Factors for Adoption of Gerontechnology by Community-Dwelling Elderly in the Western Cape

by

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DECLARATION

I, Stanton Ian Clark, declare that the contents of this thesis represent my unaided work and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it expresses my opinions, not necessarily those of the Cape Peninsula University of Technology.

28/02/2025

Signed **Date**

ABSTRACT

Acquiring quality healthcare in South Africa is expensive, even for the working class. Maintaining long-term care for the aged is no exception. Many elderly people cannot afford to maintain decent health. The elderly need to maintain focus on health to be self-reliant. Older adults must continue to partake in social activities and continue to be independent. This research problem is significant as it addresses a pressing issue in South Africa, where the elderly population is growing and the cost of healthcare is a major concern.

The purpose of this study is to understand the factors that impact the acceptance and adoption of technology by community-dwelling elderly people, as technology can assist individuals through ageing.

The data collected from this study will be categorised into themes to understand why older people over the age of 60 use technology in their daily lives and the factors that affect their acceptance and adoption of modern technological interventions.

The findings of this study, which may align with those of similar global qualitative studies in terms of factors such as social influence, expected benefits, and technology concerns, also offer unique insights. South Africa, as a developing nation with a past apartheid background, presents a unique context that can provide new and intriguing insights into behavioural intentions and technology adoption among the elderly.

Society will benefit from reviewing this research study. Firstly, the elderly, who are maintaining a valuable quality of life whilst ageing, to maintain their independence are primary benefits. Secondly, the typical adult informal caregiver who provides care to their aged parents can have peace of mind that technology can be used to monitor the health of their parents and trust that privacy is supported. The expected benefits of technology adoption include improved health monitoring, enhanced independence, and increased peace of mind for caregivers.

Finally, government ministries are to be made aware that the burden can be shared and supported and that such technologies must be factored into urban and rural planning.

Keywords: Technology Acceptance; Accessibility; Ageing; Digital Divide; Elderly; Gerontechnology; Health; Human-Computer Interaction; Technology Adoption; Usability.

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GLOSSARY

ACRONYMS	DEFINITION
AAL	Ambient Assisted Living
ADL	Activities of Daily Living
BCG	Balistocardiogram
BI	Behavioural Intentions
BPSD	Behavioural and Psychological Symptoms of Dementia
CAT	Cognitive Assisted Technologies
CB	Challenging Behaviour
CPUT	Cape Peninsula University of Technology
DMN	Digital Memory Notebook
ECG	Electrocardiogram
ETAM	Extended Technology Acceptance Model
GDP	Gross Domestic Product
GDPR	Gross Domestic Product per Region
GT	Grounded Theory
IADL	Instruments of Activities of Daily Living
ICT	Information Communications Technology
MMC	Mobile Monitoring and Care Systems
NKD	Negative Key Determinant
PA	Physical Activity

ACRONYMS	DEFINITION
PEU	Perceived Ease of Use
PKD	Positive Key Determinant
POPIA	Protection of Personal Information Act
PU	Perceived Usefulness
RAS	Robotic Activity Support systems
STAM	Senior Technology Acceptance Model
TAM	Technology Acceptance Model
UN	United Nations
USA	United States of America
UTAUT	Unified Theory of Acceptance and Use of Technology
WHT	Wearable Health Technology

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1 CHAPTER ONE: INTRODUCTION

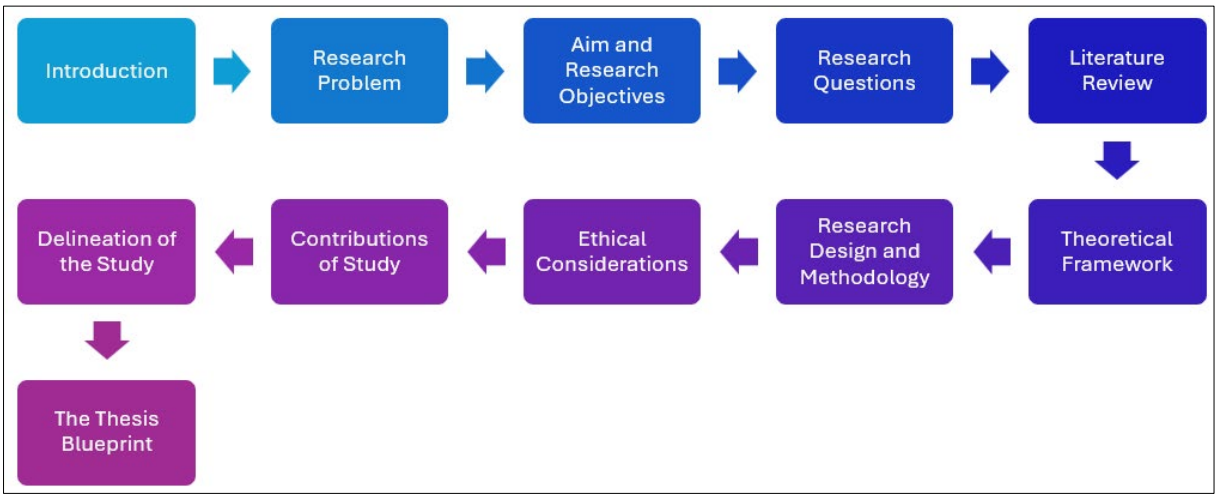

Figure 1-1 Chapter One Outline

1.1 Introduction and Background

Gerontechnology, the application of technology to support ageing, has become increasingly vital in addressing the challenges faced by older adults. In South Africa, where the population is growing and healthcare resources are limited, gerontechnology presents promising solutions to significantly enhance the quality of life for the elderly, offering hope for a better future.

South Africa, amongst other African countries, will face a significant increase in the aged population towards 2030, with statistics reporting showing an expected significant increase in elderly persons between 60 years and older (Knickman & Snell, 2020; Stats South Africa, 2017). This increase will have a heavy burden on South Africa's economy and resources, not only because of the volume of the aged but also due to the negative impact that the apartheid legacy has had on the lack of economic wealth of each previously disadvantaged elderly individual and to eldercare facilities (Burman, 1996; Tanyi and Pelser, 2018). However, even older people who may have the economic resources to afford technologies that can assist with ageing are still faced with accepting these technologies and ensuring that the technology protects the identity of each elderly person, their independence and the professionalism of caregivers to perform tasks, be secure in their careers, and in addition for the technology to be easy to use and is useful in supporting activities of daily living (ADL). Acquiring good quality healthcare in the 21st Century is not an inexpensive exercise (Young, 2016:9), even for the

working class. Maintaining long-term care in the healthcare sector for the aged is no exception. Across many countries, the amount of elderly in public or private aged-care environments who maintain a decent quality of health varies, and increased focus on maintaining health for the elderly to be self-reliant, continue to partake in social activities and continue to be independent is imperative (Peek *et al.*, 2014).

Similar literature being reviewed assesses the Technology Acceptance Model and the extensions thereof. Aggelidis and Chatzoglou (2009) elucidate that with the modernisation of technology, questions will be raised as to whether people are willing to adopt these interventions. This research seeks to understand the perceived perceptions or factors that influence the acceptance and adoption of modern technologies, such as assistive, sensory, and wearable healthcare technology to community-dwelling elderly (Rantz *et al.*, 2013; Wang & Sun 2016; Talukder *et al.*, 2020; Wilkowska *et al.*, 2020). A variation in research methods was employed across the different research studies in many different countries using both the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Davis, Bagozzi and Warshaw (1989) and by Venkatesh *et al.*, (2003) respectively.

The need for research on gerontechnology acceptance in South Africa is significant, as it is under-researched and can provide valuable insights into the adoption factors of the elderly. While studies conducted in Europe, the Middle East, Australia, Asia, and the USA have already assessed the challenges regarding the increased ageing population and lack of long-term caregiver resources, their perceptions of modern technologies, such as Wearable Health Technology (WHT), can assist the elderly in their daily activities (ADL) in their respective countries. However, in South Africa, gerontechnology acceptance studies are under-researched, with only three studies. Du Preez and De la Harpe (2019) outline the design interaction and engaging factors that impact the elderly using web-based services and technologies. Msweli (2020) explores the adoption rates of the elderly using mobile banking applications, and Fotoyi and Cilliers (2023) understand the adoption factors of mobile health monitoring and care systems in remote settings. Access to modern assistive and sensor technology is not a priority for the elderly. Yet, there are potentially significant medical insurance and financial cost savings to be gained.

The key significance of gerontechnology in South Africa can be explained in the four points below.

- In addressing the ageing population, South Africa is experiencing a significant increase in its elderly population. Gerontechnology can help older adults maintain independence, improve their quality of life and significantly reduce the burden on healthcare systems, providing reassurance about the potential benefits.
- Gerontechnology has the potential to bridge the healthcare gap in South Africa. Acknowledgement must be given to the shortage of geriatric and special care-giving personnel in South Africa, which strains public healthcare. Gerontechnology can provide assistive solutions, reducing the need for constant supervision and enabling the elderly to live more independently.
- In addressing the economic impact, it is recognised that the ageing population can have significant economic implications. Gerontechnology can contribute to economic growth by creating new industries, jobs, and markets related to technology development and implementation in South Africa.
- Boosting social inclusion means that Gerontechnology can help older adults stay connected to their communities and reduce social isolation (Wang and Sun, 2016). Technologies like smartphones, video conferencing, and social media platforms can facilitate communication and social interaction.

Despite the growing importance of gerontechnology in South Africa, several research gaps remain in existing literature and are explained as follows:

- Long Term Impact

Having conducted a thorough research investigation, it was found that limited research exists on the long-term impact of gerontechnology on the health, well-being, and quality of life of the elderly in South Africa.

- Cultural and Social Factors

Studies exploring how cultural factors, social norms, and economic disparities influence the acceptance and adoption of gerontechnology among the elderly in South Africa are limited.

- Accessibility and Affordability

Research on the accessibility and affordability of gerontechnology for the elderly with different socio-economic backgrounds is vital to ensure equitable access.

- Integration with Healthcare Systems

  Studies investigating the integration of gerontechnology into existing healthcare systems and its effectiveness in improving healthcare delivery for the elderly.

By addressing the above research gaps, this research study can contribute significantly to the understanding and implementation of gerontechnology in South Africa, ultimately improving the lives of the elderly.

1.2 Research Problem

Despite the growing elderly population in South Africa, the adoption of gerontechnology to support independent living remains under-researched. The study aims to address the gaps mentioned earlier by exploring the factors influencing the acceptance and adoption of gerontechnology among community-dwelling elderly in the Western Cape.

The literature review highlights the growing shortage of geriatric and special care-giving personnel in South Africa, which places a significant burden on public healthcare. Governments and societies need to understand ageing support technologies and plan for their implementation in aged-care environments. Previous studies have identified key variables such as “Perceived Usefulness and Perceived Ease of Use” as predictors of technology adoption (Peek *et al.*, 2014:237). However, factors like affordability and experience with different types of technology are subjective and can make technology acceptance a complex phenomenon (Peek *et al.*, 2014; Chen & Chan, 2014).

Many elderly people find it difficult to maintain a high quality of life independently. Understanding how elderly individuals accept various technologies is crucial for developing effective solutions to support their health and well-being (Wilkowska *et al.*, 2020). If the factors that influence or challenge the acceptance of technology are not understood, existing technology solutions may not be effective in addressing the public healthcare burden created by the growing, previously disadvantaged elderly population (Burman, 1996; Tanyi & Pelser, 2019).

This study is essential for creating awareness about the growing elderly population and the lack of understanding of acceptance factors in South Africa. By exploring the factors that influence the acceptance and adoption of gerontechnology among community-dwelling elderly

in the Western Cape, this research can contribute to addressing the identified problem and informing policy decisions.

1.3 Aim and Research Objectives

1.3.1 Aim

This study aims to explore the factors that can influence the acceptance and adoption of Gerontechnology amongst the community-dwelling elderly in the Western Cape.

1.3.2 Research Objectives

The research objectives are:

- **RO1**: To identify the key determinants influencing the adoption of gerontechnology among community-dwelling elderly.
- **RO2**: To determine the role of key moderators in facilitating or hindering the adoption of gerontechnology.

1.4 Research Questions

This study will seek to address the following main research question by answering the two sub-research questions.

- **MRQ**: How can the key acceptance and adoption perceptions of the elderly influence how gerontechnology is accepted within elderly environments in the Western Cape?
- **SRQ1**: What are the key determinants influencing the adoption of gerontechnology by community-dwelling elderly in the Western Cape?
- **SRQ2**: How do key moderators, such as performance expectancy, facilitation conditions, social influence, and price-value, influence the adoption of gerontechnology?

1.5 Overview of the Research Topic

The research will evaluate global research involved in understanding the acceptance of technology within aged-care environments. Using a qualitative approach will offer reasonable

inductive reasoning between the theories on offer within the literature for this study and the collected data through semi-structured interviews with the community-dwelling elderly.

1.5.1 Technology as a Medium to Support Ageing

The reality is that all humans are destined to age, and all will require some support in one way or another. Technology can be a viable medium in supporting the aged. Medically, these can be described as instruments of daily living (IADL), which describes activities like cleaning, shopping, health management, communication management and financial management as examples and activities of daily living (ADL), which describe mundane activities such as eating and bathing (Nimrod, 2019). Technology has become an important medium for assisting the elderly in conducting their daily activities, especially in environments where elderly persons live alone in private or public settings. Studies have identified a growing shortage of geriatric and special care-giving personnel who could pose a detrimental risk to the economy and society. With the introduction of ambient assistive technology, Wilkowska *et al.* (2020) explain that various functionalities are available in both single devices and complex integrated smart home applications that support social interaction and health care needs, such as emergency detection. Using such ambient assistive technologies motivates older people and keeps them interested and open-minded about including such modern technologies in their daily lives. Assistive technologies as a viable solution could benefit community-dwelling older people, especially the elderly suffering from chronic diseases, to maintain an improved quality of health (Wilkowska *et al.*, 2020). A study by Rantz *et al.* (2013) investigated the impact of registered nurse care coordination and the use of sensor technology in eldercare and found that participants reacted positively towards sensor technology but made it clear that camera technology was found to be intrusive and would violate their right to privacy yet accepted the sensor devices on the premise that the sensors could detect a range of emergencies and would require little to no intervention from the participant and that it was reliable. After full integration, participants initially familiarised themselves with the technology. After that, participants learned to live with the technology and soon became accustomed to having the sensor technology as part of their daily living. It did not interfere with their activities. With the integration of the sensor technology Rantz *et al.*, (2013) proved that there are financial savings benefits with these sensor technology medical programs involving the group of participants compared to a general nursing home group and those without registered nurse coordination. One of the standout findings is the changes in density maps and the ability to trigger alerts to clinicians in changes in the participants' mental illness.

1.5.2 Factors that Influence the Acceptance of Technology Amongst Community-dwelling Elderly

With the ever-increasing future use of technology across diverse groups, Wilkowska and Ziefle (2009) argue that addressing the acceptance of technology needs to be extended to older people. It is not just the working class, as evidentially, individual factors play a pivotal role in determining acceptance, such as the individual's historical experience with technology and how facilitating conditions impact acceptance outcomes within older groups. Key acceptance criteria from this research included usefulness and ease of use. Ergonomics played a vital role in how older people consumed their information, with the preference for bigger screens to assist in navigating across menus. The study further identified that in addition to usefulness and ease of use, factors such as gender, economic status, culture, voluntariness and tech experience are criteria to consider when understanding the acceptance and adoption of technology. In addition, the study admittedly identified the need for active involvement to partake in interacting with new technology to be accepted and approved by older people (Wilkowska & Ziefle, 2009). Chen and Chan (2014) empirically tested senior participants using an extension of previous acceptance models and added age-related health and ability attributes to formulate the senior technology acceptance model (STAM). Community-dwelling older people prefer to be independent, and policymakers favour supporting the elderly to remain so. However, the challenges of impairment, frailty and chronic diseases, leading to reduced social interaction, challenge this independence idealism. Peek *et al.* (2014) identified 27 factors contained within 6 themes that outline the influence that impacts the acceptance of technology among community-dwelling older people. The qualitative studies from different countries revealed that factors related to concerns, benefits, needs and alternatives of technology, as well as characteristics of the elderly and their social influence, affect the acceptance of technologies to the extent that if UTAUT is coupled with social influence and facilitating conditions as well as 4 moderating factors of voluntariness of use, age, technology experience and gender, UTAUT explains 70% of the variance in intention (Peek *et al.*, 2014).

As the appetite for modern technology grows amongst older people, next-gen platforms are becoming available to older people to improve social interaction and physical conditioning. Wang and Sun (2016) prove that they were able to improve the original TAM model. The extended technology acceptance model (ETAM) accounted for 63% of the variance in intention. Results revealed moderating factors such as experience with gameplay, gender, and age agree with earlier findings that corroborate with the TAM and UTAUT theories (Peek *et*

al., 2014; Chen and Chan, 2014; Wang & Sun, 2016). Furthermore, the elderly who live alone and elderly women had the highest intention to play games (Wang and Sun, 2016; Wilkowska *et al.*, 2020). Wearable health technology (WHT) studies conducted by Talukder *et al.* (2019) investigated the key criteria of technology adoption and acceptance but coupled constructs such as technology anxiety, resistance to change and self-actualisation to the UTAUT model. They revealed that 'social influence (Peek *et al.*, 2014), hedonic motivation, expected performance and functional congruency were key to positive acceptance, whereas anxiety and resistance to change were negative. Wu and Lu (2013) differentiate between extrinsic motivators, encompassing usefulness and intention, job relevance, image, affiliation, reward and punishment and intrinsic motivators, which encompass enjoyment, flow, playfulness, pleasure and arousal. The findings revealed that extrinsic motivators are key factors in using utilitarian systems, and intrinsic motivators are key to predicting the hedonic use of systems. In addition, extrinsic motivators are confirmed to be far more important with utilitarian systems than hedonic, usefulness and intention (Perceived Usefulness) being the highest motivators across a few studies. The study makes use of a small sample, which affects generalizability (Wu & Lu, 2013).

The modern South African society is no different from other countries in that it faces the challenges of a growing elderly population. Findings from the Msweli (2020) study revealed that the adoption rate amongst the elderly using mobile banking is exceptionally low in comparison to other age cohorts. The lack of information, trust, level of difficulty, usability with banking applications, and adaptation hindered the adoption of mobile banking, whereas convenience and cost-effectiveness promoted mobile banking. The study made use of the Actor-Network Theory (Msweli, 2020).

A developing country will need to face these challenges and prepare to cope with the increase in older people. It will need to factor in the perceptions around the use of certain technologies in its urban planning. Such technologies, such as surveillance technologies, may be seen as obtrusive and violate the privacy of individuals' data (van Heek *et al.*, 2017; Rantz *et al.*, 2013). Van Heek *et al.* (2017) explain that overall acceptance of surveillance technology is dependent on the context of whether surveillance technology is used as crime surveillance or medical surveillance. Findings revealed that cameras are rejected for medical surveillance (Rantz *et al.*, 2013) in private locations but accepted for crime surveillance, especially in public locations such as train stations and other public transport locations, as safety is preferred over privacy. However, crime surveillance technology was rejected in private locations (bedrooms and living rooms), and medical surveillance technology has been accepted. The study, however, is

conducted with a small sample size. The item content is too vague with regard to crime surveillance, and more specific and tangible items should be used to address perceived safety aspects, such as the use of quantifiable increases or decreases in crime rates. Specifics in technology types between visible and invisible must be considered in future studies (Rantz *et al.*, 2013).

1.6 Theoretical Framework

1.6.1 Theories of the Acceptance of Technology

The proposal highlights two main theories to explain acceptance behaviour concerning technology. Davis, Bagozzi and Warshaw (1989) deduce that the 'technology acceptance model (TAM) explains the variance in intention and use to be between 47% and 51% respectively'. Perceived usefulness (PU) significantly influenced the intentions of individuals and accounted for more than half of the variance over 14 weeks, significantly being the strongest factor. Perceived ease of use had a small yet significant effect; however, this seemed to dissipate over time. Chen and Chan (2014) explain that PU is described as 'the degree to which a person believes that technology can enhance their job or task performance'. This model was used to understand acceptance and usage behaviour (Chen & Chan, 2014). Venkatesh *et al.*, (2003) adapted the TAM model in a study that combined TAM with seven other models and theories to produce a unified model that integrates elements across the different acceptance models and then validates empirically. This model can explain up to 69% of the variance in behavioural intentions to use technology (Venkatesh *et al.*, 2003). Studies that focus on the acceptance and adoption models within care facilities by caregivers should not be discounted as they offer insight into how individuals perceive the use of technology in care environments. Still, it is not the main purpose of this proposal. However, these studies explain the TAM and UTAUT constructs, which can be used to understand the acceptance factors in the use of technology aimed at assisting community-dwelling old people. These studies examined the factors that determine acceptance of health IT applications in care facilities and found that perceived usefulness and perceived ease of use coupled with computer skills do have a positive impact, with computer skills indirectly impacting the ease of use (Yu *et al.*, 2009; Alipour *et al.*, 2016). For this study, the researcher will make use of the extended UTAUT theory, termed UTAUT2, which offers additional moderators such as Hedonic motivation, Price Value and Habit and explore Age, Gender and Experience as key differentiators (Venkatesh *et al.*, 2012). The extended UTAUT2 theory is anticipated to offer a

better insight into the moderators that provide the understanding of key perceptions of the South African elderly.

1.7 Research Design and Methodology

1.7.1 Research Design

Kumar (2018) explains that a research design adopts a conceived plan, strategy and structure to an investigation to answer questions or challenges relating to the research. The research design balances efficiency and rigour by strategically collecting and analysing data. Kumar (2018) explains two study designs, namely quantitative and qualitative study designs. Characteristics of a quantitative research design include being well structured and specific, and the validity and reliability of the research were tested. The qualitative study design is focused on exploring, investigating perceptions, analysing experiences, assessing attitudes, and potentially clarifying situations amongst a group of people (Kumar, 2018). To explore the influences and challenging factors of the elderly accepting technology, this study will adopt a phenomenological research design to gain insight into the usage and interaction experiences of the elderly with technology. Furthermore, the research seeks to understand their experiences with technology by adopting an interpretivism paradigm within their aged-care environments (Kumar 2018). Using this research design, the researcher will study how the elderly perceive the use of technology and how their experiences influence their acceptance of technology.

1.7.2 Research Methodology

Creswell (2014) argues that research methods can either be quantitative, whereby a researcher adopts an experimental design, tests a theory and either rejects or fails to reject the hypotheses or qualitative, whereby shared patterns of behaviour can be identified through interactive engagements in natural settings. This study will adopt a qualitative research method and the case study approach to investigate community-dwelling elderly people to understand the factors that influence the acceptance and adoption of technology.

Creswell (2014) assesses both deductive approaches and inductive approaches and concludes that deductive approaches are more suited to quantitative studies and that theory is placed towards the beginning of the proposed study to test the theory as opposed to developing it. With regards to induction reasoning within qualitative studies, the researcher will

start with a theoretical model, and the orienting lens is transformative and shapes the questions being asked, thus influencing the collection and analysis of data, then prompting a call for change or a call to action (Creswell, 2014).

1.7.3 Data Collection

Data collection for qualitative studies, as Kumar (2018) notes, offers structural flexibility and freedom. This adaptability allows the study to adjust to the unique needs and experiences of the participants. The methods of data collection, depicted in Figures 1-2, will involve semi-structured interviews to understand the technology acceptance model and develop an understanding of the influences and challenges of accepting and adopting technology in an aged-care environment through interaction with the participants.

Figure 1-2 Sources of Data

1.7.4 Data Analysis

The data analysis for this study will be conducted using thematic analysis principles applied to a general inductive approach, as outlined by Thomas (2006). This systematic and rigorous approach involves the researcher noticing interesting patterns of meaning within the data during the data collection process. Themes, which are abstract constructs derived from the pre-analysis, during, and post-analysis phases, will be identified by writing down concepts and thoughts and formulating coding schemes. This approach ensures a comprehensive and insightful interpretation of the data.

- Step one is for the researcher to immerse themselves by transcribing the data into written form and reading verbatim to note initial concepts. Become familiar with the data.
- Step two is to generate codes by systematically noting interesting features within the data, ensuring that it is done across the entire data set. This is seen as organising your data into meaningful groups. At this point, the researcher begins interpreting the data according to the arguments about the researched phenomenon. It is important to

note that coding can be done manually or through software solutions (Mayring 2014; Braun & Clarke 2006:88). This is a crucial step as the researcher needs to work through the whole data set and apply holistic focus to each data item to identify interesting features in the data items.

- Step three is to ensure that related and unrelated codes are collated and that potential themes are derived. Here, the applicable use of mind maps or tables can aid in sorting different themes and subthemes.
- Step four is for the researcher to check if the theme relates to the codes identified at level 1 and the whole data set to formulate a 'thematic map of analysis' (Braun & Clarke, 2006:91). Through a process of refinement, the researcher will gain a clear understanding of the main themes. At this point, the researcher is required to read through the collated data extracts of each theme to identify a coherent pattern. Alternatively, the researcher needs to assess if an incoherent theme is not fit, if it will be reworked into a new theme, or if it will simply be discarded from the analysis entirely.
- Step five allows for the researcher to continually analyse and refine each theme and storyline to create clear defining attributes of each theme. Braun and Clarke (2006:92) define this as capturing the essence of each theme, which a researcher can write a detailed analysis of, and as telling the story behind the data concerning the research question to ensure no overlap between themes. At this point, the researcher is ready to begin applying working titles to each theme that gives the reader a concise explanation of what each theme is about.
- Step six is the opportunity for the researcher to finalise the analysis on the selected coding and theme extracts and link it back to the research question and literature review with the intent of producing an analysis report. The analysis report provides sufficient proof of the themes within the data by providing vivid examples that answer the research question logically. In addition, the analytical narrative must storyline the data that forms the argument concerning the research question (Braun & Clarke, 2006:93; Braun & Clarke, 2013).

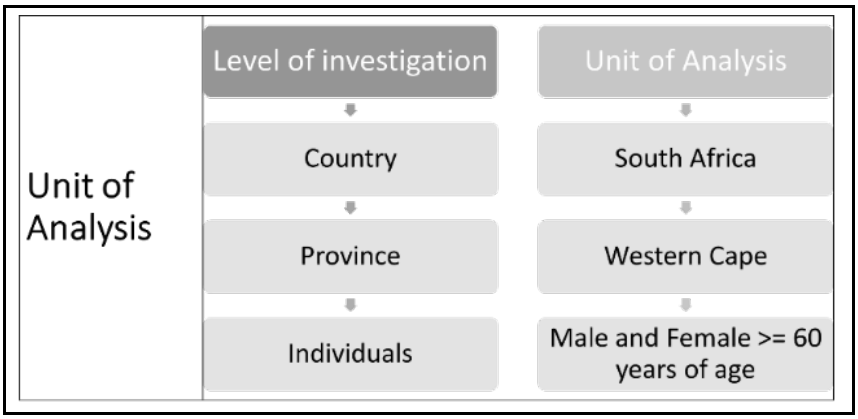

Figure 1-3 Unit of Analysis

Findings for the report will be derived from evaluating these themes individually.

Figures 1-3 display the unit of analysis that will be used to recruit potential participants who will offer responses to questions about the use of technology in their homes and communities.

