



**Linnæus University**

Sweden

Masters Thesis

# Innovative solutions for dementia care using ICT: A qualitative content analysis.



*Author:* Adeyinka Lawrence Adejo  
*Supervisor:* Linda Askenäs  
*Examiner:* Associate Professor Päivi Jokela  
*Date:* 2020-05-28  
*Course Code:* 4IK50E, 15 credits  
*Subject:* Information Systems  
*Level:* Graduate  
Department of Informatics

## Abstract

**Aims/Objectives:** The objectives of this thesis were to examine and discuss the existing information and communication technology (ICT) tools used in the healthcare sector for older adults with dementia, the benefits and challenges of using these ICT tools from the perspective of older adults with dementia and their health care providers.

**Research methods:** Data was collected using semi-structured interviews with older adults with dementia and health care providers and managers at a nursing home in Nigeria. All interviews were audio recorded with the consent of the research participants and then transcribed verbatim. All interview transcripts were analyzed using qualitative content analysis using the deductive approach. The coding scheme used for data analysis was derived from an existing framework called the Human-Organization-Technology fit (HOT) Framework. In addition, existing literature were reviewed on the use of ICT tools by older adults with dementia, their caregivers and their health care providers.

**Empirical findings:** A total of six participants were interviewed for this study: two older adults with dementia, two nurses and two managers (one senior manager and one manager from the medical team). One older adult was 72 years old and was diagnosed with dementia one year ago. The other older adult was 70 years old and was diagnosed with dementia two years ago. The nurses that I interviewed have been working at this nursing home for 3 and 4 years respectively. The managers that I interviewed have also been working at this nursing home for 3 and 4 years respectively. Two ICT tools are currently being used at this nursing home: 1) a GPS tracker and 2) a device that assists older adults with their daily activities. Eight themes emerged from the interviews: system quality, service quality, user satisfaction (perceived usefulness), system use, user expectation, organization structure, organization environment and net benefits.

**Conclusion and Future research:** This study demonstrated that older adults with dementia and their caregivers (i.e. nurses) perceived the GPS tracker and the ADL assistant as user-friendly and helpful for supporting the daily activities. Most of the existing research on ICT tools used for dementia care have been conducted in North America and Europe. Therefore, there is a need for more research in Africa.

**Keywords:** Information and communication technology (ICT), Information System (IS), Human-Organization-Technology fit (HOT) Framework, Dementia patients, Older adults, E-Health, Qualitative Content Analysis.

## Table of Contents

<b>1. Introduction .....</b>	<b>5</b>
1.1 Purpose Statement .....	7
1.2 Research questions .....	7
1.3 Topic justification .....	8
1.4 Scope and limitations.....	8
1.5 Thesis Organization.....	8
<b>2. Review of the literature.....</b>	<b>10</b>
2.1 Adoption of ICT in the health sector .....	10
2.2 Adoption of ICT in dementia care for older adults .....	11
2.2.1 Location tracking (GPS technology) .....	11
2.2.2 Assistive robot .....	12
2.2.3 Education and social support .....	13
2.2.4 Supporting memory, social contacts, safety and daily activities .....	14
2.2.5 Management of neuropsychiatric symptoms (NPS) .....	14
2.2.6 Monitoring persons with dementia.....	14
2.2.7 Supporting autobiographical memory.....	15
2.2.8 Improving well-being .....	15
<b>3. Methodology and Theoretical Framework .....</b>	<b>16</b>
3.1 Methodological tradition .....	16
3.2 Research setting .....	16
3.3 Data collection.....	16
3.4 Qualitative content analysis.....	18
3.5 Human-Organization-Technology fit (HOT) Framework .....	19
3.5.1 Technology dimensions .....	20
3.5.2 Human dimensions .....	21
3.5.3 Organization dimensions .....	22
3.5.4 Net benefits .....	22
3.5.5 Application of the HOT-fit framework in previous studies .....	22
3.6 Coding scheme based on the HOT-fit framework .....	23
3.7 Data analysis procedure.....	24
3.8 Reliability & Validity in qualitative research .....	25
3.9 Ethical considerations .....	29
<b>4. Empirical findings.....</b>	<b>30</b>
4.1 Participant characteristics .....	30
4.2 Description of ICT tools .....	30
4.3 Themes .....	30
4.3.1 Human .....	30
4.3.2 Technology .....	32
4.3.3 Organization .....	33
<b>5. Discussion .....</b>	<b>34</b>

