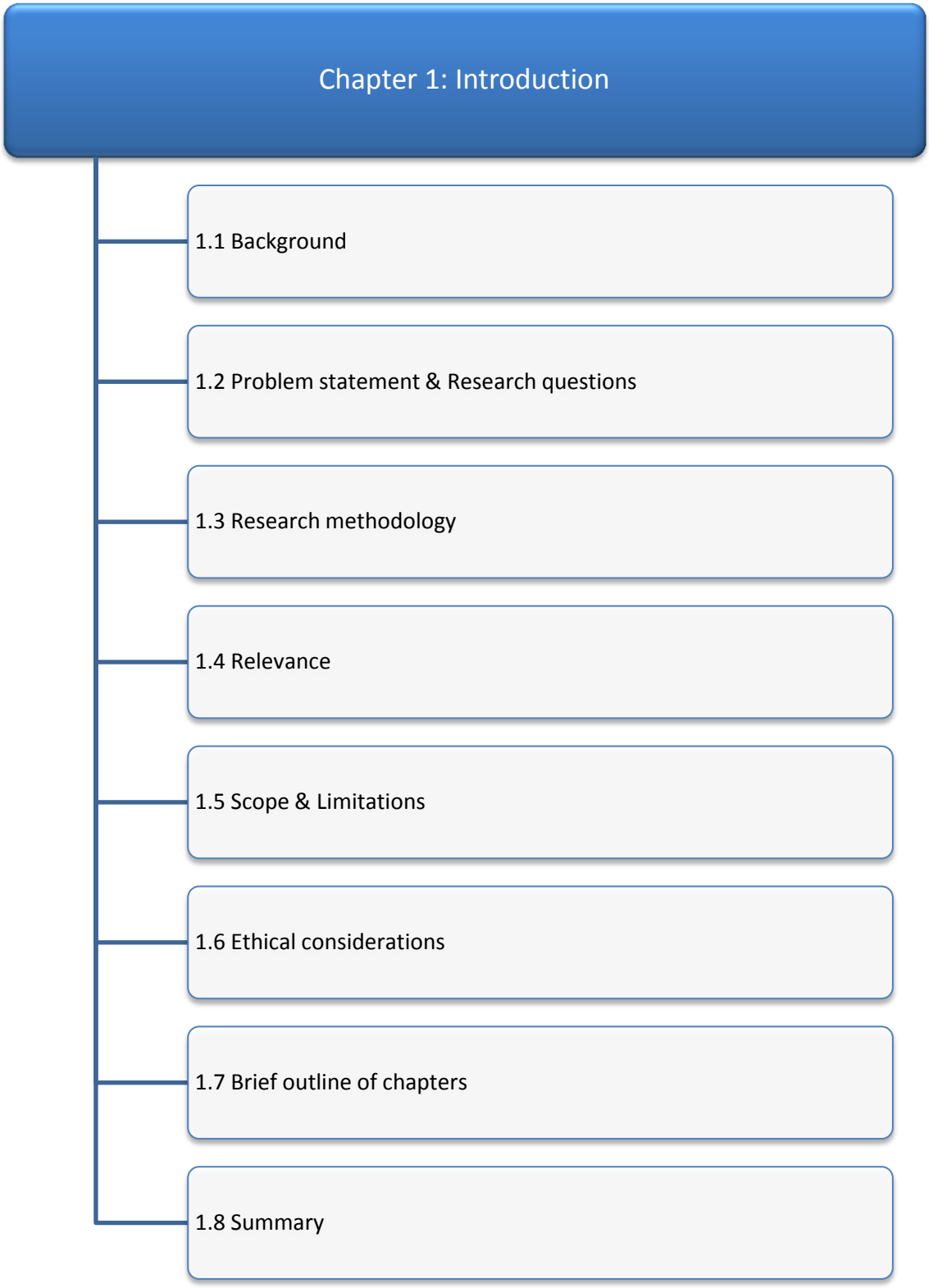


Figure 1-1: Schematic index of Chapter 1 (Researcher, 2013)

Chapter 1 Introduction

1.1 Background

The Post-PC era is a term used to describe how mobile devices are becoming a ubiquitous part of people's lives. People are moving away from Personal Computers (PCs).

The reality of a post-PC era is evident in the global sales. Overall PC sales are on a decline and mobile computing devices are on a steady incline (International Data Corporation (IDC), 2013c; International Data Corporation (IDC), 2013d). These sales make it clear that mobile technology is increasing in popularity globally.

Mobile computing is a technology that enables access to digital resources at any time, from any location (Forman & Zahorjan, 1994). Kaur (2006) defines mobile computing as a "technology that allows transmission of data, via a computer, without having to be connected to a fixed physical link" (Kaur, 2006, p. 83). This definition highlights two key elements of mobile computing:

- It must be portable and accessible from any location;
- It must have wireless data transmission capabilities.

The mobile computing domain encompasses many different devices such as smartphones, notebook computers, personal digital computers and tablet computers. A tablet is a small portable computer that accepts input directly on to its screen rather than via a keyboard or mouse (Oxford English Dictionary, 2013).

Tablets, smartphones and touchscreens have a history going back decades. Within the last 6 years, however, mobile computing has been completely revolutionised. The turning point was the launch of Apple's new line of smartphones in 2007, called the iPhone. Steve Jobs, the driving force behind the iPhone, declared that "Apple is going to reinvent the phone"

(Apple, 2007). The launch of the original iPhone introduced the world to its innovative and user-friendly multi-touch touch screen. The multi-touch touch screen allowed the users to interact with the device by way of their fingers instead of a stylus or keyboard. This promotes a feeling of confidence and control in the user when interacting with the system as opposed to a feeling that the system controls the user (Bachl, Tomitsch, Wimmer, & Grechenig, 2010). The iPhone modernised the way people viewed mobile devices and paved the way for the launch of the iPad tablet.

The iPad is Apple's brand of tablet and was launched in 2010. Since its launch, the iPad has dominated the tablet industry (International Data Corporation (IDC), 2013c). It is important to note, however, that even though the iPad dominates the tablet industry at present, its competitors are gaining on market share. The popularity of the tablet in general is undeniable.

The increasing abundance of lower-priced tablets has created an accelerating shift from PCs to tablets (Gartner, 2013). Globally, the mobile computing market and more specifically the smartphone and tablet market, have been on a steady incline (Table 1.1). Concurrently, the Personal Computer (PC) has been on a downward trend within the last year. There was a 13.9% decline in PC shipments compared to the first quarter of 2012 (International Data Corporation, 2013). Gens (2012) stated that tablets proved a potent competitor and alternative to PCs in 2012 and in 2013, the cannibalization effect would accelerate.

Table 1-1. Global device shipments taken from Gartner (2013))

Worldwide Devices Shipments by Segment (Thousands of Units)				
Device Type	**2012**	**2013**	**2014**	**2017**
PC (Desk-Based and Notebook)	341,263	315,22	302,315	271,612
Ultramobile (thin and light Notebooks)	9,822	23,592	38,687	96,350
Tablet	116,113	197,202	265,731	467,951
Mobile Phone	1,746,176	1,875,774	1,949,722	2,128,871
Total	**2,213,373**	**2,411,796**	**2,556,455**	**2,964,783**

This trend is being seen globally from developed to emerging markets. Developed markets are markets such as America and Australia that have a developed economy and advanced technological infrastructure. Emerging markets, such as the BRICS (Brazil, Russia, India, China and South Africa) countries, are in the process of economic and technological growth. Emerging markets have many limitations which have hindered the growth of mobile computing.

Tablets are expected to escalate in popularity rapidly in emerging markets. Sales of desktop PCs in BRICS countries are predicted to drop and tablet and smartphones sales to proliferate (International Data Corporation (IDC), 2013b). Table 1.2 reveals that the demand for mobile devices such as tablets and smartphones is shifting from developed to emerging markets such as BRICS.

Table 1-2. Emerging market sale shipments (International Data Corporation (IDC), 2013b)

Smart Connected Device Unit Shipments by Region and Product Category, 2012-2017				
Region	**Product Category**	**2012**	**2013***	**2017***
Developed Markets	Desktop PC	55.3	49.5	43.2
Developed Markets	Portable PC	94.1	83.5	84.2
Developed Markets	Tablet	90.8	131.9	219.6
Developed Markets	Smartphone	296.5	338.9	465.6
Total Market		536.8	603.8	812.8
Emerging Markets	Desktop PC	92.9	84.9	80.6
Emerging Markets	Portable PC	106.8	103.8	125.2
Emerging Markets	Tablet	53.6	97.3	190.6
Emerging Markets	Smartphone	425.9	619.8	1,113.1
Total Market		679.2	906	1,509.5
Worldwide	Desktop PC	148.2	134.4	123.8

Smart Connected Device Unit Shipments by Region and Product Category, 2012-2017				
Worldwide	Portable PC	200.9	187.4	209.5
Worldwide	Tablet	144.4	229.3	410.3
Worldwide	Smartphone	722.4	958.7	1,578.7
Total Market		**1,216.1**	**1,509.9**	**2,322.4**

Table 1.3 shows that in emerging markets in 2012, the tablet volume grew by 111.3%. It is predicted (IDC, 2013a) that tablet sales in emerging markets will surpass those in mature markets when the mature market sales plateau. South Africa is one of these emerging markets.

Table .1-3: Emerging markets 2012 (IDC, 2013a)

Region	Product Category	2012	2013*	2017*
Mature Market	Desktop PC	-4.8%	-5.5%	-2.9%
Mature Market	Portable PC	-8.1%	-3.1%	-1.4%
Mature Market	Tablet	62.8%	41.4%	8.3%
Mature Market	Smartphone	20.6%	15.1%	4.6%
Total Market		15.6%	13.8%	4.2%
Emerging Markets	Desktop PC	-3.8%	-3.5%	0%
Emerging Markets	Portable PC	-0.8%	4.1%	7.1%
Emerging Markets	Tablet	111.3%	60.7%	13.4%
Emerging Markets	Smartphone	69.7%	35.1%	12.2%
Total Market		41.3%	26.6%	10.9%
Worldwide	Desktop PC	-4.1%	-4.3%	-1.0%
Worldwide	Portable PC	-3.4%	0.9%	3.7%
Worldwide	Tablet	78.4%	48.7%	10.6%
Worldwide	Smartphone	46.1%	27.2%	9.8%
Total Market		29.1%	21.2%	8.5%

South Africa has participated in this global trend and is experiencing a huge uptake in mobile computing. There are over 10 million South Africans who own smartphones (Deloitte SA Blog, 2013). Additionally, more than 1.4 million tablet PCs have been sold in South Africa by the end of June 2013 (Staff Writer, BusinessTech, 2013a). This, coupled with the increased broadband services could assist with leading South Africa into the post-PC era (Seacom, 2013).

Tablet PCs represent one of the fastest growing sectors of mobile computing and are becoming increasingly popular, while being targeted at a wider audience. This broad spectrum of users, who have different levels of computer experience and knowledge, require that sufficient user experience (UX) studies be conducted so as to best serve each possible user.

UX guidelines have been created in order to promote a positive UX. These guidelines have been established for tablet PCs and mobile computing devices; however, each platform has its own set of UX guidelines. This provides a challenge for developers as there is no standardized set of guidelines.

Multiple usability and UX studies have been conducted on tablets; there are, however, none of these studies that have been conducted in a South African context. “A South African context” for the purposes of this research refers to studies conducted in South Africa and / or with South African participants.

This research will begin by identifying whether the UX guidelines are relevant in a South African context and will ultimately determine the factors that impact tablet PC usage in low-income communities in South Africa.

1.2 Problem Statement and Research Questions

In order to conduct this research the following problem statement and research questions are addressed.

This section will cover the primary and secondary research questions and corresponding objectives, as well as provide the problem statement.

1.2.1 Problem statement

There is currently a lack of understanding of the factors that impact on the overall user experience of tablet PCs in a specific context.

1.2.2 Main research question

Table 1-4 Research questions and objectives (Researcher, 2013)

Question	Objective	Method
Main research question and objective		
What are the factors that impact on tablet PC usage in low-income communities?	To identify the factors that impact on tablet PC usage in the low-income communities.	• Case study • Analysis of findings and results
Sub-research questions and objectives		
RQ1: Are existing user experience guidelines relevant to South African users?	To determine whether UX guidelines are relevant to SA users?	• Literature review • Observation
RQ2: Does exposure to touch screen technology impact the user experience?	To determine whether prior exposure to touch screen technology impacts user experience?	• Literature review • User satisfaction questionnaire
RQ3: How does the identification of specific factors assist in improving the user experience of	To determine how the identification of factors assist in improving tablet PC usage.	• Literature review • User satisfaction questionnaire

Question	Objective	Method
Tablet PC users in a specific context?		• Observation

The following section discusses the research methodology that was adopted in this research in order to ultimately answer the research questions.

1.3 Research Methodology

The research methodology follows the systematic process described by Saunders, Lewis and Thornhill (2009). The different phases of the research methodology are discussed in detail in Chapter 2 (see section 2.3).

The primary research strategy used for this research was a case study. The research philosophy that was applied in this study followed a phenomenological stance. This is further discussed in Section 2.3.1. The research approach that was followed was a deductive approach (see section 2.3.2) and the strategy was that of a case study (see section 2.3.3).

1.4 Relevance

There are currently no published studies on usability or user experience of tablet PCs in South Africa. User experience in this study includes not only usability, but also user readiness, device usage and contextually relevant factors. User experience is further discussed in Chapter 4.

South Africa has many different types of users in different contexts. As the literacy levels of the country remain below those of most developed countries, it is necessary also to investigate the unique factors that will impact on the usage of technology and then, more specifically, tablet PCs.

Ultimately, factors will be identified that impact on tablet PC usage in low-income communities.

1.5 Scope and limitations

The scope is limited by topography, guidelines and tasks restrictions. The scope of this research was limited geographically to participants in Motherwell, South Africa. Only a limited number of participants were selected from Motherwell.

Each mobile operating system has its own set of guidelines, which combined would make an exhaustive list. Therefore the guidelines were limited to one particular operating system – Apple's iOS – as they are the most adaptable guidelines available. The guidelines are further discussed in Section 4.4.

The tasks that were selected for the participants to complete were limited to tasks that did not require an internet connection.

1.6 Ethical considerations

It is important for any researcher to ensure that no harm is done to participants of the research study. It is therefore important to take ethical considerations into account. Participants should be made fully aware regarding what they are being requested to do and participation must be voluntary.

No uniquely identifying data was gathered, nor were any vulnerable groups involved in the study. Hence ethical clearance was not required. Participants were, however, given consent forms. The consent forms were explained by the moderator as well as read through by the participants before any data collection began. All consent forms were signed (see Appendix C). The participants were also made aware that they could leave at any stage, should they wish to do so.

1.7 Brief outline of chapters

This thesis contains the following chapters:

- Chapter 1 - Introduction:
    - This chapter provides an overview of the area of research and highlights the problem domain. Additionally it discusses the problem statement and research objectives. Furthermore the scope and limitations are presented.
- Chapter 2 – Research Methodology and Design:
    - This chapter will present the research methodology followed in order to conduct this research.
- Chapter 3 - The South African tablet PC uptake landscape:
    - This chapter outlines the digital divide between South Africa and the rest of the world. It highlights the current uptake of tablet PCs in South Africa, as well as the limitations that contribute to this digital divide.
- Chapter 4 - UX:
    - This chapter provides a brief background on usability, user experience and the human computer interaction domain. Previous usability studies that have been conducted on tablet PCs are then explored and the UX guidelines for tablet PCs are discussed.
- Chapter 5 – A case study of Motherwell:
    - This chapter touches on low-income communities in South Africa and focuses on a specific low-income community called, Motherwell. The chapter then describes the participants from Motherwell. Furthermore, it describes the case study that was carried out in detail and summarizes the results and findings found during the case study.
- Chapter 6 – Factors that impact on tablet PC usage:
    - This chapter outlines the factors that impact on tablet PC usage. These factors were derived from the case study (Chapter 5) and literature review (Chapter 3 and 4).

- Chapter 7 – Conclusion:
    - This chapter addresses and answers all of the research questions. It concludes the dissertation by discussing the contributions and further research.

1.8 Summary

This chapter sought to highlight the steep incline in sales and popularity of tablet PCs globally. Due to the rise in tablet PC popularity, it is important that sufficient UX studies are conducted. It is furthermore important that these studies are conducted in varying contexts. The context for this research is South African low-income communities.

The chapter presented the necessity for this research and highlighted the research questions and objectives. In addition it provided an outline of the chapters in the dissertation.

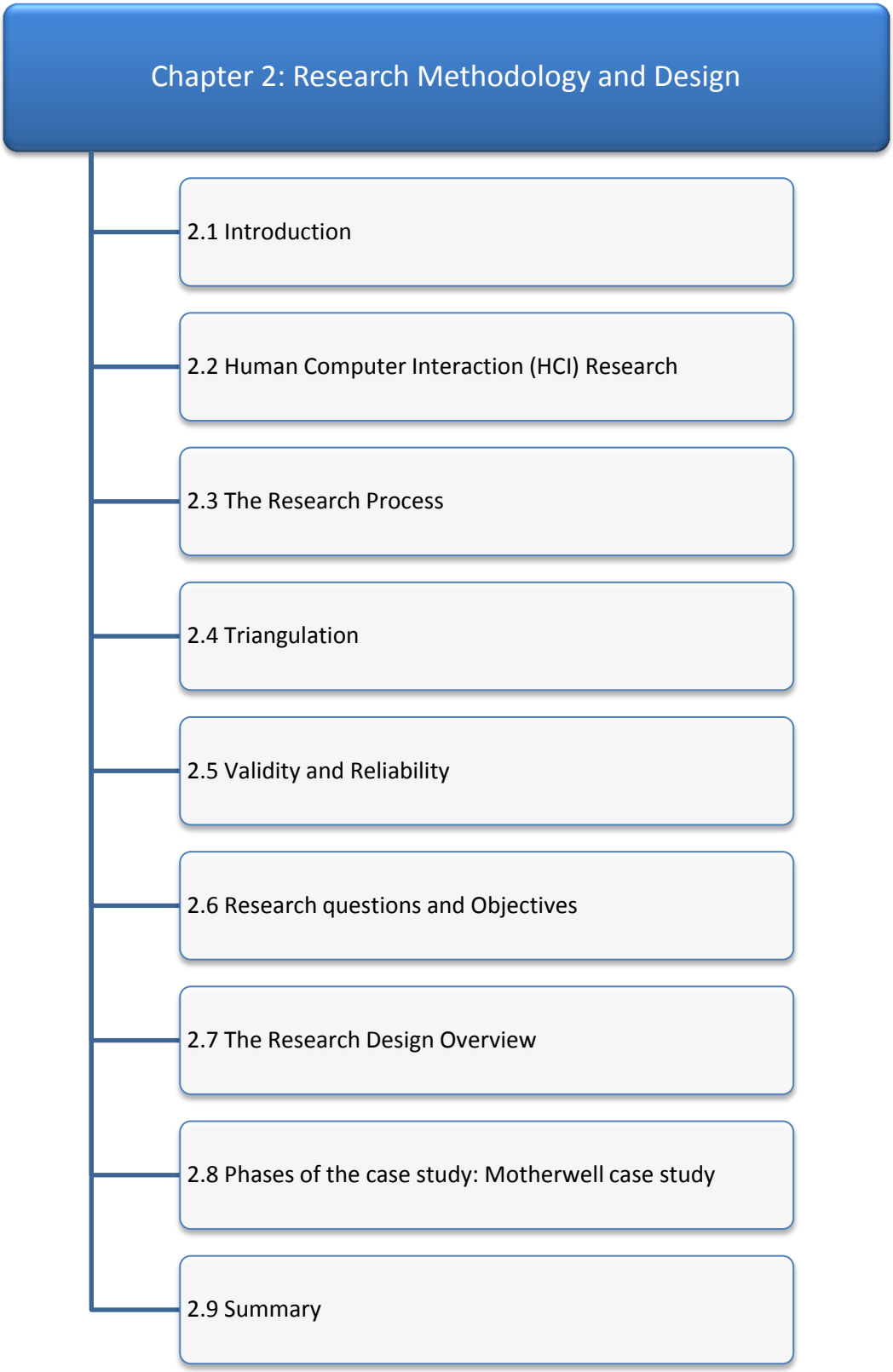


Figure 2-1: Schematic index of Chapter 2 (Researcher, 2013)

Chapter 2 Research Methodology and Design

2.1 Introduction

The purpose of this chapter is to provide insight into the methodological process that was selected and followed during the research. This systematic process is comprised of the research methodology and the research design. Research methodology includes the various methods that are used in order to collect data. Research design can be thought of as a blueprint for how the researcher will go about applying the chosen research methods in order to answer the research questions. De Vaus (2001) states that "the function of a research design is to ensure that the evidence obtained enables us to answer the initial question as unambiguously as possible" (p. 9).

This chapter examines different research methodologies and presents the methodology used in this study, as well as reasons for the choice and an outline of the specific process followed.

2.2 Human Computer Interaction (HCI) Research

Historically, Human Computer Interaction (HCI) was a specialised area with its origins in Computer Science and the concept of usability at its core. However, HCI has since grown more diverse in its concepts and expanded to a point where it is now its own discipline and not just an area within Computer Science. Carroll (2013) described HCI as a "multifaceted community, bound by the evolving concept of usability, and the integrating commitment to value human activity and experience as the primary driver in technology".

HCI is the study of how people use and interact with computers in their lives. HCI has a multidisciplinary nature and consequently consists of many different approaches. These are further discussed in Section 2.2.1 to 2.2.4.

2.2.1 Traditional Science

HCI is regarded as a traditional science. Traditional science is comprised of three core features (Welman, Kruger, & Mitchell, 2006). Firstly, knowledge is obtained via means of observation. Secondly it is gathered in a controlled manner and thirdly it is replicable.

Quantitative approaches such as empirical, quasi-experimental and non-experimental research are most associated with traditional science (Welman, Kruger, & Mitchell, 2006) which is based on observable data by testing or creating hypotheses. This allows for the researcher to draw deductive or inductive conclusions based on empirical enquiry.

2.2.2 Design Science

The Design Science paradigm has its roots in engineering and the "sciences of the artificial" (Simon, 1996). It is an approach fundamentally oriented towards problem solving. "Design Science creates and evaluates IT artefacts intended to solve identified problems" (Hevner, March, Park, & Ram, 2004, p. 75). Design Science consists of two core design processes and four design artefacts. These two design processes are *build* and *evaluate*. The four artefacts are *constructs, models, methods* and *instantiations* (Hevner, March, Park, & Ram, 2004).

This approach allows for the scientific study of the human experience as it relates to IT artefacts, while simultaneously creating new and powerful interactive experiences (Prestopnik, 2013).

2.2.3 Engineering

The engineering approach includes a combination of methods such as experiments, in-depth interviews and observations. It is largely related to software engineering. Software engineering considers how functional requirements are translated into a running system and is based on empirical evidence (Wood, Daly, Miller, & Roper, 1999). Thus, empirical

research is important to software engineering research. In order to achieve meaningful results however, the researcher must overcome human challenges as well as threats to experimental validity (Wood, Daly, Miller, & Roper, 1999).

It strives to recognize HCI issues and bring about advancements to the interaction of the device.

2.2.4 UX Research

UX consists of a wide range of research methods which have their roots in scientific practice. According to Rohrer (2008) this wide range of methods however can be divided into three dimensions:

- Attitudinal vs. Behavioural
- Qualitative vs. Quantitative

2.2.4.1 Attitudinal vs. Behavioural

"This distinction can be summed up by contrasting "what people say" with "what people do" (very often quite different)" (Rorher, 2008). Attitudinal methods include card sorting, surveys and focus groups to measure attitudes. Behavioural methods seek to understand how people react and what they do. Behavioural methods include eye tracking and A/B testing, which is separately testing a controlled and treated group in controlled environments. Usability studies generally utilize a mixture of both attitudinal and behavioural methods (Rorher, 2008).

2.2.4.2 Qualitative vs. Quantitative

Qualitative studies gather non-numerical data and are generally gathered directly via methods such as observation. Quantitative studies gather numeric data and are generally collected via surveys. Qualitative methods are suited for answering the why and how questions, whereas quantitative methods answer how many and how much type of questions (Rorher, 2008). A mixed methods approach was adopted for the purpose of this study as both qualitative and quantitative data collection techniques were exploited.

2.3 The Research Process

As previously stated in Section 2.1, the research process is the overall plan. Saunders (2009) illustrated this concept as the entire research onion, as depicted in Figure 2.2. The various layers of the onion portray the different choices and paradigms a researcher is faced with when deciding on the research design. The research methods are the specific techniques used for the data collection and analysis phase and are represented in the centre of the onion in Figure 2.2.

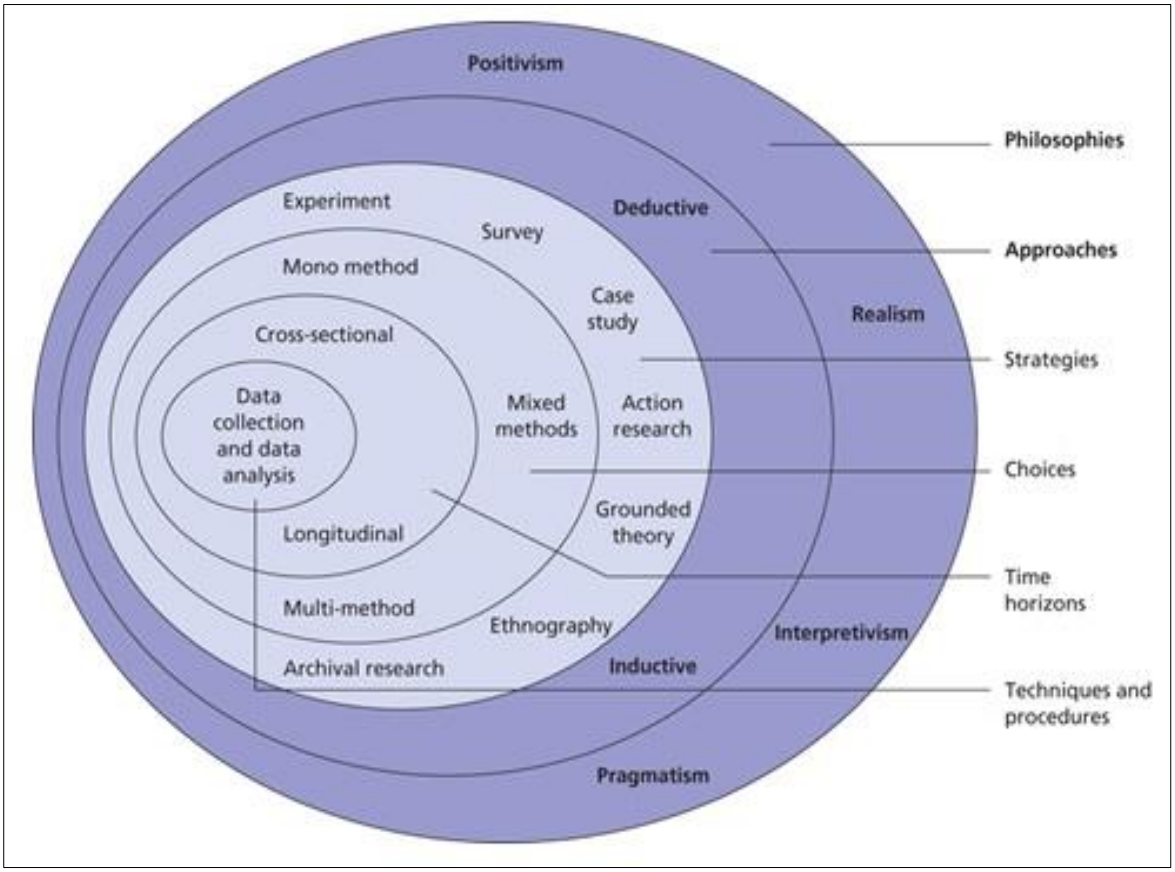


Figure 2-2: The research onion (Saunders, Lewis, & Thornhill, 2009)

Bryman (2012) emphasizes that the researcher's research design decisions reveal the importance being allocated to the various components of the research process.

2.3.1 Research Philosophy

According to Bryman (2004), research philosophy or a research paradigm can be described as "a cluster of beliefs, which for scientists in a particular discipline influence what is studied, how the research should be done and how results should be interpreted" (p. 453).

2.3.1.1 Phenomenology

The chosen philosophy that was followed within this research was phenomenology. Creswell (2003) defines phenomenological research as the identification of the essence of human experiences concerning a phenomenon, as described by participants in a study.

2.3.2 Research Approach

There are two general means of reasoning, namely deduction and induction.

Deductive reasoning, which may also be commonly referred to as the "top-down" approach, essentially tests a theory (Trochim, 2006). The researcher will begin with a general statement (a hypothesis) and based on the results collected through observation and experiments will come to a specific conclusion.

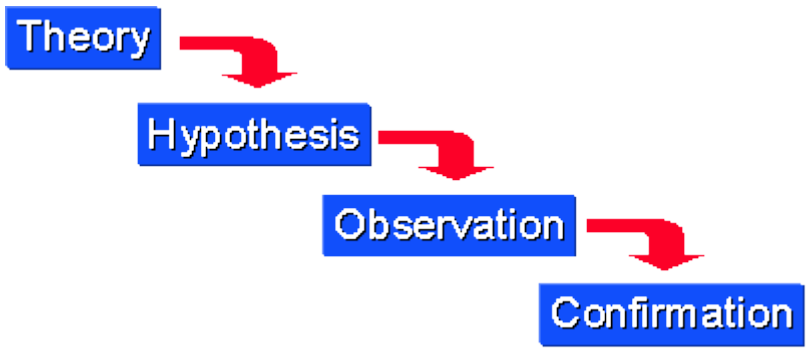


Figure 2-3: A deductive research approach (Trochim, 2006)

Contrary to deductive reasoning, inductive reasoning moves from specific observations in which a pattern is identified, creating broader generalizations which then form the basis of theories. It is frequently referred to as the bottom up approach (Trochim, 2006).