1.8 Ethical Considerations

As the research uses a qualitative research design for data collection, ethical issues must be considered due to the closer relationship between the research stakeholders (Blaxter, 2010). Consent will need to be obtained, not only from the University but also from the elderly participants who take part in the study. Each participant will be required to complete an approved individual consent form before the interview takes place. The researcher will need to ensure confidentiality when gathering information that must be used for this study. To ensure confidentiality, the researcher will opt not to document the names of the participants and only identify the participants by their alias. The interview transcripts will be securely stored. Assurance must be given to the participants by the researcher to ensure that individuals or organisations are not identifiable in the final report. The researcher must ensure professionalism and not plagiarise the work of fellow researchers. All recordings and transcripts must be stored with password-protected security. Special care will be taken when setting up the interview. The time and location will be at the members' discretion to ensure accessibility and comfort, and no travel from the elderly is needed or expected. The research recruitment requests will include the following: if the carer needs to be available when the interview is conducted, this will be welcomed when the interview is scheduled at the participant’s convenience and discretion. If there is any distress caused during the interview of

the elderly person, it will be addressed by contacting the available emergency contact details visible on the participant's consent forms.

1.9 Contribution of Study

This study makes several significant contributions to the field of gerontechnology, particularly in developing nations like South Africa.

1.9.1 Theoretical Contribution

This study contributes to the existing body of knowledge on gerontechnology acceptance by examining the factors influencing technology adoption among older adults in South Africa. The findings can help refine theoretical models and provide insights into the unique challenges and opportunities faced by the elderly in developing countries.

1.9.2 Methodological Contribution

The use of a judgement sampling strategy and interviews with a diverse group of older adults from different socioeconomic backgrounds enhances the generalizability of the findings. This methodological approach can serve as a model for future studies in similar contexts.

1.9.3 Practical Contribution

The practical implications of this study are significant. The findings can inform the development of gerontechnology interventions that are culturally appropriate, accessible, and affordable for older adults in South Africa. Additionally, the study can guide policymakers in developing strategies to support the ageing population and promote the adoption of gerontechnology in the Western Cape and broader South Africa.

1.10 Delineation of Study

This empirical study focuses on understanding the factors that influence the acceptance and adoption of gerontechnology by community-dwelling elderly in the Western Cape. The term acceptance refers to the perceived usefulness and ease of use of technology, as well as the intention to use it. Adoption refers to the actual use of technology in daily life (Davis, Bagozzi and Warshaw, 1989; Venkatesh *et al.*, 2003).

The study does not delve into the technical development of gerontechnology devices or their use in institutional care environments. Instead, it will concentrate on the perceptions and experiences of community-dwelling elderly regarding technology adoption. While fleeting references to professional caregivers may be made, their perceptions and experiences are not the primary focus of this research.

1.11 The Thesis Blueprint

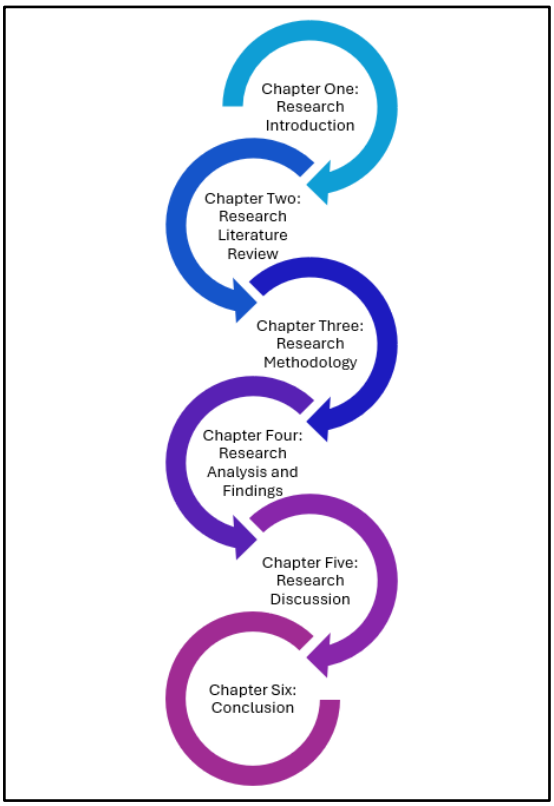

Figure 1-4 Thesis Blueprint

- Chapter One: Introduction to the research focus.
- Chapter Two: Focuses on the literature review linked to his research.
- Chapter Three: Details the research methodology adopted in this study.
- Chapter Four: Highlights on the research analysis and findings.
- Chapter Five: Provides a discussion of the findings.
- Chapter Six: Concludes the research.

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2 CHAPTER TWO: LITERATURE REVIEW

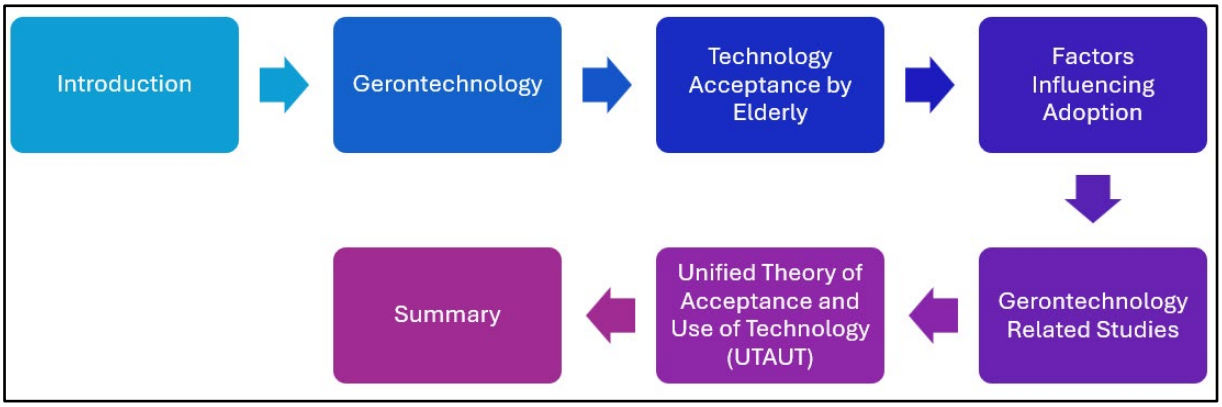


Figure 2-1 Chapter Two Outline

2.1 Introduction

This literature review provides a comprehensive overview of the existing research on gerontechnology adoption among community-dwelling elderly. By examining the factors influencing technology acceptance and use, this review will contribute to a deeper understanding of the challenges and opportunities associated with implementing gerontechnology in the Western Cape.

This literature review directly connects to the research problem and objectives outlined in Chapter 1. By exploring the factors that influence the acceptance and adoption of gerontechnology, this review will help to identify the key determinants and moderators that can be investigated in this empirical study.

The literature review will focus on the following key themes.

- Gerontechnology and Ageing environments

The role of gerontechnology in supporting independent living and improving the quality of life for older adults within their community-dwelling environments.

- Factors Influencing Technology Adoption

The determinants and moderators that influence the acceptance and use of gerontechnology among older adults include perceived usefulness, ease of use, social influence, price value and facilitating conditions.

- Gerontechnology interventions

Examples of gerontechnology interventions, such as sensor technologies, which have been implemented in aged-care environments

- Challenges and Opportunities

The challenges and opportunities associated with implementing gerontechnology in developing countries like South Africa.

The literature review will focus solely on community-dwelling elderly and their ageing environments. Community-dwelling elderly are older people above the age of 60 who live independently in the Western Cape and who may suffer from various health care issues through ageing. Community-dwelling elderly will accept any modern technology provided such technology is not intrusive or obtrusive, is specific to their needs and can maintain intrinsic health (Lette *et al.*, 2015). However, there are misconceptions that technology is beyond the aged; they are too old to learn and would possibly be a waste of time, funding and resources. Chen and Chan (2014) explain that Gerontechnology aims to use technology to assist the elderly with problems that have developed through ageing. By enabling assistive technology, the objective is to support the elderly in maintaining their independence and continuing with their social engagements. Chen and Chan (2014) further report that many studies globally have suggested that Gerontechnology has the potential to improve issues associated with ageing. The study will outline gerontechnology installations such as sensor technologies (Jeong *et al.*, 2010; Rantz *et al.*, 2013; Talukder *et al.*, 2019) using monitoring techniques with independent age-care environments. However, a study by Fotoyi and Cilliers (2022) using the socio-technical systems (STS) theory explained the technical costs of establishing mobile monitoring and care systems as a barrier to adopting technology by elderly people in the Eastern Cape of South Africa. Such studies emphasised that the government and society should collaborate to resolve the imminent elderly crisis.

Figure 2-2 below depicts the core focus between the technologies, elderly perceptions and underpinning theory as guidance through this chapter.

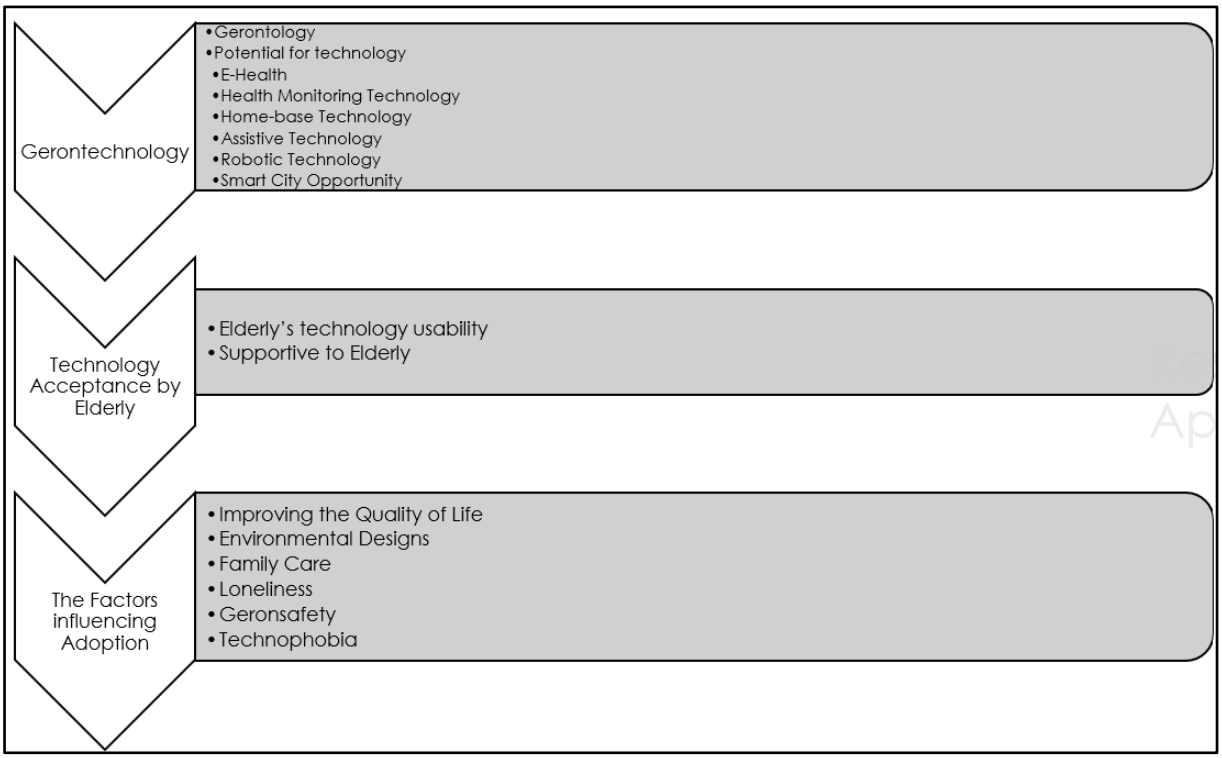


Figure 2-2 Core Literature Review Flow

2.2 Gerontechnology

Gerontechnology is not a new concept in the research realm. There are related studies that have been conducted since the late 1980s. Gerontechnology is a concept first established by Jan Graafmans in 1989 (Kohlbacher *et al.*, 2011:80). The Gerontechnology term is a combination of Gerontology, the study of ageing aspects affecting processes and problems thereof, and technological solutions, both aimed at improving the day-to-day activities of elderly persons. Gerontechnology, as a multi-disciplinary concept, seeks to not only explore the usage of technology to improve the quality of life but also evaluate the overall product development as a service to the aged cohort (Ozsungur, 2019).

2.2.1 Gerontology

The elderly are challenged by ageing and many chronic conditions within their aged environments. Modern medicines have enabled adults to live longer (Atella *et al.*, 2019).

Dementia is a disease of the mind. It is a “collection of symptoms” impacting the degradation of memory, ultimately affecting the individual’s ability to communicate and sense of reasoning. (Mitseva *et al.*, 2012; Dharan *et al.*, 2021:1). Gutman *et al.* (2021) explain that according to the WHO report of 2020, dementia will affect the global population, increasing from 82 million to 152 million people between 2030 and 2050.

Mitseva *et al.* (2012) expose that care offerings are only in place for severe cases of dementia, and society needs to be made aware of the early symptoms of dementia and the stresses imposed on informal care personnel (Mitseva *et al.*,2012; Sanchez *et al.*, 2024).

There have been several technological interventions aimed at improving the quality of life for the elderly to assist in instances of loss of balance and consciousness, cognitive impairment, and protection against falling because of psychological issues (Ozsungur, 2019). Such devices designed to intervene in gerontological circumstances only, impact on increasing the quality of life, should the device meet elderly needs are evaluated to be effective (Fozard et al., 2000; Ozsungur, 2019)

2.2.2 Potential for Technology in Aged Environments

These technological opportunities can have an improvement and beneficial impact on the elderly and be supported by the care personnel if it is introduced in the early stages of gerontological illnesses (Peterson, 2014; Gutman *et al.*, 2021; Sanchez *et al.*, 2024).

2.2.2.1 E-Health Technology

Arcinas *et al.* (2020) conducted a study across 5 participating countries in Asia to determine how e-services platforms can assist older adults with healthy ageing, for these elderly to build and maintain relationships, continue to have freedom of choice and make contributions to their society. In the Philippines and Sri Lanka, the study revealed that emerging technologies such as computer-based health records and informational online sites do not specifically cater to the elderly. The reason cited for this is the lack of adoption for elderly people.

Willard *et al.* (2019) explored the availability of e-health online platforms for older adults in the Netherlands. These care platforms, which amount to 21, are shared among the elderly, care professionals and informal caregivers. This is a testament to the focus and drive to provide the elderly of the Netherlands with digital capabilities and support.

2.2.2.2 Health Monitoring Technology

Health technologies can be of support to all community-dwelling elderly concerned with ageing successfully (Wang *et al.*, 2019). Mejia *et al.* (2020) explain that health monitoring technology can increase motivation to apply daily life tasks. Self-monitoring tools offer a visual synopsis of goal progression.

Findings from a study conducted by Mejia *et al.* (2020), when evaluating the duration of use and engagement, revealed that monitoring technology usage improved extensively after elderly participants had a sense of lower well-being during the day. This suggests that the elderly will only use technology in times of need.

Lapierre *et al.* (2018:245) report that camera-based technologies provide the home environment with an efficient home-based monitoring system suitable for monitoring evening walks and "person-environment interaction." Such technologies provide essential safety benefits for the elderly, particularly the female gender.

2.2.2.3 Home-based Technology

Bian *et al.* (2020) reported that frailty was prevalent in up to 23% of community-dwelling elderly in Canada. Fortunately, the study revealed that pre-frailty, if detected early and interventions applied, can potentially be reversed. This is possible with various types of sensor technology, such as "Body-worn sensors", providing accurate results aligned to "frailty criteria and functional testing". This systematic review study highlighted that there is a lack of longitudinal studies that can be referred to when predicting progressive frailty. It stated that in future, sensor technology testing on the elderly with developing comorbidities should be prioritised, as the elderly are at higher risk (Bian *et al.*, 2020:8).

Fotoyi and Cilliers (2022) explain that there are a range of Mobile Monitoring and Care (MMC) systems for frail care that can be adopted by the elderly to monitor their health in remote or rural South African settings, and within the home environment, as an alternative to waiting in a queue at an under-resourced health care centre (Fotoyi & Cilliers., 2022).

Chang *et al.* (2018) evaluated an instrumented home-installed floor tile designed to measure an elderly person's ballistocardiogram (BCG) and electrocardiogram (ECG) signals as part of a home-based smart system. This technological advancement would record a person's ECG signals while either standing or sitting, with an accuracy of 89% to the ECG gold standard.

Furthermore, the BCG heart rate had an extremely low error ratio in comparison with the gold standard ECG.

Gutman *et al.* (2021:1) explored the potential of exposing a calming device to persons with "behavioural and psychological symptoms of dementia (BPSD)". Bathing as an activity of daily living triggers a fear behaviour in persons with dementia, resulting in extending the duration of bathing times for these care patients. With the introduction of calming devices, Gutman *et al.* (2021) measured an improvement in the duration of bathing activities.

Merilampi *et al.* (2020) believe that increasing the quality of life is possible by adopting more assistive technology earlier. Smart furniture is an intelligence-operated system powered by an energy source and linked to user data. Krejcar *et al.* (2019:94822) explain that the system is designed to "anticipate the user's need" by using the sensors activated within the user's environment.

2.2.2.4 Assistive Technology (AT)

Orenius *et al.* (2021) believe that Physical Activity (PA) benefits have a direct impact on functional and positive health outcomes. In a study conducted in Finland among the Finnish elderly, 95% indicated a fear of falling whilst walking. Smart rollator with intelligent functionality that monitors the walking path for imbalances can reduce falling events and injury outcomes and ensure safety (Orenius *et al.*, 2021; Weeks *et al.*, 2024).

Assistive technologies have been designed to assist the elderly and provide rich data about life habits. Lussier *et al.* (2020) state that monitoring technologies such as Ambient Assisted Living (AAL) allow care professionals to derive daily patterns from the elderly's ADL activities. With this data, care professionals can evaluate their intervention plans to recommend better the best home care services that will align with the needs of the elderly.

Dharan *et al.* (2021) believe that cognitive assistive technologies (CATs) can assist the elderly with dementia by improving their performance through activities of daily living (ADL). Modification to an existing CAT improved the activity of handwashing, resulting in alleviating the burden of an ever-present caregiver in this activity scenario. This is important, as Kristoffersen *et al.* (2019) indicated in a previous study conducted in Sweden, as such technologies will only derive value if the contextual factors are understood and considered. This study also highlighted the importance of the adverse effects of technology should there

be no consideration of any acceptance and adoption factors (Kristoffersen, *Kolkowska and Loutfi*, 2019).

2.2.2.5 Robotic Technology

Raghunath *et al.* (2020) posit that robotic technology is being explored to assist the elderly in their daily lives. These robotic solutions are being paired with home-based smart systems to monitor the elderly individual's daily activities, generate patterns and suggest corrective measures in the daily execution.

Beer *et al.* (2017) presented findings from a study in the USA, where older adults observed a mobile manipulator robot conducting a few programmable tasks, such as delivering medication, learning to turn a light switch on and off, and rearranging some home items. This study was significant as it showed that the demonstration positively influenced the preferences for robotic assistance within the home of the elderly being exposed to this solution. Furthermore, Mitzer *et al.* (2018) supported the use of personal assistant robots. However, it is noted that, on the one hand, robotic assistance may add productive value and save time when conducting medical tasks. On the other hand, it could potentially be hazardous to the elderly when performing close-contact activities with the care patient. Both studies highlighted the positive perceptions and benefits, but importantly, the studies recognise the negatives for the elderly in terms of usage.

Currently, the elderly show a lack of interest in adopting Robotic Activity Support systems (RAS) (Raghunath *et al.*, 2020:9). Progress still needs to be made on the development of robotics technology as an assistive intervention for the elderly as potential robotic assistance can play a major role in bridging the gap in healthcare personnel shortages (Mitzner *et al.*, 2018).

2.2.2.6 Smart City Opportunity

In Africa, there is an opportunity to develop middle to lower socio-economic groups by incorporating a smart city framework (Arnardu & Francke, 2021). This framework could potentially assist in developing care environments for the elderly. Arnardu and Francke (2021) explain the 5 principles of the Smart Africa manifesto, which recognises the positive correlation between Gross Domestic Product (GDP) growth and the adoption of the Internet, thus creating digital empowerment within public services such as aged care facilities for elderly citizens within the Western Cape.

Africa is touted as the fastest-growing population by 2050 (Güneralp *et al.* 2017:1). This exponential growth means that more than 50% of the population is likely to reside in urban areas, prompting the need to incorporate smart city technology into urban settings (Echendu & Okafor 2021). Therefore, the Echendu and Okafor (2021) study corroborates the findings of Arnardu and Francke (2021) to implement a Smart City framework approach within the Western Cape.

2.3 Technology Acceptance by the Elderly

The senior technology acceptance model (STAM) study conducted by Chen & Chan (2014) could explain 68% of the variance in the use of gerontechnology. This study explains that self-efficacy, ability attributes, anxiety, age, gender and facilitating conditions all affected acceptance of technology and in addition, the social, physical as well as psychological characteristics of the elderly affect the way an elderly person interacts with technology. The study, however, was unavoidable in its biased selection as it only considered socially active seniors, and consideration must be given to the notion that different gerontechnology varies with regards to the purpose of use, learnability and the intelligence of the user (Chen & Chan, 2014).

Wilkowska *et al.* (2020) evaluated older people in an online survey, measuring their attitudes towards the quality of life, ageing in general and what indicators of acceptance were relevant for health technologies to support community-dwelling older people and deduced that more than half of the participants suffered from chronic disease but had no experience with health-supporting devices in their daily living. It was found that there is a strong correlation between the positive effects of ageing and quality of life, and this was an affirmative attitude towards quality of life and that it was positively connected to perceived benefits of the use of health technology and general attitude towards health technology deployment. Wilkowska *et al.*, (2020) further emphasised that the study though found that the independent variables of gender, health status and age had a weak linear relationship as age was connected to almost all study factors and gender displayed weak connections with quality of life as elderly women having a more positive attitude than men towards these factors (Wilkowska *et al.*, 2020).

2.3.1 Elderly's Technology Usability

The population of developed countries is increasing the usage of information and communications technologies in their daily lives. Knowledge of how to use these technologies

is ever-increasing, involving different stakeholders and all providing input into a "gerontechnology ecosystem" (Pui, 2024:1). Most of the knowledge and exposure has often been centred around Internet-linked mobile devices such as smartphones, digital cameras, and various handheld devices. These devices play a significant part in daily life across many different people of different ages (Hernandez-Encuentra, Pousada and Gómez-Zúñiga, 2009; Pui, 2024). Understanding usability is important to product development. Usability assessments determine whether the components and features of a product effectively meet the needs and expectations of the intended users (Alkawaldeh *et al.*, 2020), a factor to be considered when the elderly are adopting technology. After reviewing this study, there was no prevalence of a theory; however, TAM and UTAUT constructs were made relevant in the study. Leese *et al.* (2021) argue that there is an association between usability and acceptability factors. In an exploratory study that used both quantitative and qualitative research methods across elderly persons with mild cognitive impairment, the findings revealed that consultation with older adults is imperative through product development. In hindsight, this direct input from the elderly will promote long-term usability and adoption of a product relevant to improving the quality of life of elderly people (Leese *et al.*, 2021). Alkawaldeh *et al.* (2020:2) argue that "Usability" or "User Friendliness" are factors that denote that the product displays its quality in how easily the product can be operated using its application interface. Consequently, the users' exposure and experience, coupled with the hardware/software components and network connectivity capabilities, contribute to the product usability (Issa & Isaias, 2022). Studies conducted by Leese *et al.* (2021), which tested the interactions between the product and older persons involved, revealed that there is a high overall satisfaction rate because of usability testing, which meant that the elderly users accepted the product due to its simplicity and ease of use.

Usability exposes the concerns the elderly have with accepting the use and adoption of certain technologies, even though such technologies may contribute to an improved quality of life. A study conducted in the USA evaluated the usability of an amulet wearable device as a mHealth intervention strategy for elderly living with obesity. The prototype was sampled across 29 older adults and involved community leaders and clinicians in a rural setting. Batsis *et al.* (2018) reported concerns about the intrusiveness of the product due to the consistent monitoring capability and privacy issues. Furthermore, measurement accuracy was seen to be paramount to all users. The study highlighted the importance of elderly end-users in user-centred design across wearable mHealth technology solutions (Batsis *et al.*, 2018).

The technology incorporated into the elderly's home environment, where devices are integrated, proves to be essential in improving activity monitoring capabilities for the elderly. The smart home-driven solutions for the elderly provide alert features that inform them of time-driven complete and incomplete activities and notify them of activities that are still to take place. These technologies aim to assist cognitively impaired older persons. Dahmen *et al.* (2018) conducted a study whereby a notebook interface was paired with an implemented smart home solution that appealed to users with memory difficulties. During the iterative design phase, feedback received for the digital memory notebook (DMN) app interface revealed the app was generally usable by the participating older adults. That satisfaction had improved through iterative feedback. A cluttered interface was cited as a major concern for adopting the technology, and this was improved through consecutive iterations. As a result, simplification of interfaces was discovered to improve the overall usability (Dahmen *et al.*, 2018).

2.3.2 Supportive to Elderly

As the design of technologies should encompass a high rate of usability, these technologies should be supportive solutions to the needs of elderly people. Vichitvanichphong *et al.* (2014) argue that assistive technologies provide support to the elderly in their daily lives and are a positive factor in adopting technology. These technologies include solutions classified as smart home, robotic solutions, general purpose ICT and remote care. Australian studies related to evaluating the potential to support seniors with their independent living stated that these technologies are designed specifically to assist the elderly. Such technologies have a direct ability to maintain their independent lifestyle. Another important factor to be considered within the Vichitvanichphong *et al.* (2014) study on adopting technology is the ability of assistive technologies to empower the elderly to remain socially inclusive among their collective of friends (Vichitvanichphong *et al.*, 2014).

With the ongoing struggle of the elderly to maintain a good quality of life, there are challenging situations where the elderly suffer from cognitive impairments. A study performed by Peeters *et al.* (2021:1) exploring the use of wearables in the nursing home assesses "Challenging Behaviour (CB)" among the elderly in the Netherlands. Challenging Behaviour and dementia decrease the quality of life amongst the elderly and have the potential to increase perceived levels of stress and overload on caregivers. (Hazelhof *et al.*, 2016; Kales, Gitlin, & Lyketsos, 2015). This study revealed that the use of wearable technology has proven to be not only of value and comfort factors but also of increasing knowledge and the ability to remain

informative, thus making it acceptable to the elderly. This study gives insight into the potential of wearable technology to be considered as a supportive solution (Peeters *et al.*, 2021).

The elderly should be empowered to adopt self-monitoring technologies with the intention to use the technology and gain insights from the recorded data. Self-monitoring technologies assist and support the elderly in creating and setting performance standards over time (Lee *et al.*, 2014; McDermott *et al.*, 2016). Gu *et al.* (2024) argue that these technological advances improve not only health but also self-confidence. The elderly can act on the data with the aim of changing and improving health behaviours based on the derived feedback (Kersten-van Dijk *et al.*, 2017; Yerrakalva *et al.*, 2019).