5.1 Limitations .....	35
<b>6. Conclusion .....</b>	<b>36</b>
6.1 Research Contribution .....	36
6.2 Future research .....	37
<b>7. References .....</b>	<b>38</b>

## List of figures

Figure 1: Organization of the thesis .....	9
Figure 2: Diagram of the Human-Organization-Technology fit (HOT-fit) framework for evaluating Health Information Systems (HIS) .....	20

## List of tables

Table 1: Preliminary coding scheme based on the HOT-fit framework .....	24
---	----

## 1. Introduction

**Chapter summary:** Chapter 1 introduces information and communication technology (ICT) with an emphasis on how ICT is used in the health care sector especially by older adults with dementia and their caregivers. This chapter will also state the aims and objectives as well as the research questions for my thesis. Lastly, I will discuss the justification for my research topic as well as the scope and limitations of my research.

---

Information and communication technology (ICT) is a broad term that refers to a diverse array of technological tools used to create, transmit, store or exchange information (UNESCO Institute of Statistics, 2020). ICT tools include computers, the internet (e.g. blogs, emails and websites), telephony (e.g. mobile phones, satellite and videoconferencing), live broadcasting (including radio and television) and recorded broadcasting (e.g. podcasts and video/audio players) (UNESCO Institute of Statistics, 2020). With the development and spread of technology, ICT has been adopted in virtually every aspect of life.

One sector with rapid and innovative adoption of ICT tools is the health care sector (While and Dewsbury, 2011). For example, ICT tools have been used for health portals which enable patients to store information about their health and receive personalized feedback from health care professionals (While and Dewsbury, 2011). Alpert et al. (2017) conducted in-depth interviews with patients and focus groups with health care providers to examine their perspectives on how a health portal called “My preventive care” could be improved. The results of this study showed that both patients and health care providers wanted the health portal to be integrated with other devices such as smartphones (Alpert *et al.*, 2017). Patients and health care providers also stated that they wanted the health portal to coordinate care by including information from all the specialists that care for the patient instead of information from the patient’s primary care physician only (Alpert *et al.*, 2017). Alpert et al. (2017) also found that patients wanted to incorporate lifestyle elements into the portal such as personalized recommendations on how to lose weight or how to stop smoking. Lastly, Alpert et al. (2017) found that both patients and health care providers believed that patients should have more control over their health portal. Additionally, Irizarry, Dabbs and Curran. (2015) conducted a state of the science review to examine the factors that influence patient engagement with health portals. This review found that patients’ interest and ability to use health portals are determined by various personal factors including age, education level, health status, ethnicity, health literacy and their role as a caregiver (Irizarry, Dabbs and Curran, 2015). Moreover, health care delivery factors such as health portal usability and provider endorsement also influence patients’ level of engagement with health portals (Irizarry, Dabbs and Curran, 2015). Lastly, this review stated that future research should investigate the specific contexts and populations that would benefit most from greater engagement through health portals (Irizarry, Dabbs and Curran, 2015).

ICT tools have enabled health care professionals to conduct virtual appointments with their patients over the internet (While and Dewsbury, 2011). For example, Powell et al. (2017) conducted semi-structured, in-depth interviews with patients to examine their experiences following a video appointment with their primary care physician. This study found that all patients were satisfied with the video appointment and most of the patients were interesting in having more video appointments in the future instead of in-person appointments (Powell *et al.*, 2017). Patients stated that the main advantages of the video appointments were increased convenience and decreased costs (Powell *et al.*, 2017). On the other hand, disadvantages of

the video appointments were privacy concerns (fear that someone might overhear their conversation) and inability of their physician to perform a physical examination (Powell *et al.*, 2017). Additionally, Appireddy *et al.* (2019) examined the feasibility and logistics of conducting virtual follow-up appointment instead of in-person appointments at a stroke prevention clinic for older adults (Appireddy *et al.*, 2019). For the virtual appointments, physicians used a desktop computer with a webcam and a microphone while patients were allowed to use any device they wanted (mostly smartphones or tablets) (Appireddy *et al.*, 2019). This study found that virtual appointments resulted in shorter wait times than in-person appointments (mean wait time for virtual appointments= 59.98 (SD= 48.36) days vs. mean wait time for in-person appointments= 78.36 (SD= 50.54) days;  $p < 0.001$ ) (Appireddy *et al.*, 2019). Patients were also more satisfied with the virtual appointments than the in-person appointments (Appireddy *et al.*, 2019). Moreover, virtual appointments only took 10 minutes on average while in-person appointments took 90 minutes on average (travel time plus appointment time) (Appireddy *et al.*, 2019). Lastly, this study found that patients saved an average of \$52.83 (range= 31.26 – 94.53) by receiving virtual appointments instead of in-person appointments (Appireddy *et al.*, 2019).