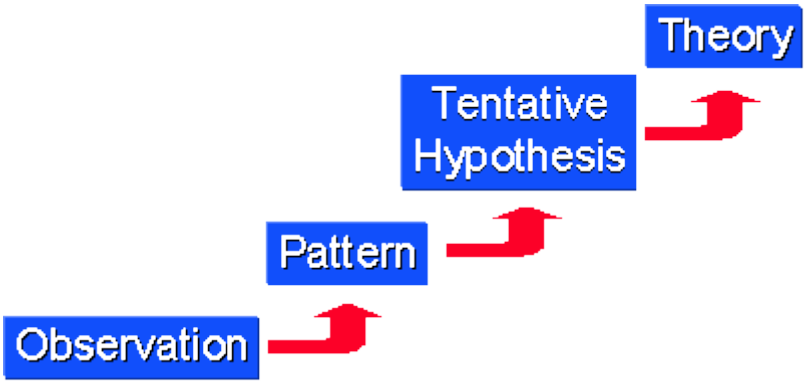


Figure 2-4: An inductive research approach (Trochim, 2006)

Inductive reasoning is generally exercised in qualitative research and deductive reasoning with quantitative research (Cresswell, 2003; Walliman, 2006).

2.3.3 Research strategy

The research strategy is the broad concept of how the researcher endeavours to answer the research questions. Saunders (2008) highlights several strategies; however, only the strategies which are applicable to this research are discussed.

2.3.3.1 Ethnography

Ethnography is a research strategy with its origins in anthropology; however its application to technology is especially relevant. Ethnography is a qualitative research design aimed at exploring cultural phenomena. Common ethnographic techniques include observations, questionnaires and interviews. The aim of ethnography is to provide rich, holistic insights into people's views and actions and their context, through the collection of detailed observations and interviews (Reeves, Kuper, & Hodges, 2008).

In ethnography it is important that the researcher's record all that they see and hear. It is furthermore important to distinguish between what the researcher sees and hears and what the researcher infers that people see and hear (Somekh & Lewin, 2011).

Ethnography is beneficial in the study of UX as it allows the researcher to view the user in real-world interactions with devices. This assists the researcher in gaining insight into how context may impact the UX (Weber & Cheng, 2013).

2.3.3.2 Experiment

Research strategies are either experimental or non-experimental. The major difference from non-experimental approaches is that in experimental approaches the investigator manipulates the selected variables. Two forms of experiments can be used, namely, field or laboratory experiments. Laboratory experiments allow for more control over variables than field experiments. This leads to a potential for greater internal validity.

The advantages of laboratory experiments are that they are the only means to establish cause and effect. They allow for control of variables. Experiments can be replicated, which assists in validity.

A limitation of laboratory experiments is that they are not based on real life situations and are rather artificially designed.

2.3.3.3 Survey

Not all phenomena under research can be directly observed. If observation is not a possibility, then people who have experienced a certain phenomenon can relay this information to a researcher (Nachmias & Nachmias, 1992). This can be done through surveys.

Surveys are a means to elicit and gather responses to questions pertaining to specific variables of interest. Surveys can be divided into questionnaires and interviews. The data can be gathered in person, telephonically or via email. Limitations include the lack of trustworthiness of the participant's responses, low return rate and no opportunity for probing (Nachmias & Nachmias, 1992).

2.3.3.4 Case study

A case study is defined as a comprehensive examination of a specific case or scenario within a real-life context (Lazar, Feng, & Hochheiser, 2010). Case studies build upon theory and include either single or multiple cases.

The case in a case study is the subject matter that the researcher is interested in examining. Examples of a case could be an individual, group, organization and a scenario. A case study may be based on a single or multiple cases. Multiple cases are generally used when comparisons are desirable and are necessary for inductive purposes.

Soy (1997) explains that the advantage of the case study methodology is its applicability to real-life situations coupled with the accessibility of the findings through reports.

2.3.3.5 Phases of the Case Study

The research will follow the case study methodology as described by Robert K. Yin (Yin, 2008). The following steps will be carried out.

2.3.3.5.1 Plan

The first phase in the case study process involves establishing a solid research focus. This is followed by determining and defining the research questions and objectives.

2.3.3.5.2 Design

During this phase the researcher determines the research design that will be followed, as well as the specific methodologies, techniques and approaches that will be used throughout the research. The type of case also is determined in this phase. This may include single or multiple case studies. It is important for the researcher to have a solid knowledge of research design and methodologies in order to choose those that are most suitable for the research at hand.

2.3.3.5.3 Prepare

This phase includes activities which prepare for the data collection phase. In order to not lose sight of the original research goals, the researcher needs to have a clear understanding of the procedures that will be used.

A pilot study must be conducted. It is a valuable procedure to carry out as it allows the researcher to identify any possible issues and rectify them for the main study.

2.3.3.5.4 Collect

In this phase the researcher must gather the data. Due to the fact that data is collected in varying forms, everything must be documented and stored systematically.

2.3.3.5.5 Analyse

This phase involves evaluating and analysing the data which is collected in the previous phase. A case study includes multiple gathering and analysing techniques, which provides opportunities for checking the data against each other (triangulation).

2.3.3.5.6 Share

The last phase includes portraying the data gathered and analysed in a manner that can be shared with others.

2.3.4 Research Choices

Researchers may make use of quantitative and/or qualitative techniques for their research as mentioned in section 2.2.4.1 above. The way in which the researcher chooses to use either or both techniques is referred to as the research choice. Saunders (2009) defines the following methods of data collection:

- Mono-method uses a single data collection technique and analysis procedure.
- Multi-method makes use of more than one data collection technique; however quantitative and qualitative techniques are not mixed.

- Mixed methods make use of both quantitative and qualitative data gathering techniques.

2.3.5 Time Horizon

The time horizon for research can either be longitudinal or cross-sectional. The former refers to the research continuing over an extended period of time and the latter refers to the study occurring at a specific time.

2.3.6 Techniques and procedures

Data gathered can be broadly grouped into primary and secondary data. Similarly data sources may be categorized into primary and secondary data sources. Primary data is data collected by the researcher via primary sources. Examples include interviews, questionnaires and observation. Secondary data is derived from existing data sources, for example, literature.

There is a vast range of methods that the researcher can adopt for the data collection phase. The choice of which methods to use depends on the researcher and the type of research. Only the techniques that are applicable to this research are discussed.

2.3.6.1 Literature Review

In this study, secondary data was gathered from resources such as books, documents and internet sources. One of the advantages of conducting a thorough literature review is that it does not require intrusion into people's lives, and the data are relatively easy to get hold of in a timely fashion. A literature review can also assist with comparing data and triangulating findings. De Vaus (2001) states that case studies require a solid theoretical foundation in order for them to bring value for broader generalization.

A disadvantage of a literature review is that data could be costly if it has previously been gathered for commercial reasons and careful consideration must be taken into account with regards to the sources data quality. This is especially crucial when the internet is being used as a tool to source documents.

2.3.6.2 Direct Observation

Direct observation is a method for observing phenomenon on a first hand basis. Robson (1993) describes direct observation as a method in which the researcher does not converse with the participants and ask about their views, but rather watches what they do and listens passively to what they say.

An advantage of direct observation is that it is a non-intrusive technique, where participants can be observed without being disturbed.

Conversely a disadvantage of direct observation is that it is time consuming and the participant's actions often come into question when they realize that they are being observed. This is known as the Hawthorne effect, whereby participants perform better or differently to how they usually would because they are aware that they are being observed. Often a participant will perform activities or provide responses that the individual thinks will garner the observer's approval (Heim, 2007). Nielson (2001) also highlights this fact in an article in which he states how it is important to pay attention to what users do and not what they say. Due to this it is imperative to utilise methodological triangulation. Methodological triangulation entails the use of more than one research method to gather data (Mitchell, 1986).

2.3.6.3 Questionnaire

A questionnaire is a list of predetermined questions which participants respond to by interpreting the questions and then answering them. A questionnaire may include either or both open- and close-ended questions, both of which have advantages and disadvantages. Close-ended questions will either yield a yes or no response or one of a limited number of possible answers set out in the questionnaire. On the other hand an open-ended question requires that the respondent elaborate his or her answer. It is generally easier to analyse closed-ended question data.

One of the advantages of questionnaires is the fact that they provide anonymity. This increases the confidence of the participant to answer any question that might require

sensitive or opinionated information. It is also seen as an inexpensive form of data collection.

One disadvantage of the use of questionnaires is lack of clarification if the participants do not understand the question or interpret it differently from other participants. An additional disadvantage is the fact that questionnaires are limited to a sample that can read and write.

2.4 Triangulation

Saunders (2009) defines triangulation as the use of multiple data collection techniques in order to increase credibility and reliability of data results. According to Yin (2009), the process of basing an entire study solely on one individual data source is not conducive to conducting case studies. He states that it is more advantageous for multiple data sources to be used within a case study as the researcher can then triangulate the data. Triangulation ensures that discoveries are more likely to be conclusive if they are based on several different sources.

2.5 Validity and Reliability

In research, determining the impact of results is dependent upon two concepts: validity and reliability. Reliability is the extent to which any measuring procedure, such as experiments and tests, yield the same result on repeated trials. Validity is the degree to which a study accurately assesses the specific concept that the researcher intended to measure (Howell, et al., 1994-2013).

Validity is either internal or external. External validity, which is also known as "generalizability", involves whether the results given by the study are exchangeable to other groups of interest (Last, 2001). Internal validity is concerned with whether the results of the study are legitimate based on the way the test groups are selected and the data is recorded and analysed. Factors which may impact on internal validity are either intrinsic or extrinsic to the research (Nachmias & Nachmias, 1992). Handley (n.d.) explains that poor validity can be seen if the testing is not performed the same way in the treatment and control group.

2.6 Sampling

Trochim (2006) describes sampling as the process of selecting units (a sample) from a population. Examples of these units may be people or organizations and the samples is representative of the entire population. A population in sampling terms refers to the defined group of elements that the researcher wishes to study. By studying a specific sample the researcher may generalize the results of the research.

The sampling procedure can be divided into two types, namely probability and non-probability sampling.

Non-probability sampling is concerned with the sampling of elements whereby the elements do not all have an equal chance of being selected. Probability sampling is defined as a sampling method whereby all elements have an equal chance of being selected.

Non-probability sampling methods can be broadly divided into accidental and purposive sampling. Purposive sampling places participants in groups relevant to criteria that fit the research question. Silverman (2000) states that purposive sampling requires that the researcher consider all the parameters of the population that the research is interested in and choose the sample case wisely on this basis.

2.7 Participants

Lazar et al. (2010) discussed the importance of selecting participants with personal attributes and goals that are most applicable to the research. These personal attributes could be, for example, the participants' demographic or education.

Case studies can often be conducted and successfully completed with a small number of users, especially if observation methods are being used, as this may take more time per participant.

2.8 The Research design overview for this study

Section 2.3 discussed the various processes within the research onion. This section highlights the processes that are utilized in this research. Figure 2.5 illustrates the particular choices that impact the nature of this study.

Figure 2-5: Research design for this study (Researcher, 2013)

The chosen philosophy that was followed within this research was phenomenology. Following this philosophy permitted the researcher to get close to participants and interpret their subjective perception of reality.

The research approach that was followed was a deductive approach as the research involved identifying whether the UX guidelines are relevant in a South African context and ultimately determining the factors that impact tablet PC usage in low-income communities in South Africa.

The case study research strategy was the most applicable strategy to use in order to answer the research questions as the research was dealing with a "contemporary phenomenon in a

real-life context" (Yin, 2009). This research followed the case study methodology as prescribed by Robert K. Yin (Yin, 2009) and made use of a single case study as the representative case does not require comparisons.

The case for this research included a selected group of user's representative of a low-income community within the South African context.

A mixed methods approach was adopted for the purpose of this study as both qualitative and quantitative data collection techniques were exploited.

The time horizon encompassed a cross-sectional perspective. A cross-sectional time horizon was used as the research took the form of a snapshot at a particular time.

Qualitative techniques were made use of. A literature review and observation were used, and mixed methods, which include both qualitative and quantitative techniques, were also used in the form of questionnaires. For the purpose of this study both biographical and user satisfaction questionnaires were used.

An initial literature review was conducted in order to build a foundation of knowledge on various topics such as research design and methodologies. A literature review was also conducted on subject areas such as tablet PCs, the tablet PC market in South Africa and globally, as well as the various user experience guidelines that the different tablet PC suppliers provide. A further study included investigating the unique characteristics of the typical users within low income communities in South Africa.

This contributed to triangulating the different data found during the data analysis phase.

2.9 Phases of the case study: Motherwell case study

2.9.1 Plan

The literature review was conducted in various phases. The research commenced by conducting an initial literature review. Phase one investigated the broad overview of the tablet PC market whilst phase two examined prior usability studies that have been performed on tablet PCs. Phase three of the literature review delved into how tablet PCs are

currently being used in South Africa, as well as what studies have been conducted on the tablet PCs within a South African context. The problem description was outlined (see Section 1.2) and research questions were formulated (see Section 1.2) after a thorough literature review had been conducted.

2.9.2 Design

The research strategy that was used is that of a single case study. The case selected included the research environment, which was the NMMU Emmanuel Haven Living Lab. The tools which were used were the UX guidelines, and the participants were chosen from this Living Lab.

2.9.3 Prepare

The researcher sought to obtain any ethical clearance that might be needed. However, for the purpose of this research ethical clearance was not necessary, as no uniquely identifying data was gathered, nor were any vulnerable groups involved in the study. Instruments such as the user satisfaction questionnaire, biographical questionnaire (see Appendix D), task list, consent form (see Appendix C) and moderator script (see Appendix E) were developed.

2.9.3.1 Development of supporting instruments

The following data collection instruments were prepared for use in the collection phase (see Section 2.9.4) of the case study.

2.9.3.1.1 User satisfaction questionnaire

The questionnaire made use of a four-point Likert scale (see Appendix G). The reasoning behind selecting this type of scale was to ensure that the participants chose a positive or negative response with no central tendency bias.

- The questions were based on the following user experience guidelines (Apple Inc., 2013) that were applicable to the tasks that the users needed to complete:

- Focus on the Primary Task;

- Elevate the Content that People Care About;
- Consider Adding Physicality and Realism;
- Start instantly;
- Use User-Centric Terminology;
- Delight People with Stunning Graphics;
- Handle Orientation Changes;
- Use UI Elements Consistently;
- Make Usage Easy and Obvious;
- Think Top Down;
- Give People a Logical Path to Follow.

The rest of the questions were based on the user's experience whilst interacting with the tablet. The purpose of the questionnaire was to determine the user's satisfaction level, attain the participant's opinions regarding their experience and determine whether certain UX guidelines were applied.

2.9.3.1.2 Biographical questionnaire

The biographical questionnaire (see Appendix D) was designed gather background information on the participants of the case study. The questions were aimed to ascertain their general demographic details, as well as their computer literacy level and prior touch screen experience.

2.9.3.1.3 Tasks

The tasks (see Appendix F) were selected based on two criteria:

- Simplicity;

- Variety.

In order to ensure that the study remained focused on UX, simple tasks were selected so as to minimise the chance of the user being confused about the actual task itself.

An assortment of tasks was selected to represent every-day activities that one might perform on a tablet PC. This was to ensure that the user encountered a diverse range of functionality. This provided a broad spectrum of opportunities to discover whether or not the UX guidelines were effective.

2.9.3.1.4 Consent form

A consent form (see Appendix C) was created for the participants of the study to read and sign before the data collection took place. The consent form informed the participants what the study is about and the potential benefits.

2.9.3.1.5 Moderator script

The moderator's script (see Appendix E) was designed to give the moderator a systematic flow of events. It also provided a platform for the moderator to document observations and additional comments.

In addition to developing the above instruments for the collection phase, the device that the study was going to be conducted on needed to be determined.

2.9.3.1.6 Device

The device used for the purpose of this study was the Wise Touch tablet (see Section 3.4). This particular tablet was selected as it is a low cost solution for the South African market compared to the existing higher-priced well-known brand tablets. The tablet ran Android version 4.0.3 as the operating system, also commonly known as Ice Cream Sandwich. The primary method of interacting with the device is through the touch screen The Wise Touch tablet used for this study had a screen size of seven inches and a Cortex-A9, and a 1.5 GHz Dual Core central processing unit.

2.9.4 Collect

The data was collected during the case study in four separate phases (Figure 2.6). During these phases the researcher acted as the observer and observed each participant individually. The sessions were recorded via means of observation, note taking and recording.

The first phase was the pilot study. During the pilot test which was initially conducted, no issues were identified and, as a result, the researcher proceeded to move onto the second phase. The second phase consisted of determining whether the UX guidelines are relevant for South African low-income tablet PC users. The third phase focused on whether prior touch screen exposure impacts on tablet PC usage, and the fourth phase highlighted the factors which impact on tablet PC usage. These phases are further discussed in Chapter 5.

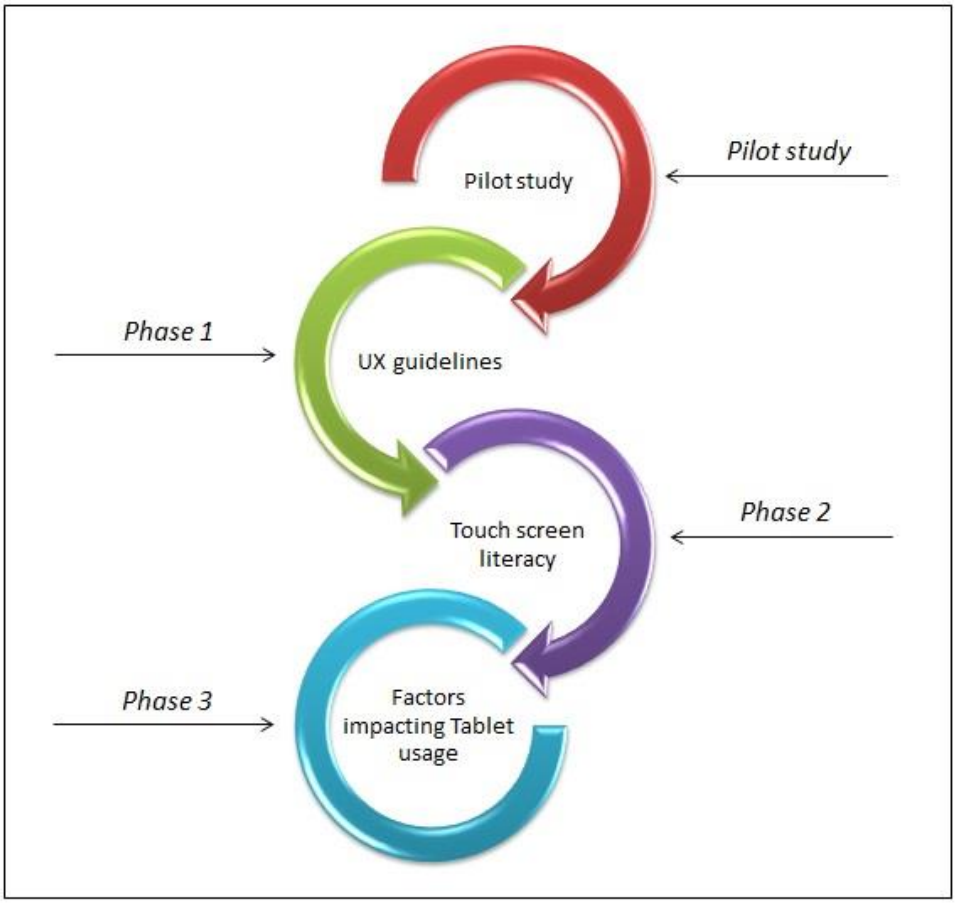


Figure 2-6: The different phases of the case study (Researcher, 2013)

Quantitative and qualitative data collection techniques were used. The quantitative methods included questionnaires. The questionnaires included biographical, user satisfaction and usage questionnaires. The qualitative methods comprised of observation and informal interviews.

2.9.5 Analyse

The data gathered was evaluated and analysed. Data gathered from the literature review, questionnaires and observation were triangulated in order provide credibility in the results (see Section 6.3). The literature review provided a sufficient foundation of knowledge on the various subject areas. The questionnaires provided subjective feedback from the participants in the form of numerical data. Finally the observations provided qualitative data and provided the researcher with the opportunity to observe the participants whilst completing their tasks. Triangulation was particularly helpful in this instance as the answers which the participants selected on their questionnaires were often contradictory to what the researcher observed. The analyses of the data are further discussed in Sections 5.3.5, 5.4.5 and 5.5.6.

2.9.6 Share

The analysis phase of the case study was followed by the share phase. This involved identifying the specific factors that impact on tablet PC usage by South African users from low income communities. These factors are discussed in more detail in Chapter 5. The case study and data collection will assist in determining how UX guidelines impact on South African users.

2.10 Summary

This chapter defined the design and research methodologies that were followed for this study. It discussed the different steps of the case study and how these steps were applicable to this study. The chapter provided an overview of the entire research process and explained the specific choices that the researcher chose to apply to ultimately answer the research questions. The researcher used both random and purposeful sampling means for

different phases of the case study, which included different participants at each phase. The observations and more in-depth details of the case study are discussed in Chapter 5.

In addition, the importance of triangulation and its impact on validity and reliability were discussed.

The chapter concluded with detailing the various phases of the case study.

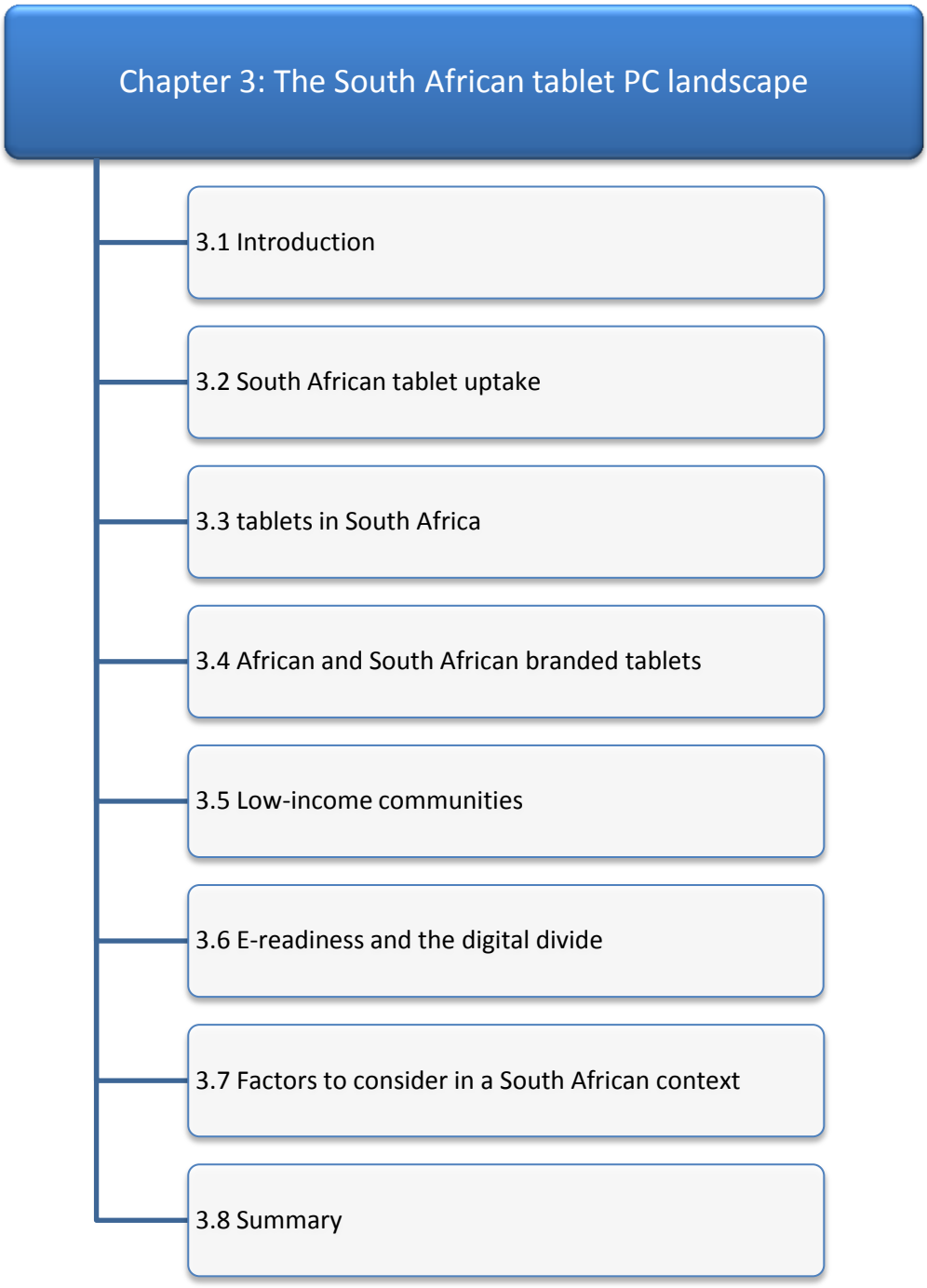


Figure 3-1: Schematic index of Chapter 3 (Researcher, 2013)

Chapter 3 The South African tablet PC landscape

3.1 Introduction

Technology is evolving at a rapid pace and people are continuously presented with the hurdle of adopting new technologies. Different people react differently to new technology and the adoption rate at which people accept new technology varies. Technology adoption allows individuals to partake in the rapidly evolving world of technology. Individuals who do not adopt new technologies are not able to derive the benefits from technology which contributes to the elements that create the digital divide amongst groups. Once the user has adopted the technology it is important to note what factors impact on the usage.

This chapter investigates and outlines the uptake of technology in South Africa as it compares to other African and developed countries. In doing so, it considers aspects of the digital divide and e-readiness.

This chapter furthermore discusses the South African tablet PC landscape. It highlights the limitations that contribute towards this digital divide as well as the factors which influence technology usage. Moreover, this chapter aims to address the following research question: *RQ2: Does exposure to touch screen technology impact the UX?*

3.2 South African tablet uptake

Despite the fact that nearly half of South Africans live in poverty, the mobile uptake in South Africa has been considerable (Staff Writer, Business Tech, 2013b). Research reveals that an estimated 78% of South Africans have mobile phones. Using the mobile phone for internet connectivity over stationary Internet is very popular in South Africa as mobile Internet offers a cheaper alternative to access Internet (UNICEF New York, Division of Communication, Social and Civic Media Section; Beger, Gerrit; Sinha, Akshay, 2012). The fact that mobile

phones have internet capabilities is significant because it provides accessibility to the internet for people that otherwise would not have this service. South Africa's mobile telephony has been a significant component in reducing the communication gap between urban and rural demographics. This is due to the fact that mobile telephony provides communication and access to areas which are undeveloped in terms of main telephone lines and information and communications technology (ICT) infrastructure (UNICEF New York, Division of Communication, Social and Civic Media Section; Beger, Gerrit; Sinha, Akshay, 2012). Mobile technology provides access to an assortment of services that the internet provides, such as online banking, communication and many other beneficial services. Low-income communities in South Africa are often densely populated areas, with a high level of crime and lack of service delivery (Affordable Land & Housing Data Centre, 2012)(

Out of the 78% who have smartphones, only 27% have active smartphones (Staff Writer, Business Tech, 2013b). Active smartphones in this instance are smartphones which are actively being used on South African cellular networks. This low percentage of smartphone penetration in South Africa contributes to the low level of touch screen exposure. This in turn presents the user with a steep learning curve when interacting with a touch screen on a tablet PC for the first time.

Despite the limitations that impact on the mobile user in South Africa, South Africans have embraced the tablet market. Consequently South Africa has experienced a substantial tablet uptake (Deloitte SA Blog, 2013). The total sales of tablets sold in South Africa at the end of September 2012 totalled to 788 000 with the iPad being the market leader. Goldstuck (2012) explains that it is a significant amount as tablets only officially reached South Africa in 2011 and consequently have been available in the South African market for only two years. Figure 3.2 depicts a breakdown of the different brands of tablets sold ending September 2012.

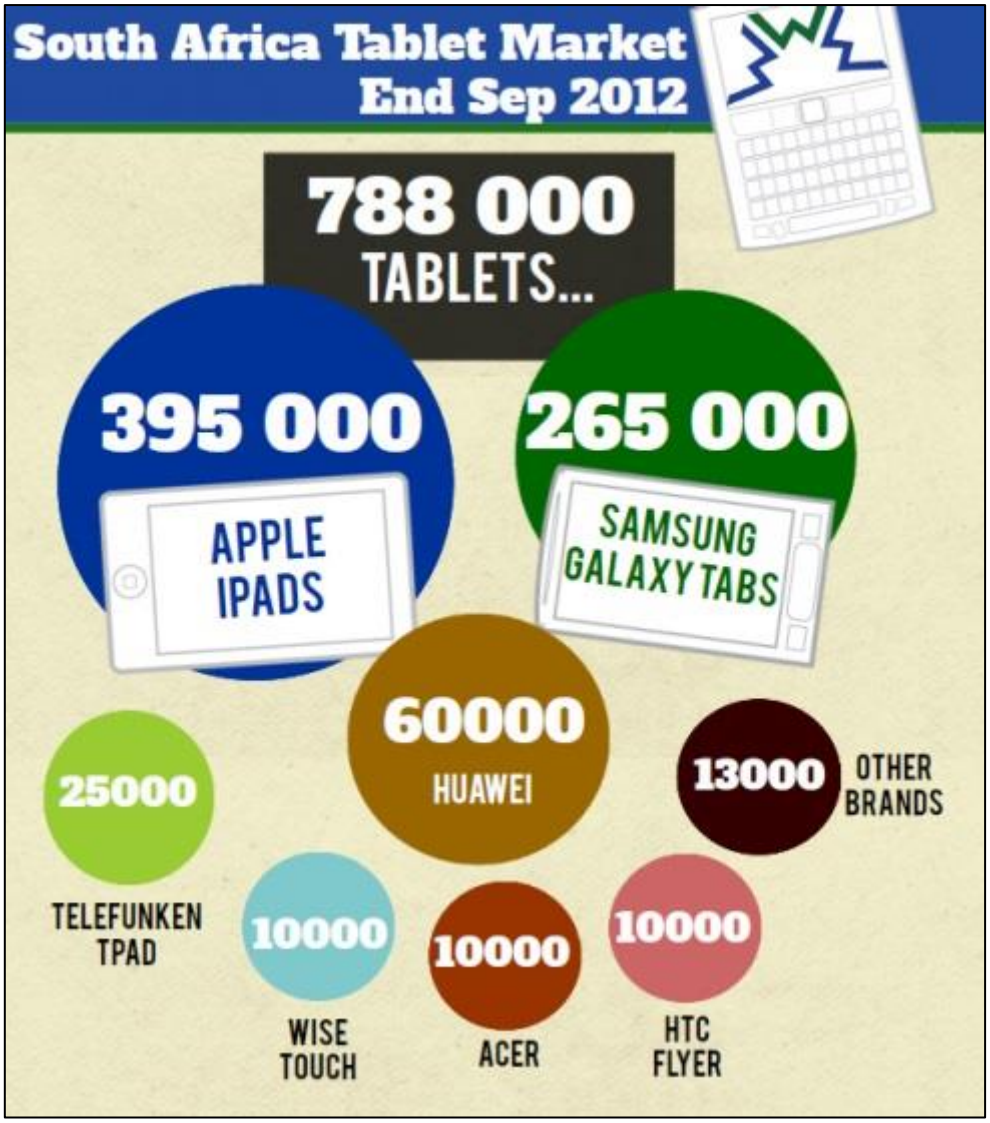


Figure 3-2: South African tablet market (Goldstuck, 2012)

The iPad has dominated the tablet market since its launch in 2010. It has been and still is the global tablet market leader. However, Smit's research on the South African consumer tablet market reveals that in 2013, Samsung has surpassed the iPad and is now the most popular tablet brand to own in South Africa (Smit, 2013). Samsung has the highest market share in South Africa with 58% and 31% of the market share owned by iPad as depicted in Figure 3.3.