2.4 Factors Influencing Adoption

2.4.1 Improving the Quality of Life

Maintaining a good quality of life is important despite ageing (Bong, 2019). Studies linked to evaluating the use of technology for the elderly all have a similar aim of improving the quality of life. Wilkowska *et al.* (2020) found that while over half of older adults surveyed had chronic diseases, most lacked experience with health-supporting devices. The study established a strong correlation between positive ageing perceptions and quality of life, which in turn linked to favourable attitudes towards health technology. However, gender, health status, and age showed weak linear relationships with these attitudes, with age influencing most factors and women generally having more positive attitudes than men.

Estebsari *et al.*, (2020:3) conducted a study with the purpose of presenting a concept to consider when measuring successful ageing. It was reported that the definition of successful ageing involves “cognitive action, perception, control, life satisfaction and ethics”. Furthermore, the study revealed that older adults defined successful ageing as having excellent happiness introspective and being satisfied with their life regardless of past or present.

2.4.2 Environmental Designs

There is a relevant overarching concept to be considered when combining usability, supportiveness and other key determinants of acceptance and adoption of technology. This study explores the literature of aged building environments as a notion of achieving a healthy quality of living. Kort (2018) exposes the need for improvement in the physical aspects of the indoor environment, potentially impacting the health of older adults. These included improving

aspects such as indoor air quality, lighting, and temperature control, impacting the elderly and thus becoming relevant in society. Positive change Interventions over safety and security should also include maintaining the health demands of older adults (Kort, 2018). The study did, however, lack theory when considering the factors of the elderly using smart technologies for social and physical activity.

A particular study in the Netherlands evaluates how communities can be involved in re-inventing aged care facilities. Boerenfijn (2018) argues that trust must be established in local communities to take the lead in determining the needs and wishes of future generations within these reinvented buildings. It was found that using the efficient Røring method established a workable process and galvanised support among the broader community. Furthermore, partnerships between different professional care organisations were established to share rental accountability. This creates a preventative measure to reduce the risk of vacancy in the building. In addition, this study promotes collaboration between the local community, the elderly and technology, and this relationship can be used for the benefit of the elderly from a safety and financial perspective (Boerenfijn, 2018).

As the building structures to accommodate the elderly improve with the assistance of the community. Rahmawati and Jiang (2019) propose that individual elderly spaces can be further improved if the design of these living spaces is considered to maximise their quality of living. Studies recognising the need to improve the design of elderly living spaces find that when the elderly can be categorised into three physical ratings, with the elderly being either independent or requiring support through a walking stick or can or requiring a wheelchair, can be evaluated to understand accurately the positives and negatives of their living space designs. The study conducted in Indonesia proposes a framework to guide the establishment of elderly spaces and considers human factor principles as a basis for evaluating elderly living space facilities (Rahmawati & Jiang, 2019). This study piqued the interest of the researcher as it brings a new dynamism to guiding technology implementation against the elderly's anthropometrical body dimensions.

2.4.3 Family Care

Fritz *et al.* (2020) argue that acknowledgement must evaluate family engagements as part of technology adoption. In many cases, family support is important to eradicating hurdles of technology acceptance, adoption and regular use of gerontechnology (Fritz *et al.*, 2020; Weeks *et al.*, 2024). However, many adults prefer not to approach their family members for assistance

(Peek *et al.*, 2014). Knight and Winterbotham (2019) explain that the elderly are hesitant to ask for help for fear that they may appear as incapable. Osman *et al.* (2020) argue that technology hesitation is aligned with the elderly's perception of uncertainty when using technology and the belief of unexpected loss as a result of a system error situation. In situations where family members support the elderly, these members find it increasingly frustrating to slow down and explain information at a level that the elderly can comprehend a piece of technology (Portz *et al.*, 2019). Along with loneliness, safety, and technophobia, these factors may be construed as determinants that hinder the adoption of technology.

2.4.4 Loneliness

Loneliness is an occurrence that not only exists among the elderly. Studies have revealed that there are many determinants of loneliness, ranging from lack of income or good health to loss of loved ones, which all can be related to ageing (De Jong-Gierveld and Van Tilburg, 2010; van den Berg *et al.*, 2016).

With technology constantly improving, this may be challenging in some instances. Previous studies have revealed that the elderly perceive that the continual use of ICT services to replace face-to-face contact makes them feel lonelier (Abolhassani *et al.*, 2019). Furthermore, some technologies are complex, leading the elderly to a state of subnormality and dependence in their old age (Kaspar, 2004; Ozsungur, 2019).

The ability of the elderly to improve their social relationships is imperative to maintaining a better quality of life.

The right technology introduced into an elderly home aims to improve the elderly's mental health by reducing factors such as loneliness and providing a channel to improve the elderly's interactive activities with family and community members (Castilla *et al.*, 2018).

2.4.5 Geronsafety

The elderly are constantly reviewing technology to understand whether or not technology is safe to use (Le Deist & Latouille, 2016). Research highlights the ever-increasing need to factor in ergonomics and safety-orientated environments (Pinto *et al.*, 2000; Ozsungur, 2019). Ozsungur (2019) highlights that there is a strong correlation between the increase of electrical components within technology and an increase in accidental risk. These accidents have a

detrimental impact on the sensory abilities of the elderly. Safety considerations are imperative to the development of health technologies and applying these technologies to social services.

2.4.6 Technophobia

Studies have shown that factors are impeding the widespread rollout of technology. Aranha *et al.* (2021) identify recurrent behaviours from the elderly, such as anxiety and low trust in modern technology, which hinder the adoption of technology.

In an Israeli study that evaluated older persons 60 years and older, Nimrod (2018) discovered that technophobia is significant on two levels of the digital divide, referred to by the elderly as the 'grey divide'. This is explained as firstly distinguishing between users and non-users, then secondly, the user skills and abilities in ICT (Schultz *et al.*, 2014; Nimrod, 2018). This essentially has been discovered as a constraining factor, hence a negative key determinant of both levels of the grey divide (Friemel, 2016). On the third level, which concerns the benefits of use, technophobia did not have an impact on the elderly user's perceived satisfaction with life (Nimrod, 2018).

In a study evaluating self-monitoring technologies, Randriambelonoro *et al.* (2017) identified fear as a factor that exists when the elderly are introduced to new technology. The elderly fear breaking their routine. This study was important in highlighting negative perceptions when dealing with technology. Accepting and exposing new technology into that routine remains a challenge due to confidence and adapting these systems to their age-related condition (Olphert *et al.*, 2009; Randriambelonoro *et al.*, 2017).

In a study conducted in South Korea, Jo and Hwang (2021) found that when older persons were interviewed, it revealed uneasiness when dealing with new technology and the difficulty of learning how to operate new devices, and eventually succumbing to requesting help and addition, being worried that they will break the device. There is fear in learning new functionality, with the elderly preferring to be content with the known functionality (Castilla *et al.*, 2018). Ultimately leading to the rejection of the new device (Pal *et al.*, 2018; Jo & Hwang, 2021).

Table 2-1 Gerontechnology-related Studies

Authors	Research	Purpose/main objective	Context	Method/approach	Model/Theory	Key Arguments and Focus
Özsungur, (2019)	Gerontechnological factors affecting successful aging of elderly	Reviewing the gerontological factors affecting the successful ageing of the elderly, the quality of life and successful ageing issues and emphasising the importance of gerontechnology on the successful ageing and creation of awareness through formal and non-formal education.	Turkey	Systematic Review of Qualitative and Quantitative Research	TAM, UTAUT/2, TPB reviewed studies	QOL, barriers to adoption, Geronsafety, Usefulness (young) vs Ease of use (old), loneliness
Peeters *et al.* (2021)	Wearables for residents of nursing homes with dementia and challenging behaviour: Values, attitudes, and needs	To identify the values, needs, and attitudes of multiple stakeholders regarding wearables in the care of people with dementia and CB	Netherlands	A qualitative study was conducted in which a real-life context was created in a Dutch nursing home. Two residents with CB wore the Empatica E4 wristband for three half-days. Multiple stakeholders (i.e., eight involved nurses and eight informal caregivers) were interviewed.	UTAUT, Normalisation Process Theory (NPT)	Wearables, supportive, important themes

Authors	Research	Purpose/main objective	Context	Method/approach	Model/Theory	Key Arguments and Focus
Aranha *et al.* (2021)	Exploring the barriers and facilitators which influence mHealth adoption among older adults: A literature review	This review aims to explore the factors that influence the adoption of mHealth among older adults.	Ireland	A search of the existing literature was conducted using Scopus and PubMed, and 3124 studies were uncovered. After applying our inclusion criteria, 23 original studies were identified for review.	UTAUT	Barriers to the adoption of technology
Leese *et al*. (2021)	Use of in-home activity monitoring technologies in older adult veterans with mild cognitive impairment: The impact of attitudes and cognition	This exploratory pilot study incorporated both quantitative and qualitative approaches to examine mild cognitive impairment (MCI) and cognitively intact older adults' attitudes (i.e., usability, acceptability, digital readiness, barriers) and adherence to in-home technologies after undergoing 7 months of in-home activity monitoring.	USA	Participants were 30 older adult veterans who were classified as cognitively intact (n = 15) or having a mild cognitive impairment (MCI) (n = 15) and participated in a longitudinal ageing and technology study that monitored their physical activity and computer use.	TAM, UTAUT	Cognitive impairment elderly, usability, acceptability

Authors	Research	Purpose/main objective	Context	Method/approach	Model/Theory	Key Arguments and Focus
Alkawaldeh *et al*. (2020)	Usability testing of a tablet-based self-management application for older adults with T2DM: The ASSISTwell application	To examine the usability factors of the tablet-based ASSISTwell self-management application for older adults with type 2 diabetes mellitus (T2DM) and refine the application.	USA	This study used qualitative semi-structured interviews and end-user testing using the think-aloud technique, whereby a purposive sample of 12 older adult individuals with T2DM was recruited. Descriptive and inferential analyses were used to analyse the quantitative data and thematic analysis was used to organise the emerging usability themes.	No theory was mentioned; however, TAM and UTAUT constructs are relevant to the study.	Usability themes, acceptance
Bixter *et al*. (2019)	Understanding the use and non-use of social communication technologies by older adults: A qualitative test and extension of the UTAUT model	The goal of the current study was to gain a better understanding of older adults' perspectives on social communication technologies, including those with higher adoption rates, such as email and those with lower adoption rates, such as social networking sites (e.g., Facebook, Instagram).	USA	Semi-structured group interviews were conducted with either users or non-users of social networking sites to gain insight into issues of adoption and non-adoption of social communication technologies.	The Unified Theory of Acceptance and Use of Technology model (UTAUT)	Base UTAUT theory is inadequate for understanding the use or non-use of social communications tech. Extending the theory

Authors	Research	Purpose/main objective	Context	Method/approach	Model/Theory	Key Arguments and Focus
Beer *et al*. (2017)	Older users' acceptance of an assistive robot: Attitudinal changes following brief exposure	investigate older Americans' robot acceptance before and after exposure to a domestic mobile manipulator, with an emphasis on understanding trialability (i.e., 'trying out' a robot for a short period) and result in demonstrability (i.e., observing the results of the robot's functionality)	Older adults in USA	Older adult participants observed a mobile manipulator robot autonomously demonstrating three tasks: delivering medication, learning to turn off a light switch, and organising home objects. We administered pre and post-exposure questionnaires about participants' opinions and attitudes toward the robot, as well as a semi-structured interview about each demonstration.	UTAUT, TAM	Robotic mobile manipulator with specific tasks with positive perceptions, usefulness and ease of use

Authors	Research	Purpose/main objective	Context	Method/approach	Model/Theory	Key Arguments and Focus
Jo & Hwang (2021)	Psychological factors that affect the acceptance and need for ICT services for older adults with chronic diseases	To identify the psychological factors affecting the acceptance of ICT services and the service-related preferences/priorities in home-dwelling South Korean older adults.	Korea, Older people age 65-75	We conducted focus group interviews with 2 groups of older adults (6 males and 6 females, age = 65–75 years) with chronic diseases in June 2019. To identify which services they prioritised, we made 20 service show cards, scored on a 5-point Likert scale. Additionally, we utilised a self-developed semi-structured interview guide based on the unified theory of acceptance and use of technology 3 model (UTAUT3) to identify how the factors affect older adults' acceptance comprehensively.	UTAUT3	Prioritise autonomy perceptions, reluctance to use new tech, technophobia, and negative perceptions of ICT services. Future dev work should guarantee autonomy and support self-reliance.

2.5 Unified Theory of Acceptance and Use of Technology (UTAUT)

In considering the acceptance and adoption of modern technologies in elder research, there are theories and models pivotal in evaluating "behavioural intentions (BI)" to use a technological solution (Davis, Bagozzi and Warshaw, 1989:983). Table 2-1 relates to similar elderly studies using theories as an orienting lens that have centred on two main theories: the Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology. Perceived Usefulness and Ease of Use are two primary constructs influencing the user's decision to accept and adopt the technology solution. However, Venkatesh, Thong and Xu, (2012) argue that as research advances, the two constructs of TAM have not been the only constructs comprehensively accountable for the predictability of technology usage. Further advancements in the theories have been conducted, will be revealed, and discussed further in this study.

Bixter *et al.* (2019) argue that the UTAUT theory is not sufficient to fully comprehend the content provided through interviews, and it will need to be expanded with additional components. Furthermore, Bixter *et al.* (2019) exposed a few additional factors that could be introduced to the UTAUT theory, such as trust in social networking sites (privacy and security concerns), which was evident in the research on users and non-users.

Upon reviewing the studies related to the research and given the context of this study, it became clear that the UTAUT theory will need to be extended to broaden the "theoretical horizons of UTAUT" (Venkatesh, Thong and Xu, 2012:160). To do this, the researcher adopted the UTAUT2 extension, which included three additional constructs: hedonic motivation, price value, and experience and habit (Venkatesh, Thong and Xu, 2012). The following key constructs are explained in the table below.

Table 2-2 Key Constructs of UTAUT2 (Adapted from Venkatesh, Thong and Xu, 2012)

Key Construct	Explanation
Performance Expectancy	The belief that using technology will improve job performance or quality of life.
Effort Expectancy	The perceived ease of use of technology
Social Influence	The perceived social pressure to use or not use technology.
Facilitating Conditions	The availability of resources and infrastructure needed to use technology.
Hedonic Motivation	The extent to which using technology is enjoyable or fun.
Price Value	The perceived value of technology relative to its cost
Habit	The extent to which technology use has become a routine behavior.

The researcher will apply the UTAUT2 theory to the research by identifying the UTAUT key constructs that are most likely to influence the adoption of gerontechnology among older adults. In the data collection and analysis phases, data will be collected from community-dwelling elderly in the Western Cape and analysed using thematic analysis to generate themes that will be story-lined.

Figure 2-3 represents the researcher's conceptual model formulated to understand the phenomenon based on the UTAUT2 research model presented by Venkatesh *et al.* (2012). This conceptual model anticipates the intersects of key moderators and positive and negative key determinants to produce an understanding of elderly perceptions of technology use.

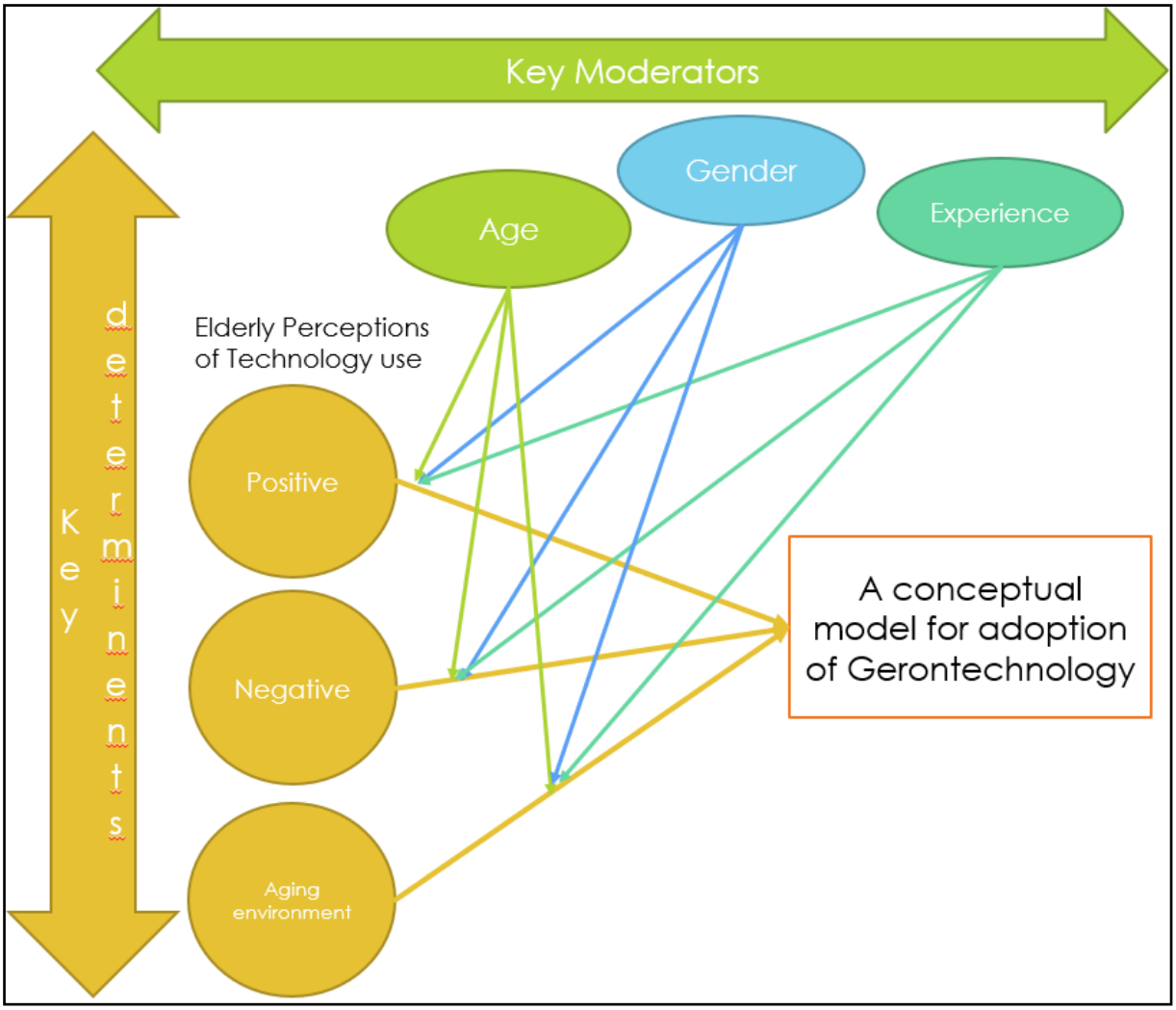


Figure 2-3 Conceptual Model for Gerontechnology Adoption

The aged environment is not restricted to just the buildings (Kort, 2017) in which the elderly inhabit but also the gerontological conditions (Ozsungur 2019) they are subjected to as they age and the type of care and technical support relevant to their conditions and the devices they operate with.

2.6 Summary

In this research study, chapter two focused on the key findings from the various literature investigated. Gerontechnology has the potential to improve the quality of life for the elderly significantly. It has the potential to support independent living, enhance social participation, and address various health challenges. The literature revealed several factors that influence technology adoption, such as perceived usefulness, ease of use, social influence, facilitating conditions, hedonic motivation, price value and habits as key moderators. As indicated in the literature review, interventions such as sensor technologies, e-health platforms, and assistive devices can be effective in addressing the needs of the elderly. However, there are challenges facing adoption, and these include privacy concerns, technical difficulties, affordability, and lack of support from family caregivers.

Therefore, further research is needed to explore the long-term impact of gerontechnology on the health and well-being of the elderly. An investigation into the role of cultural factors, social norms and economic disparities in influencing technology adoption needs to be undertaken.

Furthermore, studies on the effectiveness of different types of gerontechnology, addressing specific needs such as cognitive impairment, dementia and physical impairments, are required. Finally, the literature review can inform the development of targeted interventions and policies to promote the adoption of gerontechnology among the elderly in South Africa. In Chapter Three, the focus will be to provide the research methodology and approach undertaken for this study in the Western Cape.

3 CHAPTER THREE: RESEARCH METHODOLOGY

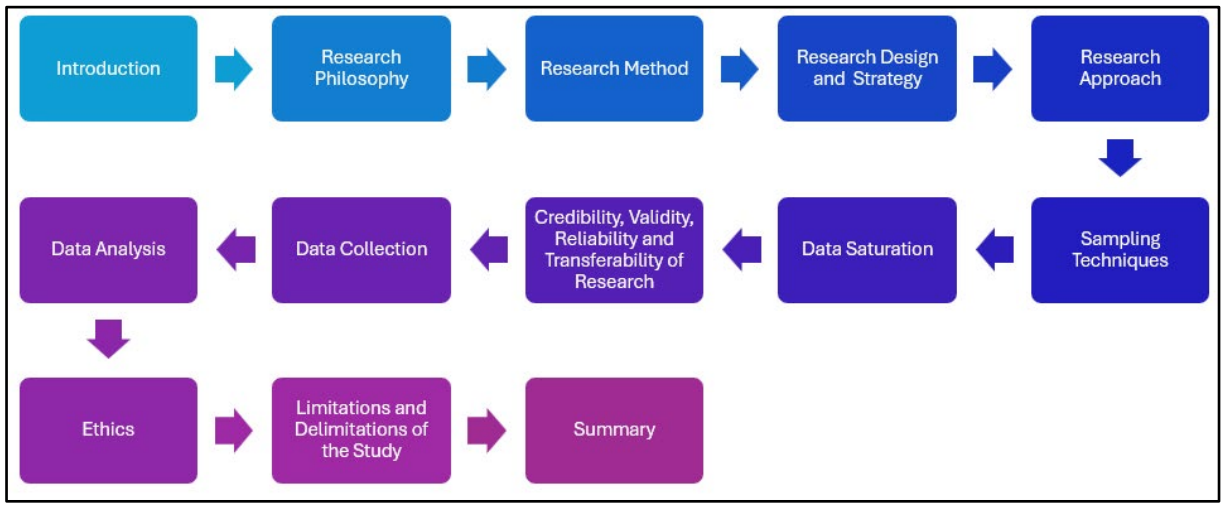


Figure 3-1 Chapter Three Outline

3.1 Introduction

A robust research design and methodology are essential to effectively address the research aims of understanding the factors influencing gerontechnology adoption among community-dwelling elderly individuals in the Western Cape. This chapter outlines the methodological approach employed in this study, including the philosophical underpinnings, research design, data collection techniques, and data analysis procedures. By combining these elements, the research seeks to provide valuable insights into the unique challenges and opportunities associated with gerontechnology adoption in this specific context.

The research onion framework (Saunders *et al.*, 2019:108) guided the overall research process, ensuring a systematic approach to each stage. As illustrated in Figure 3-2, the Research Onion highlights the interconnectedness of philosophical assumptions, research approach, research design, data collection methods and data analysis techniques.

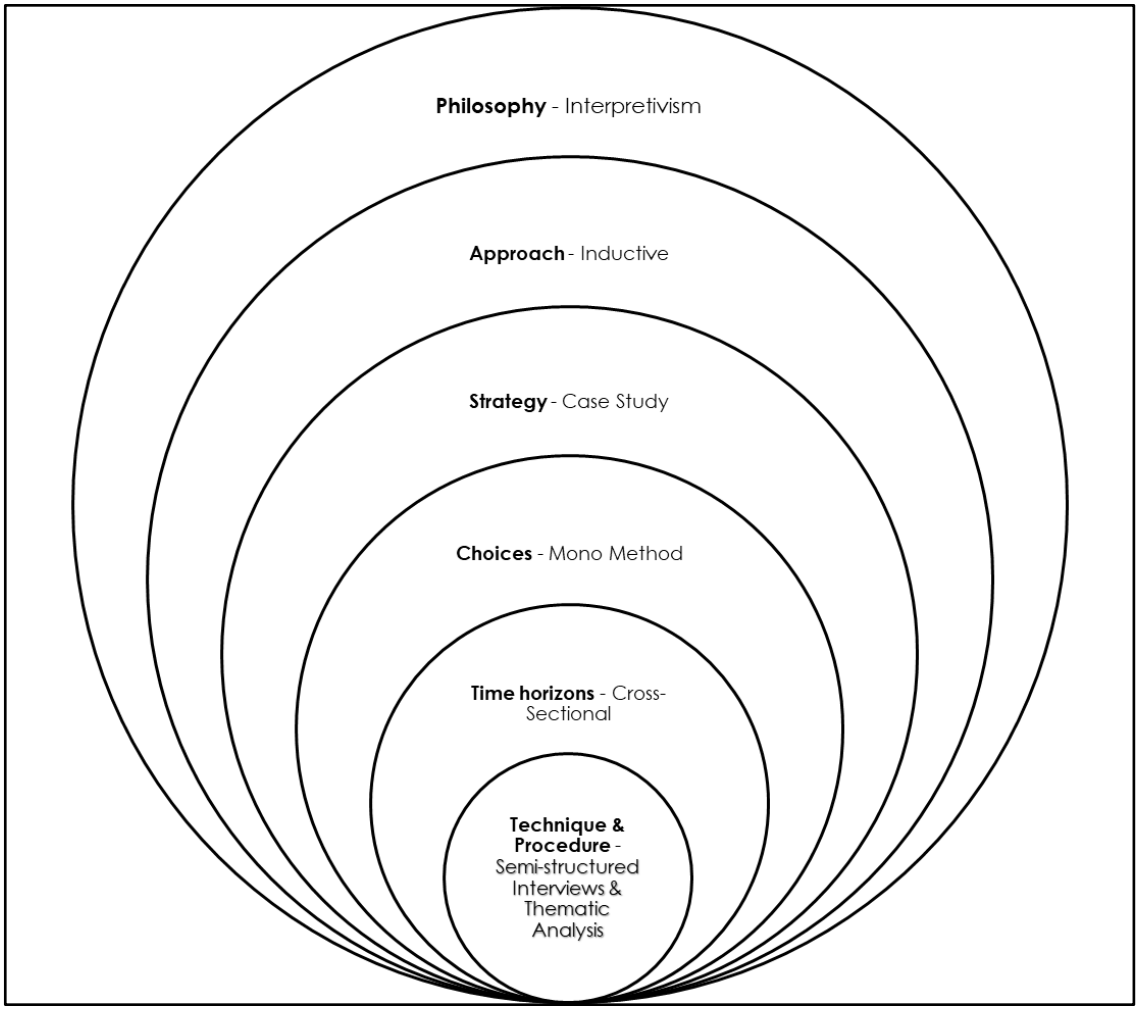


Figure 3-2 Research Onion (Adapted from Saunders et al., 2019:108)

To further clarify the research process, the framework of Creswell (2014), depicted in Figure 3-3, was employed. This framework emphasises the iterative nature of research, involving a cyclical process of planning, data collection, data analysis and interpretation.