Another application of ICT tools in health care is ICT-enabled health promotion (Mariño, Marwaha and Barrow, 2016). For example, Mariño *et al.* (2016) examined the use of a web-based health promotion program that was designed to improve oral health knowledge, oral health attitudes, oral health practices and oral health self-efficacy in community-dwelling older adults. This web-based program consisted of learning modules and interactive tools such as animations and quizzes as well as bulletin boards and e-mail (Mariño, Marwaha and Barrow, 2016). The findings of this study showed that after the web-based oral health promotion program, older adults demonstrated significant improvements in oral health knowledge, oral health self-efficacy and oral health practices such as using dental floss more regularly (Mariño, Marwaha and Barrow, 2016). In addition, older adults had more positive attitudes about oral health after the web-based oral health promotion program (Mariño, Marwaha and Barrow, 2016). Kampmeijer *et al.* (2016) conducted a systematic review to explore the use of ICT tools (m-Health and e-Health technologies) for health promotion and primary prevention among older adults. This systematic review found that many different ICT tools are used for health promotion and primary prevention including websites, applications, webinars and video consults (Kampmeijer *et al.*, 2016). This review also found that motivation, support, feedback, usability, goal setting, rewards and accessibility were all facilitators for ICT adoption by older adults (Kampmeijer *et al.*, 2016). On the other hand, lack of guidance, cost, lack of experience using technological devices, age and education level were identified as barriers to ICT adoption by older adults (Kampmeijer *et al.*, 2016).

ICT tools are also used for telemonitoring in the health care sector. Telemonitoring refers to the use of audio, video or other forms of telecommunication to monitor patients' status remotely (Brahmbhatt and Cowie, 2019). Examples of telemonitoring include devices that measure heart rate, blood pressure and oxygen saturation (Brahmbhatt and Cowie, 2019). Other telemonitoring devices include implantable cardiac devices such as pacemakers as well as wearable technologies including watches, patches and textiles that monitor body posture, body temperature and blood glucose concentration (Brahmbhatt and Cowie, 2019). A systematic review of telemonitoring devices for the management of cardiovascular disease (e.g. hypertension and heart failure) found that telemonitoring devices significantly reduced blood pressure, hospitalizations and mortality (Purcell, McInnes and Halcomb, 2014). This review also found that telemonitoring devices significantly improved quality of life and reduced health care costs (Purcell, McInnes and Halcomb, 2014). In addition, a study by Iljaž

et al. (2017) examined the effect of a diabetes telemonitoring application called eDiabetes on blood glucose concentration compared to usual care. The eDiabetes application consisted of a web-based portal for patients and health care providers as well as educational materials for patients (Iljaž *et al.*, 2017). Patients in the intervention group who had access to the application recorded personal data including body weight, blood pressure, diet and physical activity bi-weekly (Iljaž *et al.*, 2017). Nurse practitioners and physicians discussed this data with their patients during their regular appointments (Iljaž *et al.*, 2017). This study found that the telemonitoring diabetes application (eDiabetes) significantly reduced blood glucose concentration compared to usual care (Iljaž *et al.*, 2017).

Using semi-structured interviews (qualitative content analysis) and the existing literature, this thesis explored the knowledge gap in examining how ICT tools are used by older adults with dementia, their caregivers and their health care providers as well as how these ICT tools are used to improve the quality of life of older adults with dementia and their caregivers. This research study was conducted at a nursing home in Lagos, Nigeria. The nursing home's mission and vision is to provide professional care to the older adults in the most compassionate and caring way for their social, physical and health needs. Dementia is a term that encompasses various progressive neurodegenerative diseases, such as Alzheimer's Disease, which result in cognitive dysfunction including memory loss, difficulties with logical thinking and language (Sabayan and Sorond, 2017). The most common form of dementia is Alzheimer's Disease which accounts for 60-70% of all dementia diagnoses (World Health Organization, 2019). Old age, female sex, diabetes, heart disease, hypertension and smoking are all risk factors for dementia (Van Der Flier and Scheltens, 2005). Worldwide, approximately 50 million people are currently living with dementia (World Health Organization, 2019). However, this number is projected to increase to 82 million people by the year 2030 (World Health Organization, 2019).