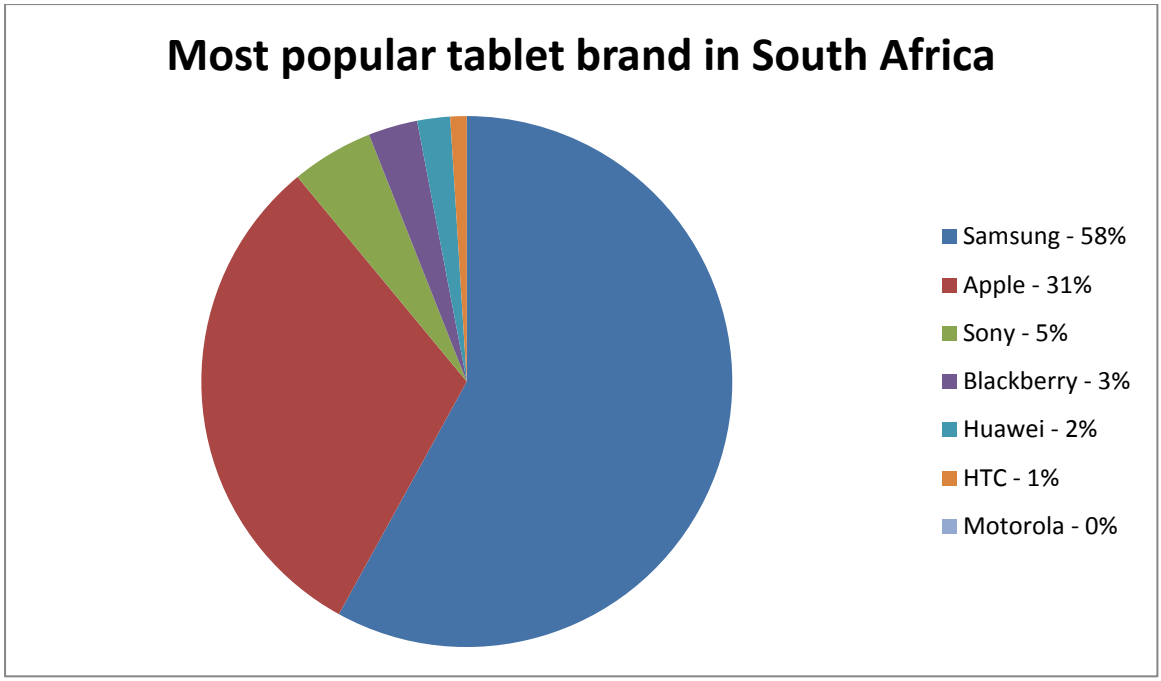


Figure 3-3: Most popular tablet brand in South Africa (Smit, 2013)

Smit (2013) also found that out of all the South African respondents coveting a tablet in future, 58% wanted a Samsung branded tablet.

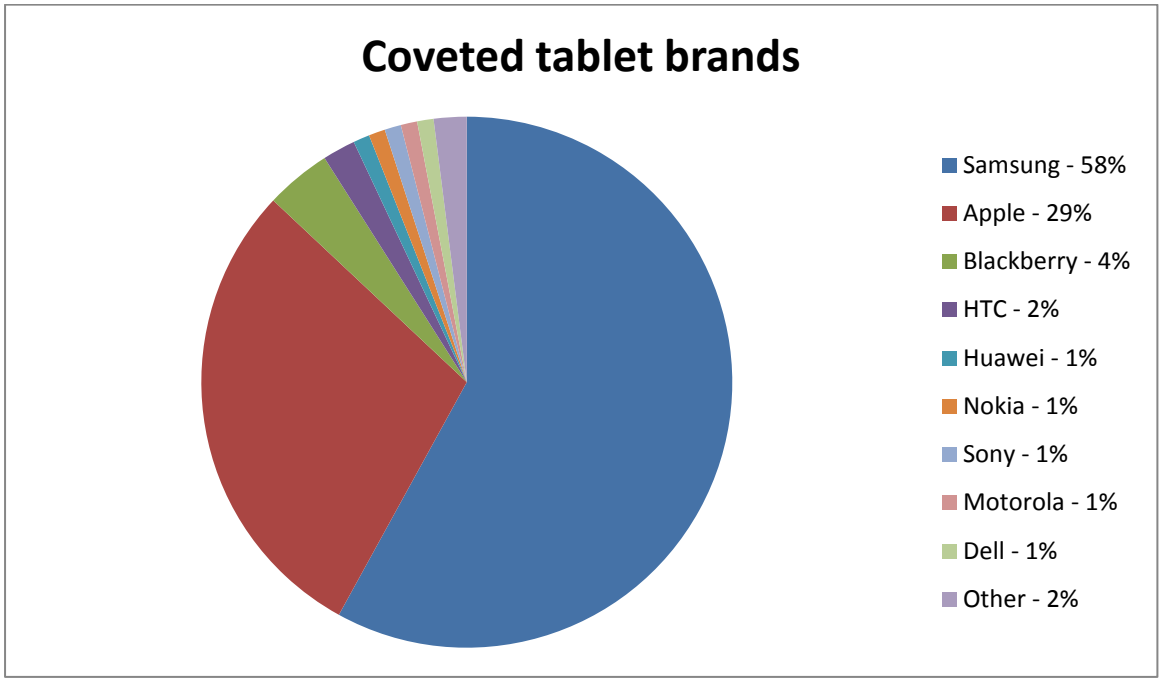


Figure 3-4: Coveted tablet brands (Smit, 2013)

As can be seen in both Figure 3.3 and Figure 3.4, Samsung is the leading tablet brand in South Africa at present. For the purpose of this study, a South African brand of tablet called Wise Touch was used, with Google's Android operating system, which Samsung also makes use of for its popular Galaxy range of tablet PCs. This means that the Wise Touch is similar to the most popular brand of tablet in South Africa.

Studies were also conducted to investigate whether the screen size of a tablet PC influenced users. Smit (2013) found that of the various possible screen sizes for tablets, the South African respondents had no clear preference (Figure 3.5).

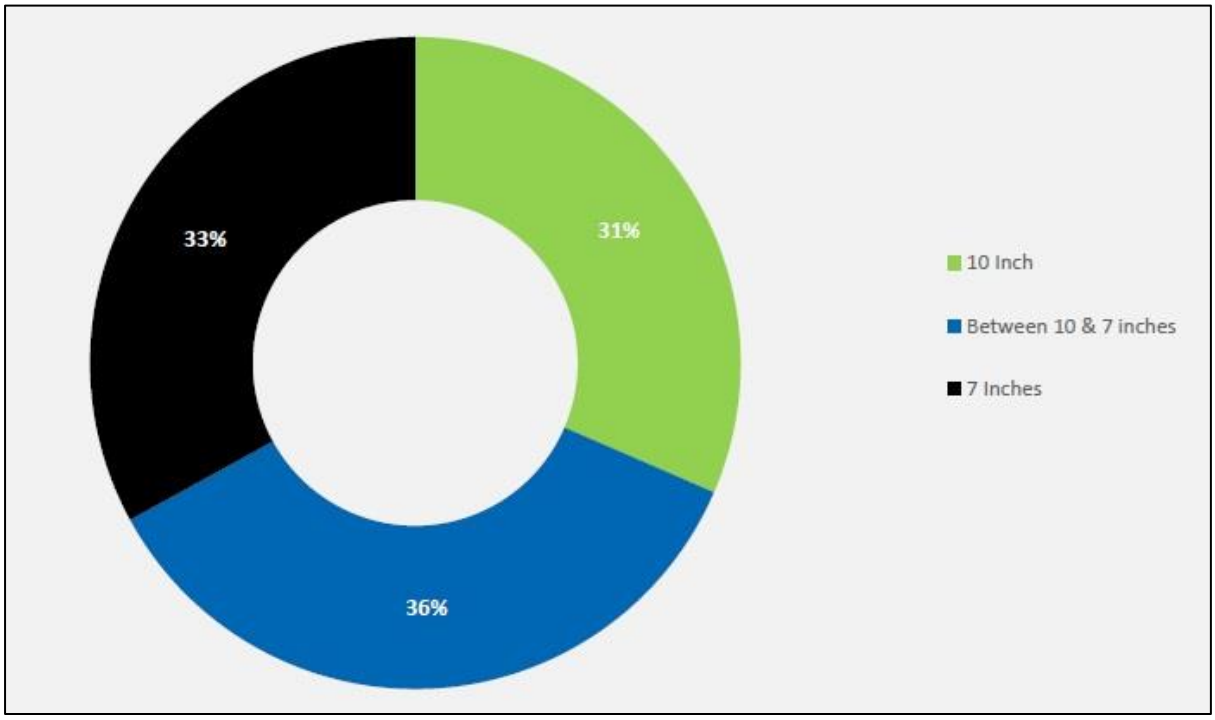


Figure 3-5: South African tablet PC screen size preference (Smit, 2013)

3.3 Tablet uses in South Africa

Similarly to personal computers and laptops, tablets have numerous functions. People use their tablets for various activities related to work, education and entertainment. Smit (2013) found that South Africans' primary reason for wanting a tablet is its portability as illustrated in Figure 3.6. Secondary to its portability capabilities, South Africans desire tablets for entertainment purposes. Work related activities and making use of the tablet to listen to music were ranked in third place.

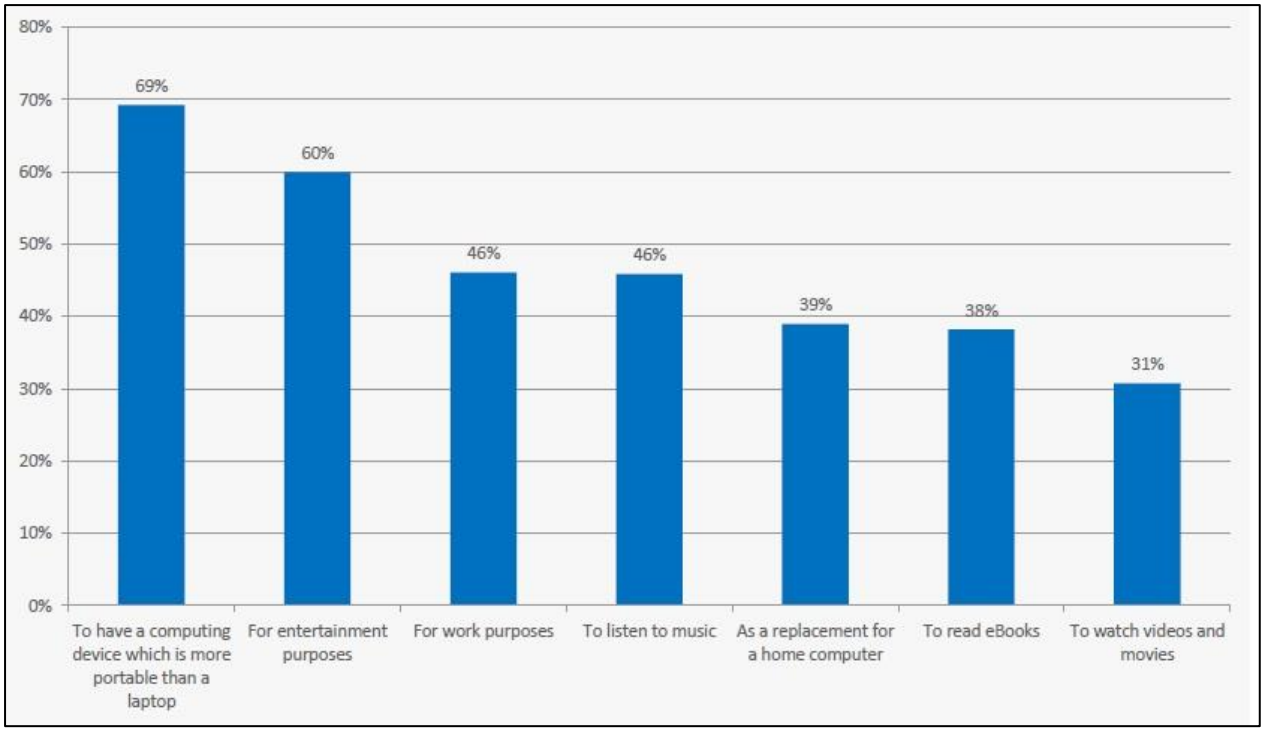


Figure 3-6: Tablets and their uses (Smit, 2013)

Steenkamp (2012) discusses how the use of tablets for educational purposes is a viable option in South Africa due to the high usage of mobile devices in the country. Several schools in South Africa are embracing the tablet revolution and incorporating iPads as part of their student's stationery requirements and curriculum. There are numerous initiatives in private and public schools, as well as urban and rural areas. These include the distribution and usage of iPads as well as Android tablets (Samsung Tomorrow, 2012; Why I love South Africa, 2012).

3.4 African and South African branded tablets

Tablets are being designed and engineered on the African continent. A company called VMK (2006) in the Congo has developed its own brand of tablet called the Way-C which has been tailored for the African market. They pride themselves on having created African solutions which can be applied to African problems. VMK addressed certain issues such as the high price points of tablets and the lack of local content. The Way-C was created to emphasize African content – applications (apps) developed by Africans – and at the same time be an affordable option for Africans.

To date, tablets available in South Africa have been in a high priced bracket. However, South African companies such as Wise Tablets and Future Mobile Technology (FMT) have realized the growing demand in South Africa for affordable devices. They have addressed this issue by launching their own brand of affordable tablets.

Wise Tablets is a South African based company specialising in creating tablets created by South Africans for South Africans (Wise Tablets, 2012). The Wise Touch tablet has a great focus on being a home grown product. The tablet comes with pre-installed apps, many of which are contextually relevant and specifically aimed at South African market.

FMT has also created a brand of tablet with the South African market in mind. Their focus is on creating affordable, internet enabled tablets that are available to the mass market. FMT created a brand of tablet named Netsurfer. Specifically, FMTs Netsurfer Dual tablet is being used as an educational tablet at the North West University (Mashego, 2013).

What makes these tablets unique for South Africans is their low price compared to the Android and iPad tablets, as well as their local pre-installed content.

3.5 Low-income communities

A low-income community is a community that has an average income lower than the national average income level. Low-income communities generally have limited access to various resources. These resources may vary from good transport systems, education, electricity, water and ICT infrastructure.

3.5.1 Africa

Africa is the world's poorest inhabited continent and the teledensity is very low. Teledensity is telecommunications expressed as a percentage of a population. People from different socio-economic backgrounds have different opportunities to access information and communication technologies. This is commonly regarded as a potential barrier for participation in the information society (Hüsing & Selhofer, 2002). Despite Africa's general poverty, mobile phones are widely used throughout the continent.

3.5.2 South Africa

South Africa's economy is the most advanced economy in Africa; however, it still faces many problems. In 2013 South Africa was estimated to have a population of 52.98 million (News24, 2013). South Africa has a teledensity of 41.52 in the largest city and 8.18 in the rest of the country, which shows a very high gap (Wolf, 2001). The economy of South Africa is ranked as an upper-middle income economy by the World Bank (The World Bank, 2012) However, there are still a large number of low-income communities in the country. Lower-income communities in South Africa are still largely made up of informal dwellings and do not often have access to fundamental services such as water, let alone telecoms. The average annual household income in South Africa is R119 542 (Statistics South Africa, 2012a). As can be seen in Figure 3.7, the average income for households varies significantly across the different demographic groups. 45 to 50% of the population in South Africa is considered to be living in real poverty, and at least 7.5 million adults are illiterate (Stillman, et al., 2011).

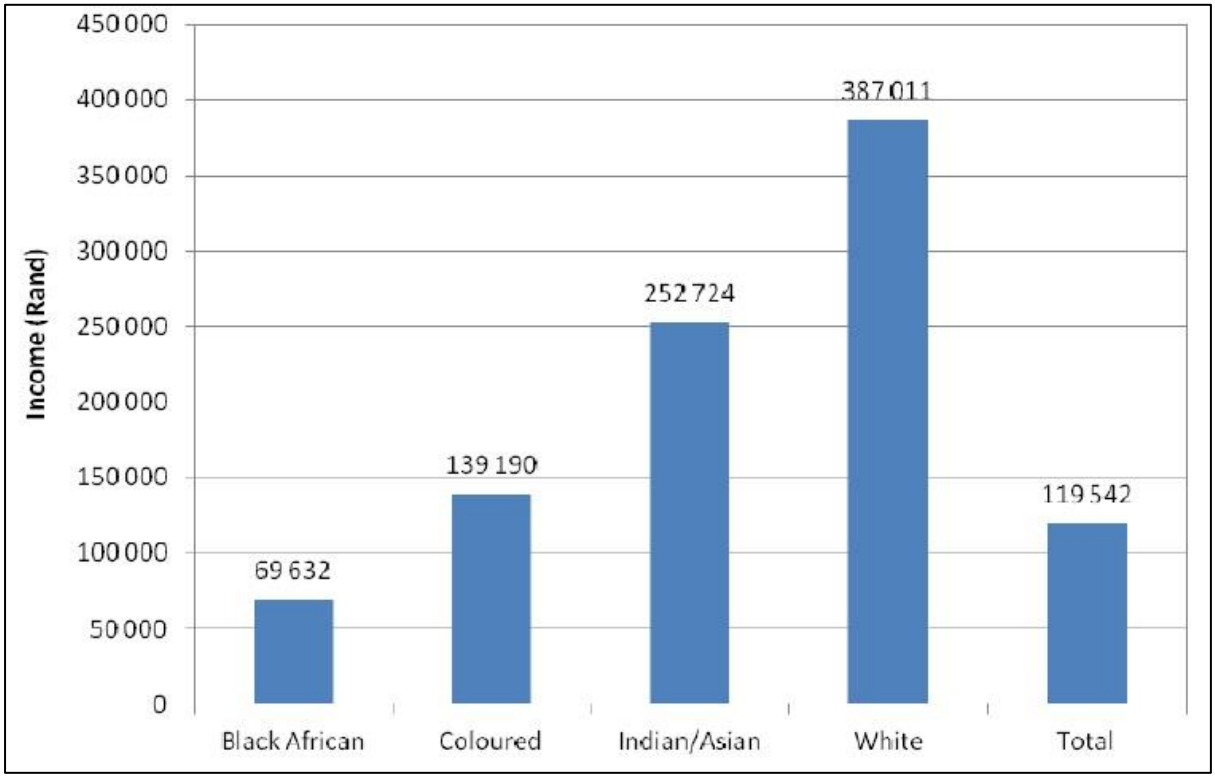


Figure 3-7: Average South Africa income (Statistics South Africa, 2012a)

One difference between middle income and low-income groups in South Africa is that only 9.74% of low-income groups work full time (Van Aardt, 2010).

3.5.3 Eastern Cape

Many low-income communities exist in the Eastern Cape. The Eastern Cape is the third biggest province within South Africa with approximately 6 562 053 people (Statistics South Africa, 2011).

The Eastern Cape is considered a low-income province with the second highest unemployment rate at 37.4% (Statistics South Africa, 2011). Table 3.1 shows the low-income figures for households in the Eastern Cape. As many as 12.1% of all households have no income at all (Human Sciences Research Council (HSRC), 2011).

Table 3-1: Annual household income in the Eastern Cape (HSRC, 2011)

Income range	Percentage
No income	12.1%
R1 – R400	7.9%
R4 801 – R9 600	12.1%
R9 601 – R19 200	25.8%
R19 201 – R38 400	21.5%
R38 401 – R76 800	9.1%
R76 801 – R153 600	6.1%
R153 601 – R307 200	3.4%
R307 201 – R614 400	1.5%
R614 401 – R1 228 800	0.4%
R1 228 801 – R2 457 600	0.2%
R2 457 601 or more	0.2%

The high unemployment rate and low-income levels experienced in the province could contribute to the fact that only 11.9% of households in the Eastern Cape have a computer (Statistics South Africa, 2012b). This is the lowest percentage among the provinces in the country.

The Eastern Cape furthermore has the lowest proportion of household internet access among the provinces, with 24.1% (Statistics South Africa, 2012b).

The Eastern Cape is home to many low-income communities of which Motherwell (the community selected as the subject of this study) is one.

3.5.4 Socio-economic status of Motherwell

Motherwell was established in 1982 in order to accommodate people who had illegally occupied areas located in Soweto-on-Sea and the city and surrounding areas of Port Elizabeth (Department of Local Government and Business Trust, 2007). The area is characterised by high long-term unemployment and high levels of poverty. It is situated in the Nelson Mandela Metropolitan Municipality and is 18 kilometres outside of the city of Port Elizabeth – so the majority of people have to commute to Port Elizabeth for work, which is time consuming and costly.

Designed initially as a residential area for approximately 120 000 people, it now consists of 16 neighbourhoods with a population of close to 140 000 people (Statistics South Africa, 2011). IsiXhosa is the main language spoken within the community, with 98.1% of the people using it as their first language.

Socio-economic studies which have been conducted in Motherwell indicate that 52.5% of the population in Motherwell live in households comprising between four and six members and in the informal dwellings; the average household size is seven to nine people (Motherwell Urban Renewal Programme (MURP), 2005). One in three households lives in informal dwellings of which 80.8% are brick structures. However, 12 000 households do not have access to electricity (Affordable Land & Housing Data Centre, 2012).

People who live in Motherwell tend to have fairly limited life skills, which contributes to the high levels of unemployment and low income in the area. Life skills refer to numerous aspects such as social skills, communication skills and education. Approximately 60% of the population is younger than 29 years of age (Veldsman & Van Greunen, 2013).

The inhabitants of Motherwell have an alarmingly low education level:

- 19.3% of people above the age of 18 have obtained a grade 12 qualification;
- 35.4% have between a grade 8 and 12 qualification;
- 17.1% have no formal academic qualification;
- 93.9% have no tertiary education (Dames, 2009).

In 2012, 1 500 households in 5 council wards were surveyed. The results from the community needs assessment indicated that Motherwell is an extremely poor community with household earnings between R601 – R1100 per month (Veldsman & Van Greunen, 2013). 76% of the Motherwell population are below the poverty line. Motherwell's employment level is rated at 18% for people ranging from 15 to 65 years of age. 42.9% of all households receive a government grant and 18.3% receive a housing subsidy (Dames, 2009).

Results from studies done in the community also specified that, despite the low-income levels, 97% of the Motherwell community owned a cell phone (Veldsman & Van Greunen, 2013).

As a low-income community, Motherwell faces many social challenges. A study by Dames (2009) showed that the major challenges that Motherwell is faced with are:

- Poverty;
- Lack of medication and home based care;
- Unemployment;
- Crime;
- Alcohol abuse amongst youth;
- High HIV/Aids prevalence;
- Teenage Pregnancy;

- Increase in number of orphans and lack of support for them (Dames, 2009).

3.5.5 NMMU-Emmanuel Haven Living Lab

A Living Lab is a research environment, which is user-centred, within real-life settings. A Living Labs focuses on the different stages of the research, development and innovation process, whereby the users are the main source of innovation for ICT.

A Living Lab has been established in the Motherwell community within the Nelson Mandela Bay Metropolitan area. In 2011, collaboration and commonly shared goals between the School of Information Communication and Technology at Nelson Mandela Metropolitan University and Emmanuel Haven resulted in the establishment of the NMMU-Emmanuel Haven Living Lab (Veldsman & Van Greunen, 2013).

The Living Lab includes a computer lab which can be used as a computer training centre. Among many of the Living Labs goals, one is to achieve primary education through ICTs (Veldsman & Van Greunen, 2013)

The Living Labs goals are:

- “Stimulate interest in technology through the establishment of a development lab to transfer skills";
- "Enhance and retain ICT skills in the Eastern Cape through the establishment of community-based ICT training centers in specific under-serviced areas” (Veldsman & Van Greunen, 2013, p. 6).

3.5.6 Typical user characteristics found in low-income communities

User characteristics help one understand the target group. No matter how advanced a computer interface becomes, users will always critique it, so their characteristics are important to consider (Liu, 1997). Based on the needs assessment conducted by Veldsman and Van Greunen (2013), the following typical user characteristics for low-income communities are:

Typical user characteristics:

- Low education levels;
    - If the individual's education levels are low they might find the complexity of the device too demanding. This could also be the result of their lack of exposure to various technologies which would increase the learning curve.
- Low-income levels;
    - If there is a lack of sufficient income to acquire access to ICTs, it does not matter if a low-income community has the ICT infrastructure.
- Lack of awareness of benefits derived from ICTs;
    - It is important for individuals to be aware of the benefits that can be obtained through ICTs.

Characteristics specific to Motherwell:

- Age;
    - Motherwell has a youthful population with 55% of the residents falling into the age group of below 30 years of age (Dames, 2009).
- Gender;
    - The male / female ratio is split quite evenly at 48:52% (Dames, 2009).
- Language and Culture;
    - The majority of the people in Motherwell speak and follow isiXhosa traditions.
- Education levels;
    - As discussed in section 3.5.4, members of the community have a low education level.
- Income levels;
    - As discussed in section 3.5.4, the members of the Motherwell community have alarmingly low income levels.
- General IT experience;
    - The majority of the individuals have no computer literacy. This tends to go hand in hand with the individuals' lack of awareness of the benefits of ICTs.

3.5.7 Initial limitations for low-income communities

Technology availability is not sufficient to influence people to adopt technology in low-income communities. Other factors come into play, such as affordability and content. A core reason for low internet penetration in South Africa has been pricing (Goldstuck A. , 2012b). South Africans have faced numerous limitations in the past which have impacted on mobile computing growth within South Africa. These limitations included:

- The high bandwidth costs;
- The high price of devices;
- The fact that none of the tablets present any local content.

All of these elements impacted on the accessibility and acquisition of tablets for many South Africans. These issues however are being addressed.

- *High bandwidth costs*: High bandwidth costs have made it difficult for many consumers to be able to afford internet access. However in April 2012, the Independent Communication Authority (ICASA) stated that Telkom would reduce their Internet Protocol (IP) connect costs (the component of Asymmetric digital subscriber line (ADSL) charges paid by Internet Service Providers (ISPs)) by 30% (Goldstuck A. , 2012b). The costs are currently on a steady decline in South Africa (Mcleod, 2013).
- *High prices*: Most South African consumers have a problem with the high prices of the top branded tablets. However, the global increase in tablet sales has brought about a steady decrease in the average selling price of tablets in emerging markets such as South Africa (International Data Corporation (IDC), 2013b). The issue of high priced tablets is being addressed as South African companies are entering the market and creating a competitive pricing environment for the South African tablet market (see Section 3.4).
- *Lack of local content*: Within developing countries in Africa, there is a high demand for local content to suit the user's distinct tastes, cultures and languages (Hattingh, Russo, Sun-Basorun, & Van Wamelen, 2012). South African companies such as Wise Tablets are creating tablets with content that is relevant to South Africans. They

provide users with content for e-commerce, business and educational purposes (see Section 3.4).

3.5.8 E-readiness and the digital divide

E-readiness is the degree to which a society is ready to derive value from information and communication technologies (ICTs) (Dada, 2006). E-readiness involves the influence of ICT in a country's economic and social growth. This includes a country's willingness to partake in e-commerce (electronic commerce) and e-government (electronic government) activities. E-commerce is the buying and selling of products and services online and e-government encompasses digital interactions between government, citizens and business.

A country's e-readiness can be assessed. A country can be assigned what was previously known as an e-readiness ranking and is now known as a digital economy ranking. The digital economy ranking is based on assessing the quality of a country's ICT infrastructure and its ability to use ICT to its benefit (The Economist Intelligence Unit, 2010). The rankings are produced in 6 categories:

- Connectivity and technology;
- Infrastructure;
- Business environment;
- Social and cultural environment;
- Legal environment;
- Government policy;
- Consumer and business adoption.

In 2010 South Africa's digital economy ranking was number 40 out of 70 countries (The Economist Intelligence Unit, 2010). The rankings quantitatively convey the digital divide between countries.

Digital divide is essentially the gap between groups who are able to benefit from ICTs and those that do not have the same opportunities. The digital divide incorporates internet accessibility, usage and the benefits derived from ICTs (Fuchs & Horak, 2008). It is important

for a country to strive to bridge the digital divide. By bridging the digital divide, a country will be strengthened both socially and economically.

In order to start bridging the gap, it is beneficial to understand where a country is ranked with regards to their ICT infrastructure compared to the rest of the world. Apart from the digital economy ranking, the World Economic Forum and INSEAD (2013), which discloses the monitored ICT advances of countries globally, assigns a Networked Readiness Index (NRI) to each country. Similarly to the digital economy ranking, the NRI measures the e-readiness of a country. This "NRI provides decision makers with a conceptual framework to evaluate the impact of ICTs at a global level, and to benchmark the ICT readiness and the usage of their economies" (World Economic Forum and INSEAD, 2013, p. 3). The report reveals that in 2013 South Africa's NRI was ranked at 70 out of 144 countries. South Africa moved up the rank two places from 72 since 2012. Amongst the BRICS economies, South Africa is ranked the lowest on the list at 70th compared to Russia which is ranked the highest out of the group at 55th.

The NRI is subdivided into 4 categories (see Table 3.2):

- Environment in which ICTs operate;
- Readiness to adopt ICTs;
- Usage of ICTs;
- Impact on societies.