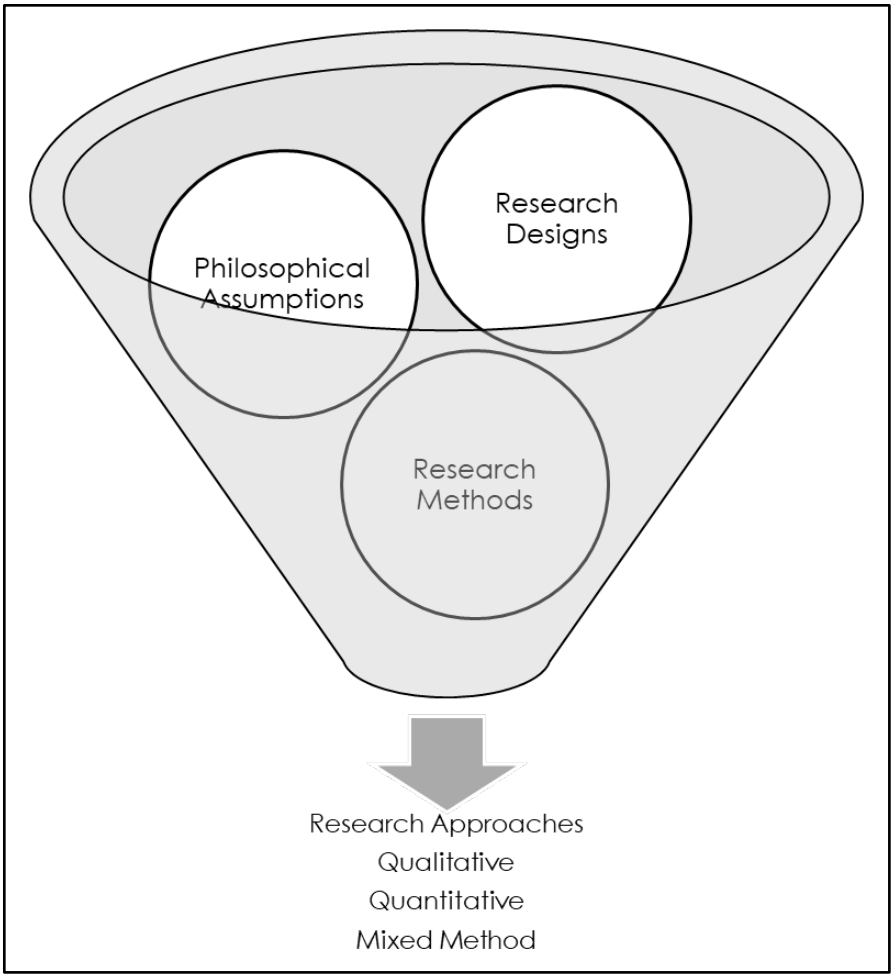


Figure 3-3 Research Approach (Adapted from Creswell, 2014)

By understanding the philosophical underpinnings, selecting appropriate research methods, and carefully designing the data collection and analysis processes, this study aims to contribute to the growing body of knowledge on gerontechnology adoption, particularly in the context of the Western Cape.

3.2 Research Philosophy

The driving force of each research study is the philosophical beliefs and assumptions (Cho & Lee, 2014). Håkansson (2013) states that these important assumptions drive the entire research from the onset. Philosophical assumptions are defined as positivism, which is associated with quantitative studies; constructivism and interpretivism, which are associated with qualitative studies; and pragmatism, which can be applied to a more mixed-method approach.

3.2.1 Positivism Paradigm

Positivism posits an objective reality. Hakansson (2013:4) explains that positivism tests the hypothesis, usually through deductive reasoning and seeks to construct a “predictive understanding of the phenomenon”. Post-positivism derives from positivism. The belief centred in post-positivism is one of “challenging the absolute truth of knowledge” (Phillips & Burbule, 2000:26; Creswell, 2014) and that human knowledge can be challenged through further investigation. Research projects of this type of experiment seek to formulate a minimal, discrete test set of variables that comprises research questions and hypotheses (Creswell, 2014).

3.2.2 Constructivism

Allen (1994:36) asserts that the sentimentality of constructivism takes a subjective stance, and the constructivist belief is that reality is created out of “meanings and values of the observer”. Creswell (2014) explains that the research is reliant on the interaction with individuals and their point of view on the situation to construct meaningful insight into understanding the phenomenon. This typically involves the more open-ended questions being asked to construct subjective meaning based on traditional and societal standards (Creswell, 2014).

3.2.3 Pragmatism

Hammond and Wellington (2013) explain pragmatism as a basic approach to applying a fit-for-purpose solution to a problem or context. This approach applies to a problem-solving mindset to effectively solve the problem, thus making it a pragmatic approach (Hammond & Wellington, 2012).

3.2.4 Interpretivism

Chowdhury (2018) suggests the belief around the interpretivism philosophical assumption is that there is an emphasis on how an individual’s character participates in both social and cultural environments. It is believed that this philosophical assumption rules out the methods of natural sciences by applying research methods that position a human’s knowledge of reality as a social construction (Eliaeson, 2000). Furthermore, interpretivists try to find meaning in human actions, such as behaviour and social interaction with others in social and cultural environments (Chowdhury, 2018).

This research adopts the interpretivism philosophy as it aims to understand the factors that influence the adoption of Gerontechnology amongst the community-dwelling elderly in the Western Cape. The researcher views the elderly's adoption of technology as a unique situation and is in pursuit of a “deeper contextual structure of the phenomenon” (Myers & Avison, 2002:55) within their different ageing environments by understanding the positive and negative key factors that either hinder or promote the elderly’s adoption of technology.

3.3 Research Methods

An interpretivist worldview with an inductive approach drives the research. The best research method suited to this study will be qualitative (Hǻkansson, 2013; Creswell, 2014; Chowdhury, 2018; Patel & Patel, 2019). The research is concerned with understanding the meanings of the phenomenon coupled with the behaviour and, to a large extent, the opinions of the elderly who have participated in the study.

3.4 Research Design and Strategy

The research design and strategies encompass a guideline methodology designed to step through the research lifecycle of any study. It involves how the research is “organised, planned, designed, and executed " (Hǻkansson, 2013:6).

This research evaluated global research involved in understanding the adoption of technology within aged-care environments. Using a qualitative approach, it offered reasonable inductive reasoning using the theories within the literature review and the collected data through semi-structured interviews conducted with the community-dwelling elderly.

A qualitative case study design was adopted to delve into the intricacies of gerontechnology adoption among community-dwelling elderly people in the Western Cape. This research design is particularly suitable for this study as it allows for an in-depth exploration of a specific phenomenon within its real-world context (Myers & Avison, 2002:55). By focusing on a limited number of cases, the researcher can gather rich, detailed data through multiple data sources, such as semi-structured interviews.

A case study allows the researcher to:

- Understand the context: The Western Cape, with its diverse socio-economic and cultural landscape, presents unique challenges and opportunities for gerontechnology

adoption. A case study design allows for a nuanced understanding of these contextual factors (Kristoffersen *et al.*, 2019).

- Explore individual experiences: By conducting in-depth interviews with the elderly participants, the researcher can gain insights into personal experiences, perceptions and motivations regarding technology use (Creswell 2014).
- Identify emerging themes: Through a rigorous analysis of the collected data, the researcher can identify patterns and themes (Ridder, 2017) related to factors influencing technology adoption, barriers to adoption, and facilitators of use.

By employing a qualitative case study design, this research aims to contribute to a deeper understanding of the complex factors that shape gerontechnology adoption among the elderly in the Western Cape.

The following sections concentrate on the research designs and strategies related to qualitative research.

3.4.1 Narrative

Narrative research is a design utilised by researchers to engage with participants and allow individual(s) to recount their life stories. Creswell (2014:14) explains that the researcher then narrates in a “narrative chronology”. Ultimately, a collaborative recount involving the participant and the researcher is constructed.

3.4.2 Phenomenology

Phenomenology is a philosophical design of inquiry used to guide researchers in understanding a particular phenomenon within a participant’s life. It offers insight into a pivotal role in the understanding of a “subjective reality” (Qutoshi, 2018:215).

3.4.3 Grounded Theory

Grounded Theory, also known as “GT”, is often associated with qualitative research projects. Yu & Smith (2021:554-555) explain that it is a flexible method that develops theoretical patterns from the empirical data set and is grounded in data (Hǻkansson, 2013). Glaser & Holton (2007) stated that grounded theory analysis initiates with open coding, albeit without an ideological framework, and then, after that, a second phase of coding is created. The reason for this is to

create credible research and allow the derived analytical data to guide the storytelling of the findings as opposed to testing a hypothesis (Yu & Smith, 2021).

3.4.4 Ethnographies

Creswell (2014) explains that Ethnographic research designs utilise observation and interviewing of the individual and people around them that have something in common as collection methods (Hǻkansson, 2013). This research design aims to intentionally gain a holistic analysis of the phenomenon by studying the individual's everyday experiences. This study design focuses on ongoing participation and observation of the situation (Creswell 2014).

3.4.5 Case Study

The case study design is an empirical study that evaluates a real-life scenario, explains Ridder (2017), where the boundary lines between the phenomenon and scenario are blurred. This method is not only described as a research design but also as a data collection method involving a small set of participants (Hǻkansson, 2013). A distinct characteristic of case studies is that it conducts random sampling. Stake (2008) argues that the reason is that the case is always chosen as it is interpreted as a case of interest and that with case studies, there is conceptual justification. Ridder (2017) makes an important positive acknowledgement that case studies offer the researcher the opportunity to better understand the real-life scenario by identifying the "patterns and relationships" and then using this to "create or extend or test the theory" (Ridder, 2017:282).

This study made use of the case study design to understand the real-life scenario of the relationship between technology and the elderly's acceptance and adoption thereof. Furthermore, the researcher derived a systematic cross-co-occurrence case analysis around the analysed positive or negative factors that have the potential to reveal "similarities and differences" between participants. This will have an impact on the ultimate findings (Ridder, 2017:282).

3.5 Research Approach

Research approaches can be categorised into three different and valuable approaches: deductive, inductive, and abductive. These approaches can provide the researcher with a

dichotomous assessment of the validity of certain statements or hypotheses (Hǻkansson, 2013).

Patel & Patel (2019) explain that when a researcher uses the *deductive* approach, the researcher seeks to apply a testing method around the validity of the initial hypotheses. When making use of an *inductive* approach, the researcher wants to contribute to the emergence of modernised theories and transferability. Hǻkansson (2013) explains that the abductive approach uses a combination of the deductive and inductive approaches. A heuristic method is employed whereby there is an initial dataset, and prerequisites are used to explain a likely outcome.

The inductive approach was used to understand the different factors that influence the elderly's decision to adopt technology.

3.6 Sampling Techniques

Aligned with the flexibility derived from adopting a qualitative research design, Marshall (1996) proposes three broad sample strategies needed when selecting a sample: convenience, judgement, and theoretical, with considerable overlap between them. Research published by Gill (2020) further enhances the qualitative sampling techniques by adding snowball sampling to the spectrum. Table 3.1 below describes each qualitative sampling technique.

Table 3-1 Sampling technique and descriptions
(Adapted from Qualitative Sampling Methods (Gill, 2020))

Sampling Technique	Description
Convenience sampling	Participants "opt-in" to be involved in the study.
Purposive sampling	This is also known as judgmental research, where the research selects participants who fit within the context of the study and can provide purposeful information on the phenomenon being studied.
Snowball sampling	This technique is referred to as the "chain" technique, in which participants refer the researcher to other participants who can provide value to the study.
Theoretical sampling	This challenging technique is usually associated with Grounded Theory studies and "develops emerging concepts and categories". Decisions are based on identifying concepts that may arise and then revisiting these leads. The researcher then writes memos that will be analysed (Butler *et al.*, 2018).

This study used the judgemental sample strategy, as the participants were selected from a pre-identified group of people, the elderly, 60 years and older, in the Western Cape. Information was collected from participants who may offer different perspectives on the research interview questions. This is achieved by collecting information from middle to lower socio-economic groups across both male and female genders.

3.7 Data Saturation

In a study conducted by Gentles *et al.* (2015), it was noted that researchers are not clear in their explanations relevant to sample size and data saturations across different research studies that included qualitative case studies, grounded theory, and phenomenology. Young and Casey (2018:2-3) examined three studies entitled "The Men Against Violence (MAV)", "The Social Workers in Criminal Justice (SWCJ)", and The Adolescent Bystander Behaviour (ABB). Findings of the research showed that for interview-related studies, MAV and SWCJ, near-completed (97% and 96%, respectively) codes were achieved at the 8th and 9th interviews. In the focus group-related study, ABB achieved 97% in 6 groups, and adding a 7th group only added 1% to the total codes.

The researcher for this study approached the sample population with the mindset of 25 interviews and proceeded to recruit. From January to March 2024, only 14 elderly people

responded to the recruitment drive. Despite the recruitment form being open until October 2024, no new elderly people wanted to take part in the interviews. Three elderly people cancelled the interviews, citing that they no longer wanted to continue.

Figure 3-4 represents the proportion of codes across the interviews conducted. The analysis below was constructed using the participants and the order of interviews that took place over time to address any temporal biases. These perception codes formed the primary analytical framework for this study, comprising the majority of the coded data. These were used to understand the perceptions of the elderly adopting technology in the Western Cape. As represented in the graph below, a downward trend (Blue) line takes place after the 8th and 9th interviews, with the 9th interview not offering much value. At this point, the researcher believed that data saturation was reached. The trajectory of the cumulative line (orange) can be observed as flattening from the 10 interview instances. In addition, the researcher continued with additional interviews but observed that in Mar 2024, there was an increase in cancellations.

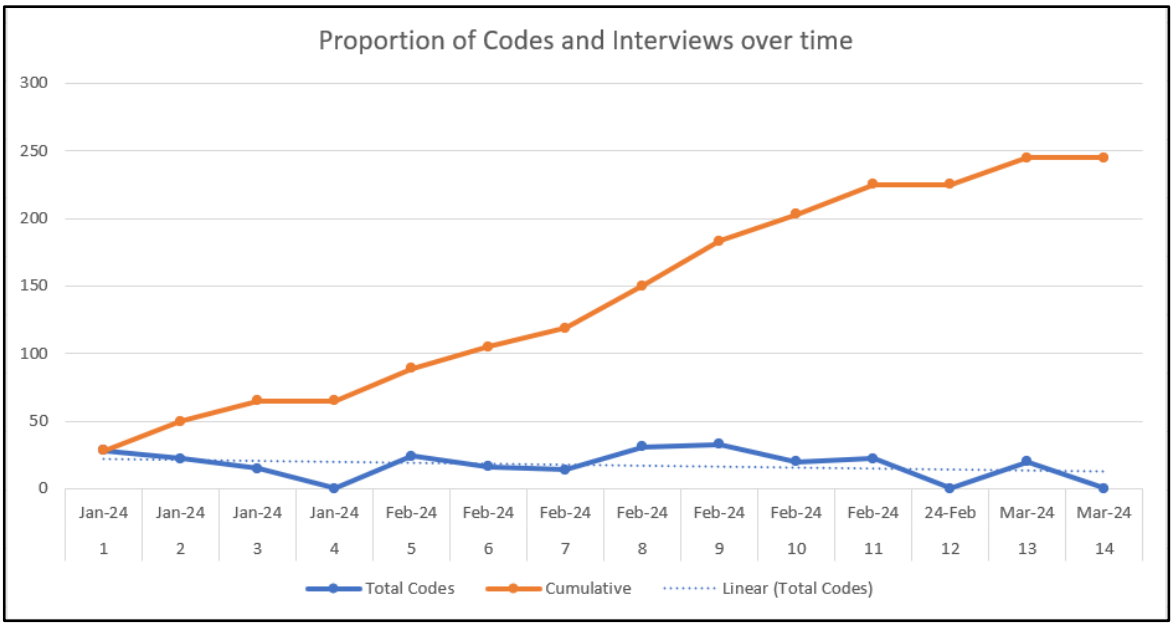


Figure 3-4 Proportion of Codes and Interviews

3.8 Credibility, Validity, Reliability and Transferability of Research

Credibility refers to the notion of how trustworthy and believable the findings are. Nowell *et al.* (2017) claim that this can be achieved by spending sufficient time with the elderly to build rapport and gain insight into their experiences. In addition, the researcher must be able to

share interpretations with participants to check if the findings corroborate with their experiences. Furthermore, sessions were held by the researcher with colleagues through mock sessions and peer presentations to discuss emerging themes, with the intent of identifying potential biases and alternative perspectives. Noble and Smith (2015) argue that the above criterion can be used to measure the credibility of the research.

Validity is sought through the participation of semi-structured interviews. This study seeks reliability by being “free of bias” and reveals the true significance of the elderly’s experience with technology. The interviews intend to naturally flow with robust discussions with the aim of gathering responses (Collingridge *et al.*, 2019:390). The qualitative data generated was subjected to thematic analysis using *ATLAS.ti*™. Lincoln and Guba (1985) assert that to enhance the trustworthiness and dependability of the findings, a comprehensive audit trail will be maintained, including all research artefacts (Nowell *et al.* 2017).

Furthermore, according to Stalmeijer et al. (2024), transferability needs to be achieved. This describes three facets. Firstly, applicability means the ability of the reader to find the relevance of the findings of this study and align them to other contexts. Secondly, for the researcher to create a resonance that spurs familiarity and thirdly, for the researcher to articulate the problem and the use of the UTAUT2 theory to explain the elderly phenomenon, in this case, by way of theoretical engagement (Stalmeijer *et al.*, 2024). Transferability is considered, as the research is set in the Western Cape, providing thick descriptions of context, participants, and data collection procedures so that the research can potentially be applied in other provinces in South Africa across low and middle socio-economic environments.

3.9 Data Collection

As the data is iteratively collected and analysed, the intention is to construct an interpretative conceptual model, as displayed in Chapter 2. Initially, the researcher established a basic screening questionnaire sent through the general community WhatsApp groups, targeting potential elderly participants who indicated that they would like to participate in the semi-structured interviews. Group Admin approval had been requested.

The researcher prepared questions for the interview and asked them in a specific order (Patel & Patel, 2019). The interviews were conducted with qualifying participants not only to gain an understanding of the elements of the research phenomenon but also a point of view from the

participant's perspective (Håkansson, 2013). The following types of interviews can be explained as follows.

The unstructured interview technique relies on the interviewee to lead the conversation by eliciting data from the interviewee's ability to tell their story in their version of events. This usually takes place over a period with the researcher iteratively connecting with the interviewee to "build a nuanced description and record those memories" (Carter & Henderson, 2005:218; Madill, 2012).

Carter and Henderson (2005:218) explain that *structured interviews* are linked to quantitative studies. In these studies, the researcher prepares specific interview questions, the majority of which are closed-ended, and delivers an inquiry with a high degree of accuracy to each interviewee.

Madill (2012) explains that s*emi-structured interviews* have gained popularity in qualitative studies. This technique allows the researcher to prepare a schedule populated with open-ended questions that align with the study; however, the questions are versatile, and the researcher iteratively investigates unexpected or spontaneous topics that arise during the interview.

The research data for this study will be collected through semi-structured interviews with the community-dwelling elderly until data saturation is achieved.

3.9.1 The semi-structured interview process

The semi-structured interviews took place as face-to-face sessions in a location and time convenient for the participant. The participants had the option of including their informal caregiver. However, on the one occasion that a caregiver did attend the interview, it was to observe the interview process only, in support of the participant.

After greetings and salutations and before the interview proceeded, the participant was requested to complete the consent form. The researcher would then proceed with initiating the recording using a smartphone device. During the interview, the researcher guided the interview with the prepared questions and invited robust responses from the participants. The researcher demonstrated examples of wearable and sensor technology and discussed potential assistive technologies from the reviewed literature.

Upon completion of the interview, each participant was thanked for their time and detailed responses, and the recording stopped. The researcher acknowledged to the participants that feedback would be given upon completion and submission of the research.

3.10 Data Analysis

Data analysis is the systematic process of examining, preparing and interpreting the collected data. In this study, the researcher employed a coding technique, applying codes to transcribed interviews to produce insights relevant to a qualitative study (Hǻkansson, 2013:7).

Vaismoradi et al. (2016) explains that content analysis and thematic analysis are two designs that utilise a combination of techniques to analyse transcribed text data and generate themes.

Three approach considerations can be applied to evaluate the appropriate use of thematic analysis. The reflexive approach focuses on retrospectively developing themes based on the researcher's development of codes, then innovatively creating "patterns of shared meanings" (Braun & Clarke, 2021:3) based on a centralised core principle.

Braun and Clarke (2021) propound that the code reliability approach is reliant on a code book or coding frame to structure the thematic approach. It focuses on producing topic summaries based on the highly frequent responses from participants. However, the researcher has predefined their analytical work, and this subjectivity can be seen as bias impacting the study's reliability. Codebook approaches combine code reliability and reflexive approaches to visualise the analysis specifically.

3.11 Ethics

As this research study extends across two disciplines, ethics approval has been sought from both a technology perspective and a health and wellness perspective. To ensure ethical conduct, the following considerations were implemented in this study:

- Informed consent: Elderly participants were provided a consent form before the interview. This document outlines the study's objectives, procedures, purpose, potential risks and benefits. The consent form explicitly states the potential duration and includes emergency contact information.
- Confidentiality and Anonymity: To protect the elderly participant's confidentiality, pseudonyms were used to identify the participants in the research report. All data,

including interview transcripts and field notes, were securely stored and accessed only by the researcher.

- Participant Welfare: The researcher prioritised the well-being of the participants by conducting interviews in locations convenient to them and ensuring a comfortable and supportive environment. If any distress was observed during the interview, appropriate measures were taken to address the situation.
- Institutional Review Board Approval: The study received ethical approval from the relevant institutional review boards, which ensured adherence to ethical guidelines and regulations.
- Data Protection: Measures were taken to protect participants' privacy and handle their personal information responsibly, in compliance with the Protection of Personal Information Act (POPIA).

By adhering to these ethical principles, the researcher aimed to conduct the study responsibly and ethically, ensuring the well-being and privacy of all elderly participants.

3.12 Limitations and Delimitations of the Study

The limitations of the study are as follows:

- Sample size: While the 14-participant sample allowed for an in-depth exploration, a larger sample could have provided a more comprehensive understanding of the diverse experiences of the elderly in the Western Cape.
- Geographic Focus: The study’s focus on the Western Cape limits the generalizability of the findings to other regions with potentially different socio-economic and cultural contexts.
- Self-Selection Bias: Participants who volunteered for the study may have had a particular opinion about certain types of technology, potentially biasing the findings.
- Time constraints: Limited time for data collection and analysis may have impacted the depth of the investigation and the number of participants.

Delimitations of the study can be detailed as follows.

- Scope: The study was specifically focused on community-dwelling elderly individuals of the Western Cape, excluding those residing in institutional care facilities.

3.13 Summary

In this research study, chapter three outlines the research methodology used to investigate the factors influencing gerontechnology adoption among community-dwelling elderly individuals in the specific context of the Western Cape. The chapter delves into the philosophical underpinnings, research design, data collection techniques, and data analysis procedures. The limitations and delimitations of the study are discussed. The unique challenges and opportunities associated with gerontechnology adoption in this context are highlighted in the next chapter.

4 CHAPTER FOUR: ANALYSIS AND FINDINGS

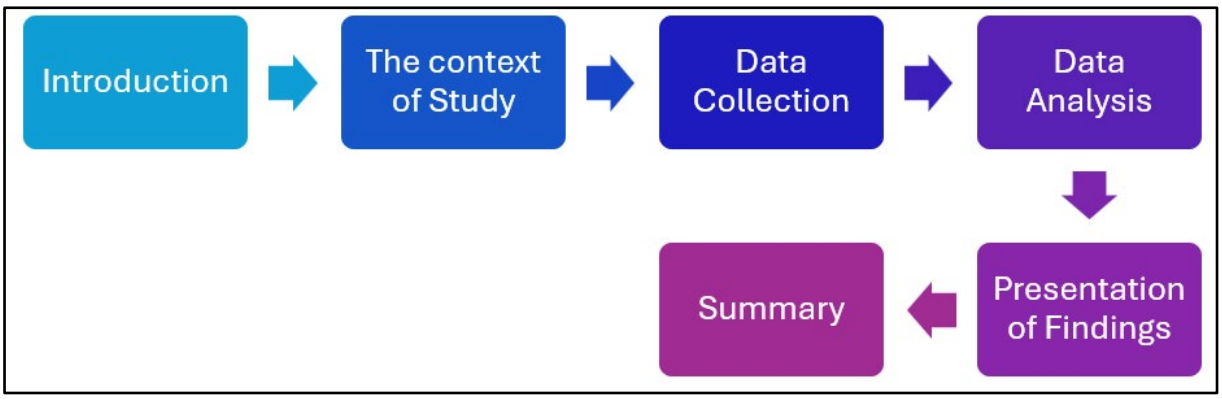


Figure 4-1 Chapter Four Outline

4.1 Introduction

This chapter details the reflexive analysis derived from the data obtained through semi-structured interviews specifically targeting elderly people within the Western Cape. Eleven participants above the age of 60 were willing to participate, and the data is included in the results. Three targeted elderly people decided not to participate in the interviews, and this data was excluded from the study.

The data sourced from the recorded and transcribed interviews undertook a reflexive approach to thematic analysis, and in this chapter, storylines are produced to encapsulate the findings.

This chapter will strictly analyse and present results and not offer any interpretations. Interpretations will be covered explicitly in the next chapter.

4.1.1 Problem Statement

There is a growing shortage of geriatric and special care-giving personnel and quality facilities in urban and rural environments, and the Western Cape's population is increasingly ageing.

4.1.2 Research Questions

- **MRQ**: How can the key acceptance and adoption perceptions of the elderly influence how technology is accepted within elderly environments in the Western Cape?
- **SRQ1**: What are the key determinants influencing the adoption of gerontechnology by community-dwelling elderly in the Western Cape?
- **SRQ2**: How do key moderators, such as performance expectancy, facilitation conditions, social influence, and price-value influence the adoption of gerontechnology?

4.1.3 Research Objectives

The following objectives to be achieved in this study are as follows:

- **RO1**: To identify the key determinants influencing the acceptance of gerontechnology among community-dwelling elderly.
- **RO2**: To determine the role of key moderators in facilitating or hindering the adoption of gerontechnology.

4.1.4 Research Aim

The study aims to explore the factors that can influence the acceptance and adoption of Gerontechnology by community-dwelling elders in the Western Cape.

4.2 The context of the study

The research was conducted in the Western Cape, a southerly province of South Africa. The Western Cape is one of nine provinces in South Africa. Bizcommunity (2024) findings of the 2023 AfricaWealth report have revealed that Cape Town, Western Cape, is increasingly becoming a choice location for retirees, with buyers opting to purchase retirement developments situated close to excellent amenities.