## 1.1 Purpose Statement

This thesis focuses on ICT tools used by older adults with dementia, their caregivers and their health care providers. The aim of this study is to examine and discuss the existing ICT tools used in the healthcare sector for older adults with dementia, the benefits and challenges of using these ICT tools from the perspective of older adults with dementia and their health care providers. The perspectives of older adults with dementia and their health care providers was obtained using semi-structured interviews.

To fully understand the point of views that ICT tools might have on older adults with dementia, their caregivers and their health care providers, it became clear to surmised that caregivers and health care providers would be willing to participate in this study and which they did. This eventually led to the important data collection for this study and the analysis that ensued, which provides a thorough understanding and knowledge about the situation. So, that improvements could be made based off this thesis contribution that supports proper care for older adults with dementia, their caregivers and their health care providers with ICT tools and systems.

## 1.2 Research questions

This research study would use qualitative content analysis to discuss how ICT tools is applied in health care with a specific focus on the types of ICT tools used by older adults with



dementia, their caregivers and their health care providers as well as how these ICT tools are used to improve the quality of life of older adults with dementia and their caregivers.

The research questions that was explored in this thesis are as follows:

1. *What types of ICT tools are used by older adults with dementia, their caregivers and/or their health care providers?*
2. *How are ICT tools used by older adults with dementia, their caregivers and/or their health care providers?*
3. *What are the benefits and challenges of using ICT from the perspective of older adults with dementia, their caregivers and/or their health care providers?*

## 1.3 Topic justification

In Nigeria, the rate of dementia has steadily been increasing over the last decade. As a result, hospitals, clinics, healthcare services are always looking for ways to help older adults with dementia through effectiveness and efficiency of their organisations (Socialstyrelsen, 2016). To the best of my knowledge, no previous research has investigated the topic of the use of ICT in dementia care. This is the knowledge gap that this thesis hoped to explore and examine in more detailed manner.

Synthesizing research is important because it helps researchers and other stakeholders (e.g. patients, their families, their health care providers and policy makers) keep up-to-date on the types of research being done in their field, the impact of this research and the gaps in knowledge that should be explored using future research. Dementia is a common condition affecting older adults worldwide. As the use of ICT in dementia care becomes more common, it is important to understand how ICT can improve the quality of life of older adults with dementia and their caregivers. It is also important to understand the challenges of using ICT tools in dementia care so that future research can be done to determine solutions to these challenges. This research may also be useful to policy makers who are looking for innovative ways to treat people with dementia while reducing health care costs.

## 1.4 Scope and limitations

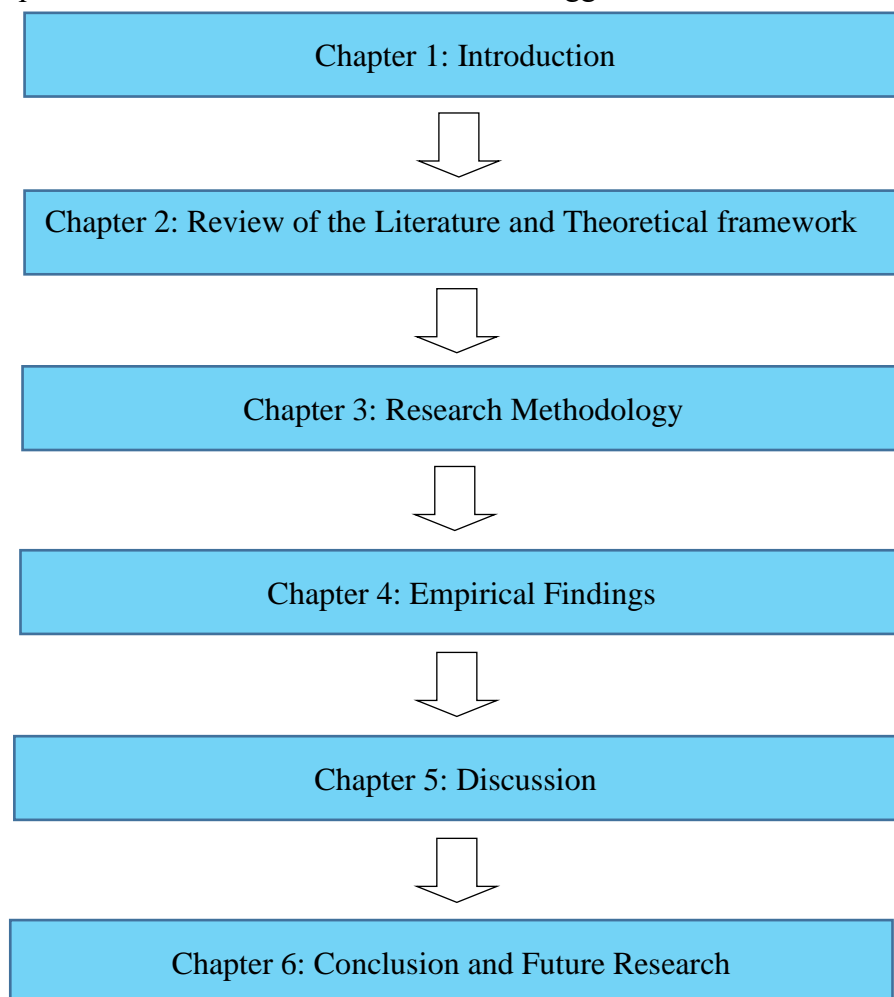
In order to find all relevant studies on the topic of ICT tools used for dementia care, a comprehensive search of the literature will be conducted in MEDLINE and SCOPUS because IS journals focus more on business than health. However, there is a chance that my search may not find all studies on this topic. For my literature review, I am relying on data from studies that have already been published. Therefore, the quality of my literature review will be affected by the quality of the data from the primary studies that I include. Additionally, primary data will be collected for my qualitative content analysis in the form of semi-structured interviews. Based on the availability of my research participants and the amount of time that they can devote to the interview, there may be a limit to the amount of data that I can collect.