Table 3-2: Networked readiness index (World Economic Forum and INSEAD, 2013))

	Rank (out of 144)	Score (1-7)
Networked Readiness Index 2013	**70**	**3.9**
Networked Readiness index 2012 (out of 142)	72	3.9
A. Environment subindex	**33**	**4.7**
1st pillar: Political and regulatory environment	21	5.0

	Rank (out of 144)	Score (1-7)
Networked Readiness Index 2013	**70**	**3.9**
2nd pillar: Business and innovation environment	55	4.4
B. Readiness subindex	**95**	**4.0**
3rd pillar: Infrastructure and digital content	59	4.2
4th pillar: Affordability	104	3.9
5th pillar: Skills	102	4.0
C. Usage subindex	**72**	**3.5**
6th pillar: Individual usage	81	3.0
7th pillar: Business usage	33	3.9
8th pillar: Government usage	102	3.7
D. Impact subindex	**92**	**3.2**
9th pillar: Economic impacts	51	3.4
10th pillar: Social impacts	112	3.1

South Africa's usage sub-index ranked at 72 out of 144 countries, moving up the rank 4 places since 2012. The usage sub-index relates to the actual usage of ICTs by individuals, business and government.

South Africa's readiness sub-index ranked at 95 out of 144 countries, improving by one place since 2012. This refers to the readiness of a society to adopt and use ICTs. This sub-index consists of elements such as ICT infrastructure, the affordability of accessing ICTs and the ability to use ICTs effectively due to a sufficient education level. South Africa ranks poorly in relation to affordability of ICTs as it was ranked 104th out of 144.

The affordability element within the readiness sub-index incorporates the cost of cellular tariffs, which for South Africa are ranked at 117. This is a considerable drop in the rankings from 85th place last year. With regards to the internet, fixed broadband internet tariffs are ranked at 89 and internet access in schools is ranked at 111.

South Africa and Africa's internet penetration is much lower than the rest of the world. There has, however, been a steady improvement to the ICT infrastructure. Despite this positive trend, the digital divide persists and South Africa still lags considerably behind advanced nations. Figure 3.8 illustrates the differences in ICT dispersion within the different continents. Europe has the highest household internet penetration with 77% compared to Africa which has the lowest of 7%.

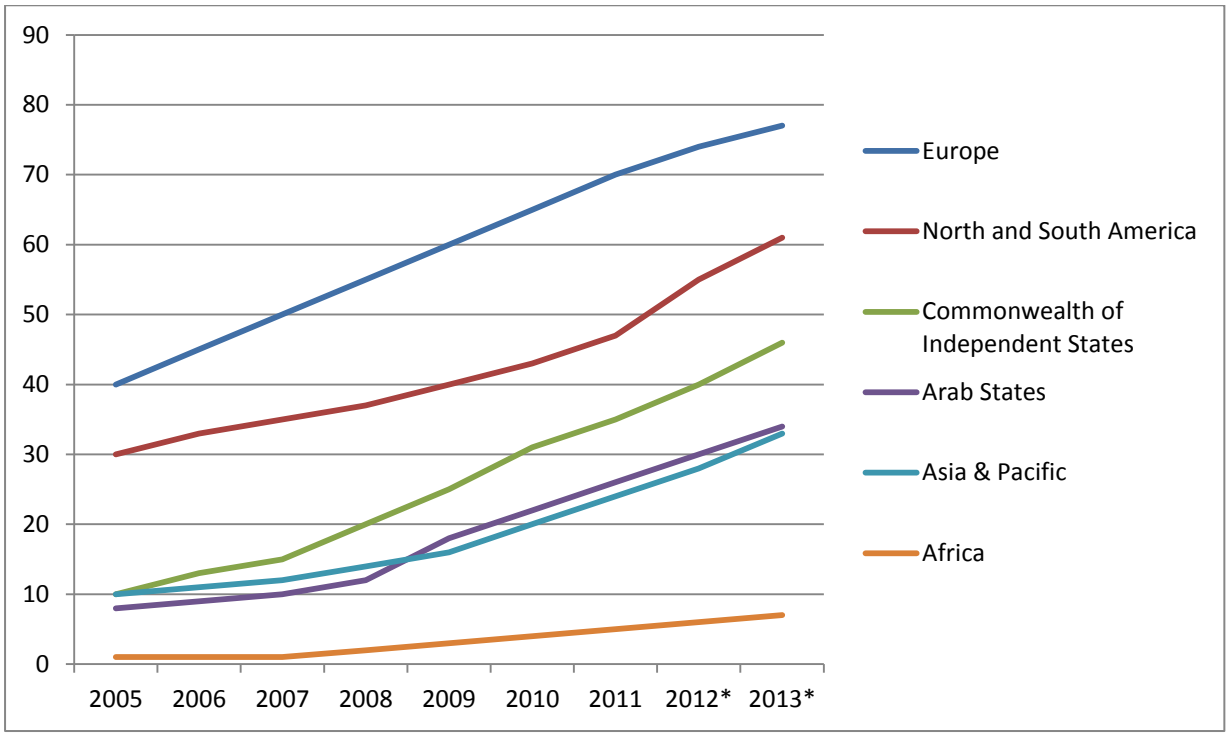


Figure 3-8: Households with internet access (International Telecommunication Union (ITU), 2013)

In the global context of internet penetration, this clearly indicates how far behind Africa is and how large the digital gap is that Africa is experiencing. One could argue that internet connectivity impacts the user experience of a tablet PC. Given that the household internet penetration rate is so low in South Africa, this could hinder South Africans' positive user experience whilst interacting with a tablet PC.

Table 3.3 displays global and African internet usage statistics. These statistics indicate that Africa makes up 15.3% of the global population and only 7% of the global internet users.

Table 3-3: Internet usage 2012 (Internet World Stats, 2012)

Region	Global population 2012	Global population %	Internet Users 30 June 2012	% of Internet Users
Africa	1,073,380,925	15.3%	167,335,676	7%
Rest of the world	5,944,465,997	84.7%	2,238,182,700	93%

3.6 Factors to consider in a South African context

The following factors relate back to the user characteristics (see Section 3.5.6). There are specific factors that must be considered. These factors are literacy and language. These two factors were the user characteristics which were most predominant in the case study which was conducted (see Section 5.5).

3.6.1 Literacy

Functional and computer literacy play a role in the usability of a system. Functional literacy encompasses the user's reading and writing literacy levels, and also their cognitive competencies. If the user cannot read or write it makes the system difficult to use right from the start of interacting with it. The majority of individuals from Motherwell (see Section 3.5.4 and 3.5.6) have a poor education which in turn means they cannot read and write in English. As there is a lack of local tablets using local languages and appropriate communication metaphors, their functional literacy is affected.

Computer literacy refers to the ability for an individual to interact and use a computer and related technology. As was discussed in section 3.5.4, the majority of individuals from Motherwell do not have a basic computer literacy level. Therefore, the users functional and computer literacy need to be considered as factors that impact on the UX of tablet PC usage.

3.6.2 Language

South Africa is a diverse country that has 11 official languages. The most widely spoken language is isiZulu, followed by isiXhosa and Afrikaans. English is ranked only 4th as a first language in South Africa (Statistics South Africa, 2011).

Language is a factor that needs to be considered. Lack of local content on tablet devices coupled with the content not being in the user's first language has a direct influence on the satisfaction and learnability of a tablet PC. The mere translation of the interface into a local language however will not solve the problem if the user has a low literacy level.

3.7 Summary

This chapter highlighted the digital divide that South Africa experiences in relation to the rest of the world. It also provided an overview of the tablet uptake in South Africa.

Additionally, low-income communities were discussed, as well as Living Labs within these communities. More specifically, the socio-economic status of Motherwell was reviewed. Typical user characteristics of people from these low-income communities were then highlighted.

Factors that need to be taken into consideration with regards to the South African tablet market were discussed.

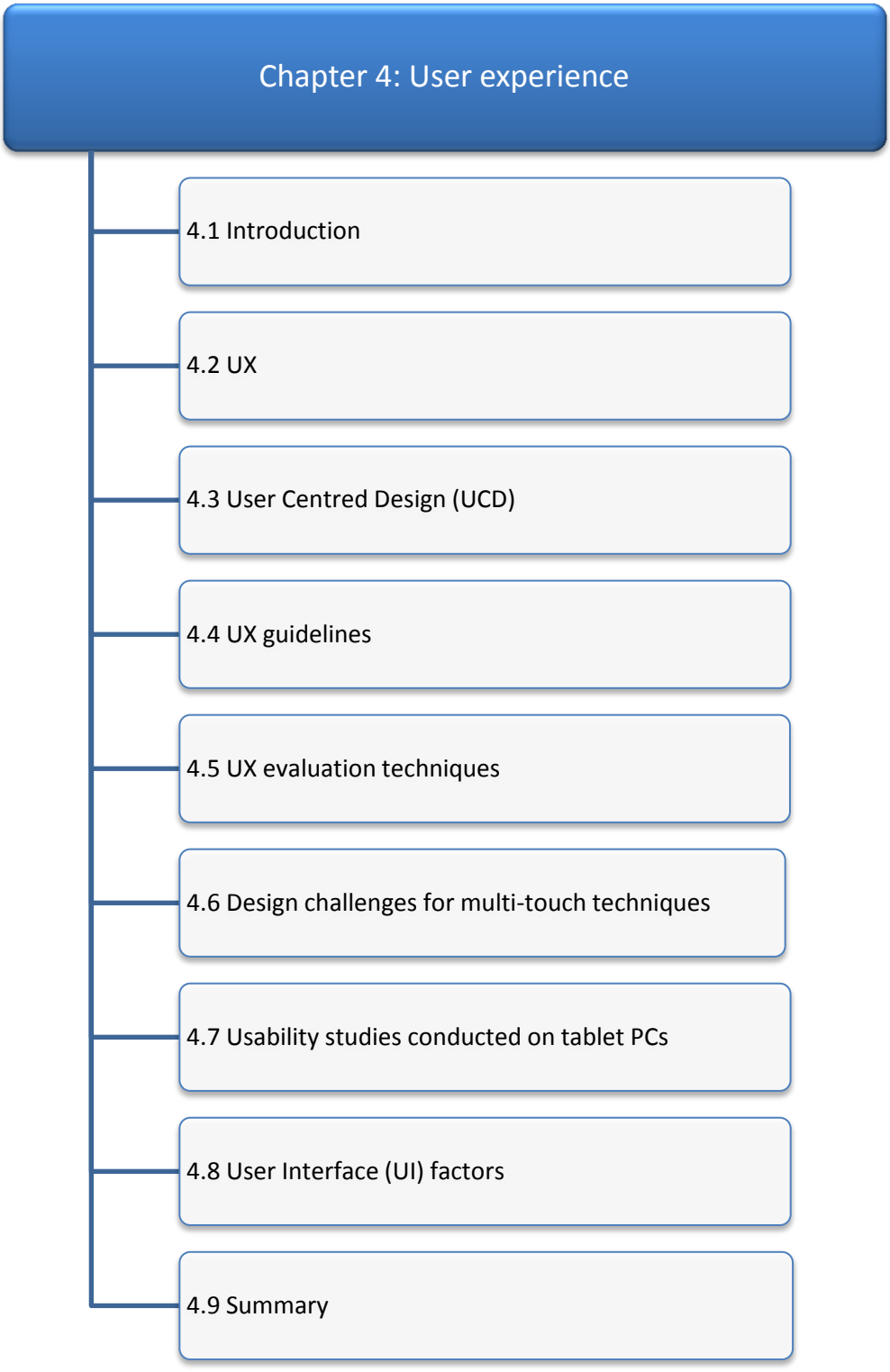


Figure 4-1: Schematic index of Chapter 4 (Researcher, 2013)

Chapter 4 User Experience

4.1 Introduction

This chapter introduces user experience (UX) and usability. Usability is essentially a component of UX and in order to achieve UX, a user centred design approach must be followed. It delves into UX guidelines and furthermore provides an overview of several usability studies which have been conducted on tablets.

This chapter addresses the following research question:

RQ1: Are existing user experience guidelines relevant to South African users?

4.2 User Experience (UX)

Whilst interacting with a system the user will have either a positive or a negative experience. It is important, however, to create the former in order to have a successful product. UX is more than how a system looks or functions. It is the holistic experience that is created for the user from start to finish. It is important to note that one cannot design a UX, because it is internal to the user, yet we can design for a UX (Robert & Lesage, 2010).

There is currently no definitive definition for UX, but rather many comparable definitions. Several of these definitions are outlined below:

- Garret (2000) defined it as the experience the product creates for the user.
- Väänänen-Vainio-Mattila, Roto, and Hassenzahl (2008) stated that “UX is subjective in nature as it is affected by the user’s internal state, the context and the perceptions of the product” (p. 1).
- The Nielsen and Norman (2007) defined UX as “that which encompasses all aspects of the end-user's interaction with the company, its services, and its products. The

first requirement for an exemplary UX is to meet the exact needs of the customer, without fuss or bother. Next follows simplicity and elegance that produce products that are a joy to own, a joy to use".

- Alben (1996) expressed UX as "all the aspects of how people use an interactive product: the way it feels in their hands, how well they understand how it works, how they feel about it while they're using it, how well it serves their purposes, and how well it fits into the entire context in which they are using it."

- Wood (2011) defined UX as "a gestalt effect. In other words, that which we experience is greater than the qualities of the individual components we perceive" (p. 7).

Many explanations exist as to why there is no universally accepted definition for UX. Väänänen-Vainio-Mattila, Roto, and Hassenzahl (2008) explain:

- "UX is associated with a broad range of concepts and variables;
- The unit of analysis is too malleable;
- The landscape of UX research is fragmented by diverse theoretical models."

However, despite there being multiple definitions for UX, one can see there are common denominators that provide for the foundation of UX:

- It is subjective;

- It encompasses the overall experience that the user had when interacting with the system.

4.2.1 Aspects of UX

UX is comprised of various aspects. Morville (2004) created the UX Honeycomb to better illustrate these various aspects. In the Honeycomb (Figure 4.2), he describes the factors that impact on UX, specifically the seven qualities that will promote the positive UX of a product. The core of the Honeycomb indicates that UX is about ensuring that the user finds value in the product. These aspects should be taken into consideration when designing an interface for any type of system (i.e. website, application etc.).

Figure 4-2: The UX Honeycomb (Morville, 2004)

The remaining facets of the UX Honeycomb furthermore depict the various qualities of the UX. Morville (2004) explains each facet:

- **Useful:** Does the system support the tasks the user set out to achieve?
- **Usable:** Is it easy to use?
- **Desirable:** Do the system's visuals and presentation evoke positive emotions and aid the pleasure of the experience?
- **Findable:** Is the content that the user needs easy to find? Is the system easy to navigate through?
- **Accessible:** Is the content accessible to all varieties of people (e.g. People with disabilities)?
- **Credible:** Is the system trust worthy and credible? Is the system presented in a reputable manner?
- **Valuable:** Does the user find value in using the system? Value is the main goal that needs to be accomplished and is derived through a positive UX. The value can either be actual value (i.e. efficiency and effectiveness) and/or perceived value (i.e. trustworthiness, emotions, satisfaction) (Moczarny, 2011).

Usability (see Section 4.2.3) is a component of UX. If a system is usable it allows the user to achieve their goals. If the users do not achieve their intended goals, they are not likely to have a positive UX.

4.2.2 Usability

Usability can be viewed as one of the facets that make up UX. Nielsen (2012b) defined usability as "a quality attribute that assesses how easy user interfaces are to use".

In order for a system to be usable, it needs to allow users to achieve their goals effectively and efficiently. For any system to be successful it is important for the user to encounter a positive experience whilst trying to achieve their goals. It is worth noting, however, that a system that is usable does not necessarily provide a user with a positive experience.

4.2.3 Difference between usability and UX

There is a fundamental difference between usability and UX. Usability is focused on the effectiveness and efficiency of a system, whereas UX encompasses usability, but more significantly centres on the emotions and attitudes of the users' entire experience with the system. Bevan (2009) states that, although there is no fundamental difference between measures of usability and measures of UX at a particular time, the difference in emphasis between task performance and pleasure leads to different concerns during development.

Spool (2007) explains, that usability and UX can be explained by asking two questions:

- **Usability:** Can the user accomplish their goal?
- **UX:** Did the user have as pleasant an experience as possible?

The usability of a system is important because users will not be able to accomplish their goals whilst using a system if it is not usable. However, it is imperative that a system is not only usable, but also that it promotes a positive UX. It does not matter how usable a system is, if the user is not having a positive UX whilst interacting with the system. If the user does not undergo a positive experience, the chances of them using the system again are much lower, as they would rather use a system with which they encounter a positive experience.

In order to create a positive UX, a system needs to be usable. To achieve a usable system a User Centred Design approach needs to be followed.

4.3 User Centred Design (UCD)

In order to achieve a positive UX, certain requirements are needed. These include usability, as well as an overall User Centered Design (UCD) approach. UCD is a philosophy that brings the user to the forefront of the design activities (Sward, 2006). Bringing the user to the forefront of the design and considering the user's perspective should ultimately optimize the usability of the system and the user's experience (Hursman, 2010).

There are several International Organization for Standardization (ISO) standards that relate to UX, UCD and Usability. The common denominator between these standards is that the user is at the centre of all the approaches.

ISO 9241-210:2010 outlines four essential requirements of the UCD process:

- **Requirements gathering** – It is essential to understand and specify the context of use;
- **Requirements specification** – It is necessary to specify the user requirements that need to drive the design and be met;
- **Design** – It is important to meet the users' requirements in the prototypes and design;
- **Evaluation** – It is imperative that usability testing and other user-centred evaluations take place in order assess and make necessary changes (ISO/TC 159/SC 4, 2010).

The ISO 9241-210:2010 standard furthermore highlights key principles that combine user experience and user-centred design. These principles are:

- The design is based upon a clear understanding of users, tasks and environments.
- Users are involved throughout development.
- The design is driven and refined by user-centred evaluation.

- The process is iterative.
- The design addresses the entire user experience.
    - This principle emphasizes the importance of focusing not only on usability but also on a ensuring a positive user experience – a key principle of UCD.

User-centred design methods used in this study included user experience evaluations, questionnaires and informal interviews.

Given the ultimate importance of the user, it is imperative to consider this approach in order to maximise the usability and user experience of the product in question. Guided by a UCD process, a positive user experience and usability of a system should be achievable.

A UCD should assist in bringing about good UX guidelines.

4.4 UX guidelines

UX guidelines are important to take into consideration because, if they are not designed with South Africans in mind and are not contextually relevant, then they will be of no use to us as South Africans.

A guideline is not a rigid standard, but rather an advised rule. Guidelines provide consistency. Consistency is an important usability principle as it provides the user with confidence from previous experiences. “The more users' expectations prove right, the more they will feel in control of the system and the more they will like it’’ (Nielsen, 2011). Guidelines are also important when third parties are able to develop software for a device. Ensuring that these design guidelines are followed by third parties ensures a consistent user experience across a variety of applications. In short, adhering to guidelines provides a fundamentally better user experience.

The aim of UX guidelines is to provide a positive user experience. Developers are strongly encouraged to follow the UX guidelines, but the guidelines are not enforced regulations. Many of the tablet brands such as Windows, Samsung and Apple have devised their own set of user experience or user interface guidelines. However, many of these guidelines are

convoluted, whereas Apple's iOS guidelines (Appendix A) are concise, clearly defined, and fundamentally universal in their applicability to multi-touch devices. As a result, for the purpose of this study, the research chose to evaluate the relevance of the Apples iOS guidelines to the South African low income user. The purpose of the iOS guidelines in this research is as a general set of guidelines that can be applied to any tablet PC.

Apple has thirty two specific UX guidelines. Two examples of these guidelines have been highlighted below:

- Guideline: Make Targets Fingertip-Size.

  This particular guideline describes the importance of ensuring that the touch elements in the target area of the device are of an average fingertip size. This guideline includes an image of the iPhone calculator as a good example this guideline in use (Apple Inc., 2013).

  This guideline is appropriate to the participants of this study as typical user characteristics specific to Motherwell (see Section 3.5.6) indicate a low level of computer literacy – and, therefore, has minimal prior touch screen experience. Hence users are unlikely to have the ability to accurately place their finger-tips on the screen.

  In Morville's UX Honeycomb (Figure 4.2), this guideline would fall into the usability category as it is related to navigation. If the UI elements are too small to accurately interact with, the navigation will become a clumsy and frustrating experience.

- Guideline: Focus on the primary task

  This guideline describes how the focus must be maintained on the primary task and that the developer must analyse what is needed on each screen. It includes an image of the iPhone calendar as an example to demonstrate that the app is focused on the current day (Apple Inc., 2013).

Figure 4-3: The iPhone calendar (iOS Developer Library, 2012)

As mentioned in section 3.5.6, the typical user characteristics of Motherwell indicated the lack of computer literacy amongst the individuals of Motherwell. Due to this, the user may not be adept at interpreting a muddled or complex UI. This guideline should assist in focusing the user's attention on the primary task at hand. By following this guideline, developers should be steered away from creating overly complex UIs.

In the UX Honeycomb (see Section 4.2.1), this guideline would be in the usability category as it is related to intuitiveness. Every interaction with the UI represents the user trying to achieve their goal of completing a certain task. In order to do this, the user needs to determine which UI elements will lead them to success. Hence, if the UI is intuitive and easy to understand, the user has a higher chance of making the correct choice the first time.

Microsoft Windows have their own set of UX guidelines that they expect will help designers and developers create a consistent look and feel for any Windows-based application (app). These UX guidelines are divided into numerous sections and then sub-divided further into categories, such as Text, Commands and Controls etc. (Microsoft, 2013). The guidelines are not as concise as Apple's iOS UX guidelines.

Guidelines are available to assist in ensuring usability, as well as promoting a positive UX. Following guidelines, however, is not sufficient. Once the system is created, it is essential that UX and usability evaluations are carried out in order to detect any problems that may arise.

4.5 UX evaluation techniques

UX evaluation includes methods that encompass the entire measure of the user's experience. These methods are different from usability methods in that they do not focus on the user's performance. Instead, the focus is on the user's subjective view of their interaction before, during and after using a system.

There is a comprehensive collection of over 100 user experience evaluation methods available (Vermeeren, et al., 2010). The following questions need to be considered in order to select which method would be most suited for a specific study (All About UX):

- Study type;
    - For instance, is it lab or field studies?
- Development phase;
    - Is it still an early concept, functional prototype or is the product in the market already?
- Study period of experience;
    - Is it a snapshot or long-term period?
- Type of evaluator;
    - Are there experts involved?
- Type of data that needs to be collected;
    - Is it quantitative, qualitative or both types of data that need to be collect?
- Applications that are going to be used in the study;
    - PC software or mobile software?
- The varying requirements such as special equipment or trained specialists.

UX evaluation methods can be classified into three groups, namely empirical, inspection and inquiry methods (Rubin & Chisnell, 2008). For the purpose of this study, inquiry and empirical methods were applied. Empirical methods are based on the users' experience. This research made use of an empirical method called user experience evaluation (see Section 2.9.4). The users were given basic tasks to perform and observed whilst completing the tasks. Inquiry methods were also used. This method focuses on the information about the user and, as such, user satisfaction questionnaires were made use of.

It is important when evaluating the user experience to keep in mind the various design challenges that arise when developing for multi-touch devices, specifically the contrast to regular desktop design in terms of screen size and interaction styles.

4.6 Design challenges for multi-touch devices

Designing for multi-touch interaction presents challenges that need to be addressed.

Applications that were originally made for devices with keyboards and mice in mind cannot be easily modified into interfaces with multi-touch capabilities (Nielsen, 2012a). The interface needs to be designed accordingly and with the appropriate device in mind. There is a difference when designing applications for mobile devices as opposed to desktop applications (Nielsen, 2012a). Due to this, different usability and UX considerations must be applied.

Studies, including Bachl, Tomitsch, Wimmer, and Grechenig's 2010 study, indicate that multi-touch design challenges can be classified into 3 categories. The categories are screen-based, user-based and input-based challenges. Screen-based challenges include affordance of screens and tactile user feedback. User-based challenges include ergonomics, individual differences and accessibility. Input-based challenges include gestures, supporting data input and multi-user support.

Due to the fact that new challenges are presented when designing for a tablet as opposed to a desktop, it is imperative that sufficient usability and UX studies are conducted on the tablets.

4.7 Usability studies conducted on tablet PCs

The usability of a product is important and an essential quality for any products survival. If a user finds the product confusing or difficult to use, the likelihood of their using it again will be minimal. It is therefore important to make use of usability testing methods in order to resolve any potential usability issues (Nielsen, 2012b).

At of when this research was conducted, no evidence of studies conducted in SA could be located. However, a number of usability studies have been conducted on the tablets within the United States.

4.7.1 Nielsen Norman Group 2010

NNG conducted usability studies of apps and websites on the iPad. NNG released two reports which provide recommendations and a valued perspective into designing apps for the iPad. The first report (Nielsen, 2010) was conducted immediately after the launch of the first iPad and highlighted the user interaction pain points. The report focused on the apps that came with the original iPad. The apps were originally developed in isolation and secrecy which prohibited them from gaining any user feedback.

In the 2010 usability study seven subjects were tested who did not have any previous iPad experience; except for one of the subjects who had one week's worth of iPad experience. It is also documented in this report that many of the bad designs that were documented were not a result of bad designers, but rather a consequence of the inevitable outcome of non-user-centred design projects (Budiu & Nielsen, 2010). There were several inconsistent apps, low discoverability and accidental gesture errors but not all of the bad design commonalities that were summed up by this study. The report also presents guidance for making iPad designs more usable (Nielsen, 2010).

4.7.2 Nielsen Norman Group 2011

In their second report the NNG took a look at whether there was any improvement in the usability of iPad apps and websites.

This report focused on usability and not on the overall UX. The second report was completed a year after the first in 2011 and is a follow-up of the first report. The subjects of this study had more iPad experience than the previous group of subjects. In this study sixteen subjects were used that had at least two months experience using an iPad.

This study tested apps and websites that had the advantage of being able to receive user feedback or even make use of the first report. 26 iPad apps and 6 websites were tested. Therefore there was a mixture of internal and external content for the iPad. Several of the same usability findings were established such as low discoverability, accidental activation or inadequate size of touchable areas. However, the report also contained new findings, such as annoying splash screens, swipe ambiguity and excess navigation, to name just a few. This report shows an improvement in the design of apps and websites for the iPad since the first test was conducted; however it still indicates that further progress and improvement is necessary (Budiu & Nielsen, 2011). In addition, given the disparity of user interfaces between apps, it's apparent that developers need studies like the ones conducted by the Nielsen Norman Group (Buys, 2010).

To date, the Nielsen Norman Group has conducted 6 usability studies on several generations and sizes of tablets. The studies included tablets from the main tablet platforms such as the iPad, Android and Windows tablets.

The research (Nielsen, 2013) indicates that there are still two main threats to tablet usability, the first threat being that of a flat design. A flat design does not allow the user to see easily what they want to do.

The second threat to tablet usability was that of rescaled design. This could be described as skeumorphism - an imitation of the design of a similar artefact made from another material (Judah, 2013). It is fundamental to understand that a good design for one device is not necessarily a good design for another device.

Apart from the above mentioned two threats, the researchers' conclusion was that tablet usability has overall improved immensely since the launch of the first iPad. These studies focused on usability. To date, there is a lack of studies focussing solely on the iPad.

4.7.3 Additional usability studies

A separate usability study was conducted on the iPad in May 2010. AnswerLab (2010) made use of twenty five user research sessions. This study was focused on the UX and usability of the iPad device whilst using applications and websites. The research discussed how consumers envisioned using the iPad not as a laptop, but for more simple tasks. These tasks were divided into commuter, vacation and recreational activities. The report that was released stated the importance of user research and described how to improve the understanding of the user's content needs (AnswerLab, 2010).

After conducting numerous usability testing sessions, usability expert, Tim Fidgeon, composed an article on usability guidelines for tablets and the iPad. The article outlines three basic usability guidelines that all website designs should consider if they intend to support the use of iPads (Fidgeon, 2011). These three basic usability guidelines are:

- There should not be any Flash content. This relates back to the accessibility facet in the UX Honeycomb (see Section 4.2.1) due to the fact that it is concerned with standard compliancy and browser compatibility. Flash is not an official World Wide Web Consortium (W3C) standard and requires a browser plug-in to run. A browser plug-in is an additional component that an app or website requires to execute certain tasks.
- The target areas on the screen must be large enough to encourage interaction. This relates to the usability facet in the UX Honeycomb (see Section 4.2.1). The target areas on the screen need to be large enough to encourage intuitiveness as well as ease of navigation.
- There should be a drive towards minimal data entry. This correlates to the usability facet of the UX Honeycomb (see Section 4.2.1). As data entry on a touch screen device is a time consuming process the less data entry that is needed the easier it is to use the system.

Another article compared the iPad and the Android user interface elements (McKenzie, 2011). This type of article is beneficial as the common design elements represent the best

possible design features that we have discovered so far. The differences would make good starting points for usability studies to determine which design elements are better.

Internationally, many usability studies have been conducted on the iPad. However, little is known about the usability and UX of tablets in the SA context.

4.8 User Interface (UI) factors

Due to the fact that the users have a poor education level and lack of computer literacy (see Section 3.5.6), the following UI factors were selected as critical as they are the most applicable to this research. Apples iOS UX guidelines assist a developer in designing intuitive systems through metaphors and familiar elements.

4.8.1 Intuitiveness

A well designed system incorporates intuitiveness. Users should be able to easily figure out what they need to do in order to achieve their goals. If a system is intuitive then the ability of users find what they need to complete tasks and achieve their goals (discoverability) is high. In a study conducted on tablet PCs, Nielsen (2010) found that most people do not like to look at or read instructions, hence intuitiveness is important.

Intuitiveness comes down, however, to how the experience is designed. Gestures should essentially be far more intuitive than interaction styles such as the mouse and keyboard, as they are a natural style of interaction. Nieman (2011) argues that touch is a sense that we develop very early on in life. If a device is intuitive it will give the users increased confidence and it will encourage them to further explore and interact with the system.

4.8.2 Familiarity

Familiarity is a UI factor that impacts on UX. Interaction styles such as mouse and keyboard are a very different way of interacting compared to touch. UX knowledge is built around traditional input methods such as the keyboard and mouse, and how to optimise the UX on desktop platforms. Touchscreens, however, change this completely, using touch which is a natural and intuitive process, and should be treated as such (Nieman, 2011).