4.3 Data Collection

4.3.1 Case Overview

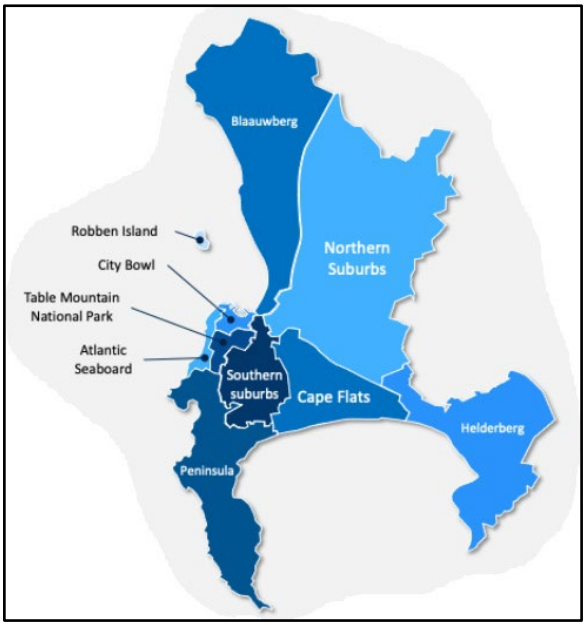


Figure 4-2 Case 1 Cape Metro Districts

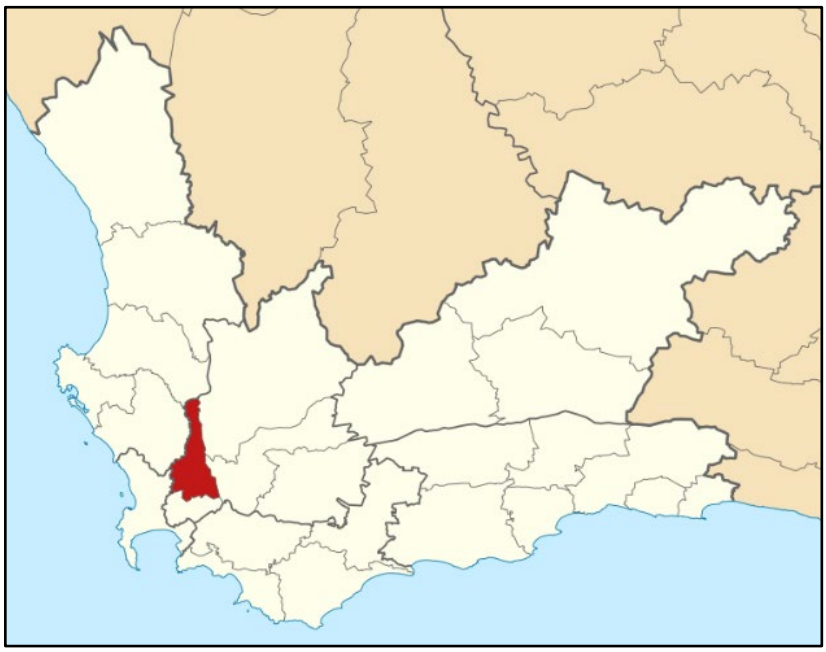


Figure 4-3 Case 2 Cape Winelands Districts

The Western Cape is home to a diverse South African elderly population. The researcher has chosen to collect data across two low to middle socio-economic areas of the Western Cape.

The first area is the Northern Suburbs of the City of Cape Town, displayed in Figure 4-2, which represents the middle socio-economic area for research data collection. Given the travel budget constraints, the researcher recruited participants from the Tygervalley and Durbanville areas.

The second area is the highlighted Drakenstein area of the Cape Winelands (Figure 4-3), which represents the lower socio-economic area for the research data collection. The researcher recruited participants from the Wellington and Paarl East suburbs.

Socio-economic standards are accepted combinations of an individual's economic prosperity and social status within an area or community. These standards can vary across regions and are influenced by different factors, i.e., education, occupation, income, etc. (Baker, 2014). According to the Urban-Econ Development Economists (2023:16), the Municipal Economic Review and Outlook report show that the GDPR per capita is a measurement that evaluates the economic well-being of the individuals but the living standards across the population. In Figure 4-4 below, the Western Cape average is R107k, with the broader Cape Metro representing many affluent suburbs showing above the average and the Winelands district showing a below-average GDPR per capita.

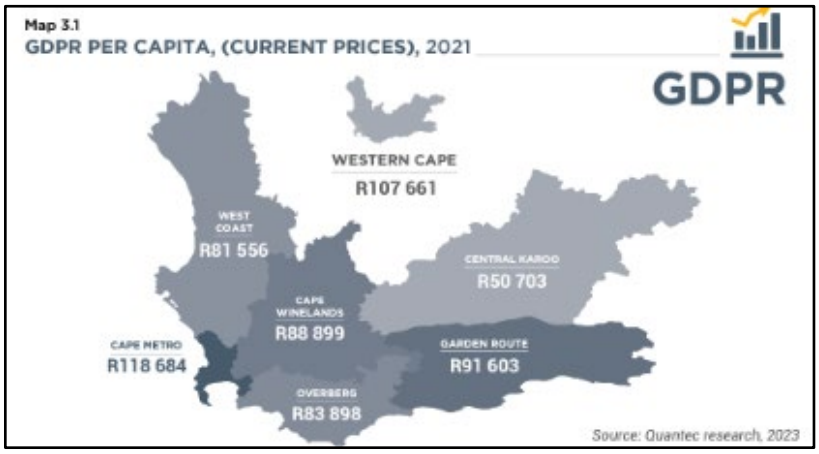


Figure 4-4 WC GDPR per capita

4.3.2 Questionnaire design

The questionnaire template was designed by the researcher with the knowledge and understanding of the constructs from the UTAUT theory. The design of the questionnaire involved five main questions, several probing questions, and a technology demonstration. Table 4-1 below represents the different types of questions that guided the semi-structured

interviews; however, it did not limit the discussion in the interview. Each main question has a theory construct relevancy that guided the researcher in exploring the different participant perceptions on offer.

Table 4-1 Interview Questions

No.	Question	Type	Relevancy
1	Can you describe your experience with using technology today?	Main	Exploring the elderly participant's technology experience
	Have you ever used technology to view the weather, book a restaurant table, or conduct banking?	Probing	
	Do you enjoy using the technology that you have experience with?	Probing	
	If not using technology, Why are you not using this type of technology?	Probing	
2	Do you know what wearable, sensor and assistive technology is?	Main	Exploring the elderly participant's experience, hedonic motivation, performance expectancy and facilitating conditions
	Is it something brand new, or have you heard about it?	Probing	
	Have you ever used wearable technology to monitor your heart rate, measure your steps, etc?	Probing	
	Did this technology help you to maintain or improve your health?	Probing	
	Do you enjoy using the technology?	Probing	
	Would you prefer someone show you how to use the technology?	Probing	
3	If this technology was more accessible, would you use it?	Main	Exploring the elderly participant's view around Price Value, social influence, and appetite for modern technology
	Would you trial it if it was sponsored/funded? Why only if it is funded?	Probing	
	Would you want others in your social circle to trial use it with you? Would they be interested in trialling?	Probing	
4	If there was any piece of technology out there that you knew could improve your health, would you pay for it if it was good?	Main	Exploring the elderly participant's habit and price value if technology was available and accessible

No.	Question	Type	Relevancy
	Why would you not pay for it?	Probing	
	Whether it is free or not, if the technology improves or maintains a good quality of health, would you use it often?	Probing	
5	What would put you at ease to start using these technologies that can potentially improve the quality of your life and do so on a regular basis?	Main	Exploring the elderly participant's effort expectancy and habit

4.3.3 Sampling and Data Collection Process

Initially, the researcher created a generic message that was posted on the community WhatsApp™ group, seeking potential participants to participate in the study. The group's admin gave permission to request participants.

The following message combinations were sent out on the Group chat.

Below are the initial messages sent out via the group chat to recruit participants.

"*Dear Neighbours*

Please assist me in participating in an interview for my Masters in Technology degree👨‍🎓*. The objective of the research is to understand the elderly's technology perceptions, good or bad, for technology to be accepted and adopted by our community elderly so that it can be factored into urban planning. Participants will need to be 60 years and older. Participants may have their Carer attend the interview as well, if needed. The interview will be up to 25 minutes of your time and includes a short tech demo. Please use the link provided to complete a very short survey and provide details so that I may contact you should you be interested in helping me with this research.*

https://surveyheart.com/form/65a1137ac7dd9c78f37db081

All information provided will be strictly confidential, and participants will be provided with all Varsity research committee approvals. Thank you in advance, Stanton🙏*.*"

Below is the follow-up message sent via the group chat to recruit more participants.

"*Hi Neighbours*

Thank you to all the elderly neighbours assisting me with my research. It has been my first time meeting these fabulous people. Testament to the awesome neighbourhood. I firmly believe our elderly should continue to have their say, and I need more participants. So, I continue to invite more elderly people to participate in the research. Feel free to forward the invite to any elderly, should they be interested in helping me with this research.

https://surveyheart.com/form/65a1137ac7dd9c78f37db081

All information provided will be strictly confidential, and participants will be provided with all Varsity research committee approvals. Thank you once again, Stanton🙏."

The responses were collated from all participants who completed the survey heart online form, as shown in Figures 4-5 and 4-6 below.

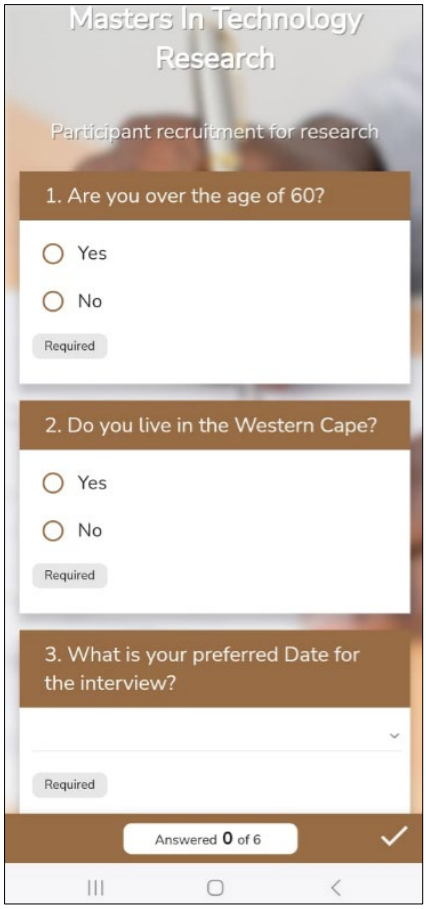


Figure 4-5 Recruitment form start

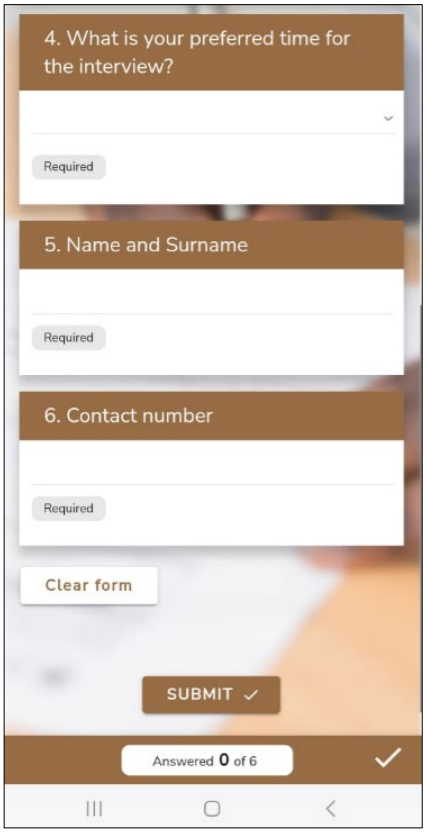


Figure 4-6 Recruitment form end

4.3.4 Research Participants

The recruitment of participants and the online form were open to responses from January 2024 to October 2024. The following recruitment responses were received and summarised in the table below.

Table 4-2 Participants

Participant ID	Age Range	Gender	Socioeconomic Community
F_S01	60+	Male	Middle
K_S02	60+	Female	Middle
M_M03	60+	Female	Middle
F_M04	60+	Male	Middle
AN_S05	60+	Female	Lower
D_D06	60+	Male	Lower
J_G07	60+	Male	Lower
C_J08	60+	Male	Lower
P_M09	60+	Male	Lower
C_S10	60+	Female	Lower
A_V11	60+	Female	Lower

The researcher notes that three additional participants were recruited for the study. The participants had opted to withdraw from the study. In line with the proposed ethical considerations, no further data for these participants have been included in this study.

4.4 Data Analysis

For this research study, the data analysis is based on the data obtained from the transcribed interviews. The Descript™ software guided the transcription processes. All documents were imported into *ATLAS.ti*™ for analysis.

The analysis created was based on the reflexive approach to thematic analysis, identified by Braun and Clarke (2006) and summarised in the table below.

Table 4-3 Thematic Analysis Steps (Adapted from Braun & Clarke, 2006; Mayring, 2014)

Step	Step Definition
One	*F*or the researcher to immerse themselves by transcribing the data into written form and reading verbatim in order to note initial concepts. Become familiar with the data.
Two	Generate codes by systematically noting interesting features within the data; however, ensure that it is done across the entire data set. This is seen as organising your data into meaningful groups. At this point, the researcher begins interpreting the data according to the arguments about the researched phenomenon. It is important to note that coding can be done manually or through software solutions (Mayring 2014; Braun & Clarke 2006). This is a crucial step as the researcher needs to work through the whole data set and apply holistic focus to each data item to identify interesting features in the data items.
Three	To ensure that related and unrelated codes are collated and that potential themes are derived. Here, the applicable use of mind maps or tables can aid in sorting different themes and subthemes.
Four	The researcher needs to check if the theme relates to the codes identified at level 1 and the whole data set to formulate a 'thematic map of analysis' (Braun & Clarke, 2006: p 87). Through a process of refinement, the researcher will gain a clear understanding of the main themes. At this point, the researcher is required to read through the collated data extracts of each theme to identify a coherent pattern. Alternatively, the researcher needs to assess if an incoherent theme is not fit, if it will be reworked into a new theme, or if it will simply be discarded from the analysis entirely.
Five	This allows the researcher to continually analyse and refine each theme and storyline to create clearly defined attributes for each theme. Braun and Clarke (2006) define this as capturing the essence of each theme, which a researcher can use to write a detailed analysis, and as telling the story behind the data in relation to the research question to ensure no overlap between themes. At this point, the researcher is ready to begin applying working titles to each theme that gives the reader a concise explanation of what each theme is about.
Six	The opportunity for the researcher to finalise analysis on the selected coding and theme extracts and link it back to the research question and literature review with the intent of producing an analysis report. The analysis report provides sufficient proof of the themes within the data by providing vivid examples that answer the research question logically. In addition, the analytical narrative must storyline the data that forms the argument in relation to the research question.

4.4.1 Analysis of data from interview transcriptions

4.4.1.1 Generating codes and categories

Upon importing the transcription, the researcher systematically reviewed each participant's responses and coded the data set. At the onset, the data groups became clear to the

researcher, who organised them accordingly by creating prefixes to the codes and colour-coding them into groups. This approach facilitated the synthesis of a codebook comprising five themes and a total of 84 codes.

4.4.1.2 Generating Themes

This segment aligns with the conceptual model described in Chapter 2 (Figure 2-3). It explores the key determinants and moderators influencing gerontechnology adoption among the elderly, as proposed by the UTAUT2 model. As the groups were formed and colour-coded, the researcher began formulating themes. The following themes were created to either expand on or corroborate with the literature relevant to elderly perceptions of technology use, identified in Chapter 2. The five identified themes are explained below.

- **Theme 1: Experience with Technology** - This theme identifies that technology exposure can be linked to experience. Exposure refers to the amount of time a person is exposed to a particular technology, either by using it themselves or observing someone else using it. Awareness refers to a person's knowledge and understanding of the technology (Venkatesh *et al.*, 2012).
- **Theme 2: Influencing Types of Technologies** - This theme describes the types of technology exposed to the elderly. There is a strong indication of ICT exposure and wearables but little to no exposure to sensors or assistive technology.
- **Theme 3: Within the Aged Environment** - This theme looks at the ageing issues and the support structures prevalent within the participant's ageing environment.
- **Theme 4: Negative perceptions towards technology** - The negative key determinants theme highlights factors that act as barriers to the acceptance and adoption of technology by the elderly.
- **Theme 5: Positive perceptions towards technology**—The positive key determinants theme emphasises factors that encourage the acceptance and adoption of technology.

The first column of Table 4-4 lists the five emergent themes synthesised after the data analysis process, which used qualitative data analysis capabilities offered by *ATLAS.ti*™. Column two sets out 83 categorised codes gleaned from participant feedback.

Table 4-4 Full List of Emergent Themes and Associated Codes

Themes	Codes
Theme 1: Experience with Technology (four codes)	• AI Awareness • Regular Usage • Technology Awareness • Technology Exposure
Theme 2: Influencing Types of Technology (five codes)	• Assistive Technology • ICT • Robotics • Sensor Technology • Wearable Technology
Theme 3: Within the Aged Environment (two codes)	• Gerontology • Support
Theme 4: Negative Perceptions Towards Technology (25 codes)	• Affordability • Basic experience • Cause of Frustration • Economic Hardships • Expensive Healthcare • Exposure to certain Ethnicity • Hesitation • Impatient Support • Lack of Accessibility • Lack of availability • Lack of formal training • Lack of funding • Lack of government support • Lack of Interest • Lack of ownership • Lack of support • Lack of understanding • Level of difficulty • Low experience • Low exposure • Low usage • No enjoyment • No exposure • Perceived exploitation • Technophobia

Theme	Code
Theme 5: Positive Perceptions Towards Technology (47 codes)	• Attractive • Benefit • Covid19 • Defined purpose • Ease of Use • Enjoyment • Facilitating environments • Fascination • Forced usage • Gain knowledge • Goal setting • Healthcare importance • Healthcare monitoring capabilities • Health care value • Health tech exposure • Improving the way of life • Individual influence • Influence

Theme	Code
Theme 5: Positive Perceptions Towards Technology Continued (47 codes)	• Intention to use regularly • Interesting • Need for efficiency • Need for mind stimulation • Need for support • Need to adapt • Need to be notified • Need to improve health • Patient to doctor familiarity • Perceived importance • Perceived need • Perceived safety • Perceived use • Positive attitude • Positive attitude • Price-value • Providing support • Quality of Life • Social Inclusion • Social Influence • Sustainable benefit • Technology improvements • Tracking health • Usability • Usefulness • User-friendly • Varying options • Willingness to learn • Willingness to trial

4.5 Presentation of findings

The following table represents the full code list with its associated theme. However, to focus on the perceptions that were more prevalent during the interview sampled population, those perceptions with less than 3 instances were not included in the analysis. By restricting the analysis to the most prevalent perceptions, it was possible to identify patterns and trends within the data more effectively.

Figure 4-7 below is solely included in this research report as a view of the perceptions with high cooccurrences that will be discussed in depth in the next chapter.

	Regular Usage Gr=17	Affordability Gr=20	Economic Hardships Gr=3	Expensive Healthcare Gr=3	Hesitation Gr=6	Lack of Accessibility Gr=8	Lack of availability Gr=3	Lack of Interest Gr=4	Level of Difficulty Gr=9	Low experience Gr=3	Low exposure Gr=5	Covid19 Gr=3	Ease of Use Gr=3	Enjoyment Gr=9	Facilitating environments Gr=8	Gain knowledge Gr=13	Goal setting Gr=3	Health care monitoring capabilities Gr=11	Intention to use regulary Gr=5	Need for efficiency Gr=7	Need for Support Gr=16	Need to improve health Gr=24	Perceived Need Gr=9	Perceived usefulness Gr=8	Price-Value Gr=9	Quality of Life Gr=6	Social Influence Gr=12	Sustainable benefit Gr=6	Tracking health Gr=3	Usefulness Gr=3	Willingness to learn Gr=7	Willingness to Trial Gr=14
Affordability	0	0	1	1	0	2	1	0	0	0	0	1	0	0	0	0	0	1	0	1	1	3	2	1	6	0	1	0	0	0	1
Basic experience	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Economic Hardships	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expensive Healthcare	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesitation	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Lack of Accessibility	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	5	0	0	0	0	0	1	2
Lack of availability	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Lack of Interest	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Level of Difficulty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Low experience	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low exposure	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
Covid19	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
Ease of Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Enjoyment	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Facilitating environments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	1	5	2	1	0	0	0	0	0	0	1	0
Gain knowledge	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	2	1	1	0	0	0	0	0	0	2	1
Goal setting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Health care monitoring	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	3	0	0	0	0	0	0	2	0	0
Intention to use regulary	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
Need for efficiency	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	1	0	2	0	0	0	0	0
Need for Support	0	1	0	0	0	0	0	0	1	0	0	0	0	0	5	2	0	1	0	1	0	2	1	0	0	1	0	0	0	2	1
Need to improve health	0	3	0	0	0	0	0	0	0	0	1	0	0	0	2	1	0	3	1	1	2	0	1	2	4	1	0	0	1	1	2
Perceived Need	0	2	0	0	1	1	0	1	0	0	0	1	0	0	1	1	0	0	1	1	1	1	0	0	1	0	0	0	0	0	1
Perceived use	0	1	0	0	0	5	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	1	2
Price-Value	0	6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	1	0	0	0
Quality of Life	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	1	0	0	0
Social Influence	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Sustainable benefit	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Tracking health	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0
Usefulness	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Willingness to learn	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	0	0	0	0	2	1	0	1	0	0	0	0	0	0	2
Willingness to Trial	0	1	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2	1	2	0	0	2	0	0	2	0

Figure 4-7 Co-occurrence Analysis

Cooccurrence Analysis offers the researcher an idea of how many codes are strongly linked to each other within a set of data.

4.5.1 Technology experience of the elderly

Interview findings reveal that ICT technology, such as smartphones, computers, and the Internet, is more prevalent among the elderly. Figure 4-8 represents the findings that reveal more awareness and exposure to Wearable Health Technologies (WHT) and sensor technology and low awareness of Assistive Technologies (AT).

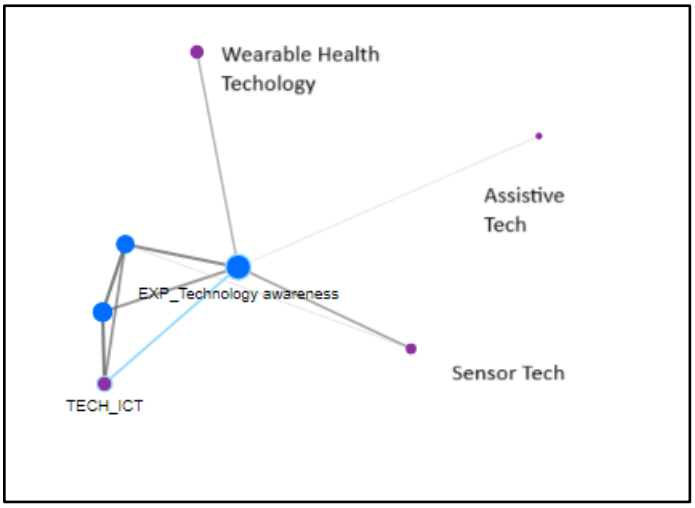


Figure 4-8 Elderly's Technology Experience

4.5.2 Findings within the Ageing Environment

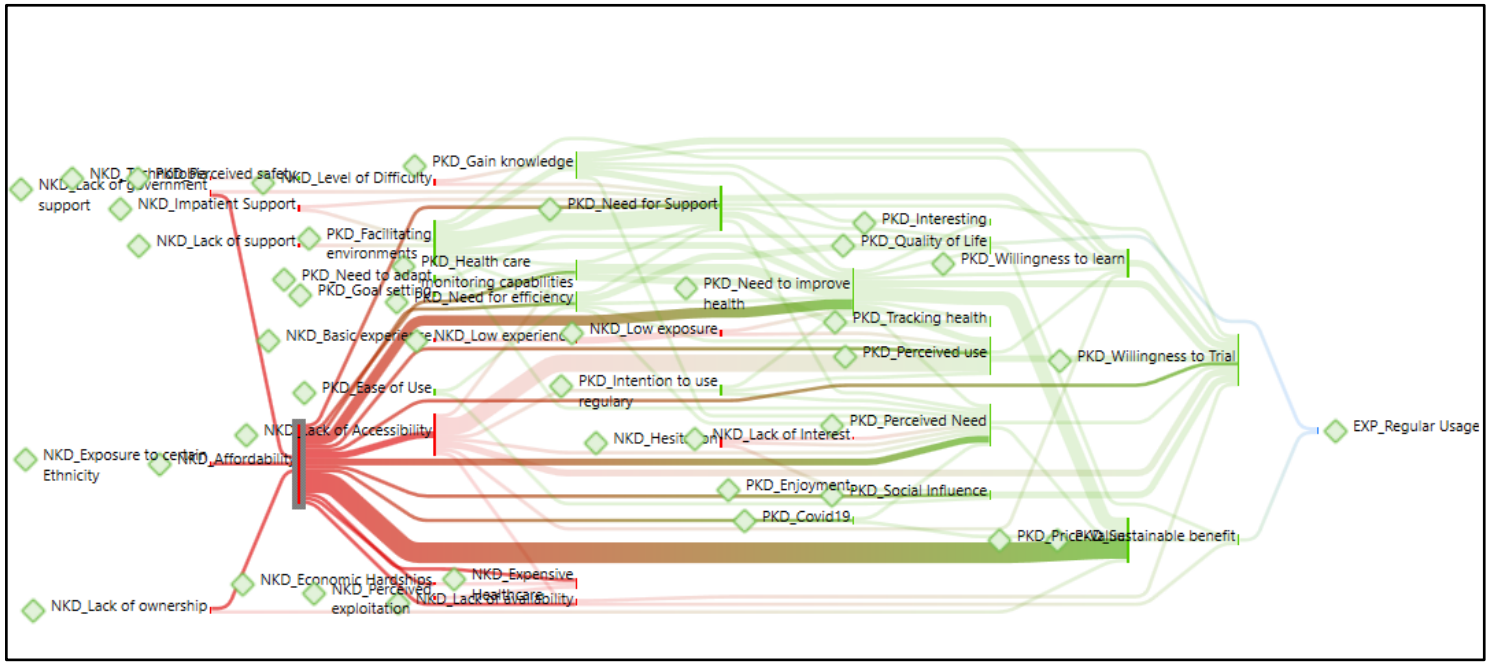
Significant findings from the interviews revealed that eight of the eleven participants openly recognised the gerontological issues of ageing within their environment. Furthermore, findings revealed that only three of the eleven participants are technologically supported within their community-dwelling aged environments.

4.5.3 Moderator differentiators to elderly technology adoption

As identified in previous chapters, Venkatesh *et al.*, (2012) argued that age, gender, and experience are vital in extending the generalizability of the UTAUT theory, particularly in the elderly environment, and are relevant to the findings of this study. The next chapter will further interpret the influence these differentiators have on the key moderators.

4.5.4 Negative findings towards technology

The following two sections are split between the negative and positive key determinants that have influenced the acceptance and adoption of technology by the elderly in the Western Cape. The following two Sankey diagrams in this study represent the flow between two sets using nodes and links. Depending on the width of each link, the thicker the band, the greater the value. Figure 4.9 visualises the factors with a negative high-influence flow.



Note: PKD =Positive Key Determinants ; NKD = Negative Key Determinants; EXP = Experience

Figure 4-9 Negative Determinants Sankey Diagram

The participant responses below reveal the key determinants of technology adoption. Tables 4-5 to 4-14 below provide negative key factor findings.

Table 4-5 represents the participants' responses linked to the affordability factor.

Table 4-5 Negative Factor - Affordability

Quotations	Code
And if I have the money, I can buy me something like that. And I can see take better care of my health [1:12 ¶ 41 in A_V11_Transcript).	**Affordability**
Yeah. This technology when I go to gym and I see the, the white people, they carry watches on the, in the, they always look. Look to their watch to check their blood pressure or their, their activity and so on. And then I say, yo, but those people got a lot of money. Now, that's the problem in South Africa [5:1 ¶ 13 C_J08_part2_Transcript).	
Technology is there, but people must, must, must put money in technology, you know, to help our elderly people [5:7 ¶ 9C_J08_part2_Transcript).	
F_S 01: It's a question of affordability. *Stanton: Do you think you could afford it?* *F_S 01: At the moment, I don't think so. Okay. I don't think so. The, uh, whole medical side, medical stuff has become so expensive now.* *F_S 01: 100%. And I don't really understand why.* (7:22 ¶ 73-76 in F_S01_Transcript)	

Table 4-6 below represents the participants' responses linked to the level of difficulty factor.