## 1.5 Thesis Organization

This thesis is organised into six chapters. Chapter one introduces the readers to a problem that needs further exploration. The introduction argues about the purpose of the thesis and the



research questions that are to be answered in the thesis. Chapter two is a literature review that aids as an introduction to the main ideas of this thesis. That is elderly people with dementia, IS and ICT tools. This thesis is of utmost importance because this area of study might be new to some readers, which makes it an added knowledge information to the society. The chapter incorporated the world of science, medicine (healthcare sector) and in the field of IS (ICT tools). The end of the chapter introduced, explained and justified the theoretical framework and model used in this thesis. Chapter three presents the research methodology of this study. The chapter includes the methodological tradition, research settings, the methods used for collection of data and analysis. Additionally, the chapter introduces the specific research methods used which is qualitative content analysis and the threats to the reliability and validity of this study. The chapter further discusses the ethical considerations involved in this study since this study involves people within healthcare such as patients with dementia and medical personnel. Chapter four describes the research findings including a description of the research participants, a description of the ICT devices used at the nursing home and a description of the themes that emerged from the interviews including usability, benefits and challenges of using these ICT devices. Chapter five provides a brief summary of the main findings of this thesis. This chapter also discusses how the findings relate to previous research. Lastly, the chapter discusses the limitations of the research. Chapter six contains the final remarks including a brief summary of the overall findings of the research. The chapter also discusses the contribution that the research makes to the current body of research. Lastly, the chapter includes the author's reflection and suggests recommendations for future research.



***Figure 1: Organization of the thesis. Source: Author***

## 2. Review of the literature

**Chapter summary:** Chapter 2 is a literature review that discusses how ICT is used in the health care sector. This chapter will also provide examples of different types of ICT devices along with descriptions of how these devices are used by older adults with dementia and their caregivers. I will also provide a brief description of dementia, its prevalence worldwide and how it affects daily lives and the health care system.

---

### 2.1 Adoption of ICT in the health sector

Information and communication technology have revolutionized the way in which health care is delivered. Many of the innovative tools available in modern health care would not exist without ICT. These tools include electronic personal health records, smartphone applications, patient portals and self-management systems (Abaidoo and Larweh, 2014). The use of smartphones is one of the most common examples of ICT adoption in health (Abaidoo and Larweh, 2014). Smartphones allow us to access vast amounts of health information easily and quickly (Abaidoo and Larweh, 2014). Today, many people search for health information using their smartphones before consulting with a doctor or other health care professional (Abaidoo and Larweh, 2014). Another ICT tool that has become popular in health care is the electronic personal health record. An electronic personal health record is a tool that allows individuals to access, manage and share their personal health information in a confidential manner (Tang *et al.*, 2006). One of the goals of electronic personal health records is to encourage individuals to become more actively involved in their health care (Tang *et al.*, 2006).