4.8.3 Metaphors

Metaphors are the fundamental concepts by which information is easily recognized, understood, and remembered (Marcus, 1985). The swipe gesture is a metaphor, being similar to the page swiping interaction when reading a book. Metaphors should not be something that the user has to figure out, they should be realized through common sense. Icons are similarly used as metaphors to real objects. For instance a calendar app would mirror a real world calendar. Metaphors can assist in improving the UX. Metaphors can do this by:

- explaining abstract or complex concepts;
- creating a sense of familiarity;
- triggering emotions;
- drawing attention to your site or certain components of it;
- motivating users to take action (Idler, 2012).

These three UI elements will be incorporated into the case study (see Chapter 5) in order to establish how they impact on the UX of a tablet PC as used in South Africa. The impact of intuitiveness and metaphors will be investigated during the case study in order to see whether the use of gestures and touch is intuitive for the users and whether the users feel that the gestures mimic real life movements. Familiarity will be examined in order to understand whether the users with prior computer experience can familiarize themselves with the tablet PC.

4.9 Summary

The purpose of this chapter was to indicate how usability and user experience are important factors to consider when designing for a tablet PC. The relationship between UX, usability and UCD were then discussed. UX guidelines (see Section 4.6) for tablets were then outlined to indicate how to design for a positive user experience on a tablet.

Design challenges which people are faced with when designing for a multi-touch interface was discussed. Additionally, various usability studies which have been conducted on tablet PCs were examined.

This chapter, moreover, identified the UI factors which are applicable to this study and which impact on tablet PC usage.

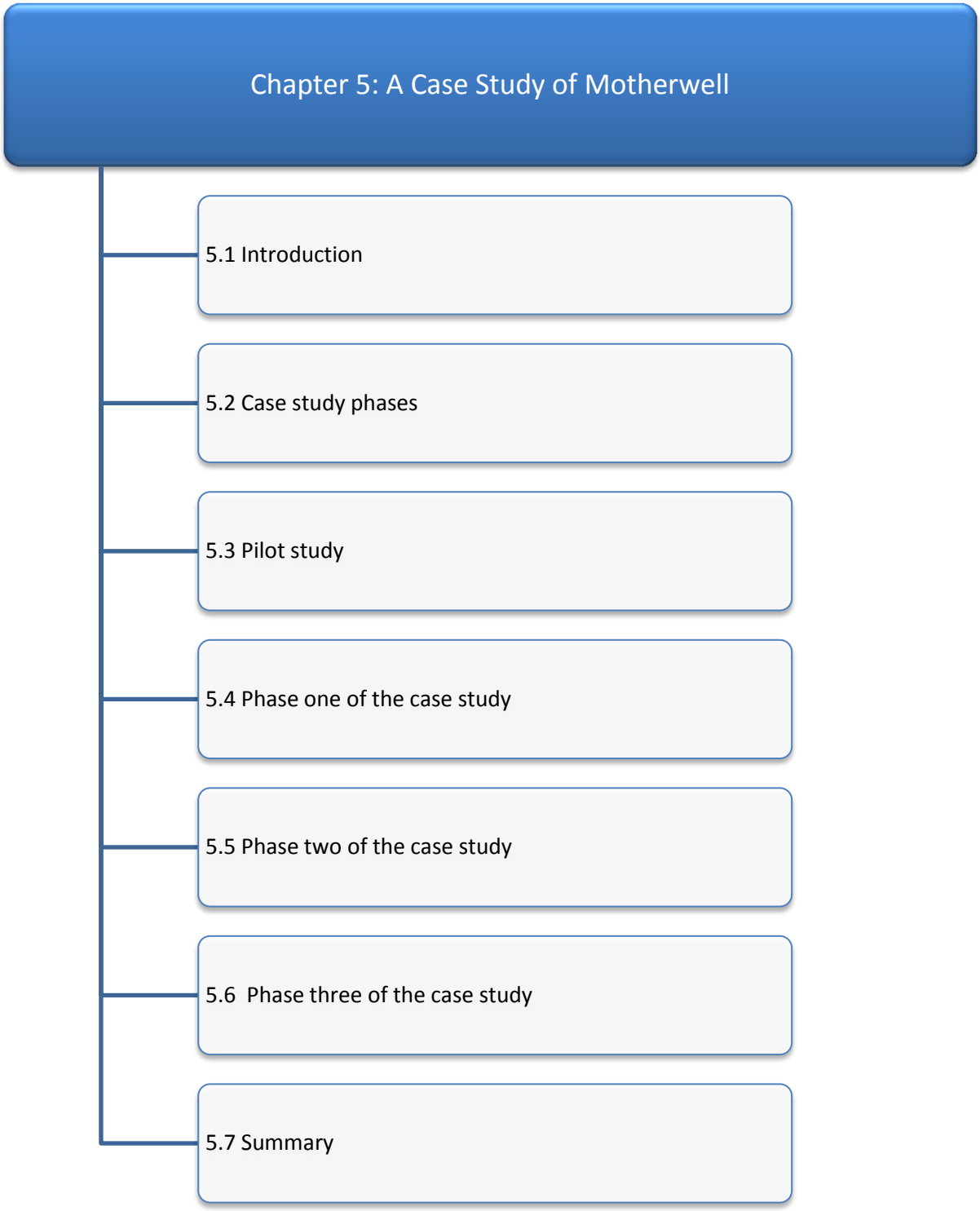


Figure 5-1: Schematic index of Chapter 5

Chapter 5 A Case Study of Motherwell

5.1 Introduction

The previous chapter discussed UX, usability and UCD. It highlighted various studies that have been conducted on tablet PC's and identified UI factors that impact on the UX.

Chapter 2 outlined the research process that was to be followed. This chapter discusses the implementation of the research process. This chapter presents the various phases of the case study as well as presents the findings of the case study that was conducted for this research. This chapter also addresses the following research question:

RQ3: How does the identification of specific factors assist in improving the user experience of tablet PC users in a specific context?

5.2 Case study phases

The research took an evolutionary approach and thus the case study consisted of different phases. Figure 5.2 illustrates the different phases of the research.

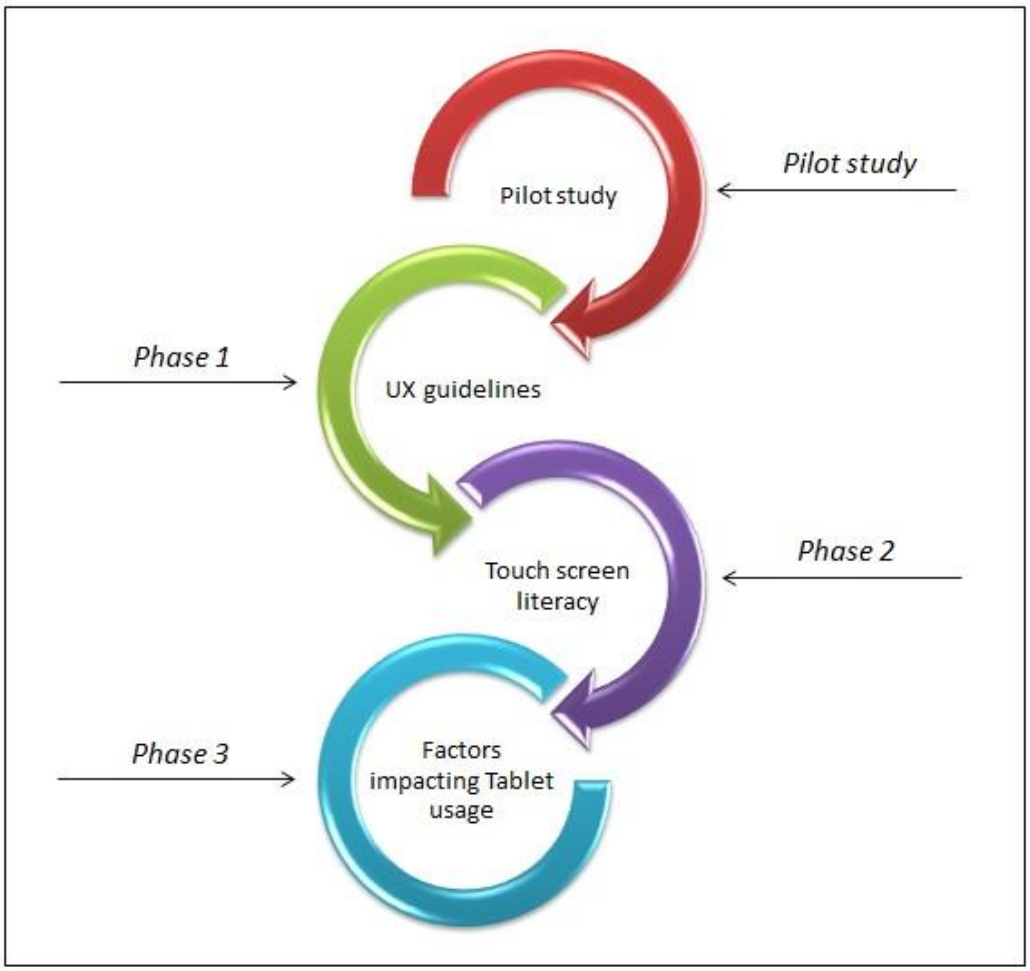


Figure 5-2: The different phases of the case study (Researcher, 2013)

Each phase followed the systematic steps of a case study approach (see Section 2.3.3.5). The following section describes the phases of the case study in detail. The research began with a pilot study.

5.3 The Pilot Study

A pilot study is a scaled down preliminary study, performed to test the logistics of the proposed study. This is done in order to reveal any issues so that they can be addressed before the actual study commences.

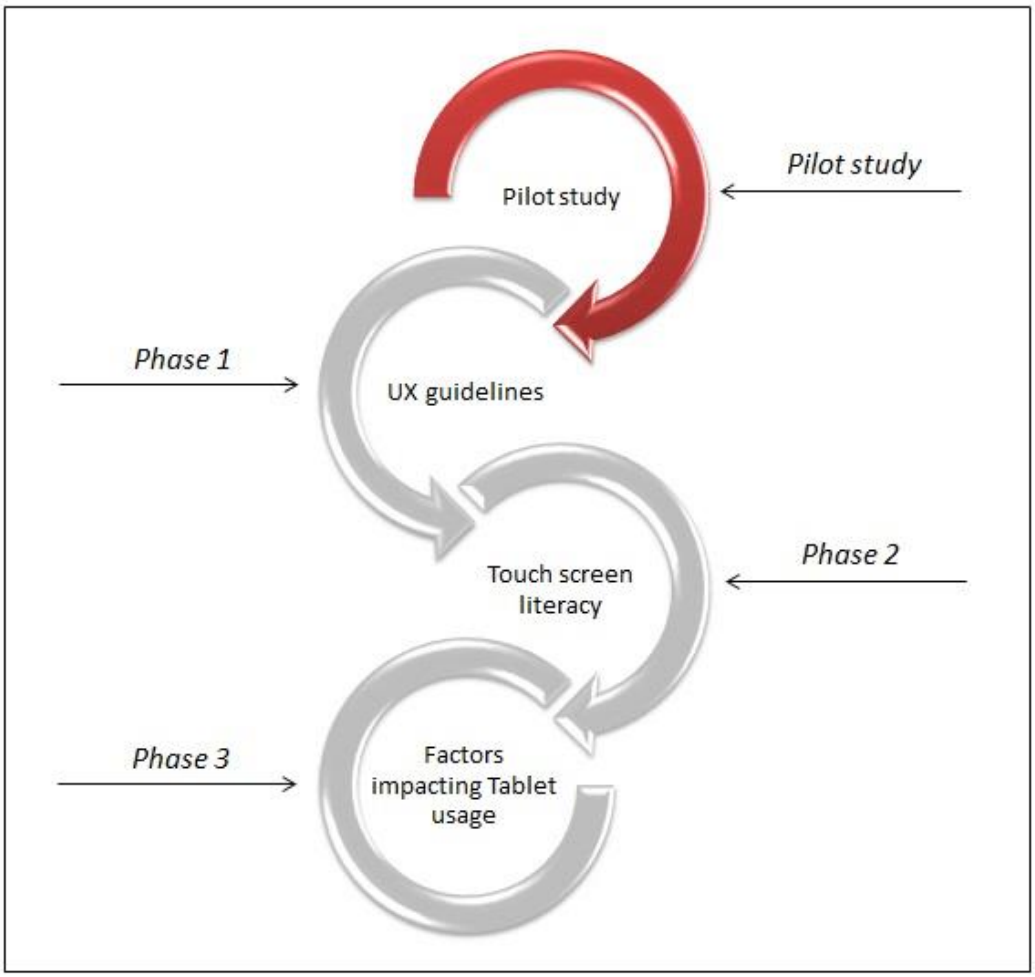


Figure 5-3: Pilot study phase of case study (Researcher, 2013)

5.3.1 Plan

A pilot study was initially conducted in order to test the various aspects of this study, such as time, applicability of questions, ease of answering questions and the overall flow.

5.3.2 Design

In order to achieve the goal as set out in Section 5.3.1, the research design (see Section 2.3) had to be established. It was determined that the pilot study was to be carried out at the Nelson Mandela Metropolitan University with random sampling means.

5.3.3 Prepare

The various instruments, such as the tasks and questionnaires that were used for the pilot study were developed (see Section 2.9.3).

5.3.3.1 Tasks

The initial task list comprised six tasks that the participants were required to complete.

1. Open the browser (eg. Chrome, Firefox, Internet Explorer) and browse to http://www.cnn.com/. Whilst on the CNN site, make use of the pinch to zoom gesture to zoom into the webpage.

   Take note of the way the tablet responds when you change the orientation of the device.
2. Use the YouTube application to search and watch a video by your favourite musician.
3. Open your email and send a new email with your name in it to s208075040@live.nmmu.ac.za
4. Open the calculator application and do the following sum: 38 x 10 =?
5. Change the date setting to tomorrows date. Change it back to automatic date setting.
6. Multitasking. Open up the browser and browse to http://www.cnn.com/. Leave the website open. Open up your email. Copy a headline from the CNN page and paste it in a new email. Send the email to s208075040@live.nmmu.ac.za

5.3.3.2 User experience questionnaire

Questions for the user satisfaction questionnaire were devised (see Section 2.9.3.1.1) based on the Apple iOS UX guidelines as discussed in Section 4.4.

5.3.3.3 Sampling

In order to conduct the pilot study, the participants needed to be sampled (see Section 2.6). Four participants were selected through random sampling means.

The ages of the four adults who were selected ranged between 20 and 23 years. The following biographical data related to all four of the participants:

- They had prior touch screen exposure;
- An intermediate computer experience level;
- Tertiary education.

5.3.4 Collect

A consent form (see Appendix C) was initially given to the participants and explained in detail. Once the consent forms were signed, the participants were given a biographical questionnaire to fill out. After the questionnaire was filled out, a set of tasks were given to the participants to complete, whilst being observed. During the observation, the moderator could document their observations and comments. After the task list was concluded a user satisfaction questionnaire was provided for the participants to complete. Any informal questions were asked at this stage.

5.3.5 Analyse

The comments from all the participants and the observations made can be seen below:

- The tasks were simple enough and they found them easy to complete.
- Overall, it was relatively quick to complete.
- All of the feedback from each participant was positive in terms of their interaction with the tablet PC.
- There were no negative responses.
- None of the participants had any issues with understanding the tasks or questions and / or jargon.

After conducting the pilot study it was concluded that no adjustments or changes were needed. Thus, phase one of the case study commenced.

5.4 Phase one of case study

5.4.1 Plan

In the first phase of the empirical study, the goal was to determine whether Apple's iOS UX guidelines were contextually relevant for South African low-income community users.

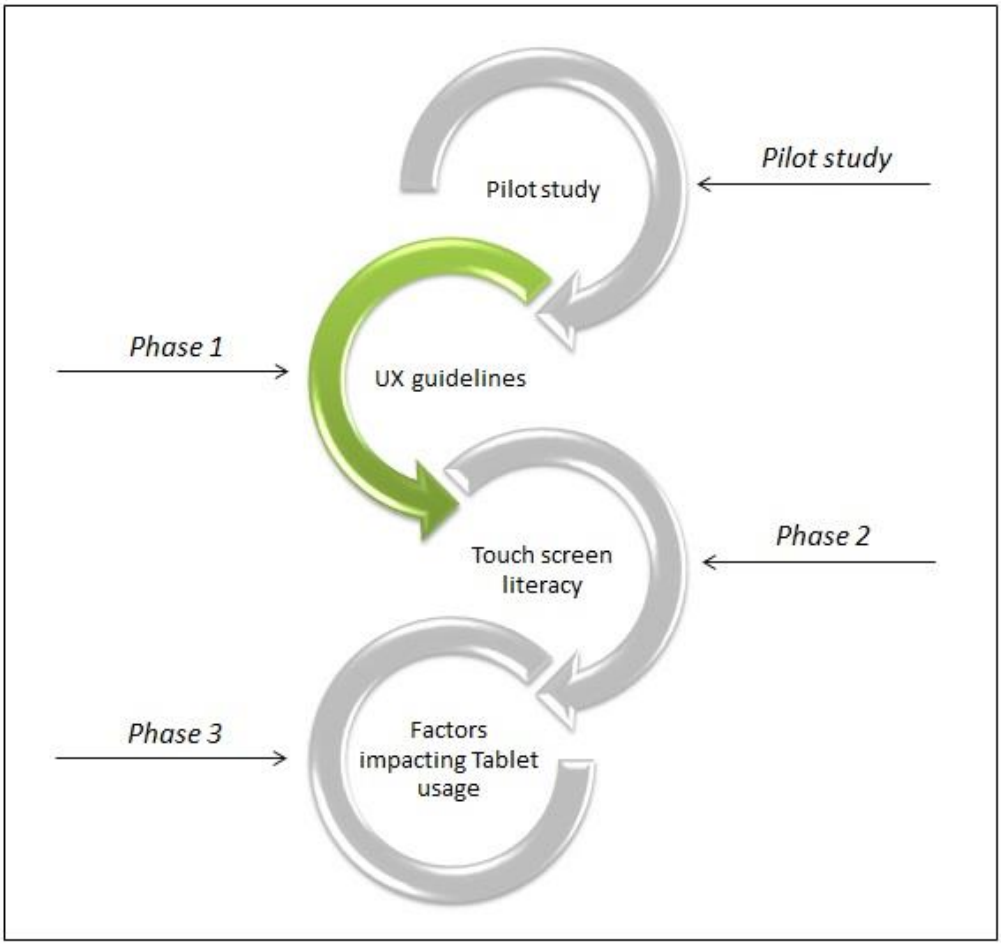


Figure 5-4: Phase 1 of the case study (Researcher, 2013)

5.4.2 Design

In order to achieve the goal as set out in Section 5.4.1, the research design (see Section 2.3) had to be established. A Living Lab environment (see Section 3.5.5) was selected in which to test the participants.

The participants were selected through random sampling means as there were no predefined criteria. Five users were selected for the user experience evaluation purposes.

5.4.3 Prepare

The tasks used in this phase were already in place and no additional preparation was required.

5.4.4 Collect

The participants were given a set number of tasks (Appendix F) to complete on the tablet and were observed whilst performing these tasks. The researcher acted as the observer and was the only observer present. Users were asked to think out loud and, if there were any questions whilst performing the tasks, the participants were given hints to assist them in completing the task. After completing the tasks on the tablet, the participants were presented with a user satisfaction questionnaire (see Appendix G).

5.4.4.1 Biographical data of participants

Biographical data was collected from the five participants. This data is illustrated in Table 5.1.

Table 5-1: Phase one biographical data (Researcher, 2013)

Single group of participants	
Number of participants	5
Home language	Xhosa
Education	5 Participants: Grade 8 - 12
Level of computer experience	4 Participants: Beginner
	1 Participant: Intermediate

This group consisted of four female participants and one male, all of whose home language was Xhosa. Their educational background ranged from grade eight to grade twelve. Regarding their level of computer experience, four participants rated their level as beginner

and one participant rated their level as intermediate. None of the participants had ever seen or used a tablet before.

5.4.5 Analyse

5.4.5.1 Participants comments

Table 5-2: Participants comments (Researcher, 2013)

Participants	Comments
P1	”It was difficult at first, but once shown how to use it I found it easy to use.”
P2	“When I repeated the task it was easier the second time around.”
P3	“It was very different to what I’ve used before.”
P4	“It was fun to use.”
P5	“Where are the buttons?”

The participant’s comments illustrated their difficulty with initially interacting with the tablet PC. The participants needed to be prompted and guided in order to be able to complete the tasks. The participants did not at first understand what gestures were or how to interact with a touch screen. Three of the participants asked where the buttons or keyboard for the device were.

This led to the conclusion that a user who has no prior touch screen experience is likely to find their initial interaction difficult. Due to this, their user experience was hindered and the lack of experience on touch screen technology yielded a less positive UX than those with touch screen experience.

The analyses drawn from the observations were that the task list required alterations as the phase one participants (see Section 5.4.4.1) found some of the tasks too difficult for their level of computer literacy. Moreover, tasks had to be changed due to internet connection constraints at the facility where the testing was carried out.

Due to the unexpected findings in this initial phase, the research was extended to a second phase.

5.5 Phase two of case study

5.5.1 Plan

Due to the findings from phase one, the second phase of the study investigated whether previous exposure to touch screen technology impacted on the UX.

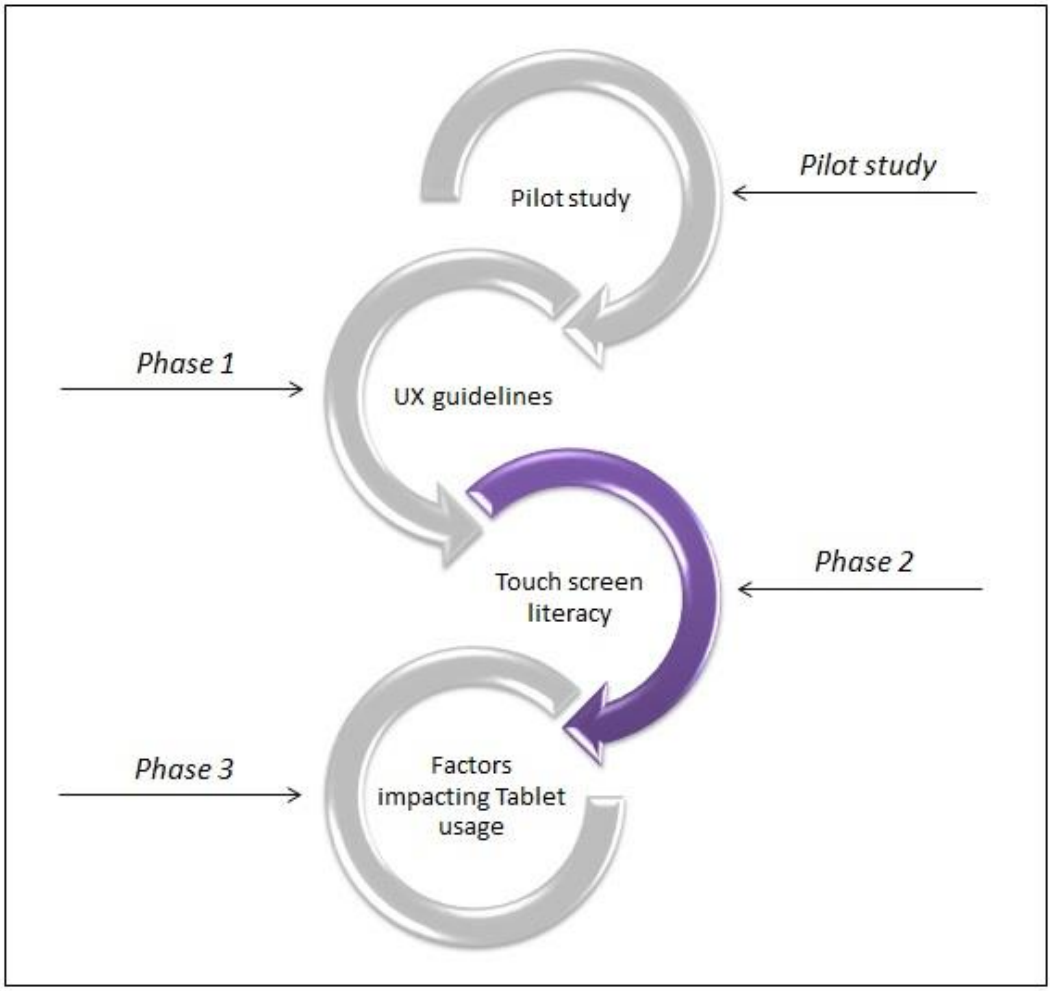


Figure 5-5: Phase 2 of the case study (Researcher, 2013)

5.5.2 Design

In order to achieve the goal as set out in Section 5.8.1, the research design (see Section 2.3) had to be established. A Living Lab approach (see Section 3.5.5) was selected as the research methodology with which to test the participants.

The participants were selected through purposeful sampling means. Five users were selected for the user experience evaluation purposes.

5.5.3 Prepare

5.5.3.1 Sampling

The participants were selected through purposeful sampling means. This was due to the fact that they had to meet specific sampling criteria. The principal criteria on which the population was based upon was whether or not the user had had or had not had previous touchscreen experience. An initial predefined group was selected which could only include participants 18 years and older. Ten participants from a disadvantaged background were gathered for the user experience evaluation purposes. The ten participants consisted of six participants who had no previous touch screen experience and four participants who had previous touch screen experience. The participants with previous touch screen experience gained this experience via mobile smartphones.

5.5.3.2 Task list

The task list was changed from the tasks that were used in the first phase. This was due to internet connectivity issues which were experienced at the Living Lab.

1. Open the calculator application and complete the following sum: 38 x 10 = ?
2. Open the camera application and take a photo of yourself.
    2.1. View the photo
    2.2. Make use of the pinch to zoom gesture, to zoom in and out of your photo

3. Change the orientation of the tablet either from portrait to landscape or vice versa depending on how you are currently holding the tablet.
4. Open the calendar application and save a new appointment in tomorrow's date.
5. Change the wallpaper display.
6. Change the date setting to tomorrow's date.

5.5.4 User experience questionnaire

No changes were made to the questionnaire for the second phase of the case study.

5.5.5 Collect

This section examines the data which was collected:

- Biographical data;
- Tasks and questionnaire;
- Participants comments;
- User satisfaction questionnaire and findings;
- Observer's observations.

5.5.5.1 Biographical data of participants

A biographical questionnaire was distributed to each participant in order to gain knowledge about the participant's background. Participants were asked to provide information about their education, language and experience with technology.

Table 5.7 presents the biographical data collected from both groups of participants. Group one consisted of six participants, all of whom had never seen or used a tablet before. Group two consisted of four participants. One participant had previous experience with a tablet and the other three participants had never seen or used a tablet before.

Table 5-3: Demographic details of participant's (Researcher, 2013)

	Group One: (No previous touch screen experience)	Group Two: (Previous touch screen experience)
Number of participants	6	4
Home language	Xhosa	Xhosa
Education	5 Participants: Grade 8 - 12	2 Participants: Grade 8 - 12
	1 Participant: Tertiary	2 Participants: Tertiary
Level of computer experience	3 Participants: Beginner	3 Participants: Beginner
	1 Participant: Intermediate	1 Participant: Intermediate
	2 Participants: No Answer	

5.5.5.1.1 Demographic Data: Group One

The first group which had no previous touch screen experience consisted of six female participants whose home language was Xhosa. Five of the participants had an educational background which ranged from a grade eight to a grade twelve level of education and one participant who had a tertiary educational background. Regarding their level of computer experience, three participants rated their level as a beginner, one participant rated his / her level as intermediate and two participants did not answer. All six participants had never seen or used a tablet before.

5.5.5.1.2 Demographic Data: Group Two

The second group which had previous touch screen experience consisted of four participants. This group consisted of one male and three females all of whose home language was Xhosa. Their educational background comprised of two participants with a grade eight to twelve educational background and two participants with a tertiary educational background. Regarding their level of computer experience, three participants rated their level as a beginner and one participant rated their level as intermediate. One

participant had previous experience with a tablet and the other three participants had never seen or used a tablet before.

No uniquely identifying data was gathered, nor were any vulnerable groups involved in the study. Hence ethical clearance was not required. Participants were however given consent forms (see Appendix C). The consent forms were explained by the moderator as well as read through by the participants before any data collecting began. All consent forms were signed. The participants were also made aware that they could leave at any stage, should they have wished to do so.

5.5.5.2 Tasks and Questionnaire

The participants were given a set number of tasks (on page 90) to complete on the tablet and were observed whilst performing these tasks. Users were asked to think out loud and, if there were any questions whilst performing the tasks, the participants were given hints to assist them in completing the task. After completing the tasks on the tablet, the participants were presented with a user satisfaction questionnaire.

5.5.5.3 Participants Comments

After the tasks were completed, and before the questionnaire was distributed, the participants were asked the following two questions:

- What did you feel was the most challenging part of the task?
- Was the task as simple to achieve as you thought it would be?

The following table summarizes the participant's general comments in no particular order:

Table 5-4: Participants comments (Research, 2013)

	Group One: (No previous touch screen experience)	Group Two: (Previous touch screen experience)
Question:	What did you feel was the most challenging part of the task?	What did you feel was the most challenging part of the task?
Comments:	Five of group one's participants articulated that they were unsure at first how to find the different applications in order to complete the tasks. These five participants all commented that the use of gestures was unfamiliar and thus made interacting with the tablet problematic.	One participant voiced that they were unsure how to find two of the applications for certain tasks as they didn't swipe far enough in order view more icons on the different screens. The remaining three participants indicated that they did not find it challenging in any way.
	Five of group one's participants furthermore expressed that, once they had completed a task, they felt confident in repeating that task again.	
	One participant did not comment.	

	Group One: (No previous touch screen experience)	Group Two: (Previous touch screen experience)
Question:	Was the task as simple to achieve as you thought it would be?	Was the task as simple enough to achieve as you thought it would be?
	Five of the participants from group one expressed that initially it was more complex than they expected, but that once they completed a task it did not seem that difficult in hindsight. One participant did not comment.	Three of the participants found that it was straightforward and one participant indicated that it was slightly more trying than they expected.