Table 4-6 Negative Factor - Level of Difficulty

Quotations	Code
I think it's something good. But, [00:02:00] sometimes for the elderly people, it's a little bit difficult (1:1 ¶ 6 in A_V11_Transcript).	**Level of difficulty**
C_S 10: But yeah, I'm well aware of my smartphone. But not all the functions; I can't do all the functions. I'm just doing the normal, you know, basic stuff on the telephone (*3:4 ¶ 11-12 in C_S10_Transcript*).	
D_D 06: experience with any Technology today for me, it's a little bit hard. It's a little bit struggling. I'm struggling with, but I'm open for learning (6:1 ¶ 8 D_D06_Transcript).	
F_M 04: We, it's nice to get something new. Because most of the times it's a major challenge (8:2 ¶ 6 F_M04_Transcript).	
*K_S 02: Yes, because the understanding, the older you get, you have wisdom that you can't always grasp for new things(*11:12 ¶ 49 in K_S02_Transcript).	

Table 4-7 below represents the participants' responses linked to the lack of accessibility factor.

Table 4-7 Negative Factor - Lack of Accessibility

Quotations	Code
C_S 10: Yeah, for sure. If it was sponsored or funded? Because it was more accessible and I am knowledgeable of it. Okay. You know, and by all means, I will use it (3:18 ¶ 69 in C_S10_Transcript)	**Lack of Accessibility**

Table 4-8 below represents the participants' responses linked to the hesitation factor.

Table 4-8 Negative Factor - Hesitation

Quotations	Code
J_G 07: I need to be in a good mental state at first. That will assist me go along going further with But using that [00:13:00] technology in, like you said, baby steps, maybe going forward (10:16 ¶ in J_G07_part2_Transcript).	**Hesitation**

Table 4-9 below represents the participants' responses linked to the lack of exposure factor.

Table 4-9 Negative Factor - Lack of Exposure

Quotations	Code
D_D 06: I will say I just saw it, but I never experienced that type of technology where I can use it (6:5 ¶ 29 in D_D06_Transcript).	**Lack of exposure**
Stanton: Okay, perfect But yourself you've never used wearable technology to monitor your heart rate or measure your steps? *K_S 02: Not yet, but I would be keen to* *Stanton: Do you think this could help maintain improve your quality of life?* *K_S 02: Yes* (11:9 ¶ 42-44 in K_S02_Transcript).	
P_M 09: Normally this stuff that you talk about now about how they how they monitor you normally must see this on on tv and yeah that is normally where I pick it up was the documentaries that I normally watch on tv so yeah but not see and not use it (13:13 ¶ 36 in P_M09_Transcript).	

Table 4-10 below represents the participant's responses linked to the lack of interest factor.

Table 4-10 Negative Factor - Lack of Interest

Quotations	Code
F_S 01: I, as I said just now, I, I, I, I haven't been interested in that. I've seen people wear them and I see the number of steps. I'm active enough. Okay. Uh, I got myself one if you want to check the weather. Okay. Weather doesn't really worry me in the first place (7:13 ¶ 36 in F_S01_Transcript).	**Lack of interest**

Table 4-11 below represents the participants' responses linked to the economic hardships factor.

Table 4-11 Negative Factor - Economic Hardships

Quotations	Code
C_J 08: Now I, I, I, I know how elderly people is suffering a lot in South Africa. It's, it's, it's, it's, it's bad to say it, but I, everywhere, every province (5:10 ¶ 24 in C_J08_part2_Transcript).	**Economic hardships**

Table 4-12 below represents the participants' responses linked to the expensive healthcare factor.

Table 4-12 Negative Factor - Expensive Healthcare

Quotations	Code
F_S 01: Okay. I don't think so. The, uh, whole medical side, medical stuff has become so expensive now. *F_S 01: 100%. And I don't really understand why (7:28 ¶ 75-76 in F_S01_Transcript).*	**Expensive healthcare**

Table 4-13 below represents the participants' responses linked to the lack of availability factor.

Table 4-13 Negative Factor - Lack of Availability

Quotations	Code
C_J 08: This technology is so good. If it comes to South Africa, I see in America on television if you see a, a, a, a quiet movie, then you see they use technology, the technology in their houses. Right (5:2 ¶ 14 in C_J08_part2_Transcript).	**Lack of availability**

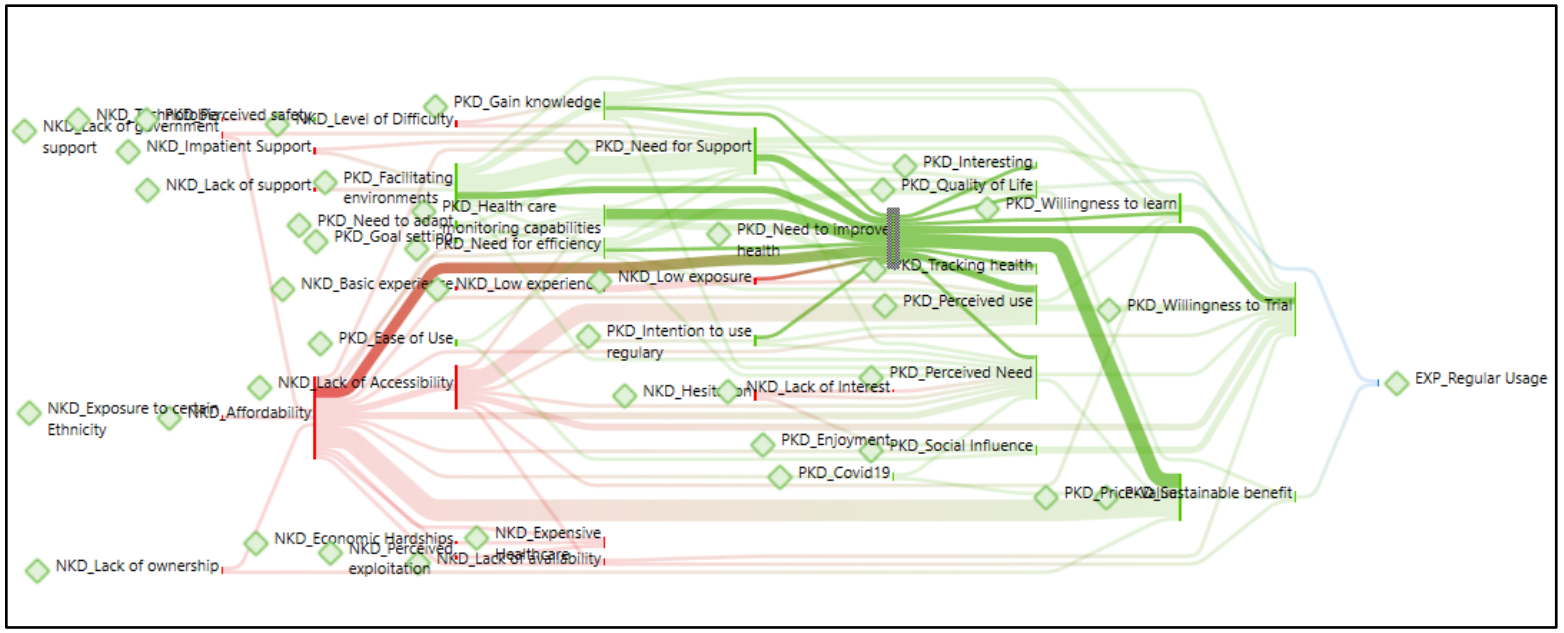
Table 4-14 below represents the participants' responses linked to the expensive healthcare factor.

Table 4-14 Negative Factor - Lack of Experience

Quotations	Code
C_J 08: Yeah, I'm not a man that, that is knowing much about technology. All I use as technology is my, my desktop computer. And then I thought the television [00:02:00] is also technology, but you may say, no, it's not technology (4:1 ¶ 7 in C_J08_part1_Transcript). *D_D 06: I will say I just saw it, but I never experienced that type of technology where I can use it* (6:5 ¶ 29 in D_D06_Transcript).	**Low experience**

4.5.5 Positive findings towards technology

The positive findings reveal that the strongest needs among participants, such as the need for health improvement and the need for support technology support, are the most significant positive factors in this study. Figure 4-10 visualises the factors with a positive high-influence flow.



Note: PKD =Positive Key Determinants ; NKD = Negative Key Determinants; EXP = Experience

Figure 4-10 Positive Determinant Sankey Diagram

Tables 4-15 to 4-33 below provide positive key factor findings. Table 4-15 below represents the participants' responses linked to the need to improve health factors.

Table 4-15 Positive Factor - Need to Improve Health

Quotations	Code
1:13 ¶ 41-42 in A_V11_Transcript *A_V 11: And I can see take better care of my health.* 1:14 ¶ 43 in A_V11_Transcript *A_V 11: Yes, I will use it. Okay. This, they need it. It's for myself. I will take better care of myself.* 1:18 ¶ 55 in A_V11_Transcript *can, I, I can. On this moment, I think if I had something like this, like that, I will think it will give me a better health.*	**Need to improve health**
2:16 ¶ 63 in AN_S05_Transcript *AN_S 05: Yes, but if I'm sick, I must use it every day. I can't, uh, ignore that thing. It's important for me, for my health. Okay,*	
3:20 ¶ 77 in C_S10_Transcript *C_S 10: Yeah, I would. I would pay for it if it was really that good. It's going to be a benefit to my health. I'm not going to pay for something that's not going to benefit my health.*	
5:21 ¶ 50 in C_J08_part2_Transcript *C_J 08: I know I'm, I'm a man who like to, to be healthy. If you go into that room, you will see I got loose weights there. to increase my health. I, I, I, I got it waits for many years and I practice there when I'm watching TV that I practice also. You can see in my body I look strong and so on because I believe in, in, in, in health and I wasn't sick for all my years.*	
6:8 ¶ 39-40 in D_D06_Transcript *D_D 06: Nobody showed me that before? And I would love to learn about that because I can hear that's going to be good for me, for my health.* *Stanton:*	
7:6 ¶ 16 in F_S01_Transcript *F_S 01: And, you know, what I feel with ageing is, uh, you need to be, keep your mind active and this helps very much with [00:04:00] that.*	
8:1 ¶ 5 F_M04_Transcript *F_M 04: Technology must be there. We have to go improve ourselves. So, I say that technology is interesting, uh, it is also, uh, helpful, um, Some of it is unnecessary in my industry. Um, but there must be technology. We don't have to stagnate in old ways.* 8:19 ¶ 57 F_M04_Transcript *F_M 04: No, I'm all for, you know, technology that has really, uh, health improvements, definitely.*	
10:6 ¶ 37 in J_G07_part2_Transcript *J_G 07: Definitely. It gives me an indication of where I am at [00:08:00] that*	

Quotations	Code
particular point with my so called fitness what I can do maybe to help and to To take it further.	
11:7 ¶ 29-32 in K_S02_Transcript *K_S 02: Does it cover sugar diabetes?* *Stanton: So, not, not at this point. Because I think with sugar diabetes you have to prick to get blood. But, uh, not at this point. I don't* *K_S 02: have it. It's just there's so many people that don't monitor and then they'll end up in a coma.* *K_S 02: For sure.*	
12:6 ¶ 31 in M_M03_Transcript *M_M03: And when I sit too much, like in church or wherever, then it says, you must move, get up and then it shows you.*	
13:18 ¶ 47-48 in P_M09_Transcript *P_M 09: If you knew yourself that this technology is going to improve your health, would you pay for it?* *P_M 09: For sure. Nothing can buy here. Health, so I, I, that is my motto in life. Doesn't matter how much it cost me. If I [00:13:00] can better my life and also give me a longer life span then definitely I will use it and I will buy it.*	

Table 4-16 below represents the participants' responses linked to the need for support factor.

Table 4-16 Positive Factor - Need for Support

Quotations	Code
A_V 11: So, when we ask people to help us with things, they laugh at us. And they don't answer. Patience. Patience. Okay. And then we must go to someone who can sit and then help us. And if we do that thing, you ask, it's very nice (1:2 ¶ 6 in A_V11_Transcript).	**Need for Support**
AN_S 05: Yes. I wonder if somebody can show me that because I'm not understand, uh, Uh, much of that *AN_S 05: thing of that technology* (2:10 ¶ 43-44 in AN_S05_Transcript].	
C_S 10: If perhaps something happens to me and the technology can assist me in getting help to me as quickly as possible. I wouldn't mind using it. And I think it will, will be of it will ease me to [00:15:00] know that someone will come and look at me. *C_S 10: If there's something wrong with me, put me at ease to know, okay this department or my brother or my sister or whoever is linked to that device will come and, and see what's going on. If it's something like that, by all means, let me know* (3:22 ¶ 83-84 in C_S10_Transcript).	

Quotations	Code
C_J 08: Correct. And it's, it's, it's things that can save a life. Bye. Bye. Yes, my life could be saved. Look, I, I, like I say the technology is needed for our elderly, but who going to pay for this technology? Who will see that the technology get used correctly? Like me, I'm now a diabetic, the diabetic guy (5:3 ¶ 15 in C_J08_part2_Transcript) *C_J 08: Technology is there, but people must, must, must put money in technology, you know, to help our elderly people* (5:7 ¶ 19 in C_J08_part2_Transcript). *C_J 08: Yeah. Slowly if it's available, then somebody must show me how I must operate it.* (5:8 ¶ 21 in C_J08_part2_Transcript).	
F_S 01: I belong to a club in Pretoria. Okay. And I enter competitions worldwide. Nice social connection. So, it's, uh, it's opened up the whole world for us. Perfect. Uh, as I said, I don't go into the fancy stuff on the phone. If I need something, something goes wrong, I take it to my son. And if he can't help me, I had a problem with the phone the other day, I go to Vodacom and fix it [7:5 ¶ 13 in F_S01_Transcript).	
K_S 02: So, somebody to help would be great (11:13 ¶ 51 in K_S02_Transcript).	
P_M 09: I try to live as, as, as close as possible to my, to my, to my son who is now with 25 years. *P_M 09: So, most of the stuff with that I didn't understand, I normally pick up with him. And that helps me a lot. And yeah, I'm that such of guy that if I don't understand something, I'm not shy to ask. And ask, help, and ask how it works, and then Try to do it on my own. So, this is how I normally pick up how to make use of all these technologies* (13:4 ¶ 8-9 in P_M09_Transcript). *P_M 09: Sometimes it's difficult, sometimes stuff, some stuff is difficult, but as I say that normally I ask my keepers, how, how it works. And then I try it on my own and then it works* (13:8 ¶ 15 in P_M09_Transcript).	

Table 4-17 below represents the participants' responses linked to the willingness to trial factor.

Table 4-17 Positive Factor - Willingness to Trial

Quotation	Code
AN_S 05: I will use it when it was sponsored or funded them. Oka. (2:12 ¶ 48 in AN_S05_Transcript).	**Willingness to Trial**
Yeah. Slowly if it's available, then somebody must show me how I must operate it (5:8 ¶ 21 in C_J08_part2_Transcript).	
D_D 06: I will definitely use it and I will definitely love someone to sponsor something like that because I [00:10:00] can see that it will be a good thing for elderly people (6:9 ¶ 44 in D_D06_Transcript).	
F_M 04: Oh, I'm always prepared, Jim. If you try out something that can do, make improvements (8:20 ¶ 63 in F_M04_Transcript).	
J_G 07: I would definitely use it. I mean, will we improve my lifestyle (10:10 ¶ 47–48 in J_G07_part2_Transcript).	

Table 4-18 below represents the participants' responses linked to the gaining knowledge factor.

Table 4-18 Positive Factor - Gain Knowledge

Quotation	Code
AN_S 05: experience with the technology is like, uh, It is something good for the people and we learn a lot of that (*2*:1 ¶ 8–9 in AN_S05_Transcript)	**Gain knowledge**
C_S 10: I need to know all that stuff. Okay. Because I'm alone. Sometimes I'm alone. My son is not with me. I need to know what to do. So, yeah. I'm quite up to, to date with all these new things (3:6 ¶ 18 in C_S10_Transcript). *C_S 10: Yeah, I think it would be interesting to know. And how you can, you know, how you can use it to your advantage. I know it's there, but I never, you know, make use of it to see what's it going to be to me. Okay. So, yeah* (3:17 ¶ 66 in C_S10_Transcript).	
C_J 08: I can, I know how to look up for, if I need something to know about my health or if I get some medicine from the doctor that I see the name of the medicine on Google, I, I see what, what does it do for you? Is it good? Because sometimes you get medicine, but then it's not. Good for you. Or, or you, you want to know what you drink? (4:4 ¶ 13 in C_J08_part1_Transcript). *C_J 08: So, I read a lot about books on technology on the on the web.* *C_J 08: Which helps me a lot to better my mind. Right* (4:6 ¶ 16 – 17 in C_J08_part1_Transcript)	
J_G 07: I am aware [00:06:00] of it. I like to read up about it when I see something is bubbling under. When I also my my knowledge, I'd like to expand by, like I said, like by reading up stuff, like especially AI also. I've read about a case about AI where this robot is instructing this robot, not the robot, this thing from the screen of that person (10:2 ¶ 25 in J_G07_part2_Transcript).	

Table 4-19 below represents the participants' responses linked to the social influence factor.

Table 4-19 Positive Factor - Social Influence

Quotation	Code
Stanton: Would you get anybody else in your social circle to use it and, and, and test it with you? A_V 11: If I can speak with them and tell them what it's doing for me, they will use it (1:15 ¶ 44–45 in A_V11_Transcript).	**Social Influence**
AN_S05: Yes, I will, I will share it with them. I will share it with them. Okay. And talk about this, the new technology of the watch (2:13 ¶ 51–52 in AN_S05_Transcript),	
C_S 10: I think so, but most of my social circles are younger than I am, you know. *C_S 10: They're also going to* *C_S 10: get old one day. I just, I've got two older brothers at the back. So maybe I will you know, introduce them to it as well* (3:19 ¶ 71–73 in C_S10_Transcript),	
C_J 08: Yeah, look, I belong [00:17:00] to a men's choir, Manakur. I can, I can show all, all the guys that they can go and shows all the, because the mother quarter, the men's choir is all, all people older than 60 and they all need it shows deaf. Their wives are also most probably over 60. Like my wife also will be within a few months in May, she will be 65. *C_J 08: I'm 65. She will be 65 in May. So, I will introduce it to a lot of people, my family, my sisters. I mean, but I must tell you the family got no money. I must be open and speak openly to you, Mr. Stanton is no good. I will say, bring the technology. Then you come here. Then you say, [00:18:00] Mr. Jacob, that is only three and a half thousand rent.* *C_J 08: I, I must send you away then* (5:19 ¶ 44–46 in C_J08_part2_Transcript).	
D_D 06: I will definitely mobilize older people to go to talks like that, to know more about the new technologies (6:10 ¶ 47 in D_D06_Transcript).	
F_S 01: For photography. So, that side of the technology I use. Okay. Uh, you need in society, uh, I joined, I belong to a photographic club. And technology has made that a lot easier (7:3 ¶ 12 in F_S01_Transcript).	
J_G 07: So, yes, I'm using it to great advantage, not, not only for myself, like I said, but for the community as well. Okay (9:11 ¶ 19 in J_G07_part1_Transcript), *J_G 07: I enjoy it. I, I mean, it's a, it's a, it's a big help. It's a big help to use, so, so that I can be informative of younger generation, people around me maybe talk about it or I conversations relating to that.* *J_G 07: So yeah, I enjoy it* (10:8 ¶ 42 – 43 in J_G07_part2_Transcript).	

Quotation	Code
K_S 01: Yes, I'd say to [00:12:00] my friend, you haven't got one, um, What about this? It's absolutely fabulous. I know we all want to wear a nice watch, but there's nothing wrong with that because that is the modern way of doing it. K_S 02: And this is attractive to people who want to run and grab it. And maybe that's not so attractive to them. And from a safety perspective, it might also be better (11:15 ¶ 54 – 55 in K_S02_Transcript).	

Table 4-20 below represents the participants' responses linked to having health care monitoring capabilities.

Table 4-20 Positive Factor - Healthcare Monitoring Capabilities

Quotation	Code
C_S 10: If perhaps something happens to me and the technology can assist me in getting help to me as quickly as possible. I wouldn't mind using it. And I think it will, will be of it will ease me to [00:15:00] know that someone will come and look at me. *C_S 10: If there's something wrong with me, put me at ease to know, okay this department or my brother or my sister or whoever is linked to that device will come and, and see what's going on. If it's something like that, by all means, let me know* (3:22 ¶ 83–84 in C_S10_Transcript).	**Health care monitoring capabilities**
F_S 01: No, look, we, we only use those, uh, uh, units while we were exercising. Okay. To check, uh, for argument's sake, when you start, uh, in, in, in, with the, uh, spinning cycles, you warm up first, get your, your, uh, uh, Heart rate, get that going, and then see, uh, at what, when you start getting, put a bit of pressure on, and get a bit of speed up, and see how, uh, how your [00:10:00] heart rate reacts (7:15 ¶ 42 in F_S01_Transcript).	
J_G 07: Definitely. It gives me an indication of where I am at [00:08:00] that particular point with my so called fitness what I can do maybe to help and to to take it further (10:6 ¶ 37 in J_G07_part2_Transcript).	
K_S 02: Today we used a blood pressure machine here at home because I am a, I had a heart attack and so on. So I [00:03:00] wasn't feeling well this morning and we used the blood pressure machine which is also technology (11:3 ¶ 11 in K_S02_Transcript). *K_S 02: If I didn't have that machine this morning, I wouldn't Know if my blood pressure was right or not get the headache and then you realize and it turned out forgot to take my pills this morning* (11:10 ¶ 46 in K_S02_Transcript).	
And then you can also feel when your heart rate is, you know, maybe there's somebody that can see you. *M_M 03: And then you take a look and then you realize that, uh, it's elevated.* *Stanton: Yes. Correct.* *M_M 03: You know, way too high or whatever. And that alerts you to calm yourself down.* (12:8 ¶ 34–38 in M_M03_Transcript).	

Table 4-21 below represents the participants' responses linked to the price-value factor.

Table 4-21 Positive Factor - Price-Value

Quotation	Code
Stanton: So, if you knew that this type of technology or a piece of technology out there can [00:11:00] improve your health and it was really good, would you pay for it? *A_V 11: If, if, if it's for me and if it's for my health or a better life, I will. You would pay? If I can afford* it (1:16 ¶ 47–49 in A_V11_Transcript).	**Price-Value**
Yeah, I would. I would pay for it if it was really that good. It's going to be a benefit to my health. I'm not going to pay for something that's not going to benefit my health (3:20 ¶ 77 in C_S10_Transcript).	
D-D 06: I will pay for it. Yes. Well, I will pay for it. To have my own. Yes, I will definitely do that. Okay (6:11 ¶ 49 in D_D06_Transcript).	
J_G 07: Sure, I will pay for it. If I have the money, I will pay for it, yes. Technology is the way to go. I mean, if I can help myself firstly and then out of that I can help somebody else, like I said numerous times now, I'm sure I will do it (10:14 ¶ 57 in J_G07_part2_Transcript).	

Table 4-22 below represents the participants' responses linked to the enjoyment factor.

Table 4-22 Positive Factor - Enjoyment

Quotation	Code
Stanton: Okay. Do you enjoy using the technology? *A_V 11: Of course, I enjoy it because I can do it in my home*	**Enjoyment**
*C_J 08: I enjoy using it, yes, because it gives you [00:05:00] a (*1:5 ¶ 13 – 14 in A_V11_Transcript *).lot of options. It's not only one option it gives you.* *C_J 08: 20 to 50 options so you can go through and you and your wife can discuss, me and my wife discuss it always and say no, let me go to that one or to that one* (4:7 ¶ 21–22 in C_J08_part1_Transcript).	
J_G 07: I am enjoying it. I am using it. To good value here in the community where I am at the Newtown Service Centre for the Elderly. I'm [00:04:00] their treasurer and I'm helping them and I'm assisting them with keeping their books up and running to applications, to to the lotto, stuff like that, you know (9:10 ¶ 18 in J_G07_part1_Transcript).	
Stanton: Do you enjoy using the technology? [00:08:00] *M_M 03: technology. For sure. It just, I think it, it helps you to realize you need that because it makes you aware of things that you were never aware of. How many steps do you do during the day? You know, I think it's awesome. It's absolutely awesome. Wonderful* (12:7 ¶ 33–34 in M_M03_Transcript).	

Table 4-23 below represents the participants' responses linked to the facilitating environments factor.

Table 4-23 Positive Factor - Facilitating Environments

Quotation	Code
C_S 10: If perhaps something happens to me and the technology can assist me in getting help to me as quickly as possible. I wouldn't mind using it. And I think it will, will be of it will ease me to [00:15:00] know that someone will come and look at me. *C_S 10: If there's something wrong with me, put me at ease to know, okay this department or my brother or my sister or whoever is linked to that device will come and, and see what's going on. If it's something like that, by all means, let me know* (3:22 ¶ 83 – 84 in C_S10_Transcript).	**Facilitating environments**
F_S 01: I belong to a club in Pretoria. Okay. And I enter competitions worldwide. Nice social connection. So, it's, uh, it's opened up the whole world for us. Perfect. Uh, as I said, I don't go into the fancy stuff on the phone. If I need something, something goes wrong, I take it to my son. And if he can't help me, I had a problem with the phone the other day, I go to Vodacom and fix it (7:5 ¶ 13 in F_S01_Transcript).	

Table 4-24 below represents the participants' responses linked to the perceived usefulness factor.

Table 4-24 Positive Factor - Perceived Usefulness

Quotation	Code
F_S 01: And if I have a serious problem with the bank, I've got a bank I can phone. *F_S 01: Okay. He's in East London, but I can find him. Okay. So, that's as far as that technology is, it's very [00:05:00] useful, yeah* (7:10 ¶ 22–23 in F_S01_Transcript).	**Usefulness**
it is definitely very useful on my age (13:9 ¶ 15 in P_M09_Transcript).	

Table 4-25 below represents the participants' responses linked to the need for efficiency factor.

Table 4-25 Positive Factor - Need for Efficiency

Quotation	Code
But if we had this technology like we have now, like an email and a fax or SMS, it should have cut out a lot of unused time (4:9 ¶ 23 in C_J08_part1_Transcript).	**Need for efficiency**
K_S 02: Oh, yes. It's so much easier than, um, trying to catch it on the radio. If you've missed that particular time slot, your phone is, is amazing in that regard (11:5 ¶ 14 in K_S02_Transcript).	

Table 4-26 below represents the participants' responses linked to the willingness to learn factor.

Table 4-26 Positive Factor - Willingness to Learn

Quote	Code
D_D 06: Definitely. *D_D 06: Definitely. If I can learn more about it* (6:7 ¶ 35–36 in D_D06_Transcript). *Nobody showed me that before? And I would love to learn about that because I can hear that's going to be good for me, for my health* (6:8 ¶ 39–40 in D_D06_Transcript).	**Willingness to learn**

Table 4-27 below represents the participants' responses linked to the quality-of-life factor.