Information and communication technology have also created new channels for patients and health care professionals to interact with each other. Traditionally, health care could only be delivered through face-to-face, in-person consultations. However, the development of ICT has given rise to a new method of health care delivery called telehealth. Telehealth is defined as “the provision of health care remotely by means of a variety of telecommunication tools, including telephones, smartphones, and mobile wireless devices, with or without a video connection (Dorsey and Topol, 2016, p. 154)”. One of the greatest benefits of telehealth is that it has increased access to health care particularly for individuals with limited access such as people living in rural communities, people serving in the military and people in prison (Dorsey and Topol, 2016). A review on the use of telehealth by Australians living in rural or remote communities found that the main benefits of telehealth reported by patients were reduced costs and greater convenience (Moffatt and Eley, 2010). Traveling from a rural or remote community to a town or city to receive health care can be very expensive due to the costs of transportation, parking and accommodation (Moffatt and Eley, 2010). Traveling is also inconvenient because individuals have to take time off work (sometimes days) and may also have to find childcare while they’re away from home (Moffatt and Eley, 2010). This review also found that telehealth is also beneficial to health care professionals working in rural or remote communities because they can access continuing education through these telehealth platforms (Moffatt and Eley, 2010). A systematic review of diabetes management via mobile phones showed that ICT can be used for many important functions in persons with diabetes including recording blood glucose values, carbohydrate intake, calorie consumption and physical activity levels (Holtz and Lauckner, 2012). In addition, Garcia-Lizana and Sarria-Santamera (2007) conducted a systematic review on the effectiveness of ICT

interventions for chronic disease management. They included 24 studies: 7 diabetes studies, 5 asthma studies, 6 heart failure studies, 3 hypertension studies, 2 heart disease prevention studies and 1 home telecare study (García-Lizana and Sarriá-Santamera, 2007). This systematic review found that overall, ICT interventions (e.g. interactive educational computer games, telemonitoring of weight, blood pressure and oxygen saturation and videoconferencing) did not improve clinical outcomes (García-Lizana and Sarriá-Santamera, 2007). However, this review found that ICT tools used for detection and follow-up of cardiovascular diseases resulted in improved clinical outcomes, reduced mortality and reduced health service utilization (García-Lizana and Sarriá-Santamera, 2007). Lastly, this review found that ICT tools used for social support and education were effective (García-Lizana and Sarriá-Santamera, 2007).

## **2.2 Adoption of ICT in dementia care for older adults**

Worldwide, the number of older adults ( $\geq 65$  years) is rapidly increasing due to reduced fertility rates and increased life expectancy (World Health Organization, 2010). The prevalence of many chronic diseases including dementia increases exponentially with age (van der Flier and Scheltens, 2005). Dementia is a broad term for a class of progressive neurodegenerative diseases, including Alzheimer's Disease, which cause cognitive dysfunction such as memory loss, difficulty with logical thinking and language problems (Sabayan and Sorond, 2017). Alzheimer's Disease is the most common form of dementia which accounts for 60-70% of all dementia diagnoses (World Health Organization, 2019). In older adults age 65-69 years, the prevalence of dementia is only 0.8% (Van Der Flier and Scheltens, 2005). However, in older adults age 90 years and older, the prevalence of dementia is 28.5% (Van Der Flier and Scheltens, 2005).

Dementia negatively impacts the quality of life of older adults with dementia and their caregivers (e.g. spouse or adult children). In addition to cognitive deficits, older adults with dementia also experience higher levels of depression, anxiety and psychosis than persons without dementia (Gerlach and Kales, 2018). For example, a cross-sectional study of 17,031 participants (1612 participants with dementia), from eight countries, found that the prevalence of depression was 5.8% among all participants and 12.4% among persons dementia (Andreasen, Lonnroos and von Euler-Chelpin, 2014). Similarly, dementia caregivers experience anxiety and depression due to the burden of caregiving (Schulz, Martire and Schultz, 2004). A systematic review of 790 caregivers from ten studies found that the prevalence of depressive disorders among caregivers was 22.3% (Cuijpers, 2005). Additionally, the stress associated with caring for someone with dementia has negative physiologic impacts including poor cardiovascular health, prolonged wound healing and reduced immunity (Schulz, Martire and Schultz, 2004). Moreover, dementia is associated with a high economic burden (World Health Organization, 2019). Worldwide, the total cost associated with dementia is estimated at \$818 billion USD (World Health Organization, 2019).

There are various ways in which ICT has been adopted in dementia care which will be discussed below.