Additionally to the above comments, two of the users indicated that the metaphors used in icons were not apparent to the users. When looking for the calendar app, they commented that they did not find it because the actual wording 'calendar' was not below the icon. This is a result of the users' lack of prior technology experience.

5.5.5.4 User satisfaction questionnaire results

Tables 5.6 to 5.8 are representations of the participants' answers to certain questions. These questions focused on the relevance of an individual's prior experience with a touch screen as well as their feelings about their interaction with the tablet after having used it. Figure 5.6 illustrates that the participants felt strongly that prior touch screen experience would have made the initial interaction with the tablet easier.

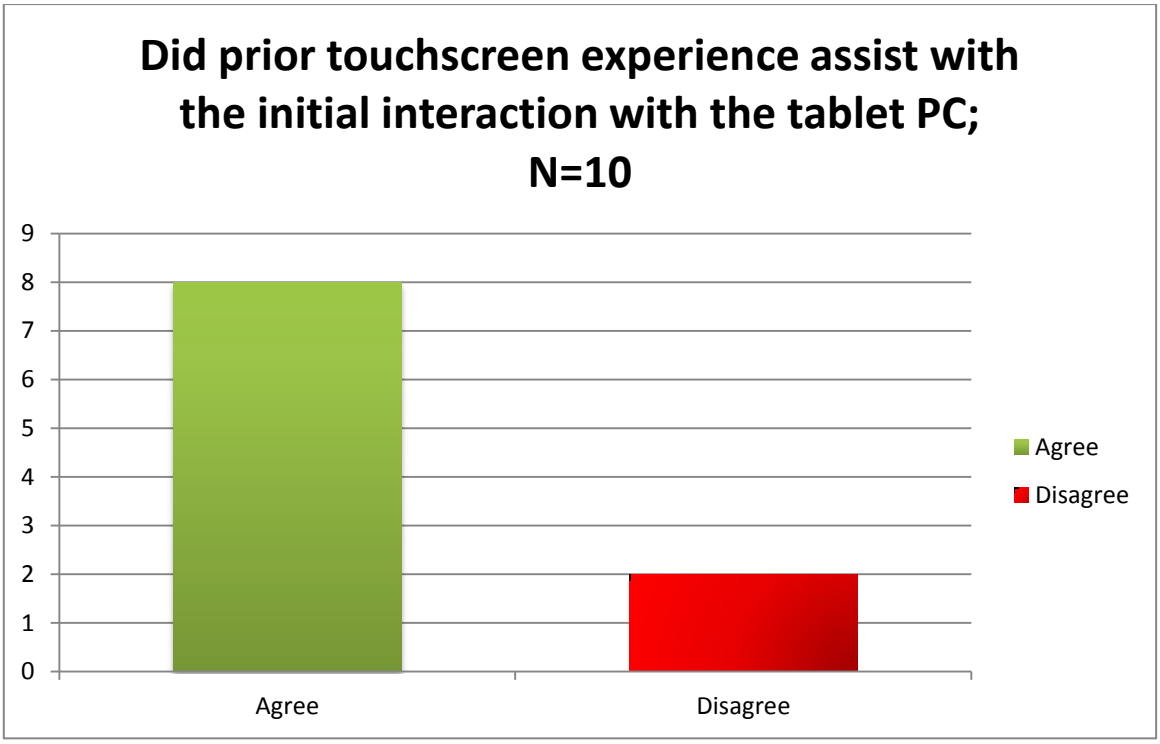


Figure 5-6: Relevance of participant's prior touchscreen experience (Researcher, 2013)

Figure 5.7 indicates that all of the participants felt a positive response towards the tablet PC and are thus likely to recommend it to other individuals.

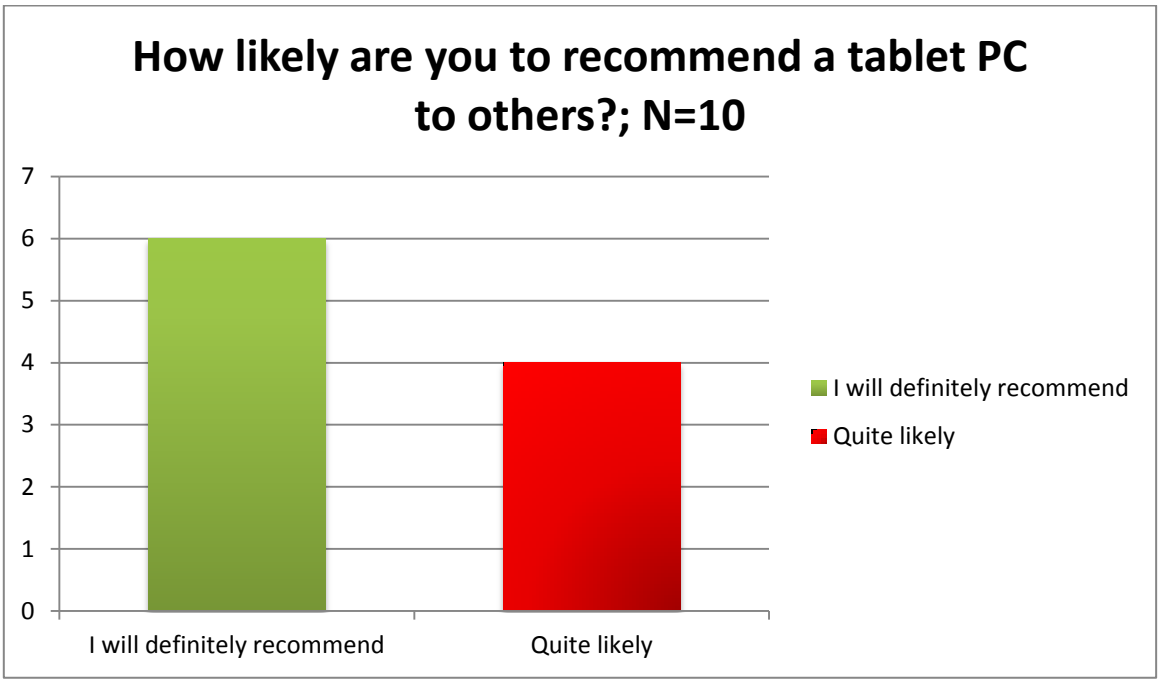


Figure 5-7: Recommendation of tablet (Researcher, 2013)

Figure 5.8 indicates that the majority of participant's would prefer to use a tablet PC over a desktop computer for their normal computer activities.

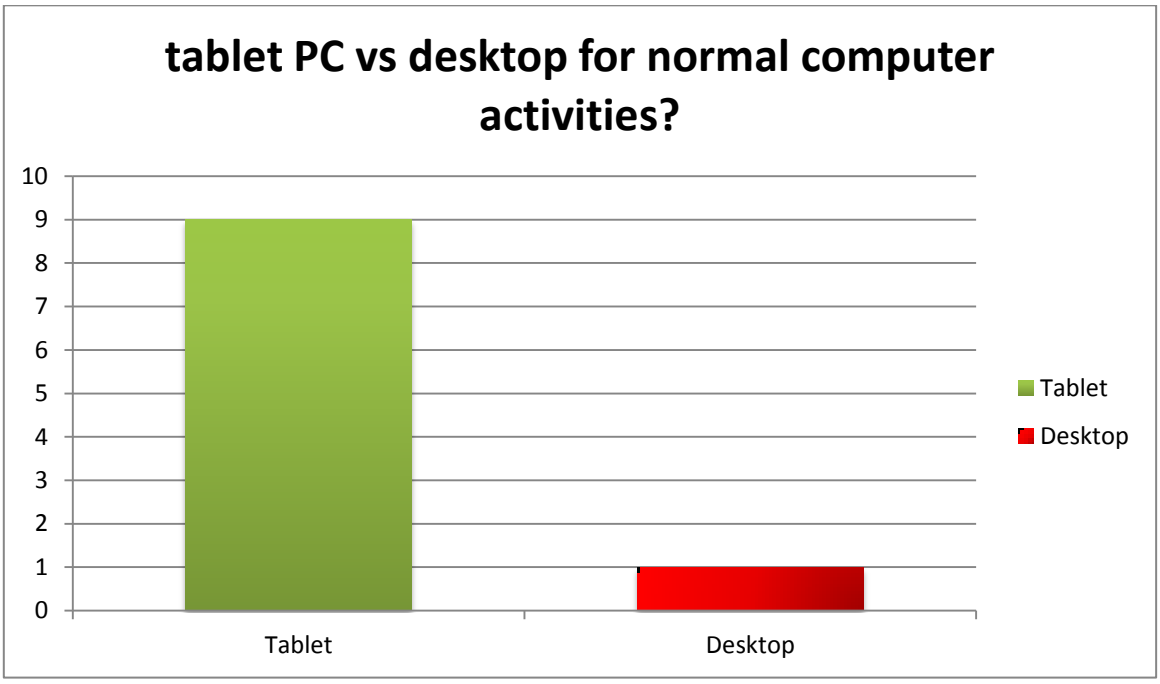


Figure 5-8: Tablet versus desktop (Researcher, 2013)

The technique that the researcher opted to use in order to analyse the data from the questionnaire is to view the top two-box scores. Tullis and Albert (2008) describe the top two-box scores as the two responses which were displayed as most favourable and that expressed the strongest positive attitude.

Table 5-5: Question 1

1. Overall, did you feel that the applications (apps) you were using were focused on its primary task and highlighted the most important information?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	2		8	

Eight out of the ten participants agreed with question one. This indicates that the most important functionality was highlighted whilst completing tasks with different applications.

Table 5-6: Question 2

2. When you were completing the tasks with the various apps, did you feel that the most important information was displayed at the top of the screen?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		7	1	2

The response indicates that there was a lack of agreement with the statement. Seven out of ten participants felt that the most important information was not displayed at the top of the screen.

Table 5-7: Question 3

3. Did you feel that there was a logical flow to the apps that you used i.e. You always knew where you were in an app and could easily move back with the use of back buttons if needed?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		6	1	3

The responses to this question indicate that navigation within the applications was not straight forward.

Table 5-8: Question 4

4. Did you feel the correct jargon was used when necessary? Meaning, was the text simple and easy to understand or technical in the appropriate instances.				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1	2	5	2

These responses indicate that the majority (seven out of ten) of the participants felt positive that the correct jargon was used when necessary.

Table 5-9: Question 5

5. Overall, did you feel that labels and text were concise and to the point?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1	1	8	

Eight of the participants agreed with the question which indicates that the labels and text were concise.

Table 5-10: Question 6

6. Overall, did you feel that the realistic look and feel of the apps made it easier to understand and more enjoyable?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1	1	6	2

The responses to this question indicate that eight out of ten participants agreed that the realistic aesthetics aided the enjoyment and understanding of the application.

Table 5-11: Question 7

7. Did you feel the graphics of the various apps made your experience more enjoyable?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		1	7	2

The responses to Question 7 indicate that nine participants-a majority of the participants-agreed that the graphics aided the enjoyment application.

Table 5-12: Question 8

8. Did the tablet do what you expected it to when you changed orientation of the device?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		3	6	1

As shown, seven out of ten agreed that the tablet met the participant's expectations when the device was orientated.

Table 5-13: Question 9

9. Did you feel that the consistency of buttons and icons made learning how to use the apps easier and thus your experience a more enjoyable one?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1		8	1

The responses to this question show that nine out of ten, which is the majority of the participants, agreed that consistency aided the enjoyment application.

Table 5-14: Question 10

10. When using gestures with the device (when you used the pinch to zoom feature while viewing the photo you took), did you feel the app responded in the way you expected or predicted it would?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		7	2	1

As shown, seven out of ten of the participants had issues with using gestures and indicated that the gestures were not intuitive.

Table 5-15: Question 11

11. Overall, did you feel that the apps provided sufficient feedback when necessary and in doing so contributed to an enjoyable experience?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		1	8	1

As shown above, nine participants, which is the majority of the participants, agreed that sufficient feedback was provided and thus aided in the enjoyment of the application.

Table 5-16: Question 12

12. Do you feel your past experience with a desktop computer has made working with the tablet easier?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count			8	2

The responses to Question 12 indicated that all of the participants agreed that past experience with a desktop computer increases one's interaction experience with a tablet in a positive manner.

Table 5-17: Question 13

13. Do you feel that your past experience with a touchscreen device has made working with the tablet easier?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		2	5	3

As shown, eight of the participants (a majority) agreed that past experience with a touchscreen increases ones interaction experience with a tablet in a positive manner.

Table 5-18: Question 14

14. Did you find your experience with the tablet engaging?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		1	9	

Nine of the participants agreed with the question. This indicates that a majority of the tablet users found the tablet engaging.

Table 5-19: Question 15

15. Did you feel that important information or information that was necessary to the task at hand was displayed and highlighted on the screen?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count			10	

All of the participants agreed that they were made aware of any important information.

Table 5-20: Question 16

16. Overall, did you feel that labels and text were elaborate, long-winded and lengthy?				
	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1		8	1

Nine participants, which is the majority of the participants, agreed that the labels were not concise. However, this directly contradicts question five where eight participants agreed that the labels were indeed concise. The researcher concludes that the participants did not understand the questions and the data from question five and seventeen is now rendered inconsistent.

Table 5-21: Question 17

17. Overall, did you feel that the apps grabbed your attention immediately?				
	Definitely not	Probably not	Probably	Definitely
Participant count			4	6

Four of the participants opted for *probably* and six opted for *definitely* as their answer to the question. This indicates that all the participants agreed that the applications were immediately appealing.

Table 5-22: Question 18

18. Having completed this set of tasks once, would you feel more confident completing them a second time around?				
	Definitely not	Probably not	Probably	Definitely
Participant count			3	7

Three of the participants opted for *probably* and seven with *definitely* as their answer to the question. This indicates that all the participants felt confident in completing a task a second time.

Table 5-23: Question 19

19. How likely are you to recommend this tablet to friends / family?				
	I won't recommend it	Not very likely	Quite likely	I will definitely recommend it
Participant count			4	6

Four of the participants opted for *quite* likely and six chose *I will definitely recommend it* as their answer to the question. This indicates that there is a significant chance that the tablet PCs would be recommended to others by all the participants.

Table 5-24: Question 20

20. Overall, how enjoyable was your experience with the tablet?				
	Not at all enjoyable	Below average	Somewhat enjoyable	Excellent
Participant count		1	2	7

These responses reveal that nine participants, which is the majority of participants, found interacting with the tablet enjoyable.

Table 5-25: Question 21

21. How did the experience on the tablet compare to a desktop computer / laptop?				
	It varied a great deal	Not very similar	Somewhat similar	It was very similar
Participant count		1	4	5

Nine participants, which is the majority of participants, found that interacting with a tablet was similar to interacting with a desktop computer and / or laptop.

22. Overall, did you find your experience with the tablet was frustrating?				
	It was extremely frustrating	It was frustrating at times	It was not frustrating	It was enjoyable
Participant count			3	7

All of the participants found that interacting with a tablet was not frustrating but rather was enjoyable.

Question twenty three was administered to the participants who had no prior touch screen experience.

Table 5-26: Question 23

23. Having never used a touch screen device before, how did you find working with the tablet?				
	Frustrating	Dissatisfying	Satisfying	Very pleasing
Participant count	1		4	1

Five of the participants found that interacting with a tablet and a touchscreen for the first time ranged from *satisfying* to *very pleasing*.

Question twenty four was administered to the participants whom had prior touch screen experience.

Table 5-27: Question 24

24. Having used a touchscreen device before, how did you find working with the tablet?				
	Frustrating	Dissatisfying	Satisfying	Very pleasing
Participant count			3	1

As shown above, all the participants who had prior touch screen experience found that interacting with a tablet ranged from *satisfying* to *very pleasing.*

Table 5-28: Question 25

25. Given your experience with the tablet in this research study, do you look forward to your next encounter with a tablet?				
	Definitely not	Not really	Somewhat	Definitely
Participant count			1	9

One of the participants selected *somewhat* and nine selected *definitely*, as their answer to the question. This indicates that all of the participants are looking forward to their next encounter with a tablet.

Table 5-29: Question 26

26. Having worked with a tablet in this study, would you consider using a tablet for your normal computer activities as opposed to a desktop computer or laptop?				
	Definitely not	Probably Not	Probably	Definitely
Participant count		1	4	5

Nine participants, which is the majority of the participants, would be probably or definitely happy to consider using a tablet PC in place of their normal computing device for their normal computer activities.

Table 5-30: Question 27

27. Did you feel that things worked the way you expected them to when using the tablet?				
	Definitely not	Rarely	Sometimes	Definitely
Participant count			6	4

All of the participants felt that the tablet met their expectations in the way it worked – either wholeheartedly or at least sometimes.

Table 5-31: Question 28

28. Did you feel that the menu system of the tablet was easy to navigate?				
	Definitely not	Rarely	Sometimes	Definitely
Participant count		1	2	7

As shown, nine participants, which is the majority of the participants, felt that the navigation was definitely or sometimes straightforward.

29. Did you feel comfortable using the tablet?				
	Definitely not	Hardly ever	Most of the time	Definitely
Participant count			5	5

All of the participants felt comfortable whilst using the tablet PC at least most of the time.

5.5.6 Analysis

5.5.6.1 User satisfaction Questionnaire

The user satisfaction questionnaire revealed a predominantly positive response with regards to the participants' interaction with the tablet. All but one participant out of both groups rated their experience with the tablet as very pleasing or satisfying. The one participant with a negative response rated their experience as frustrating. My observations, however, were contradictory to what the majority of the participants answered on their questionnaires. This is a common occurrence in ethnographic observation (see Section 2.3.6.2). In this case, both quantitative and qualitative methods were used in the forms of questionnaires and

observations. This ensures that the data from the observation and questionnaire can be compared and result in unbiased data.

5.5.6.2 Empirical findings

The user satisfaction questionnaire reflected a largely positive response from both the participants with and without prior touch screen experience. The participants indicated that:

- They felt comfortable using the device;
- It was easy to navigate;
- Their expectations were met;
- It was an enjoyable experience;
- They would recommend the tablet PC to others.

5.5.6.3 Observation Comments

Contrary to the positive response from the user satisfaction questionnaire, the main trend observed was that participants with no prior touch screen experience found interacting with the tablet difficult, unintuitive and, at times for certain participants, frustrating. It was observed that the participants were hesitant and displayed a lack of confidence to experiment and explore the device. The participants who had no prior touch screen experience were unaware of the concept of gestures, such as swiping or pinch to zoom and were not be able to progress with the task until further assistance was provided. If the application for a particular task was not on the home screen of the tablet the participant could not progress with the task.

There is a discrepancy between the empirical and the observational findings. As stated in Section 5.5.6.1 this is a common occurrence in ethnographic observation. The researcher can infer that the participants either did not understand the questions in the questionnaire, or that they selected a positive response in order to please the observer.

5.6 Phase three of the case study

Phase three incorporates the findings from phase one and two.

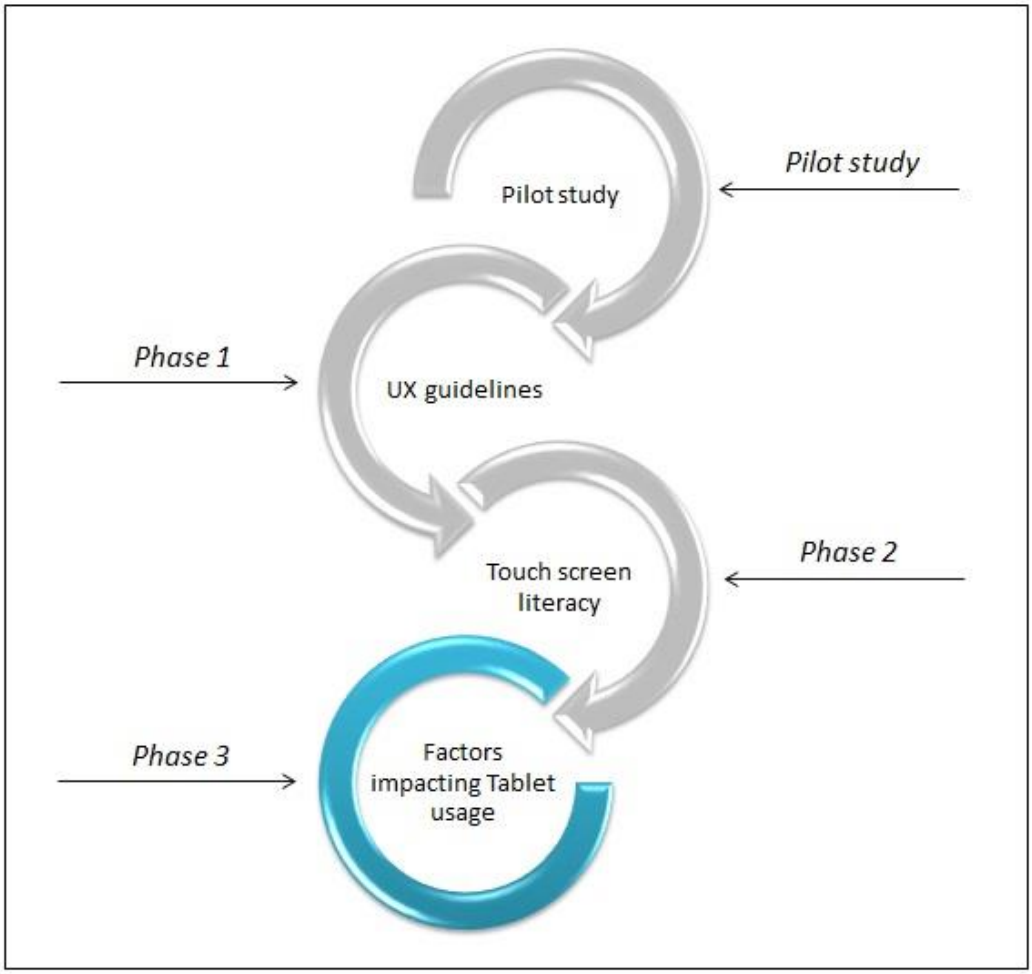


Figure 5-9: Phase 3 of the case study (Researcher, 2013)

Based on the findings it appeared that the lack of experience of touch screen technology yielded a less positive UX than that experienced by those with touch screen experience. Prior touch screen experience was the main factor that influenced the user's interaction with a tablet PC. It was observed that there is a steep learning curve for users with no prior touch screen exposure.

5.6.1 Factors identified in this case study

Various factors which impact on the UX of a tablet PC were identified in this case study. These factors were software related and incorporated UX guidelines and UI content. UX

guidelines were included in the questionnaire in order to determine if these guidelines were met. Chapter 6 outlines which of these UX guidelines were adhered to, based on this study.

The intuitiveness of the device was identified as a factor because the users did not find gestures intuitive (see Section 5.5.3.1).

Familiarity is a factor which was evident (see Section 5.5.5.4) in the answers to question 24 in the user satisfaction questionnaire, when the users who had prior touch screen experience indicated that they had positive experience with the tablet PC.

In the user satisfaction questionnaire (see Section 5.5.5.4) the participants' answers to Question 10, indicated a negative response in that they did not find the use of gestures intuitive, as they did not function in the way expected. Therefore the metaphor of using real world gestures, such as swiping, did not assist the users.

These factors are further discussed in Chapter 6.

5.7 Summary

This chapter presented the different phases of the case study. A pilot was conducted. This was followed by the first phase of the study. The findings from the first phase impacted the second phase. The findings from this case study, coupled with the literature review from chapter 3 and 4, provide the basis for the conclusions drawn in the following chapter.

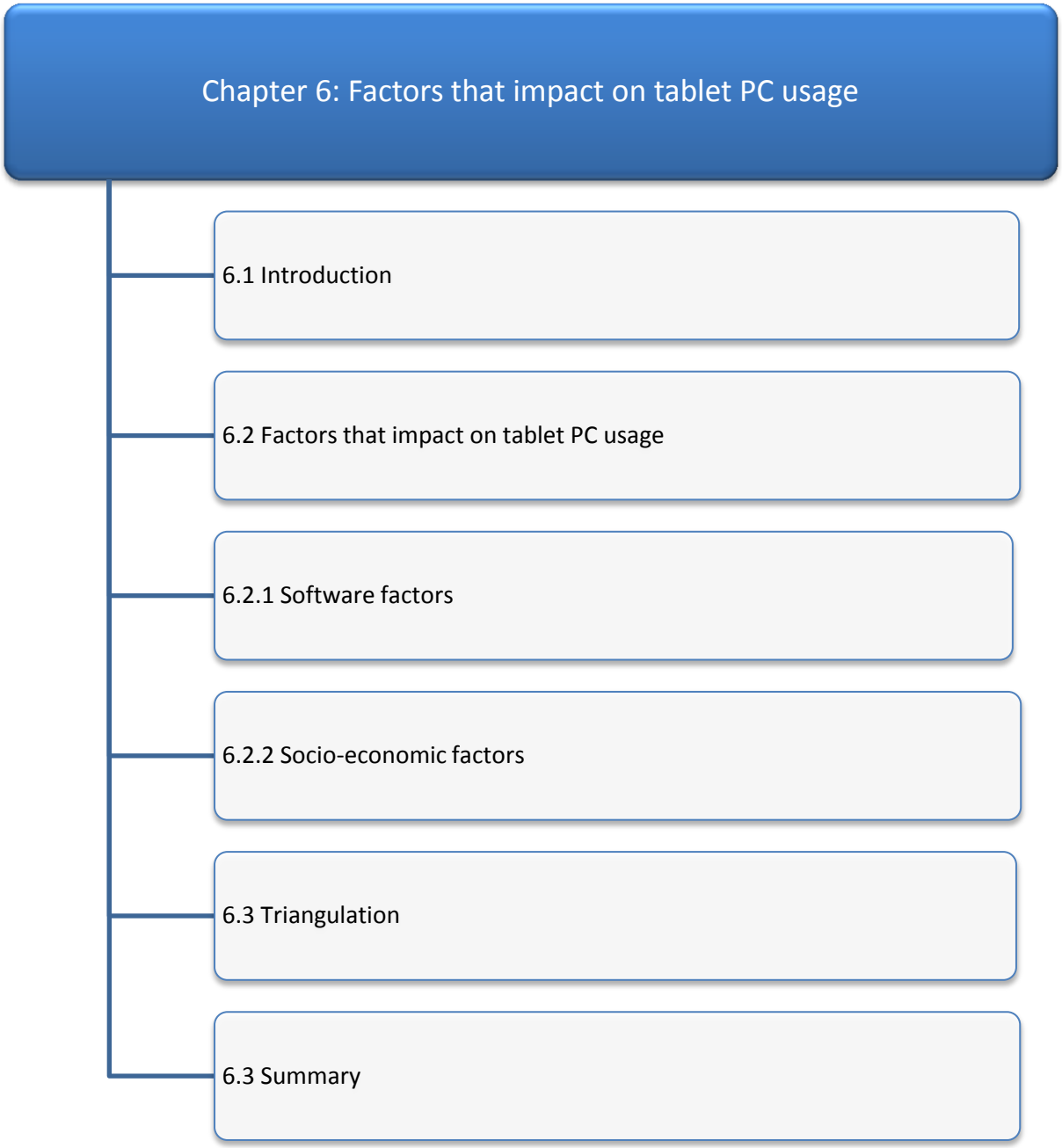


Figure 6-1: Schematic index of Chapter 6 (Researcher, 2013)

Chapter 6 Factors that impact on tablet PC usage

6.1 Introduction

In the previous chapter, the data gathered from the case study was discussed. This data was analysed, and from this various factors that impact on the UX of tablet PC usage were identified.

These factors are outlined in this chapter. The factors are categorized into two sections, namely, software factors and socio-economic factors. The software factors include factors such as UX guidelines, the content that is available on tablet PCs for South Africans and UI factors. The socio-economic factors which impact on tablet PC usage include, economic and consumer factors.

The following research question is addressed in this chapter:

MRQ: What are the factors that impact on tablet PC usage in low-income communities?

6.2 Factors that impact on tablet PC usage

Numerous factors impact on the UX of tablet PC usage in low-income communities. These factors are derived from the findings obtained in the case study and are categorised below:

- Software factors
- Socio-economic factors

Figure 6.2 depicts the different factors which fall into certain categories.

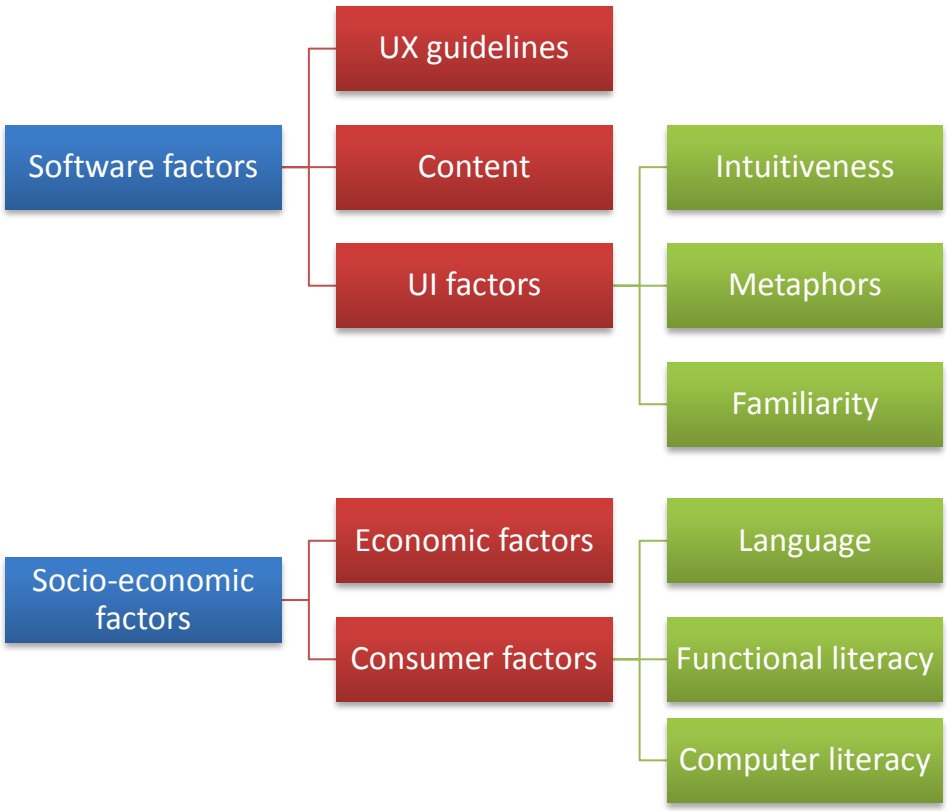


Figure 6-2: Factors that impact on tablet PC usage (Researcher, 2013)

These factors are further discussed below.