Table 4-27 Positive Factor - Quality of Life

Quotation	Code
C_J 08: Yeah, look buddy, the very important thing is, you know, if, if technology increase and better your lifestyle and your living, then, then you will take that technology. You will take it, whatever. And you know, it's not a once off thing. It must be for your life, for your whole life, you must use it. Like I'm practicing (5:24 ¶ 56 in C_J08_part2_Transcript).	**Quality of Life**
K_S 02: So yes, why should I have to ride so far when I, if I've got technology that can support. *K_S 02: Me and and make my life better (*11:19 ¶ 60–61 in K_S02_Transcript). *K_S 02: But once you've had it on, if it's a watch or whatever it might be, and you've seen that it works and it does make a, an impact on your life, I think that's the way that for us, for the future* (11:21 ¶ 72 in K_S02_Transcript).	

Table 4-28 below represents the participants' responses linked to the sustainable benefit factor.

Table 4-28 Positive Factor - Sustainable Benefit

Quotation	Code
D_D 06: I will say I will use it regularly because I think it's good for my body, it's good for my health and can alert me long before something would happen to me. *D_D 06: That's why I will use it the whole time* (6:13 ¶ 55–56 in D_D06_Transcript).	**Sustainable benefit**

Table 4-29 below represents the participants' responses linked to the factor of intention to use technology regularly.

Table 4-29 Positive Factor - Intention to Use Regularly

Quotation	Code
A_V 11: I will, I think I will use it every day (1:17 ¶ 51 in A_V11_Transcript).	**Intention to use regularly**
*AN_S 05: Yes, but if I'm sick, I must use it every day. I can't, uh, ignore that thing. It's important for me, for my health. Okay (*2:16 ¶ 63 in AN_S05_Transcript).	
C_S 10: If it can benefit me, I will use it and not throw it to the side, you know. By all means, I will use it (3:21 ¶ 80 in C_S10_Transcript).	
P_M 09: as soon as it is available and it is tested and approved that there's no they call it negative effects or side effects on my health. *P_M 09: And they will immediately start using it (*13:20 ¶ 51–52 in P_M09_Transcript).	

Table 4-30 below represents the participants' responses linked to tracking health.

Table 4-30 Positive Factor - Tracking Health

Quotation	Code
F_M 04: Yes. Okay. I'm in such a mode already, I, I test in the morning, or if I've had breakfast. *F_M 04: I have a test, uh, uh, lunchtime after I've had lunch, and I've, and supper time after supper. And then, we've got used to going to bed at nine, and half past nine, but later than ten, because then I use a different injection for the night, because it's a longer lasting injection. Um, that one is, I've got a little bit of a hassle with, uh, Because my sugar is sometimes quite low, [00:13:00] 10 o'clock or half past 9.* *F_M 04: Then I don't, I normally inject 90, uh, parts, uh, when it's, when it's like 10. But then some evenings it's like 5, 5. 2. And I don't know how to work it out, and I, Only inject 49 or nine 50 and then know, I I, it takes me through the night. I've, I haven't had for a long time where I wake up and my feet is like, thing like this* (8:15 ¶ 43 – 45 in F_M04_Transcript).	**Tracking health**

Table 4-31 below represents the participants' responses linked to the influence of Covid19.

Table 4-31 Positive Factor - Covid19

Quotation	Code
C_S 10: I had to buy one when I got Covid to monitor myself (3:10 ¶ 31 in C_S10_Transcript).	**Covid19**
it's just that my son used something like this when, you know, when the COVID was bad. (7:11 ¶ 28 in F_S01_Transcript).	

Table 4-32 below represents the participants' responses linked to the goal-setting factor.

Table 4-32 Positive Factor - Goal Setting

Quotation	Code
F_M 04: *it's there to help her have a better quality. Before she goes to bed, she'll go, what? I've done 4, 000 steps today. 5, 000 steps* (8:12 ¶ 32 in F_M04_Transcript).	**Goal setting**
K_S 02: to, to the elderly. Oh yes, yes. I like the measuring the steps thing. Because we walk all the time. All the time. And I'd like to know how many steps I walked. Just for interest (11:8 ¶ 37 in K_S02_Transcript).	

Table 4-33 below represents the participants' responses linked to the ease-of-use factor.

Table 4-33 Positive Factor - Ease of Use

Quote	Code
9:5 ¶ 9 in J_G07_part1_Transcript *Like I was helping her this morning with an app at the, [00:02:00] at the at the bank. and how things work, how you can pay out of apps every, I mean you can do your business from the apps and so on* (2:6 ¶ 21 in AN_S05_Transcript).	**Ease of Use**

Table 4-34 below represents the participants' responses linked to the safety factor.

Table 4-34 Ambivalent Factor - Safety

Quotation	Code
AN_S 05*: it's more, um, safe. Okay. For the people to go to the bank. We can do editing on, on the phone. And so, and that is a good thing* (2:6 ¶ 21 in AN_S05_Transcript).	**Perceived safety**
C. S *10:I do. But sometimes it And people, what do they do?* C_S 10: *They hack into your phones? It happened to me. So, I'm very, you know, cautious. Cautious about doing specifically the bank things on my phone. Because they hacked into my account. And I, I lost some money. So yeah. Okay. That [00:04:00] is the scary part of technology* (3:7 ¶ 20–21 in C_S10_Transcript).	**Safety**

4.6 Summary

Chapter 4 presents a detailed analysis and findings for this research and reflects on the interpretivism foundations of the study. The chapter commences with the introduction and key research focuses, followed by the context of the study.

The data collection efforts involved recruiting elderly people 60 years and above who reside in the Western Cape. Consideration was given to gathering vibrant responses from middle to lower-socio-economic communities. Recruitment for potential participants took place from January 2024 to October 2024. The participants were subjected to semi-structured interviews involving 5 main questions

The first column of Table 4-35 concretises the five emergent themes synthesised during data analysis findings (Section 4.5). This process was supported by qualitative data analysis capabilities offered by *ATLAS.ti*™. Column two sets out 83 categorised codes gleaned from participant feedback.

Table 4-35 Full List of Emergent Themes and Associated Codes

Themes	Codes
Theme 1: Experience with Technology (four codes)	• AI Awareness • Regular Usage • Technology Awareness • Technology exposure
Theme 2: Influencing Types of Technology (five codes)	• Assistive Technology • ICT • Robotics • Sensor Technology • Wearable Technology
Theme 3: Within the Aged Environment (two codes)	• Gerontology • Support
Theme 4: Negative Perceptions Towards Technology (25 codes)	• Affordability • Basic experience • Cause of Frustration • Economic Hardships • Expensive Healthcare • Exposure to certain Ethnicity • Hesitation • Impatient Support • Lack of Accessibility • Lack of availability • Lack of formal training • Lack of funding • Lack of government support • Lack of Interest • Lack of ownership • Lack of support • Lack of understanding • Level of Difficulty • Low experience • Low exposure • Low usage • No enjoyment • No exposure • Perceived exploitation • Technophobia

Theme	Code
Theme 5: Positive Perceptions Towards Technology (47 codes)	• Attractive • Benefit • Covid19 • Defined purpose • Ease of Use • Enjoyment • Facilitating environments • Fascination • Forced usage • Gain knowledge • Goal setting • Healthcare importance • Healthcare monitoring capabilities • Health care value • Health tech exposure • Improving the way of life • Individual influence • Influence

Theme	Code
Theme 5: Positive Perceptions Towards Technology Continued (47 codes)	• Intention to use regularly • Interesting • Need for efficiency • Need for mind stimulation • Need for support • Need to adapt • Need to be notified • Need to improve health • Patient-to-doctor familiarity • Perceived importance • Perceived need • Perceived safety • Perceived use • Positive attitude • Positive attitude • Price-value • Providing support • Quality of Life • Social Inclusion • Social Influence • Sustainable benefit • Technology improvements • Tracking health • Usability • Usefulness • User-friendly • Varying options • Willingness to learn • Willingness to trial

Considering the 6 steps of the thematic analysis approach, a report was created from the participants' responses from both socio-economic community cases. It revealed that many elderly people adopted newly introduced technologies and their experiences thereof, as well as positive and negative perceptions about technology and the findings that exist in an elderly environment. These findings were presented with quotations from the participating elderly individuals and graphically summarised.

The findings for this chapter conclude with a summary of the key factor findings derived from 5 themes representing positive and negative key determinants, types of technology exposure and technology experiences of the elderly, as well as issues related to the aged environments. There are five themes comprising 83 codes (Table 4-35) from 11 participants. Three participants' data were omitted from the study. The next chapter will interpret and discuss the findings presented in Chapter 4

5 CHAPTER FIVE: DISCUSSION AND INTERPRETATION

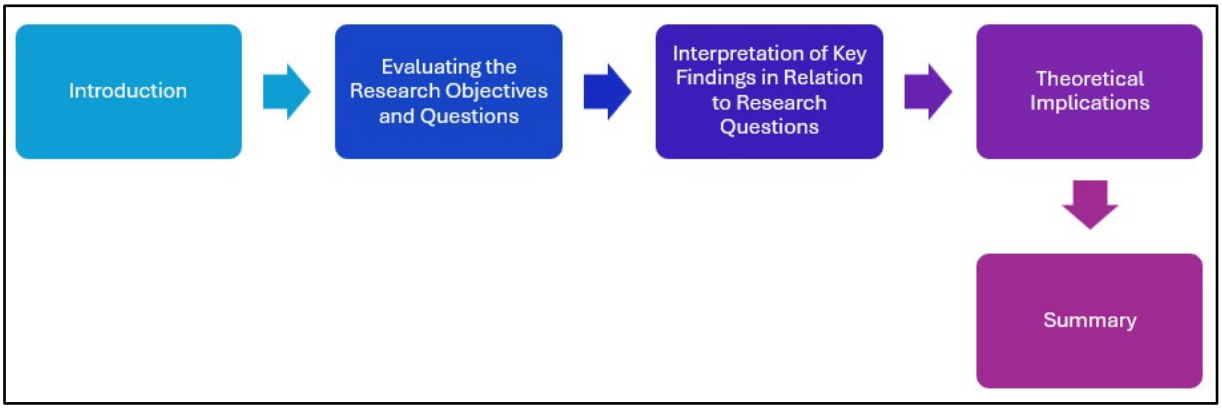


Figure 5-1 Chapter Five Outline

5.1 Introduction

This chapter will discuss and interpret the findings of the analysis conducted on the data in the previous chapter, received from the interviews conducted within two middle and lower socioeconomic communities of the Cape Town region in the Western Cape.

This study aims to explore the factors that can influence the acceptance and adoption of Gerontechnology amongst the community-dwelling elderly in the Western Cape and thus gain an understanding of the elderly's perceptions of using technology in aged environments to improve their quality of life.

This Chapter is divided into 5 areas of discussion related to the themes exposed in the previous chapter.

5.2 Evaluating the Research Objectives and Questions

The primary objective of this research is to explore the factors influencing gerontechnology adoption among community-dwelling elderly individuals in the Western Cape. By exploring these factors, the study reveals what the elderly perceive as influential factors in adopting technology. These factors either promote or hinder the acceptance and adoption of gerontechnology.

The secondary research questions below focus on understanding the barriers, enablers, and overall perceptions related to gerontechnology.

- **SRQ1**: What are the key determinants influencing the adoption of gerontechnology by community-dwelling elderly in the Western Cape?
- **SRQ2**: How do key moderators, such as performance expectancy, facilitation conditions, social influence, and price-value influence the adoption of gerontechnology?

By providing answers to the above questions, conclusions around the main question (MRQ) of this research will be provided:

- **MRQ:** How can the key acceptance and adoption perceptions of the elderly influence how technology is accepted within elderly environments in the Western Cape?

By providing interpretations from the findings, the study provides answers to the main question, thus providing an understanding of the perceptions that influence community-dwelling elderly people in the Western Cape.

5.3 Interpretation of Key Findings in Relation to Research Questions

5.3.1 Aged Environments of the Community-dwelling Elderly

The Oxford meaning for “environment” is the surroundings or conditions in which a person, animal, or plant lives and the “external conditions in general affecting the life” (Oxford English Dictionary, 2023). The aged environment is not restricted to just the buildings (Kort, 2018) in which the elderly inhabit but also the gerontological conditions (Ozsungur 2019) they are subjected to as they age and the type of care and technical support relevant to their conditions and the devices they operate with.

Although this study did not focus on exposing the specific types of gerontological issues that each elderly participant is subjected to, the elderly participants were open to discussing the existing ailments. However, as the researcher deems this information to be personal and private, it must only be highlighted that this does exist within their ageing environments.

5.3.2 Elderly Experience with Technology

The elderly’s experience is highly subjective and often based on historical experiences. There are many instances where the participant’s experience has derived from their previous work

environments, family members or social circles, which creates awareness or ideally exposes them to different technologies.

> *"That is correct. Like I said, I was a project manager in my work time. So, IT project manager." (9:7 ¶ 11 – 12 in J_G07_part1_Transcript)*

> *"I had to use it when I had Covid. Correct. And I'm a nurse, so I need to know what it is." (3:9 ¶ 26 in C_S10_Transcript)*

"We use phones, we use the computers and things. Computers came way back. You know, we were not born in the time of computers. Right. So, when I first had to get my degree, all of a sudden, everything I needed to do was on the computer. Right. So, my younger sister helped me with a crash course in technology and all of that. " (3:1 ¶ 6 in C_S10_Transcript)

> *"I got a lady friend that have such one and she normally shows me, see my blood pressure, you know, that, this is a total of steps that I do for the day up to now." (13:14 ¶ 39 in P_M09_Transcript)*

The findings have revealed that ICT devices remain the technology of choice; however, some elderly people have been exposed to smartwatches, either directly or indirectly.

> *"Uh, I, uh, we're exposed to all levels and different types of technologies. Uh, the first obviously is computers. Cell phones, mainly. And, uh, things around, mainly around computers and uh, cell phones. Uh, I, uh, definitely do not probe into all the different types of technologies. I, use what I need. (7:1 ¶ 8 in F_S01_Transcript)*

> *"Cell phones. Cell phones. Okay. Digital watches are also... Ah, smartwatches. Smartwatches. That's nice. And, um, what's it? Internet. Internet is good, yeah." (2:2 ¶ 11 – 12 in AN_S05_Transcript)*

Sensor technology exposure has enabled some elderly people to monitor their ailments, especially during visits to the hospital. However, assistive technology remains elusive to the elderly, and the potential benefits of these technologies are not being realised within their own homes and communities (Peterson, 2014; Gutman *et al.*, 2021; Sanchez *et al.*, 2024).

5.3.3 Perceptions Towards Technology

The results uncovered from the data represent both positive and negative key determinants that influence accepting and adopting gerontechnology. The following sections are key to addressing the first sub-question in the research. The negative influences will be first addressed.

5.3.3.1 Negative Perceptions

The negative key determinants that predominantly emanate from the findings revealed strong factors for discussion.

5.3.3.2 Affordability

This study recognises affordability as a key influence in the elderly acquiring technology for health improvement needs. This is confirmed by the study by Peek *et al.*, (2014).

> *"It's a question of affordability. Do you think you could afford it? At the moment, I don't think so. Okay. I don't think so. The, uh, whole medical side, medical stuff has become so expensive now. And I don't understand why." (7:22 ¶ 73 – 75 in F_S01_Transcript)*

This is indicative of the economic hardships experienced by the lower socio-economic communities because of the legacy of apartheid (Tanyi & Pelser, 2019). The current state of expensive healthcare experienced by the elderly in middle socio-economic communities of South Africa has also had an impact (Young, 2016; Ballot, 2021).

5.3.3.3 Complexity of Technology

The elderly struggle with the difficulties experienced with some technology. This supports findings from several studies (Liu & Joines, 2020; Pal *et al.*, 2018; Jo & Hwang, 2021).

> *"Experience with any Technology today for me, it's a little bit hard. It's a little bit of a struggle, I'm struggling with it, but I'm open to learning. " (6:1 ¶ 8 in D_D06_Transcript)*

Hesitation to use certain features of the technology was also acknowledged as a negative key determinant (Osman *et al.*, 2020).

5.3.3.4 Accessibility

The lack of accessibility of technologies corroborates with the findings of O'Connell *et al.*, (2018), especially for the elderly in remote lower socio-economic communities, which negatively influence adoption.

> *"If it was sponsored or funded? Because it was more accessible, and I am knowledgeable of it " (3:18 ¶ 69 in C_S10_Transcript)*

Major strides evident in the literature review show that Gerontechnology efforts by government and private institutions are a high focus. However, South Africa struggles to stay within range of global innovations, and this has an impact on the elderly. The findings reviewed show the elderly are willing to try gerontechnology interventions. The lack of interest in more modern gerontechnology, i.e., assistive technologies, is potentially a direct result of the lack of accessibility, availability, and exposure.

5.3.4 Positive Perceptions

The data reveals many positive influences. Many elderly have a perceived need for technology (Peek *et al.*, (2014)

5.3.4.1 Perceived Need

The elderly will adopt technology that addresses their needs. One predominant need, as an extension to the Peek *et al.* (2014) study, is centred around the need to improve their health, with the recent pandemic Covid19 being a strong motivator.

> *"Yes, but if I'm sick, I must use it every day. I can't, uh, ignore that thing. It's important for me, for my health. Okay" (2:16 ¶ 63 in AN_S05_Transcript)*

> *"Nobody showed me that before? And I would love to learn about that because I can hear that's going to be good for me, for my health" (6:8 ¶ 39 – 40 in D_D06_Transcript)*

The elderly will adopt technology if it can be supported. Support can be provided by informal caregivers who may have an aptitude for technology and are willing to undergo training from the institutions that provide gerontechnology. This is preferential to the elderly, as these

persons have a direct relationship with and provide care to the elderly. The institutions also have a responsibility to provide or establish facilitating conditions for technical training.

> *"So, when we ask people to help us with things, they laugh at us. And they don't answer. Patience. Patience. Okay. And then we must go to someone who can sit and then help us. And if we do that thing (referring to the use of the technology), you ask, it's very nice (1:2 ¶ 6 in A_V11_Transcript)*

The technology that the elderly operate must provide efficiency to their daily routine.

> *"Oh, yes. It's so much easier than, um, trying to catch it on the radio. If you've missed that particular time slot, your phone is amazing in that regard" (11:5 ¶ 14 in K_S02_Transcript)*

5.3.4.2 Support

Another predominant need is support during the use of gerontechnology to maintain social interaction, and healthcare needs corroborate with the Wilkowska et al. (2020) study. Support is a key influence and is indicative of the facilitating conditions that must be established to allow the elderly to trial health technologies.

> *"If I need something, something goes wrong, I take it to my son. And if he can't help me, I had a problem with the phone the other day, I go to Vodacom and fix it." (7:5 ¶ 13 in F_S01_Transcript)*

These environments will support the elderly in gaining knowledge about gerontechnology solutions and further sharing their experiences within their social environments.

5.3.4.3 Enjoyment

Being able to enjoy the technology is a key determinant to adopting gerontechnology.

> *"I am enjoying it. I am using it. To good value here in the community where I am at the Newtown Service Centre for the Elderly. I'm their treasurer, and I'm helping them, and I'm assisting them with keeping their books up and running to applications, to the lotto, stuff like that, you know" (9:10 ¶ 18 in J_G07_part1_Transcript)*

> *"For sure. It just, I think it, helps you to realise you need that because it makes you aware of things that you were never aware of. How many steps do you do during the day? You know, I think it's awesome. It's absolutely awesome. Wonderful." (12:7 ¶ 33 – 34 in M_M03_Transcript)*

The elderly are more likely to adopt gerontechnology if they find it enjoyable and easy to use, especially when it can be used within the familiar setting of their own homes. This study confirms that the hedonic motivating attributes discovered are centred on a variety of functionalities that technologies provide (Peek *et al.*, 2014).

5.3.4.4 Health Monitoring Capabilities

This study confirms that the elderly accept technology with health monitoring features, such as tracking health and the ability to set goals, as identified in the Mejia *et al.* (2020) study.

> *"Definitely. It gives me an indication of where I am at that particular point with my so-called fitness and what I can do maybe to help and to take it further." (10:6 ¶ 37 in J_G07_part2_Transcript)*

> *If I didn't have that machine this morning, I wouldn't know if my blood pressure was right or not get the headache and then you realise… and it turned out that I forgot to take my pills this morning" (11:10 ¶ 46 in K_S02_Transcript)*

Should health monitoring features be available in a device, the elderly will adopt and use gerontechnology regularly.

5.3.4.5 Social Inclusivity

This study confirms that for the elderly to remain independent, a pivotal factor is to continue being social. Being social eliminates loneliness and provides the elderly with a sense of well-being and inclusivity (Wang and Sun, 2016). The elderly potentially use technology to gain knowledge and share experiences collectively.

> *"Yes, I will share it with them. I will share it with them. Okay. And talk about this, the new technology of the watch" (2:13 ¶ 51 – 52 in AN_S05_Transcript)*

Having gained knowledge and experience in the use of technology that potentially can improve the quality of life, the elderly want to remain socially inclusive by sharing their experiences.

5.3.5 Ambivalent Perceptions Towards Technology

Although this study does not uncover a strong determinant, it confirms that this factor remains relevant to the adoption of technology. The factor of safety is evident as a positive and negative factor of accepting and adopting technology.

> *"it's more, um, safe. Okay. For the people to go to the bank. We can do anything on the phone. And so, and that is a good thing" (2:6 ¶ 21 in AN_S05_Transcript)*

> *"But sometimes it and people, what do they do? They hack into your phones. It happened to me. So, I'm very, you know, cautious. Cautious about doing specifically the bank things on my phone. Because they hacked into my account, and I lost some money. So yeah. Okay. That is the scary part of technology" (3:7 ¶ 20 – 21 in C_S10_Transcript)*

These findings corroborate the factor of geronsafety, whereby safety considerations are imperative to the overall development of technologies and the application of these technologies to social services. (Pinto *et al.*, 2000; Le Deist & Latouille, 2016; Ozsungur, 2019)

5.4 Theoretical Implications

Exposing the key determinants guides the researcher in understanding the key moderators influencing the adoption of technology among the South African elderly. This section is key to addressing the second sub-question of this research.

In addressing the differentiators, this study's findings revealed that age and gender, indeed, do have a joint impact on this specific cohort of the population. Venkatesh *et al.*, (2012) findings reported that there will be a significant differentiation across the genders the older people become. This study challenges the findings of Venkatesh *et al.* (2012) and corroborates the findings of Wilkowska *et al.* (2020) that age and gender were weak linear relationships in elder studies. The study revealed that age and gender work in tandem with experience, corroborating with Venkatesh *et al.* (2012) when they are associated with the main moderators for behavioural intentions to use technology.

In addressing the UTAUT2 theory, the older moderators will be assessed first based on the literature of (Venkatesh *et al.*, 2003; 2012), reviewed in earlier chapters of this study.

Performance Expectancy evaluates an elderly person's belief that the system will help achieve health improvement. A positive key factor result is the usefulness of the exposed systems to the elderly. Peek *et al.*, (2014:237) report that PU and PEU are strong predictors of technology adoption, and the elderly adopt technologies that allow them to accomplish tasks that improve their daily living activities. However, the lack of availability, accessibility, and exposure prevents South African elderly people from realising that there are advances in technology that can improve their health performance. Therefore, performance expectancy is key to understanding the adoption of gerontechnology.

Effort expectation evaluates the ease at which the elderly use a technology device. This key moderator is evident in the responses, particularly with the ease at which the elderly have adopted using banking applications within the comforts and confines of their homes. However, systems do possess a level of complexity and safety factors that may hinder the elderly from adopting technologies. The elderly do worry that they will break the device and experience fear in learning new technologies, as acknowledged by Jo & Hwang (2021), and practical implementations need to be considered with the objective of eradicating the uneasiness for the elderly to adopt gerontechnology.

Social Influence evaluates the perception that an elderly person needs to involve others to use the technology. In this study, it was evident that the involvement of a family member was crucial not only in sharing experiences but also in providing support to the elderly. It is also evident in the interviews of this research that as the elderly encounter technology that benefits their daily lives, it is vital to assist other elderly who may need the knowledge to operate the device. This is a strong key moderator in sharing newly discovered technology with friends, family and the broader community that shapes the elderly's adoption decisions.

Facilitating conditions evaluate that an elderly person has the belief that there is a technical support structure available when adopting a piece of technology. This is a strong key factor, coupled with the need for support from their immediate surroundings, will reassure the elderly that help is available. Failure to establish adequate facilitating conditions in place for the elderly to resolve instances of technology system failure corroborates with Osman *et al.*, (2020), which results in hesitancy to use the technology. Therefore, by incorporating affordability considerations, establishing the right infrastructure and accessible means to the use of the

technology, the correct facilitating conditions may provide a platform for the elderly to adopt technology and be able to use it regularly, making facilitating conditions key to understanding the adoption of gerontechnology.

In addressing the additions to the UTAUT2 theory, the newer moderators are assessed below.

Hedonic Motivation evaluates the belief of an elderly person finding pleasure or enjoyment because of using technology. The elderly have a positive emotional experience through enjoyment and pleasure when using technology, and these variables have a high correlation with both usage and behavioural intention (Wu & Lu, 2013). Enjoyment, as a finding in this study, is a strong key factor in the adoption of technology by the elderly participants, making this moderator key to understanding the adoption of gerontechnology.

Price-value evaluates the extent to which the elderly derive value from the technology they acquire and operate. The elderly demonstrate a keen interest in paying for the technology provided it meets their need to improve their health and that the benefits are sustainable. However, the pressures of economic hardships, expensive healthcare, and high-value-priced products (Jo & Hwang 2021:6) currently hinder the adoption of technology, as the elderly struggle to acquire the most needed devices. Therefore, the elderly are not given the opportunity to assess their perceived value (Özsungur, 2019). This moderator is key to understanding the adoption of gerontechnology.

Habit evaluates the extent to which the elderly target and use technology constantly over some time. This moderator does need to consider the fear perception of breaking the elderly's daily routine, as identified in the study conducted by Randriambelonoro *et al.* (2017). This remains a challenge, and further studies are needed to expose this. This study's findings suggest that given that the technology is tested and approved and there are no side-effects to using it, it makes this an acceptable moderator for the elderly in South Africa to adopt and use gerontechnology regularly and intentionally.

Having identified the key determinants and understanding their alignment to the theoretical key moderators, this research reveals the considerations of key acceptance and adoption perceptions of the elderly and how they influence the adoption of gerontechnology within elderly environments in the Western Cape.

5.5 Summary

In summary, the discussion in this chapter demonstrates that while ICT technologies are prevalent amongst the elderly, there is an opportunity for gerontechnology to be adopted by the elderly. The positive key perceptions of health improvement, support, efficiency, enjoyment and safety and the negative key perceptions of affordability, complexity and accessibility considerations must be addressed for the elderly to adopt gerontechnology across the Western Cape and broader South Africa. The findings not only align with the Unified Theory of Acceptance and Use of Technology Model (UTAUT) and its additional moderators but also extend the role of safety in the gerontechnology adoption process. The chapter examines the key perceptions of the elderly, aligns these perceptions with the old and new UTAUT2 moderators, and clearly explains the roles of age, gender, and experience differentiators. By addressing the theoretical implications, this research contributes to a deeper understanding of gerontechnology adoption by elderly persons. In the next chapter, the practical implications will be detailed. This will pave the way for future implementations across community-dwelling aged-care environments.