### **2.2.1 Location tracking (GPS technology)**

Olsson et al (2013) examined the use of a GPS tracker called the passive positioning alarm package (PPAP) in older adults with dementia and their spouses (caregivers). The PPAP

consisted of a cell phone, transmitter, manual and access to support personnel (Olsson *et al.*, 2013). In this study, older adults with dementia carried the transmitter with them during their daily walks (Olsson *et al.*, 2013). Before the older adults left their homes, the transmitter was activated by their spouse or other caregiver (Olsson *et al.*, 2013). If the older adult walked further than 500 meters their spouse or other caregiver automatically received a message with a map of their location (Olsson *et al.*, 2013). After the study, participants reported that the PPAP made them feel safer and reduced their fears of their loved ones getting lost (Olsson *et al.*, 2013).

Pot, Willemse and Horjus. (2012) also studied the use of ICT for location tracking of older adults with dementia. The location tracking device consisted of GPS and a radio service. One of the main functions of this device was “track and trace”; using signals from GPS satellites, the device sends position coordinates to a secure website using a mobile phone network (Pot, Willemse and Horjus, 2012). The caregiver can then log into the secure website to see the exact position of the person with dementia as well as a map of their route (Pot, Willemse and Horjus, 2012). The second main function of this device is telephone contact, for this function, the caregiver’s number is programmed into the device allowing the person with dementia to call their caregiver by pushing just one button (Pot, Willemse and Horjus, 2012). Lastly, the third main function of the device is a loud speaker which allows the caregiver to get into direct contact with the person with dementia at any time (Pot, Willemse and Horjus, 2012). Pot, Willemse and Horjus (2012) tested this device among persons with dementia and their caregivers and found that most caregivers were able to successfully integrate the device into their daily lives and would recommend it to others. Additionally, almost 50% of persons with dementia reported that the device gave them more freedom and made them feel safer when going outside alone (Pot, Willemse and Horjus, 2012).

## 2.2.2 Assistive robot

Begum *et al.* (2013) described an assistive robot designed to help older adults with dementia perform activities of daily living such as making a cup of tea. The robot hardware consists of a tablet computer for onboard processing, a microphone, two speakers, a screen which displays an animated face and video prompts and two cameras which allow the robot to see the client and their environment and ensures safe navigation of the robot (Begum *et al.*, 2013). The robot software is designed as a server-client model (Begum *et al.*, 2013). In this model, the robot PC hosts the server and the operator PC the client portion of the software (Begum *et al.*, 2013). The client portion of the software consists of a graphical user interface (GUI) which allows the client (person with dementia) to control the robot remotely and deliver prompts (Begum *et al.*, 2013). The server then transmits real-time visual and audio feedback to the client with a very short transmission delay of less than 0.5 seconds (Begum *et al.*, 2013). The server also controls the robot using movement commands (found on the GUI) sent by the client such as: “go forward”, “go backward”, “rotate right”, “rotate left” or “stop” (Begum *et al.*, 2013). The robot can travel at a maximum speed of 0.5 meters per second (Begum *et al.*, 2013). The GUI of the robot also contains a list of pre-recorded audio and video prompts to assist with activities of daily living such as making a cup of tea (Begum *et al.*, 2013). For example, the robot delivered the following prompts to help the client make a cup of tea: “Can you turn the water on now?”, “Try pulling the silver lever toward you.”, “Can you fill the kettle with water now?”, “Try filling the kettle under the water.” (Begum *et al.*, 2013). The robot also showed a video to demonstrate each of the audio prompts (Begum *et al.*, 2013). Begum *et al.* (2013) found that 3 of the 5 older adults with dementia and all the caregivers found the prompts from the robot helpful for making a cup of tea. However, there

were some technical glitches with the robot including interrupted communication between the server (Begum *et al.*, 2013). The clients also reported that they had difficulty navigating the robot around the room (Begum *et al.*, 2013).

## 2.2.3 Education and social support

One application of ICT is to provide knowledge and skills training to assist spousal caregivers with caring for their partner with dementia (Lundberg, 2014). Lundberg (2014) recruited ten spousal caregivers who were given an ICT system. This system contained various education modules on various topics related to dementia care include incontinence, nutrition, end of life care, facts about dementia, relaxation techniques, pressure ulcers and dealing with acute situations such as a fall or suffocation while eating (Lundberg, 2014). When interviewed, the caregivers stated that they were most interested in the education modules about pressure ulcers and dealing with acute situations (Lundberg, 2014). Another application of ICT described by Lundberg (2014) was social support. In this study, spousal caregivers of older adults with dementia were given a software package which allowed them to make video calls (Lundberg, 2014). These video calls could be used to contact a call center with trained personnel with expertise in caring for persons with dementia or to contact other caregivers in the study who could provide social support through their shared experiences (Lundberg, 2014). The caregivers stated that the support received through the call center and by calling other caregivers helped them to cope with their caregiving responsibilities (Lundberg, 2014). For example, one caregiver contacted the call center for support when her husband suddenly became very irritated on their way to the market (Lundberg, 2014). Another woman called because she needed support to deal with the fact that her husband needed to be placed in a nursing home (Lundberg, 2014).