6.2.1 Software factors

The software factors encompass any factors that are related to the software of the tablet PC. Software factors include UX guidelines, content and apps for the tablet PC and UI factors.

6.2.1.1 UX guidelines

As mentioned earlier, the numerous operating system manufacturers such as Apple, Windows and Android have each created their own set of UX guidelines. These UX guidelines are made available for developers to follow when developing apps. However, there is not one uniform set of guidelines that can be followed.

Below are the iOS UX guidelines that the participants from the case study revealed a positive response towards. The participants indicated that they were applied well to the system being studied.

- Focus on the Primary Task;
- Elevate the Content that People Care About;
- Consider Adding Physicality and Realism;
- Start instantly;
- Use User-Centric Terminology;
- Delight People with Stunning Graphics;
- Handle Orientation Changes;
- Use UI Elements Consistently;
- Make Usage Easy and Obvious.

Below are the iOS UX guidelines that the participants from the case study indicated were not applied to the applications they used, whilst completing the tasks.

- Think Top Down;
- Give People a Logical Path to Follow.

The guidelines that weren't adhered to represent areas of possible improvement going forward for tablet manufacturers and designers. However, it is also worth noting that the guidelines impact differently on people depending on prior touch screen experience.

UX guidelines strive to influence a user's tablet PC experience in a positive manner; however, if not applied correctly, they will not contribute towards a positive experience. Irrespective, the UX guidelines, as a whole, represent a factor that impacts tablet PC usage. An additional software element which is a factor that impacts on tablet PC usage is the content for the device.

6.2.1.2 Content

Tablet PC users are provided with a colossal number of apps which provide an almost limitless range of features and experiences. The need is high within developing countries for

local content which would suit individual's diverse cultures and languages (see Section 3.5.7). There is still, however, a lack of suitable local content (see Section 5.5.3.1). If the content is tailor-made for the users, they will be able to achieve their end goals which will encourage them to use the device. Localized content will assist in providing the user with more incentive to use the device as the content will be applicable to the user's needs and easier to understand. Content that is familiar and useful will increase the chances of the engaging the user and the greater the variety of content available, the more likely the tablet PC will have an application available that would be beneficial to the user.

6.2.1.3 UI factors

6.2.1.3.1 Intuitiveness

Making use of gestures is more intuitive than using a mouse and keyboard, since you're interacting directly and immediately with the elements on the screen (see section 4.8.1).

The results from the case study found that users without any prior touch screen exposure do not find touch screens intuitive initially. The concept of using your fingers and a screen to interact with the device were foreign concepts. Due to the fact that interacting with a touch screen was a completely foreign concept, the users needed assistance in the form of hints or instructions.

6.2.1.3.2 Metaphors

The case study found that users with a lower computer literacy levels did not find that the metaphors used assisted them in interacting with the tablet PC.

6.2.1.3.3 Familiarity

If the user only has prior exposure to the interaction of a mouse and keyboard, then the concept of a touch screen is foreign. In order for the user to become comfortable with using the device they would need to familiarize themselves with the new interaction style. Furthermore, the type of prior computer exposure influences the user's familiarity with a device. When a user is not familiar with a device they often act conservatively the first time

interacting with a new device. Familiarity derives from the users past experience with similar devices or concepts.

6.2.2 Socio-economic factors

The socio-economic factors which impact on tablet PC usage consist of economic and consumer factors.

6.2.2.1 Economic factors

As was discussed in Chapter 5 (see section 5.2.2), people from Motherwell are low-income individuals. The high price of the tablet PC devices make them inaccessible to these individuals. Functionality such as browsing the internet requires an internet connection. To date, broadband costs in South Africa have been exorbitantly high compared to the rest of the world. These high broadband costs create limitations for low-income individuals in using the tablet PC to its full potential.

6.2.2.2 Consumer factors

The demographic background of the user impacts on their tablet PC usage. It is important to understand the user and their relevant context. Factors such as the user's first language, their functional literacy and computer literacy all play a significant role.

6.2.2.2.1 Language

South Africa has eleven official languages (see section 3.6.2). There is, however, currently a lack of localisation for the official languages. Localisation is a feature that ensures that the language in which the app or UI is presented is adapted to the user's language of choice. Having localisation as an option assists the user to navigate better around the system and understand and enjoy the content. Having a wide range of languages available would increase the user's engagement and usage of the device.

6.2.2.2.2 Functional literacy

The user's functional literacy impacts on tablet PC usage (see Section 3.6.1). As was discussed in Chapter 5 (see section 5.2.2), Motherwell has an alarmingly low educational level. This directly influences on their functional literacy levels. A low functional literacy level affects tablet PC usage because it affects the understanding of content, structure and navigation of the tablet PC.

6.2.2.2.3 Computer literacy

A user's computer literacy level influences their interaction with tablet PC devices. Touch screen technology is still a novel technology for South Africans in low-income communities. A contributing factor to their lack of exposure to touch screens is their low educational levels and low income levels. The users without any prior touch screen experience were conservative and lacked the confidence to explore (see Section 5.5.6.3).

6.3 Triangulation

As discussed in Section 2.4, making use of multiple data collection techniques assists in increasing the credibility and reliability of data results. Figure 6.3 illustrates the various data collection techniques that were used in this study in order to triangulate the data to meet the proposed objectives.

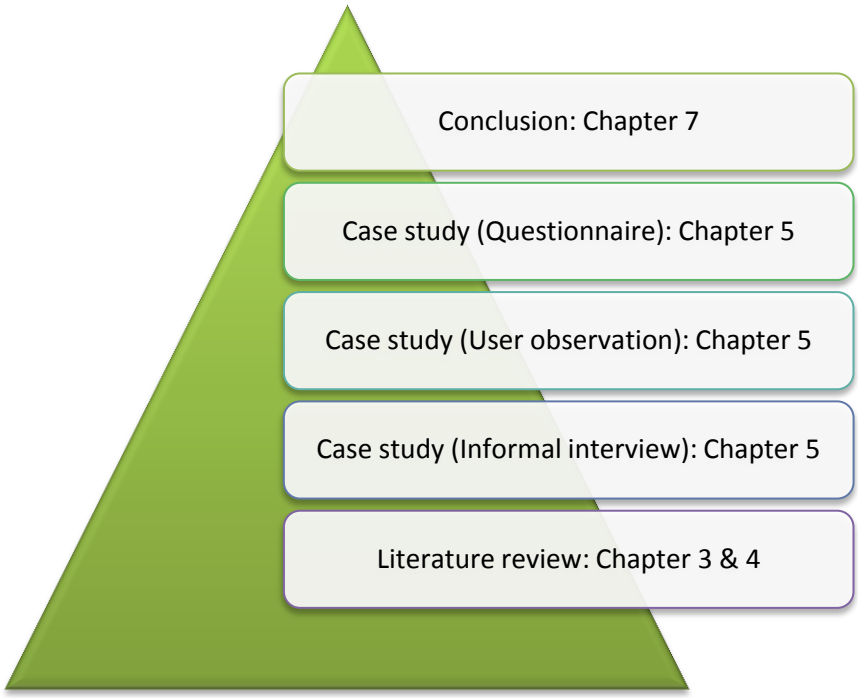


Figure 6-3: Triangulation in this study (Researcher, 2013)

Data collected via the literature study, user observations, questionnaires and informal interviews was used so that the data could be triangulated. Both qualitative and quantitative data were collected.

The literature study was conducted in order to explore the current uptake of tablet PCs in South Africa (see Chapter 3). It identified various socio-economic factors such as high bandwidth costs, high price of tablet PCs and the lack of local content for South Africans (see Section 3.5.7).

A literature review was furthermore used to explore the various UX guidelines that are available for tablet PCs (see Section 4.7). The focus for this study was specifically on Apples iOS UX guidelines (see Appendix A). As these guidelines were found to be the most adaptable they were chosen by the researcher to be used as the basis for which to evaluate the participant's interaction with the tablet PC.

A further literature study (see Section 4.11) found that certain UI factors which were applicable to this study impacted on the UX of the participants in the case study. These UI factors included:

- Intuitiveness;
- Metaphors;
- Familiarity.

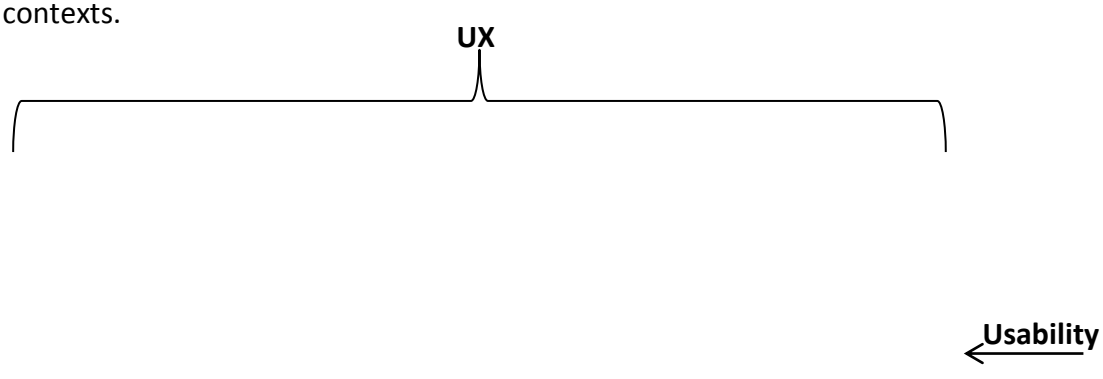
The case study (see Section 5.5.6) discovered that the researcher's observations and the participant's answers on the questionnaires were contradictory. The informal interviews (see Section 5.5.5.3) aligned with the observations (see Section 5.5.6.3) more strongly than the answers to the questionnaires.

A literature review (see Section 3.5.7), coupled with findings from the biographical questionnaires (see Section 5.5.5.1) assisted in identifying the socio-economic factors that impacted on UX (see Section 6.2.2).

The consumer factors impacting on tablet PC usage were (see Section 3.6) gathered via literature, as well as biographical questionnaires (see Section 5.5.5.1 and Section 5.5.5.1).

The multiple sources and types of data gathered for this research should enhance confidence in the findings.

Figure 6.4 illustrates how the various factors described above relate to UCD, Usability and ultimately UX. Section 4.3 specifies that two of the steps in a UCD approach is requirements gathering and specification. These steps highlight the necessity to understand the context of the user and use of the device. Following a UCD approach, content can be customized to better suit users in varying contexts. If the user's language, functional and computer literacy is established, along with relevant economic factors, a UCD approach can assist in designing for specific contexts.



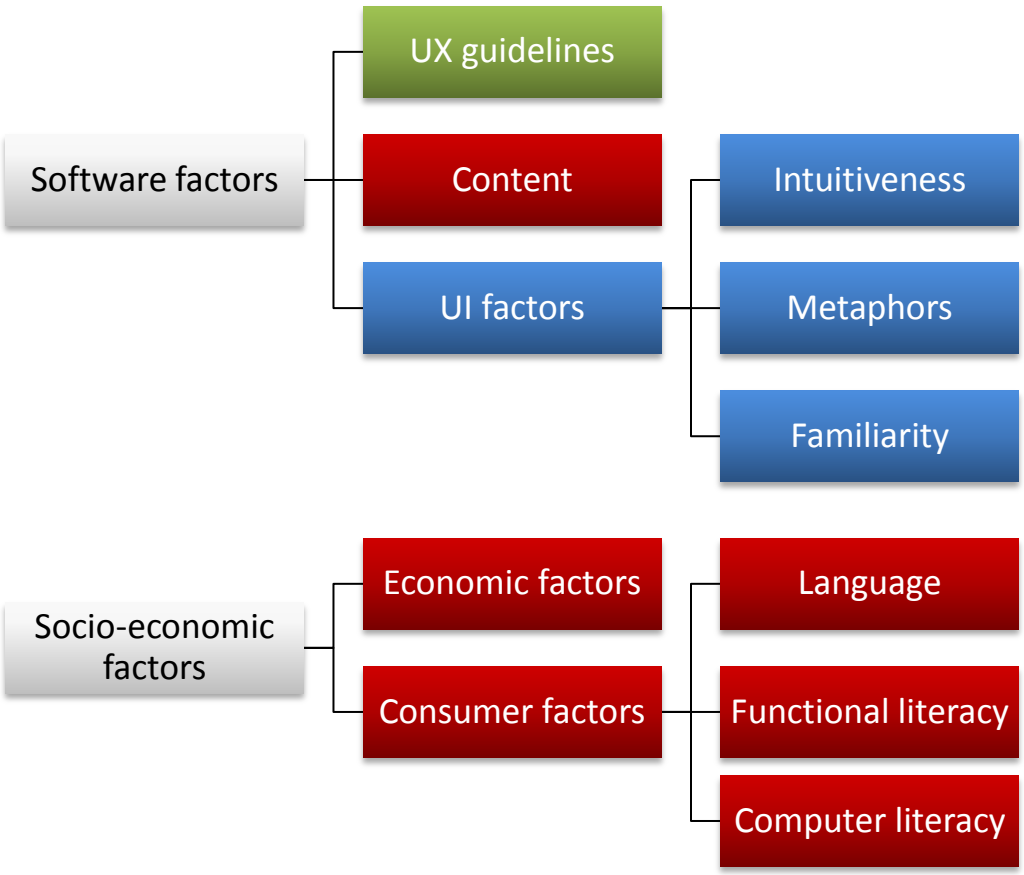


Figure 6-4: How UX, usability and UCD impact these factors

If a system is intuitive (see Section 4.8.1), a user is unlikely to struggle in determining how to complete their task and achieve their goal, increasing the usability of the system. Metaphors coincide with intuitiveness, in that they mimic real world objects and actions in an intuitive way (see Section 4.8.3). If a user can recognize a feature or action as it relates to their real world counterpart, then this helps the user achieve their goal, which improves the usability. If a system is familiar (see Section 4.8.2) to a user it goes a long way in improving the usability. If a user is familiar with a concept, this will help them learn a new system and hence increase the usability.

Ultimately, if the system is designed with a UCD approach and usability as a goal, the factors which impact on the UX of a tablet PC can be addressed, and the likelihood of a positive UX being achieved is greatly enhanced.

6.4 Summary

This chapter highlighted the factors which impact on tablet PC usage in low-income communities. These factors were identified through literature study and the case study which was conducted. These factors can be categorized into software and socio-economic factors.

Triangulation was used in order to amalgamate and analyse the findings that were gathered via various means. These means included literature review, user observation, questionnaires and informal interviews.

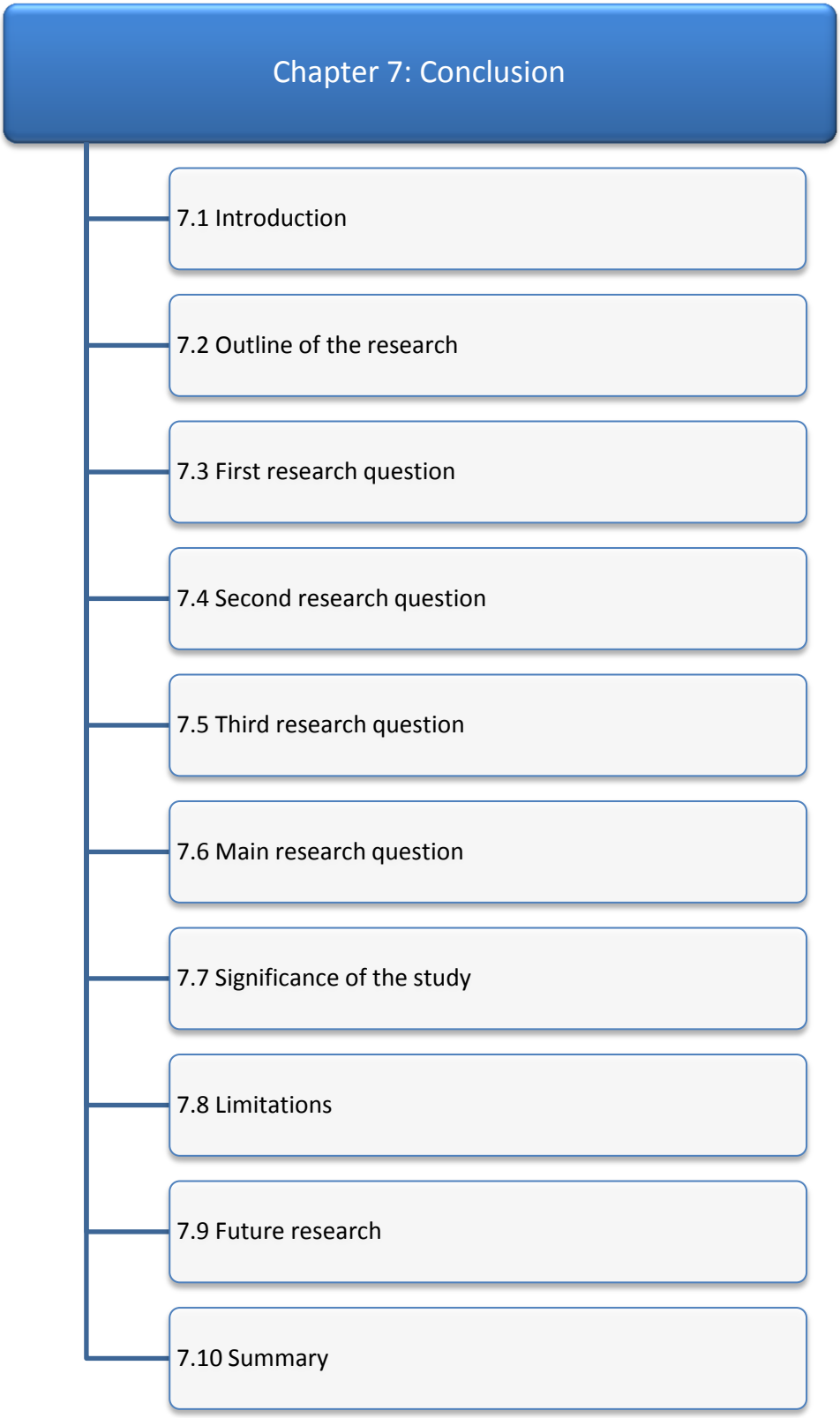


Figure 7-1: Schematic index of Chapter 7 (Researcher, 2013)

Chapter 7 Conclusion

7.1 Introduction

This research has sought to identify the factors which impact on the UX of tablet PC usage in low-income communities. Chapter 6 highlighted these factors which impact on the UX of tablet PC usage.

This chapter concludes the findings of the entire research. Furthermore it highlights the significance and limitations of this research, as well as identifying future research opportunities. The following section outlines the research and addresses the research questions.

7.2 Outline of the research

In order to answer the main research question, it was necessary to answer the sub-research questions and objectives.

Table 7-1: Research questions and related chapters

Sub-research questions:	Addressed in chapter:
Does exposure to touch screen technology impact on UX?	3
Are existing user experience guidelines	4

relevant to South African users?	
How does the identification of the factors assist in improving tablet usage?	5

7.3 First research sub-question (RQ1)

RQ1: *Does exposure to touch screen technology impact the UX?*

Objective: *To determine whether* prior *exposure to touch screen technology impacts UX.*

This research objective was achieved through methods of observation, biographical and user satisfaction questionnaires, teamed with a thorough literature review. The literature review was tackled in Chapter 3 and the research question and objective was addressed in the case study in Chapter 5.

The findings of this research confirm that prior touch screen exposure does impact on the UX if the user is interacting with a touch screen device. The research also indicates that UI factors such as intuitiveness, familiarity and metaphors can impact on the UX negatively as well as impeding task completion.

Intuitiveness: The participants who had no prior touch screen experience did not find working with the tablet PC intuitive at all. The notion of using gestures and touch was completely overlooked.

Familiarity: The participants were familiar with the interaction style of a mouse and keyboard due to their prior experiences. If users had never been exposed to touch screen technology their unfamiliarity was evident in their hesitation to explore.

Metaphors: The gestures and icons resemble real world interaction and objects. However, this did not enhance usability if the users failed to notice them because of their lack of prior touch screen exposure.

7.4 Second research sub-question (RQ2)

RQ2: *Are existing user experience guidelines relevant to South African users?*

Objective: *To determine whether UX guidelines are relevant to SA users.*

This research objective was achieved through observational means, coupled with the literature review. The literature study was addressed in Chapter 4 and the case study for this research was discussed in Chapter 5.

The UX guidelines are relevant to a certain extent. They are relevant for the users that have prior touch screen experience. However, they are not relevant for users without any prior touch screen experience. The users who had prior touch screen experience were confident and found the device intuitive. The UX guidelines therefore assisted in promoting a positive experience for the user. Conversely, the users without any prior touch screen experience were conservative and lacked the confidence to explore. Due to the fact that these users encountered a lack of task completion unless they were guided and prompted, the UX guidelines were essentially irrelevant. The user's prior technology experience is clearly an influencing factor on the UX on any new technologies that they encounter.

7.5 Third research question (RQ3)

RQ3: *How does the identification of the factors assist in improving tablet usage?*

Objective: *To determine how the identification of factors assist in improving tablet usage.*

By identifying factors that impact on tablet PC usage, recommendations can be derived which can be used to improve tablet PC usage. Essentially the main concern is that, when designing guidelines, it is important to consider the background of the user as well as the various aspects of the system in question. The following are proposed recommendations which are based on the first and second research questions findings:

Based on RQ1 the following recommendation is proposed:

Recommendation: The user characteristics and background of the user must be considered.

Based on RQ2 the following recommendation is proposed:

Recommendation: The user's prior PC and technology experience must be considered.

Recommendation: Aspects of the system, including the intuitiveness, the familiarity and metaphors of the system, must be considered.

7.6 Main research question

The main research question for this study is:

Main Research Question:

What are the factors that impact on tablet PC usage in low-income communities?

Triangulation (see section 2.4) was used in order to answer the main research question. This was achieved by checking the literature, the data collected from the case study, and observation against each other. The data collected in the case study was collected via means of observation, user satisfaction questionnaires and biographical questionnaires. This in turn led to answering the sub-research questions, which subsequently assisted in answering the main research question.

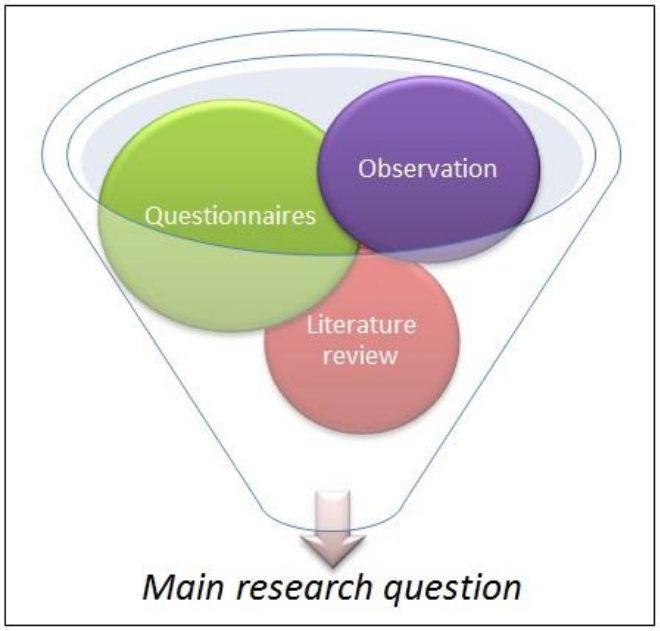


Figure 7-2: Main research question triangulation (Researcher, 2013)

The factors that impact on tablet PC use in low-income communities can be divided into two categories:

- Users aspects;
- System aspects.

Users can be further divided into two groups:

- Users with touch screen experience.
- Users without prior touch screen experience.

This research found that users with prior touch screen experience found interacting with the tablet PC intuitive, familiar and recognized the metaphors.

The findings for the users without any prior touch screen experience were different from those with touch screen experience. These users did not find interacting with the tablet PC intuitive. This was evident in their conservativeness and confusion in how to interact with the device.

The users did not find the tablet PC similar to the technology they were familiar with from their prior experiences. They found gestures to be a foreign concept, as they were used to the mouse and keyboard interaction style.

Metaphors did not assist the users. Gestural metaphors are similar to real world physical action, but the swipe gesture, which was one of the main gestures used, was not intuitive to the user. Similarly, the metaphors used in the icons were not of no assistance to the users in identifying apps.

Factors which impact on the UX of tablet PC usage in low-income communities are (see section 6.2):

- UX guidelines
- Content
- UI factors
- Economic factors
- Consumer factors

7.7 Significance of the study

This research is significant because there is a lack of published findings on studies of tablet PCs in South Africa. The research involved South African participants and was conducted in South Africa.

As was discussed in Chapter 3, 97% of the individuals in Motherwell own a mobile phone. The fact that the majority of individuals in low-income communities own mobile phones, indicates that they accept and use technology in their daily lives. This, coupled with the fact that tablet PCs have had such a huge uptake in South Africa, illustrates the importance of researching the usage of tablets in communities which have not yet adopted them. This study identified the factors which impact on the UX of tablet PC usage in low-income communities.

The factors were identified (see Section 6.2) and recommendations were derived (see Section 7.5). The research highlighted (see Figure 6.4) how, if a UCD approach is followed

and certain usability factors (see Section 6.2.1.3) are taken into consideration, this will assist in addressing the UX factors which impact on a tablet PC in a South African context. It can therefore be used in the future in order to improve the UX of tablet users in SA if specific factors are kept in mind.

7.8 Future research

Little is known about user experience factors impacting on tablet usage. Future research will include the testing of a much larger user base in various geographical areas in order to see whether there are other factors that would be worthy of consideration. These factors will then be utilized in order to derive a set of guidelines which will assist in enhancing the user experience of tablets. Such guidelines can be used to improve the user experience of tablets used in developing countries such as South Africa.

7.9 Summary

This research established the factors which impact on the UX of tablet PC usage in low income communities.

With technology becoming a ubiquitous part of our lives, it is important to decrease the digital divide and increase the technology adoption and usage rate. There is a need to prepare and educate individuals in low-income communities within South Africa, so that they are in a position to engage with tablet PCs in a confident manner, and be considered e-ready for tablet PC usage.

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Appendix A: UX guidelines

Apple has defined 27 user experience guidelines:

UX guideline	Explanation
Focus on the Primary Task	Only display information or functionality on the screen which is applicable at that point in time
Elevate the Content that People Care About	This is similar to the guideline above. Highlight the functionality necessary to the task at hand
Think Top Down	Place the most important and frequently used information at the top of the screen.
Give People a Logical Path to Follow	Make the flow of the system easy to follow and logical. The user should be provided with easy to understand and use navigational options.
Make Usage Easy and Obvious	Make the applications prime function immediately apparent.
Use User-Centric Terminology	Use jargon appropriately and only when necessary. Ensure that you understand the user of the system in order to be able to make use of the correct terminology.

UX guideline	Explanation
Minimize the Effort Required for User Input	Make it easy for users to insert their input and provide the necessary feedback.
Be Succinct	Convey information in a clear and concise manner.
Use UI Elements Consistently	Use standard controls for standard actions – users like consistency.
Consider Adding Physicality and Realism	Realistic aesthetics assist in making an app more appealing and understandable.
Delight People with Stunning Graphics	Aesthetically pleasing apps can make the simplest task rewarding.
Handle Orientation Changes	The app should be able to handle all orientations.
Make Targets Fingertip-Size	Make target areas in the app the average fingertip size of 44 x 44 points.
Use Subtle Animation to Communicate	Use animation subtly to enhance actions, if applicable to app.
Support Gestures Appropriately	Avoid defining new gestures by rather using consistent and known gestures where applicable.

UX guideline	Explanation
Ask People to Save Only When Necessary	Ensure that the app is always saving the users work without having to make the users explicitly do it.
Make Modal Tasks Occasional and Simple	Only use modals when the users' attention is needed and a task must be completed before the user can continue.
Start Instantly	Display the useful content immediately.
Always Be Prepared to Stop	Always save the users data and current state when stopping.
Don't Quit Programmatically	Ensure the app does not close programmatically, however if it does close in this manner, present the users with relevant feedback to assist them.
If Necessary, Display a License Agreement or Disclaimer	If the app requires the user to accept the end-user license agreement, ensure that it is displayed when the program is executed for the first time.
Downplay File-Handling Operations	Users should not be encouraged to interact with files as they do on a desktop.
Enable Collaboration and Connectedness	Take multiple users interactions with a single app into consideration. When applicable, make it easy for users to share information with other users.

UX guideline	Explanation
De-emphasize Settings	Avoid including settings in the application where possible.
Brand Appropriately	Avoid being obtrusive with branding, however incorporate it in a subtle manner where possible.
Make Search Quick and Rewarding	Make the filter functionality fast, effective and efficient.
Entice and Inform with a Well-Written Description	Ensure that the App Store description is enticing and easy to read.

The following 5 UX guidelines are designed by Apple and are specifically for their iPad. However, similarly to the prior 27 guidelines, these guidelines can be adapted to use for all tablets brands.

UX guideline	Explanation
For iPad: Enhance Interactivity (Don't Just Add Features)	Only add innovative ways to interact with the content if it is directly related to the main task. Do not add unnecessary features.
For iPad: Reduce Full-Screen Transitions	Only update the relevant content, instead of the entire screen.
For iPad: Restrain Your Information Hierarchy	Give the user access to more information in one place to prevent the user from having to visit many different screens
For iPad: Consider Using Popovers for Some Modal Tasks	A popover can give the experience a lighter weight, which is preferable.
For iPad: Migrate Toolbar Content to the Top	Move toolbars to the top of the screen as it provides more space on the screen for the focused content.

Appendix B: Phase 1 Questionnaire Results

1. Overall, did you feel that the applications (apps) you were using were focused on its primary task and highlighted the most important information?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	2		8	
Percentage	20%		80%	

2. When you were completing the tasks with the various apps, did you feel that the most important information was displayed at the top of the screen?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		7	1	2
Percentage		70%	10%	20%

3. Did you feel that there was a logical flow to the apps that you used i.e. You always knew where you were in an app and could easily move back with the use of back buttons if needed?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		6	1	3
Percentage		60%	10%	30%

4. Did you feel the correct jargon was used when necessary? I.e. The text was simple and easy to understand or technical in the appropriate instances.