6 CHAPTER SIX: CONCLUSION

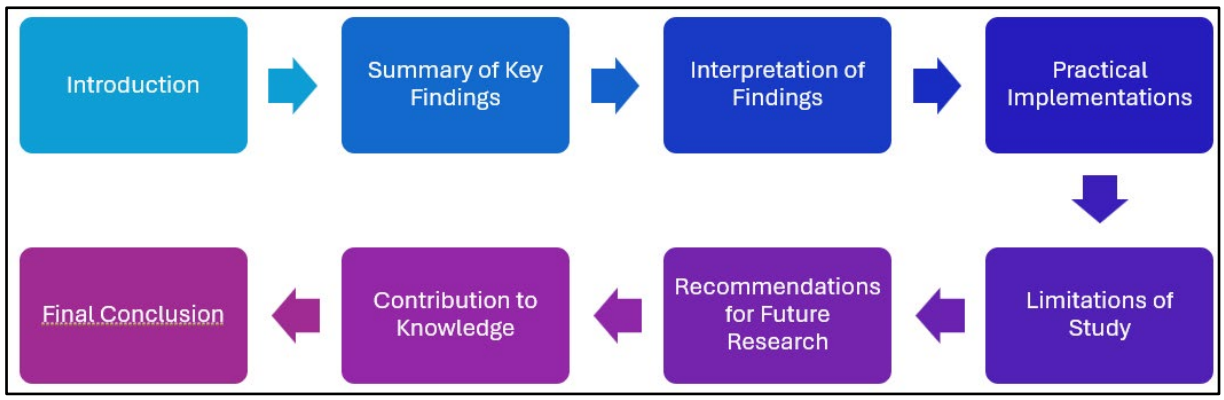


Figure 6-1 Chapter Six Outline

6.1 Introduction

This chapter concludes the research by synthesising the key findings, interpreting their implications, and discussing the practical applications of these insights for gerontechnology adoption among community-dwelling elderly in the Western Cape. It will also explore the study's theoretical, methodological, and practical contributions to the field of gerontechnology. By providing a comprehensive overview of this research, including its limitations, this chapter aims to highlight the significance of the findings and offer recommendations for future research and practical interventions.

6.2 Summary of Key Findings

This study explored the factors influencing the acceptance and adoption of gerontechnology among community-dwelling elderly in the Western Cape. Key findings identify the key determinants explored and offer insight into the theoretical key moderators. The role of the key moderators is clearly understood in terms of how the elderly can adopt gerontechnology in the Western Cape. The key findings include.

- Negative Perceptions: Affordability, complexity and accessibility were identified as significant barriers to gerontechnology adoption.
- Positive Perceptions: The elderly demonstrated a positive attitude towards technology, particularly when it can improve their health and well-being.

- Role of Social Influence: Social Influence, particularly from family and friends, played a crucial role in encouraging technology adoption.
- Importance of Support and Training: Adequate training and support were essential for the elderly to use technology effectively.

6.3 Interpretation of Findings

The findings suggest that while the elderly are receptive to technology, several factors can hinder their adoption. Addressing affordability concerns, simplifying user interfaces, and providing accessible support services are crucial to promoting technology adoption. The role of social influence highlights the importance of community-based initiatives and peer support programs in encouraging technology use.

6.4 Practical Implications

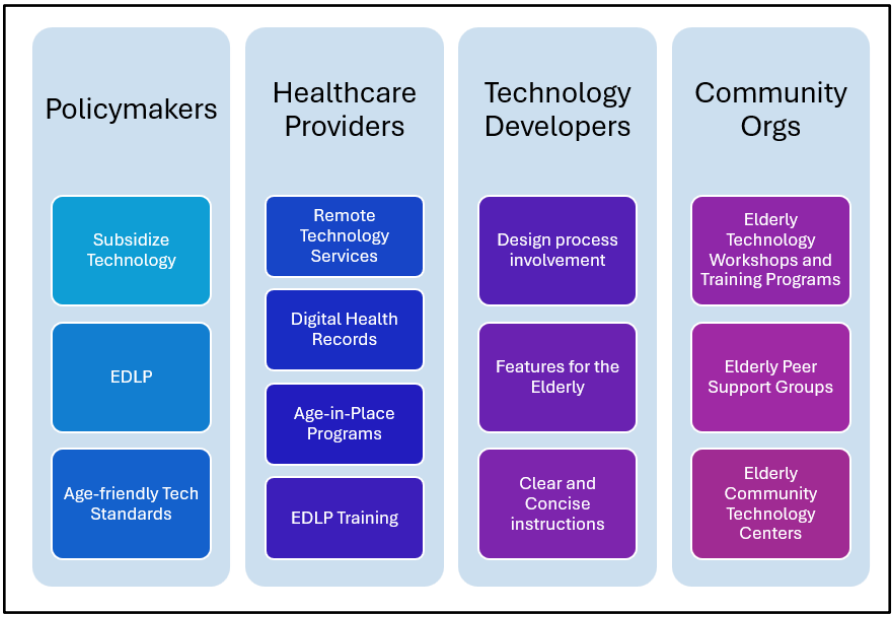


Figure 6-2 Practical implications for gerontechnology adoption

Figure 6-2 illustrates the findings of this study, offering practical implications for gerontechnology adoption:

- **Subsidise Technology**: Policymakers can develop policies that promote digital literacy and accessibility for older adults. This can be achieved by implementing subsidies for older adults to purchase assistive technology. In addition, tax breaks

can be extended to pre-retirees to acquire sensor technology to prepare for a quality life beyond retirement.

- **Elderly Digital Literacy Programs (EDLP):** Policymakers can fund digital literacy programs that are aligned with the elderly's needs, covering topics like ongoing smartphone usage, wearable technology clinics, and online banking.
- **Age-friendly Technology Standards:** Policymakers can develop and enforce standards for gerontechnology that prioritise usability, accessibility and safety for all elderly.
- **Healthcare Providers:** Incorporate technology into healthcare services to improve patient outcomes and reduce the burden on the healthcare system. The following can be considered to achieve this:
  - Remote Technology Services: Healthcare providers can expand their services to include mobile monitoring and care systems for remote consultations and monitoring, reducing the need for in-person consultations.
  - Digital Health Records: Healthcare providers can implement an Elderly Electronic Health Records database to improve elderly patient care and facilitate communications between the elderly patient and the healthcare provider.
  - Age-in-place: Medical Aid schemes can introduce age-in-place programs that require little to no human intervention in community-dwelling elderly environments. These programs provide financial savings and positive attitudes from the elderly towards gerontechnology implementations (Rantz *et al.*, 2013).
  - EDLP Training: Provide training to healthcare professionals on how to effectively communicate to the elderly about gerontechnology.
- **Technology Developers:** Design user-friendly and affordable technologies tailored to the needs of the elderly. The following can be considered to achieve this:
  - The elderly can be involved in the design process to ensure that gerontechnology is intuitive and easy to use.
  - Developers can incorporate accessibility features such as large fonts, voice commands and high-contrast displays.
  - Furthermore, it guides the elderly by providing clear and concise instructions, both in written and verbal structures.
- **Community Organisations:** Organise workshops and training programs to equip the elderly with the necessary skills to use technology. This can be achieved by considering the following.

- Elderly Technology Workshops: Organise regular workshops to teach the elderly basic computer skills, smartphone usage and online safety.
- Elderly Peer Support Groups: Facilitate peer support groups where the elderly can share their experiences and help each other with technology.
- Elderly Community Technology Centres: Establish community technology centres with trained staff to assist the elderly with technology-related issues.

Figure 6-3 culminates the study. It provides a framework of concretised concepts that inform stakeholders considering implementations, policymakers, healthcare providers, technology developers, and community organisations who can work together to promote the adoption of gerontechnology and improve the quality of life for the elderly in the Western Cape.

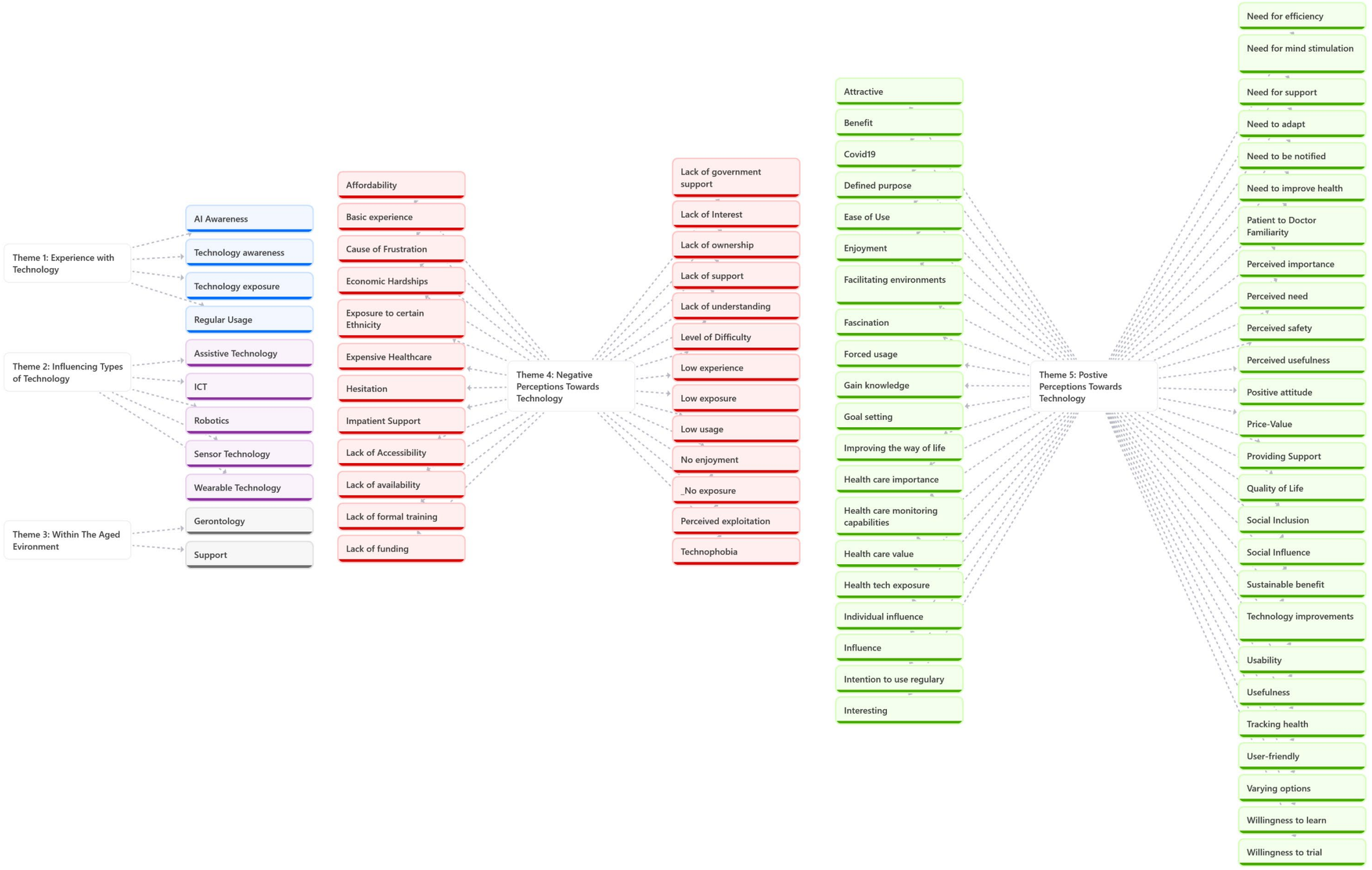


Figure 6-3 Framework of Factors for the Adoption of Gerontechnology by Community-Dwelling Elderly

6.5 Limitations of the Study

The study's limitations included a relatively small sample size and a focus on a specific geographic region. Additionally, the self-reported nature of the data may introduce biases.

The relatively small sample size limits the generalizability of the findings to a broader population of elderly. A larger sample may have provided a more comprehensive understanding of the diverse experiences and perspectives of elderly people.

This study's focus on the Western Cape region may not fully represent the experiences of all older adults in other regions of South Africa, particularly those with different socio-economic and cultural contexts.

The study's reliance on self-reported data through the interviews may introduce biases, as participants may not accurately recall or report their experiences.

This study's cross-sectional design limits the ability to draw causal inferences and track changes in technology adoption over time. Therefore, a longitudinal study can provide more insights into the dynamics of technology adoption among the elderly.

By acknowledging these limitations, the study's findings should be interpreted with caution, and further research is needed to validate and extend these results.

6.6 Recommendations for Future Research

Future research could explore the following areas:

- Longitudinal Studies: To track changes in technology adoption over time.
- Comparative Studies: To compare the experiences of older adults in a different cultural and socioeconomic context.
- Qualitative Studies. To delve deeper into the individual experiences and perceptions of the elderly.
- Mixed-Methods Studies: To combine qualitative and quantitative methods to gain a more comprehensive understanding of technology adoption.

6.7 Contribution to Knowledge

6.7.1 Theoretical contribution

This study contributes to the understanding of the factors influencing gerontechnology adoption by extending the UTAUT2 model to include specific factors relevant to the older adult population.

6.7.2 Methodological contribution

This study employs a rigorous qualitative research methodology, providing a detailed analysis of the elderly's experiences and perceptions.

6.7.3 Practical contribution

This study provides practical insights for policymakers, healthcare providers, technology developers, and community organisations to promote technology adoption among the community-dwelling elderly in the Western Cape and broader South Africa.

6.8 Final Conclusion

This research underscores the crucial importance of addressing the digital divide among the elderly in the Western Cape. By identifying key factors influencing technology adoption, this study provides valuable insights for policymakers, healthcare providers, technology developers, and community organisations. To improve the quality of life for the elderly, it is important to implement strategies that address affordability, accessibility, and digital literacy. By investing in technology-based solutions and supporting the elderly in the journey towards digital inclusion, society can empower the elderly to live independently, engage with their communities, and age with dignity and success. Further research is needed to explore the long-term impacts of technology on the health and well-being of the elderly, as well as to develop innovative interventions that can bridge the digital divide and promote equitable access to gerontechnology.

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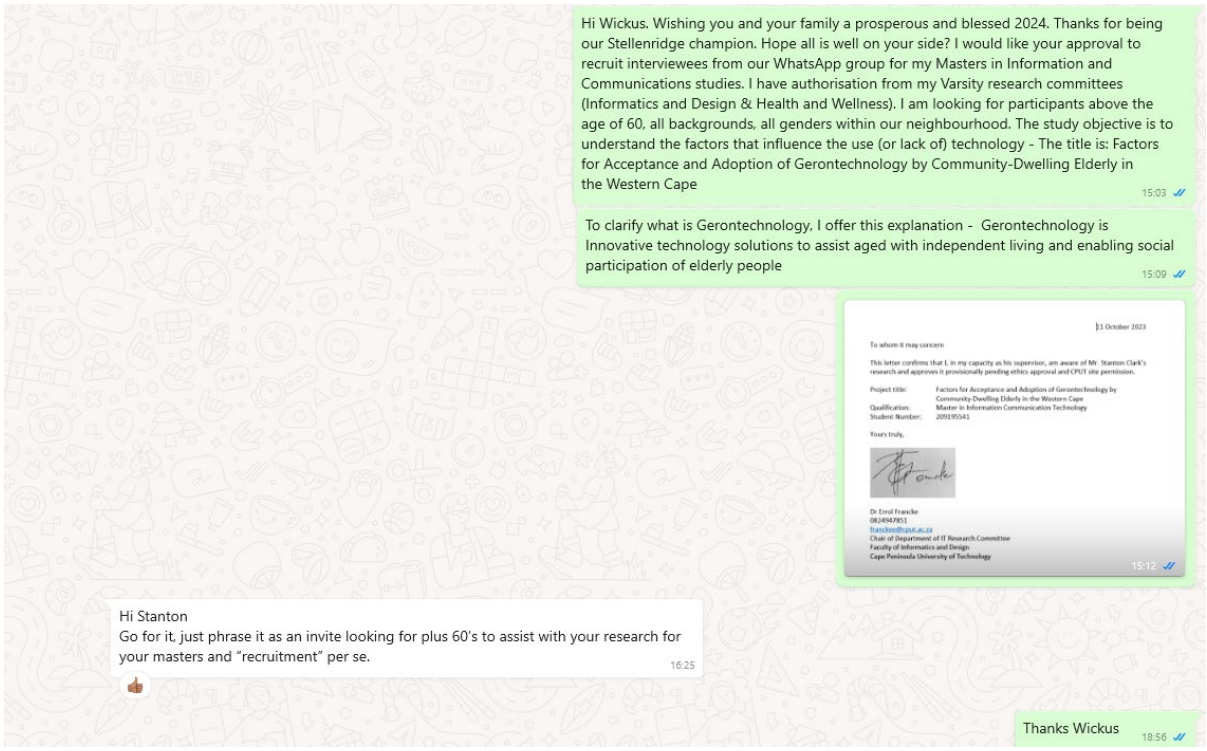
APPENDICES

APPENDIX A: Admin Approval For Recruitment On Social Group



APPENDIX B: Supervisor Research Approval

Cape Peninsula
University of Technology

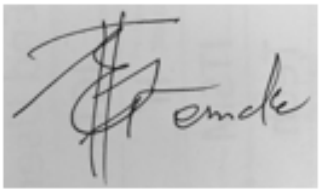
11 October 2023

To whom it may concern

This letter confirms that I, in my capacity as his supervisor, am aware of Mr. Stanton Clark's research and approves it provisionally pending ethics approval and CPUT site permission.

Project title:	Factors for Acceptance and Adoption of Gerontechnology by Community-Dwelling Elderly in the Western Cape
Qualification:	Master in Information Communication Technology
Student Number:	209195541

Yours truly,



Dr Errol Francke
0824947851
franckee@cput.ac.za
Chair of Department of IT Research Committee
Faculty of Informatics and Design
Cape Peninsula University of Technology

APPENDIX C: HWSREC Approvals

6.

7. 

Dear Mr Clark

We refer the above matter.

Kindly see feedback from the REC below for your perusal.

The Faculty of Health and Wellness Sciences Research Ethics Committee (HWS-REC) has deliberated on the application. The committee's decision is to **APPROVE** the above-named application for ethics clearance, subject to the changes/conditions listed below:

1. **STUDY DESIGN**

My biggest concern is that there is no clear place where participants will be recruited from. Community Whattsapp groups are mentioned, but it is not stated who owns these groups, or whether permission exists to recruit here. In addition, it is not clear who will be members of these groups

2. **BENEFIT vs RISK**

I suggest that reference to Covid-19 as a risk is removed as it is not a relevant research risk and confuses the risk : benefit analysis.

3. **PARTICIPANT PROTECTION**

Special care is needed for setting up interviews (accessibility and comfort). A carer may need to accompany a participant. This does not appear to have been considered e.g. confidentiality clause.

4. **FEEDBACK**

Recommended as an ethical action. Researcher should find suitable way/s to give feedback to the participants and or communities.

5. **CONSENT**

Some changes need to be made to this document:

It should be clear on the document that this research is for a masters. Student and supervisor contact details should be included. The FID REC information is

noted. It is suggested that the FHWS REC information is also added.

Informed consent information needs to be in lay language. Participants may not understand the term ‘gerontechnology’ and this should be explained. The term is

well described in the glossary of the proposal and this could be adjusted for the consent information.

Withdrawal is addressed as there being no obligation. In addition the concept of no adverse consequences should be added.

The statement that this information will be used only for a thesis is contradicted in the table where there is reference to possible publications. Please amend.

Similarly saying that only the researcher will have access to the information should be amended as the supervisor/s should also have access. It could be

expressed as the supervisor or the research team or even simply researchers in plural.

The option of consent for use of images should be removed and photographs should not be taken as the research intention does not required this level of

invasion

8. **PLANNED REFERRAL PROCESS**

It is stated that the researcher will handle adverse events. How will this happen and what may occur is not described at all.

7. **Participant Information sheet**

Contact details of the CPUT HWS-REC should be reflected.

8. **CONSENT/ ASSESNT**

The HWSREC need to be added on to the consent form should there be any complains.

9. **RESEARCH SPONSORS**

No mention is made of who the research sponsors are. Applicant needs to clearly explain how the research will be funded.

10. **SITE PERMISSION**

The research site is not properly identified

Upon affecting the above-mentioned changes, the amended proposal should be submitted to the committee secretariat, together with a document outlining the affected changes as in the below example.

Applicant:Stanton Clark – 209195541 – Master of Science in Biomedical Technology (CPUT) ***Title: Factors for Acceptance and Adoption of Gerontechnology by Community-*** ***Dwelling Elderly in the Western Cape***		
	Action	***Comment***
1.		
2.		

Kind regards

Cape Peninsula
University of Technology

HEALTH AND WELLNESS SCIENCES RESEARCH ETHICS COMMITTEE (CPUT HWS-REC)
Registration Number NHREC: REC- 230408-014

P.O. Box 1906 • Bellville 7535 South Africa
Symphony Road Bellville 7535
Tel: +27 21 959 6917
Email: sethn@cput.ac.za

19 April 2024
REC Approval Reference No:
CPUT/HWS-REC 2024/S23

Faculty of Health and Wellness Sciences

Dear Mr Stanton Clark

Re: APPLICATION TO THE HWS-REC FOR ETHICS CLEARANCE

Approval was granted by the Health and Wellness Sciences-REC to **Mr Stanton Clark** for ethical clearance. This approval is for research activities related to research for **Mr Stanton Clark** at Cape Peninsula University of Technology.

TITLE: **Factors for Acceptance and Adoption of Gerontechnology by Community-Dwelling Elderly in the Western Cape**

Supervisor: Dr. Errol Francke

Comment:

Approval will not extend beyond 19 April 2025. An extension should be applied for 6 weeks before this expiry date should data collection and use/analysis of data, information and/or samples for this study continue beyond this date.

The investigator(s) should understand the ethical conditions under which they are authorized to carry out this study and they should be compliant to these conditions. It is required that the investigator(s) complete an **annual progress report** that should be submitted to the CPUT HWS-REC in December of that particular year, for the CPUT HWS-REC to be kept informed of the progress and of any problems you may have encountered.

Kind Regards

Ms Carolynn Lackay
Chairperson – Research Ethics Committee
Faculty of Health and Wellness Sciences

APPENDIX D: Participant Consent Form

FID/REC/ICv0.1

FACULTY OF INFORMATICS AND DESIGN

Individual Consent for Research Participation

Research qualification: Masters in Information, Communications Technology

Title of the study: Factors for the Adoption of Gerontechnology by Community-Dwelling Elderly in the Western Cape

Name of researcher: Stanton Clark
Contact details: email: clarksay007@gmail.com phone: +27 836543198

Name of Supervisor: Dr Errol Francke
Contact details: email: FranckeE@cput.ac.za phone: +27 824947851

Purpose of the Study: This study aims to explore the factors that can influence the acceptance and adoption of Gerontechnology amongst the community-dwelling elderly in the Western Cape.

Clarification of term: Gerontechnology is Innovative technology solutions to assist aged with independent living and enabling social participation of elderly people.

Participation: My participation will consist essentially of interviewee.

Confidentiality: I have received assurance from the researcher that the information I will share will remain strictly confidential unless noted below. I understand that the contents will be used only for a thesis and that my confidentiality will be protected by use of pseudonyms. I understand that all information provided is treated as confidential and will not be released by the researchers to a third party unless required to do so by law.

Anonymity will be protected in the following manner (unless noted below). Participant names will not be mentioned and if the study requires reference to a particular respondent, it shall merely be referred to their chosen Alias.

Conservation of data: The data collected will be password secured. All information will be stored in a dedicated research project folder. Consent forms will be scanned and stored in the research folder and the originals will be stored in a lockable file cabinet. I have been informed that only the research team will have access to this content.

Voluntary Participation: I am aware that I am not forced to participate and have the choice to withdraw from the study at any time and/or refuse to answer any questions, without any obligation and no adverse consequences. If I choose to withdraw, all data gathered will be omitted from the study.

POPIA Statement
The Cape Peninsula University of Technology values the privacy of every individual's personal information and is committed to protecting this information.
This Protection of Personal Information and Privacy Plan applies to all personal information held by CPUT. All our stakeholders are required to collect, manage, and use personal information in accordance with this Protection of Personal Information and Privacy Plan.

Our Protection of Personal Information and Privacy Plan is designed to:

- inform you of what information we collect and what we use it for;
- explain your rights regarding how we collect and process your personal information;
- describe the legal obligations that apply to us, how we comply with those laws and how they protect you.

The CPUT *Protection of Information and Privacy Plan* applies when individuals, collectives and organisations interact and transact with us, either in person, via telephone, email, on our social media channels, or our websites, and whenever we refer to or link to this Plan.
Please read our *Protection of Personal Information and Privacy Plan* carefully. We may change this Plan from time to time as required, when there are material changes to our practices or when there are legislative amendments made by the Legislature of South Africa. Any changes to our Protection of Personal Information and Privacy practices will be published on our website. We encourage you to check our website periodically to ensure that you are aware of these changes. We will notify you of any modifications to this *Protection of Personal Information and Privacy Plan* that might materially affect the way we use or disclose the personal information of any individual, collective or organisation that we interact with, prior to the change becoming effective. Non-material changes in such use or disclosure of personal information will not require notification.

Additional consent: I make the following stipulations (please tick as appropriate):

	In thesis	**In research publications**	**Both**	**Neither**
My name may be used:				
My exact words may be used:				
Any other (stipulate):				

Expected Interview time – between 10 – 25 minutes

Acceptance: I, (print name) _____

agree to participate in the above research study conducted by Stanton Clark of the Faculty of Informatics and Design Department of IT at the Cape Peninsula University of Technology.

If I have any questions about the study, I may contact the researchers. If I have any questions regarding the ethical conduct of this study, I may contact the secretary of the ***Faculty Research Ethics Committee*** at 021 469 1012, or email naidoove@cput.ac.za. In addition, I can also contact the Secretary of the ***Health and Wellness Sciences Research Committee*** at 021 9596917, or email sethn@cput.ac.za.

Participant's signature: _____Date: _____

Researcher's signature: _____ Date: _____

For any distress caused through the interview the following contact numbers are relevant: COCT public emergency hotline (021 480 7700). Hospitals - Louis Leipoldt Emergency Unit – 084 124 Durbanville Mediclinic Emergency Room – 021 980 2126, Paarl Mediclinic Emergency Dept - 021 807 8012, Karl Bremer Emergency Unit – 021 91801936

APPENDIX E: Turnitin Report

Stanton Thesis_14 November 2024

ORIGINALITY REPORT

13%	11%	8%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	journal.gerontechnology.org Internet Source	1%
2	pubmed.ncbi.nlm.nih.gov Internet Source	<1%
3	core.ac.uk Internet Source	<1%
4	globalbim.org Internet Source	<1%
5	etd.cput.ac.za Internet Source	<1%
6	www.omicsdi.org Internet Source	<1%
7	hdl.handle.net Internet Source	<1%
8	www.researchgate.net Internet Source	<1%
9	www.grafiati.com Internet Source	<1%

APPENDIX F: Editing Certificate

DR PATRICIA HARPUR

B.Sc Information Systems Software Engineering, B.Sc Information Systems (Hons)
M.Sc Information Systems, D.Technology Information Technology

Editing Certificate

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To Whom It May Concern

This document certifies I have copy-edited the following dissertation by Stanton Clark:

Factors for Adoption of Gerontechnology by Community-Dwelling Elderly in the Western Cape

Please note this does not cover any content, conceptual organisation, or textual changes made after the editing process.

Best regards

Dr Patricia Harpur

10 December 2024