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1	2	5	2
Percentage	10%	20%	50%	20%

5. Overall, did you feel that labels and text were concise and to the point?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1	1	8	3
Percentage	10%	10%	80%	30%

6. Overall, did you feel that the realistic look and feel of the apps made it easier to understand and more enjoyable?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1	1	6	2
Percentage	10%	10%	60%	20%

7. Did you feel the graphics of the various apps made your experience more enjoyable?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		1	7	2
Percentage		10%	70%	20%

8. Did the tablet do what you expected it to when you changed orientation of the device?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		3	6	1
Percentage		30%	60%	10%

9. Did you feel that the consistency of buttons and icons made learning how to use the apps easier and thus your experience a more enjoyable one?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1		8	1
Percentage	10%		80%	10%

11. When using gestures with the device (when you used the pinch to zoom feature while viewing the photo you took), did you feel the app responded in the way you expected or predicted it would?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		7	2	1
Percentage		70%	20%	10%

12. Overall, did you feel that the apps provided sufficient feedback when necessary and in doing so contributed to an enjoyable experience?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		1	8	1
Percentage		10%	80%	10%

13. Do you feel your past experience with a desktop computer has made working with the tablet easier?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count			8	2
Percentage			80%	20%

14. Do you feel that your past experience with a touchscreen device has made working with the tablet easier?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		2	5	3
Percentage		20%	50%	30%

15. Did you find your experience with the tablet was engaging?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count		1	9	
Percentage		10%	90%	

16. Did you feel that important information or information that was necessary to the task at hand was displayed and highlighted on the screen?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count			10	
Percentage			100%	

17. Overall, did you feel that labels and text were elaborate, long-winded and lengthy?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Participant count	1		8	1
Percentage	10%		80%	10%

18. Overall, did you feel that the apps grabbed your attention immediately?

	Definitely not	Probably not	Probably	Definitely
Participant count			4	6
Percentage			40%	60%

19. Having completed this set of tasks once, would you feel more confident completing them a second time around?

	Definitely not	Probably not	Probably	Definitely
Participant count			3	7
Percentage			30%	70%

20. How likely are you to recommend this tablet to friends / family?

	I won't recommend it	Not very likely	Quite likely	I will definitely recommend it
Participant count		6	1	3
Percentage		60%	10%	30%

21. Overall, how enjoyable was your experience with the tablet?

	Not at all enjoyable	Below average	Somewhat enjoyable	Excellent
Participant count		1	2	7
Percentage		10%	20%	70%

22. How did the experience on the tablet compare to a desktop computer / laptop?

	It varied a great deal	Not very similar	Somewhat similar	It was very similar
Participant count		1	4	5
Percentage		10%	40%	50%

23. Overall, did you find your experience with the tablet was frustrating?

	It was extremely frustrating	It was frustrating at times	It was not frustrating	It was enjoyable
Participant count		1	4	5
Percentage		10%	40%	50%

24. Having never used a touch screen device before, how did you find working with the tablet?

	Frustrating	Dissatisfying	Satisfying	Very pleasing
Participant count	1		4	1
Percentage	17%		66%	10%

25. Having used a touchscreen device before, how did you find working with the tablet?

	Frustrating	Dissatisfying	Satisfying	Very pleasing
Participant count			3	1
Percentage			75%	25%

26. Given your experience with the tablet in this research study, do you look forward to your next encounter with a tablet?

	Definitely not	Not really	Somewhat	Definitely
Participant count			1	9
Percentage			10%	90%

27. Having worked with a tablet in this study, would you consider using a tablet for your normal computer activities as opposed to a desktop computer or laptop?

	Definitely not	Probably Not	Probably	Definitely
Participant count		1	4	5
Percentage		10%	40%	50%

28. Did you feel that things worked the way you expected them to when using the tablet?

	Definitely not	Rarely	Sometimes	Definitely
Participant count			6	4
Percentage			60%	40%

29. Did you feel that the menu system of the tablet was easy to navigate?

	Definitely not	Rarely	Sometimes	Definitely
Participant count		1	2	7
Percentage		10%	20%	70%

30. Did you feel comfortable using the tablet?

	Definitely not	Hardly ever	Most of the time	Definitely
Participant count			5	5
Percentage			50%	50%

Appendix C: Consent Form

Project Title

Factors impacting on the user experience of the iPad: a case study of South Africa

You have been selected as a research participant in this study conducted by Natalie Meiring, from the Nelson Mandela Metropolitan University.

Purpose of the study

The aim of the study is evaluate whether Apple's iOS user experience guidelines for the iPad are appropriate and relevant for South African users of the iPad.

Procedures

The following will be required of you:

- You will be asked to complete a biographical and a user experience satisfaction questionnaire
- You will be asked to perform certain tasks on the tablet.

Potential benefits

The potential benefit from this research is that it will assist in determining to what extent Apple's iOS user experience guidelines are applicable to South African users and thus allowing for future improvements to be made.

Payment for participation

Participation in this study is entirely voluntary and thus no payments to the participants will be made.

Confidentiality

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.

Participation and withdrawal

Your participation in this study is entirely voluntary. You can withdraw your consent and stop participation at any time without consequences. You may also refuse to answer any questions you do not wish to answer but still remain in the study.

Identification of investigator

If you have any questions or concerns about the research, please contact the researcher, Natalie Meiring by emailing: s208075040@live.nmmu.ac.za

Signature of research subject / participant

I hereby confirm that I have received, read and understood the above written information, as well as having had all of my questions answered.

I understand that my participation is voluntary and that I may, at any stage withdraw my consent and participation in the study. I hereby consent to voluntarily participate in this study.

_____

Name of Participant (please print)

_____

Participant's signature

_____

Date

Signature of researcher / investigator

_____

Name of Researcher (please print)

_____

Researcher's signature

_____

Date

Appendix D: Biographical questionnaire

Section A: Background information

Gender:	Male	Female

Age:	Less than 20	20 – 30	31 – 40	Above 40

Home Language:	English	Xhosa	Afrikaans	Other

If other, please specify which language:	

Highest Qualification:	Grade 7 or less	Grade 8 – Grade 12	Tertiary Education

Section B: Computer literacy

Have you ever used a computer before?	Yes	No

Have they ever used mobile technology before i.e. (cellular phone or tablet)?	Yes	No

How would you rate your level of computer experience?	Beginner	Intermediate	Expert

Have you used a tablet before?	Yes	No

Do you own a tablet?	Yes	No

Do you own a smartphone?	Yes	No

Which of these operating systems have you used before?	Microsoft Windows	Apple OS X	I'm not sure

How long have you been using computers?	Less than 1 year	1 – 5 years	5 – 10 years	More than 10 years

How frequently do you use a computer?	Daily	Weekly	Monthly	A few times a year	Never

Appendix E: Moderator script

Thank you for accepting the request to participate in this study. I will be observing and taking the notes throughout the study as well as record the session. The recording is to assist with the note taking and analysis only. It's strictly for research and not for public promotion.

The objective of this study is to evaluate whether Apple's iOS user experience guidelines for the iPad are appropriate and relevant for South African users of the iPad. This will allow for future improvements to be made.

During the session, I will ask you to try to complete some tasks. If you need help, please ask for it. Please inform me when you are starting and completing a task.

It is important to remember that we are doing a study on the tablets themselves and are by no means testing your abilities as an individual. If you are unable to complete a task, please be sure to let me know. Likewise, if something impresses you in any way, be sure to mention it. All of your feedback whether it may be negative or positive is important for the study. Please be honest when answering questions or giving feedback. I am here to moderate the study only and anything negative or positive you say will not impact me personally.

Any questions?

Task 1

Open the browser and browse to http://www.cnn.com/

Observations and Comments

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Ask participant:

- Were you able to complete this task successfully?
- What did you feel was the most challenging part of this task?
- Was this task as simple enough to achieve as you thought it would be?

Task 2

Watch a video on http://www.youtube.com/

Observations and Comments

.....

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Ask participant:

- Were you able to complete this task successfully?
- What did you feel was the most challenging part of this task?
- Was this task as simple enough to achieve as you thought it would be?

Task 3

Open your email and send a new email with your name in it to 208075040@live.nmmu.ac.za

Observations and Comments

.....

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Ask participant:

- Were you able to complete this task successfully?
- What did you feel was the most challenging part of this task?
- Was this task as simple enough to achieve as you thought it would be?

Task 4

Open the calculator application and do the following sum: 38 x 10 = ?

Observations and Comments

.....

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Ask participant:

- Were you able to complete this task successfully?
- What did you feel was the most challenging part of this task?
- Was this task as simple enough to achieve as you thought it would be?

Task 5

Change the date and time setting to one hour ahead and tomorrows date

Observations and Comments

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Ask participant:

- Were you able to complete this task successfully?
- What did you feel was the most challenging part of this task?
- Was this task as simple enough to achieve as you thought it would be?

Task 6

Multitasking. Open up the browser and browse to http://www.cnn.com/. Leave the website open. Open up your email. Copy a headline from the CNN page and paste it in a new email. Send the email to s208075040@live.nmmu.ac.za

Observations and Comments

.....

.....

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Ask participant:

- Were you able to complete this task successfully?
- What did you feel was the most challenging part of this task?
- Was this task as simple enough to achieve as you thought it would be?

Appendix F: Task lists

Pilot study and phase one task list:

Open the browser (eg. Chrome, Firefox, Internet Explorer) and browse to http://www.cnn.com/. Whilst on the CNN site, make use of the pinch to zoom gesture to zoom into the webpage. Take note of the way the tablet responds when you change the orientation of the device.
Use the YouTube application to search and watch a video by your favourite musician.
Open your email and send a new email with your name in it to s208075040@live.nmmu.ac.za
Open the calculator application and do the following sum: 38 x 10 =?
Change the date setting to tomorrows date. Change it back to automatic date setting.
Multitasking. Open up the browser and browse to http://www.cnn.com/. Leave the website open. Open up your email. Copy a headline from the CNN page and paste it in a new email. Send the email to s208075040@live.nmmu.ac.za

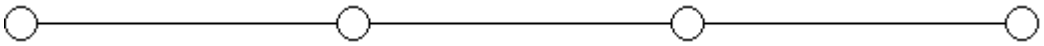
Phase two task list:

Open the calculator application and complete the following sum: 38 x 10 = ?
Open the camera application and take a photo of yourself. View the photo

Make use of the pinch to zoom gesture, to zoom in and out of your photo
Change the orientation of the tablet either from portrait to landscape or vice versa depending on how you are currently holding the tablet.
Open the calendar application and save a new appointment in tomorrow's date.
Change the wallpaper display.
Change the date setting to tomorrow's date.

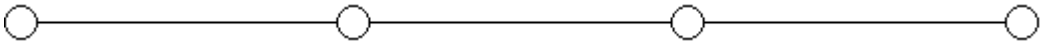
Appendix G: User satisfaction questionnaire

1. Overall, did you feel that the apps you were using were focused on its primary task and highlighted the most important information?



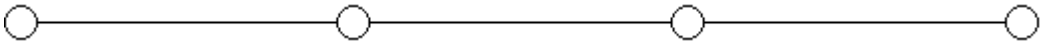
Strongly Disagree Disagree Agree Strongly Agree

2. When you were completing the tasks with the various apps, did you feel that the most important information was displayed at the top of the screen?



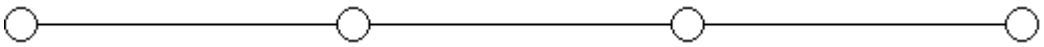
Strongly Disagree Disagree Agree Strongly Agree

3. Did you feel that there was a logical flow to the apps that you used **i**.e. You always knew where you were in an app and could easily move back with the use of back buttons if needed?



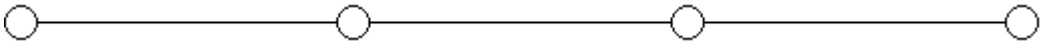
Strongly Disagree Disagree Agree Strongly Agree

4. Did you feel the correct jargon was used when necessary? I.e. The text was simple and easy to understand or technical in the appropriate instances.



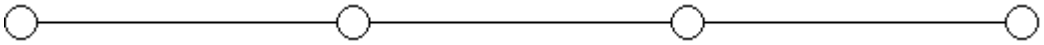
Strongly Disagree Disagree Agree Strongly Agree

5. Overall, did you feel that labels and text were concise and to the point?



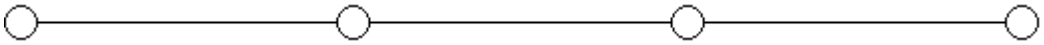
Strongly Disagree Disagree Agree Strongly Agree

6. Overall, did you feel that the realistic look and feel of the apps made it easier to understand and more enjoyable?



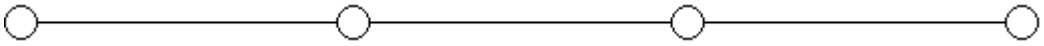
Strongly Disagree Disagree Agree Strongly Agree

7. Did you feel the graphics of the various apps made your experience more enjoyable?



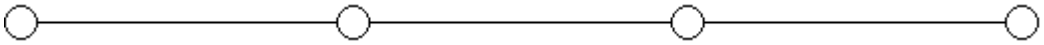
Strongly Disagree Disagree Agree Strongly Agree

8. Did the tablet do what you expected it to when you changed orientation of the device?



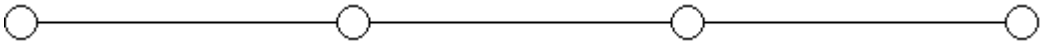
Strongly Disagree Disagree Agree Strongly Agree

9. Did you feel that the consistency of buttons and icons made learning how to use the apps easier and thus your experience a more enjoyable one?



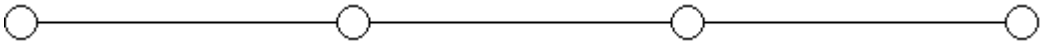
Strongly Disagree Disagree Agree Strongly Agree

10. When using gestures with the device (when you used the pinch to zoom feature viewing the photo you took), did you feel the app responded in the way you expected or predicted it would?



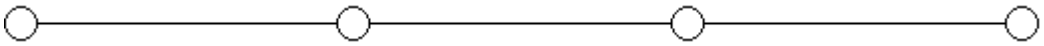
Strongly Disagree Disagree Agree Strongly Agree

11. Overall, did you feel that the apps provided sufficient feedback when necessary and in doing so contributed to an enjoyable experience?



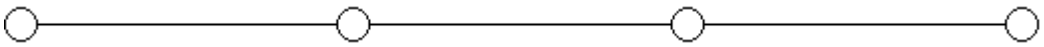
Strongly Disagree Disagree Agree Strongly Agree

12. Do you feel your past experience with a desktop computer has made working with the tablet easier?



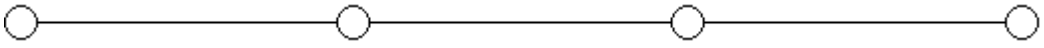
Strongly Disagree Disagree Agree Strongly Agree

13. Do you feel that your past experience with a touchscreen device has made working with the tablet easier?



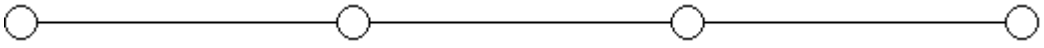
Strongly Disagree Disagree Agree Strongly Agree

14. Did you find your experience with the tablet engaging?



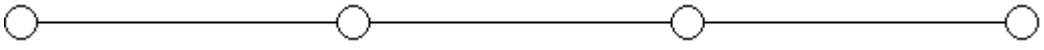
Strongly Disagree Disagree Agree Strongly Agree

15. Did you feel that important information or information that was necessary to the task at hand was displayed and highlighted on the screen?



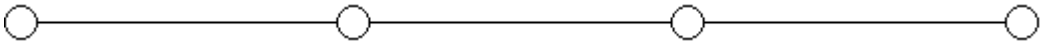
Strongly Disagree Disagree Agree Strongly Agree

16. Overall, did you feel that the labels and text were elaborate, long-winded and lengthy?



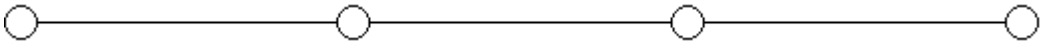
Strongly Disagree Disagree Agree Strongly Agree

17. Overall, did you feel that the apps grabbed your attention immediately?



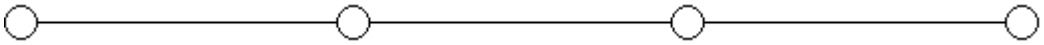
Definitely not Probably not Probably Definitely

18. Having completed this set of tasks once, would you feel more confident completing them a second time around?



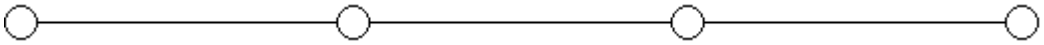
Definitely not | Probably not | Probably | Definitely

19. How likely are you to recommend this tablet to friends / family?



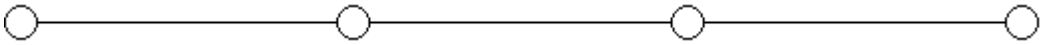
Definitely not | Probably not | Probably | Definitely

20. Overall, how enjoyable was your experience with the tablet?



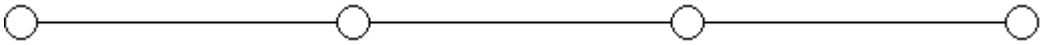
Not at all enjoyable | Below average | Somewhat enjoyable | Excellent

21. How did the experience on the tablet compare to a desktop computer / laptop?



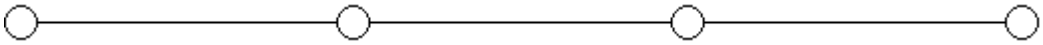
It varied a great deal | Not very similar | Somewhat similar | It was very similar

22. Overall, did you find your experience with the tablet was frustrating?



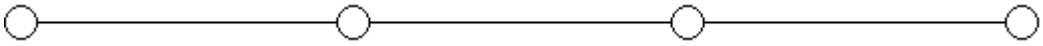
It was extremely frustrating | It was frustrating at times | It was not frustrating | It was enjoyable

23. Having never used a touch screen before, how did you find working with the tablet?



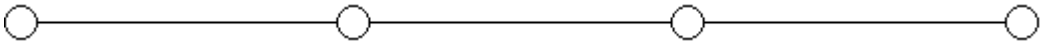
Frustrating Dissatisfying Satisfying Very pleasing

24. Having used a touchscreen device before, how did you find working with the tablet?



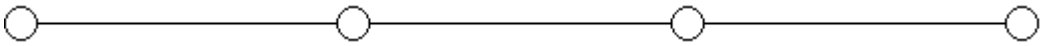
Frustrating Dissatisfying Satisfying Very pleasing

25. Given your experience with the tablet in this research study, do you look forward to your next encounter with a tablet?



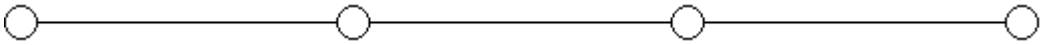
Definitely not Probably not Probably Definitely

26. Having worked with a tablet in this study, would you consider using a tablet for your normal computer activities as opposed to a desktop computer or laptop?



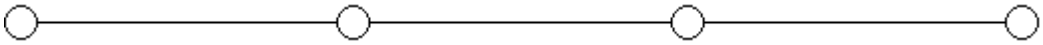
Definitely not Probably not Probably Definitely

27. Did you feel that things worked the way you expected them to when using the tablet?



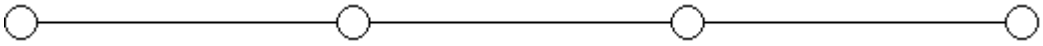
Definitely not Probably not Probably Definitely

28. Did you feel that the menu system of the tablet was easy to navigate?



Definitely not Probably not Probably Definitely

29. Did you feel comfortable using the tablet?



Definitely not Probably not Probably Definitely

Appendix H: Interact 2013 Masters Consortium paper

The Role of Socio-economic Background in Establishing the User Experience of Tablets: A Case Study of South African Users

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Email: s208075040@live.nmmu.ac.za , Darelle.vanGreunen@nmmu.ac.za

Abstract: Computer literacy is just one important factor in the socio economic background of South African tablet users. With tablet devices becoming increasingly popular it is imperative that additional user experience evaluations are carried out. Specifically, further user experience evaluations are required on tablets which will be contextually relevant for South Africans. This paper presents the results from a user experience evaluation of tablet devices which involved South African participants.

Keywords: user experience, tablets, case study, computer literacy

1 Introduction

The International Data Corporation released a report displaying a decline in personal computers (PC) sales by 13.9 %; compared to the same quarter in 2012 [3]. Concurrently, the tablet market has increased by 75% in the last year and has been forecasted to eventually overtake notebook and PC sales [4], [7]. Tablets are becoming increasingly popular, and are being targeted at a wider audience. This broad spectrum of users, who have different levels of computer experience and knowledge, require that sufficient user experience studies be conducted so as to best serve each possible user.

1.1 User Experience

Numerous usability and user experience studies have been carried out on various tablet devices. There is, however, a lack of user experience evaluations of tablets in a South African context. For the purpose of this study a South African context refers to studies either being conducted within South Africa or which involve South African participants. A South African based company called Wise Tablets, have created a local South African cost effective tablet called, the Wise Touch tablet [8]. The company prides itself in designing the tablet in South Africa and for South Africans. With tablets such as the Wise Touch tablet being designed specifically for the South African market and with the average South African in mind, it is increasingly apparent that further user experience studies are needed on tablets within a South African context [8].

1.2 User Experience Guidelines

User experience guidelines were established for tablets and mobile computing devices; however, each platform has their own set of user experience guidelines. Each established brand has created guidelines to keep within their corporate branding. This provides a challenge for developers as there is no standardized set of guidelines.

For the purpose of this study, user experience guidelines for tablets were reviewed and generalized in order to structure them as questions for the post-test questionnaire in this case study.

1.3 South Africa and Computer Literacy

There is a lack of infrastructure for Information and Communication Technologies (ICTs) in South Africa [10]. ICT is not equally distributed to all South Africans, which is one of the contributing factors for the various levels of computer literacy. Due to this, many South Africans have had limited or no interaction with computers. This results in individuals being characterized as computer illiterate [1]. People who are computer illiterate tend to have a lack of confidence in the use of technology, which will hinder their efforts to explore and learn new technology. This was clearly observed in the observation process of this case study.

This paper will present the results from a case study of South African users using a tablet and is structured as follows. Section two describes the research methodology followed. Section three illustrates the case study that was conducted and presents preliminary findings and results. Section four closes with the conclusion and section five provides an explanation of future work.

2 Methodology

The research followed the case study methodology as prescribed by Robert K. Yin [9]. The research philosophy that was applied in this study was a phenomenological stance. This allowed for the researcher to get close to participants and interpret their subjective perception of reality. The research approach was deductive as the research involved looking at general user experience guidelines of tablets and ultimately evaluating whether the guidelines were indeed applicable for South African users. The research strategy was a single case study. Qualitative and quantitative data collection methods were used in the forms of literature review, questionnaires and observation. This provided the opportunity for triangulation in the data analysis phase.

3 Case Study

The evaluations sessions were performed at the NMMU Emmanuel Haven Living Lab in Motherwell, Port Elizabeth. A Wise Touch tablet with Android as the operating system was used for this study. A group of participants from Motherwell township were selected in order to perform specific tasks on the tablet. The participants were observed whilst performing the tasks. After the task list was concluded a post-test questionnaire was provided for the participants to complete.

Prior to the actual testing sessions, a pilot test was conducted to identify potential problems and evaluate time constraints. The task list was altered as the pilot test participants found some of the tasks too difficult for their level of computer literacy. Moreover, tasks had to be changed due to internet connection constraints at the facility where the testing was carried out.

The following subsections will explore the above mentioned steps as well as highlight and describe the different aspects of the case study.

3.1 Participants

A biographical questionnaire was distributed to each participant in order to gain knowledge about the participant's background. Participants were asked to provide information about their education, language and experience with technology.

The participants were selected through simple random selection means. Ten participants from a disadvantaged background were gathered for the user experience evaluation purposes. The ten participants consisted of six participants who had no previous touch screen experience and four participants who had previous touch screen experience. The touch screen experience the four participants had derived from previous interaction with mobile phones which had a touch screen.

Table 1 presents the biographical data collected from both groups of participants. Group one consisted of six participants, all of whom had never seen or used a tablet before. Group two consisted of four participants. One participant had previous experience with a tablet and the other three participants had never seen or used a tablet before.

Table 2 Biographical data of participants

	Group One (No previous touch screen experience)	**Group Two (Previous touch screen experience)**
Number of participants	6	4
Home language	Xhosa	Xhosa
Education	5 Participants: Grade 8 - 12	2 Participants: Grade 8 - 12
	1 Participant: Tertiary	2 Participants: Tertiary
Level of computer experience	3 Participants: Beginner	3 Participants: Beginner
	1 Participant: Intermediate	1 Participant: Intermediate
	2 Participants: No Answer	

No uniquely identifying data was gathered, nor were any vulnerable groups involved in the study. Hence ethical clearance was not required. Participants were however given consent forms. The consent forms were explained by the moderator as well as read through by the participants before any data collecting began. All consent forms were signed. The participants were also made aware that they could leave at any stage, should they have wished to do so.

3.2 Device

The device used for the purpose of this study was the Wise Touch tablet. This particular tablet was selected as it is a low cost solution for the South African market compared to the existing higher priced, well-known brand tablets. The tablet ran Android version 4.0.3 as the operating system, also commonly known as Ice Cream Sandwich. The primary method of interacting with the device is through the touch screen. It has a screen size of seven inches and a Cortex-A9, 1.5 GHz Dual Core central processing unit.

3.3 Tasks and Questionnaire

The participants were given a set number of tasks to complete on the tablet and were observed whilst performing these tasks. Users were asked to think out aloud and if there were any questions whilst performing the tasks, the participants were given hints to assist them in completing the task. After completing the tasks on the tablet, the participants were presented with a post-test questionnaire. The questionnaire made use of a four-point Likert scale. The reasoning for selecting this type of Likert scale was to ensure that the participants chose a positive or negative response with no central tendency bias. The purpose of the questionnaire was to determine the user's satisfaction level and attain the participant's opinions regarding their experience when interacting with the tablet.

3.4 Findings

The post-test questionnaire revealed a predominantly positive response with regards to the participants' interaction with the tablet. All but one participant out of both groups rated their experience with the tablet as very pleasing or satisfying. The one participant with a negative response rated their experience as frustrating. The observations, however, were contradictory to what the majority of the participants answered on their questionnaires. This is a common occurrence in ethnographic observation. Often the participant will perform activities or provide responses that the individual thinks will garner the observer's approval [2]. Nielson [6] also highlights this fact in an article in which he states how it is important to pay attention to what users do and not what they say. Due to this it is imperative to utilise methodological triangulation. Methodological triangulation entails the use of more than one research method to gather data [5]. In this case, both quantitative and qualitative methods were used in the forms of questionnaires and observations. This ensures that the data from the observation and questionnaire can be compared and result in unbiased data.

Contrary to the positive response from the post-test questionnaire, the main trend which was observed was that a participant with no previous touch screen experience found interacting with the tablet difficult, unintuitive and at times for certain participants frustrating. It was observed that the participants were hesitant and displayed a lack of confidence to experiment and explore the device. The participants who had no previous touch screen experience were unaware of the concept of gestures, such as swiping or pinch to zoom. If the application for a particular task was not on the home screen of the tablet the participant would not progress with the task.

4 Conclusion

With tablets becoming increasing popular it is imperative that sufficient user experience studies are conducted. A case study was described which involved a user experience evaluation performed on a tablet. As there are currently no published findings on user experience evaluations performed on tablets in South Africa, this research aimed at providing a first step to fulfilling that gap in the research sphere.

5 Future work

Little is known about user experience factors impacting on tablet usage and acceptance. Based on the findings from this study, future research will include identifying these user experience factors that have an impact on tablet usage and acceptance. This future research will include the testing of a much larger user base in various geographical areas in order to see whether there are other factors that would be worthy of consideration. These factors will then be utilized in order to derive a set of guidelines which will assist in enhancing the user experience of tablets. Such guidelines can be used to improve the user experience of tablets used in developing countries such as South Africa.

6 References

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Appendix I Interact 2013 Poster

The Role of Socio-economic Background in Establishing the User Experience of Tablets: A Case Study of South African Users

Background

- PC sales decreased by 13.9% (2012)
- Tablet PC sales have increased by 75% (2012)

13.9 %

75%

South African Tablet Market

- 788 000 Total by end Sept 2012
- 395 000 Apple iPads
- 265 000 Samsung Galaxy Tab

Lack of UX studies conducted on tablets in a South African context

Low-income community: Motherwell

- One breadwinner per household
- Single parent households
- Earnings of R601 – R1100 per month
- Low education level
  - 19.3% have obtained a grade 12 qualification
  - 93.9% have No tertiary education
- 97% own a cell phone

Case Study

The study took place at:

Emmanuel Haven Living Lab: Motherwell

Biographical data

	Group One (No previous touch screen experience)
Number of participants	6
Home language	Xhosa
Education	5 Participants: Grade 8 - 12
	1 Participant: Tertiary
Level of computer experience	3 Participants: Beginner
	1 Participant: Intermediate
	2 Participants: No Answer

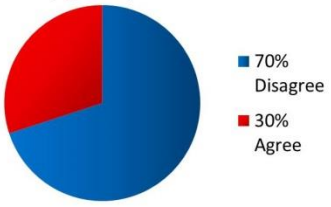
	Group Two (Previous touch screen experience)
Number of participants	4
Home language	Xhosa
Education	2 Participants: Grade 8 - 12
	2 Participants: Tertiary
Level of computer experience	3 Participants: Beginner
	1 Participant: Intermediate

Device

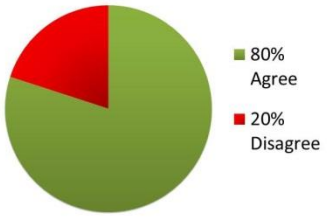
- South African: Wise Touch Tablet

Findings

When using gestures, did you feel the app responded in the way you expected it would?



Do you agree that past touchscreen experience assisted or would have made assisted with the initial interaction with the tablet?



Socio-economic factors

- Low income – high price points of device and bandwidth
- Lower education levels
  - lower exposure to certain technologies
  - Lower computer literacy level
- Language – lack of local content

No previous touch screen experience presents a steep learning curve

References

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