Torp et al (2008) implemented a service called Assisting Carers using Telematics Interventions to meet Older Persons' Needs (ACTION) to support caregivers of older adults with dementia. One of the features of the ACTION service was to provide education to spousal caregivers (Torp *et al.*, 2008). In this study, Torp et al (2008), recruited 19 spousal caregivers to test the ACTION service which consisted of three 3-hour courses delivered over a 3-week period. These courses provided caregivers with education on various topics including nutrition, social services and facts about dementia (Torp *et al.*, 2008). At follow-up, participants stated that they needed less information about dementia than they did at the beginning of the study (Torp *et al.*, 2008). The ACTION service also included an online discussion forum where caregivers could communicate with each other (Torp *et al.*, 2008). Caregivers also had the option of directly contacting other caregivers via video calling (Torp *et al.*, 2008). Additionally, caregivers had access to a call center where they could get advice from a nurse with expertise in caring for persons with dementia (Torp *et al.*, 2008). At follow-up, participants stated that the online discussion forum and the video calling feature helped them to develop a network of supportive people as well as friendships with people in similar situations (Torp *et al.*, 2008).

Ruggiano et al (2019) also examined how ICT could be used to provide education and support to dementia caregivers. They tested a technology called Care IT which is an android smartphone and web-based application (Ruggiano *et al.*, 2019). Care IT has many features including providing education to caregivers about dementia, enabling caregivers to monitor dementia symptoms using validated outcome measures and allowing caregivers to send information to their care recipient's physician through a secure server (Ruggiano *et al.*, 2019). Caregivers can also use Care IT to assess their own levels of depression and caregiver burden



using validated outcome measures (Ruggiano *et al.*, 2019). Ruggiano *et al.* (2019) conducted interviews with 18 dementia caregivers and a focus group with 18 dementia caregivers to explore their experiences using Care IT. Caregivers reported that one of the most useful features of Care IT is the ability to monitor dementia symptoms (Ruggiano *et al.*, 2019).

## **2.2.4 Supporting memory, social contacts, safety and daily activities**

Meiland *et al.* (2012) studied the effect of an ICT device made up of a touch screen, home-based sensors, cell phone and actuators on memory, safety, social contacts and daily activities in older adults with dementia. This ICT device supported memory in older adults with dementia by providing pop-up reminders as well as date/time indicators (Meiland *et al.*, 2012). The ICT device also made it easier for older adults with dementia to contact their relatives and friends through picture dialing (Meiland *et al.*, 2012). In addition, the device helped older adults with daily activities such as turning on and off their radio and lamps as well as providing instructional videos such as how to make coffee or microwave a meal (Meiland *et al.*, 2012). Lastly, the device had many safety features including a help/emergency icon, pop-up safety warning (e.g. being cautious while using household appliances) and helping older adults navigate outdoors (Meiland *et al.*, 2012). Both older adults and their caregivers found the device easy to use (Meiland *et al.*, 2012). In particular, they stated that they liked the size of the touch screen, the size and number of buttons and the size of the text (Meiland *et al.*, 2012). Additionally, the most useful features reported by the caregivers were the date/time indicators, pop-up reminders and picture dialing (Meiland *et al.*, 2012). However, they stated that the battery life of the device was too short (Meiland *et al.*, 2012).

## **2.2.5 Management of neuropsychiatric symptoms (NPS)**

Kerssens *et al.* (2015) tested the usability of a device called The Companion in 7 older adults with dementia and their caregivers (their spouses). The Companion is a touch screen computer that was designed to deliver psychosocial interventions to persons with dementia using audiovisual programs in the form of music, images and messages that are personalized to the person with dementia (Kerssens *et al.*, 2015). The Companion uses personal photos, videos and voices of loved ones to tell personal stories from the person's life (Kerssens *et al.*, 2015). In addition, The Companion also primes persons with dementia to perform important activities such as drinking water by providing verbal reminders and pictures of the activity (Kerssens *et al.*, 2015). The most common neuropsychiatric symptoms reported were sleep difficulties, agitation and depression (Kerssens *et al.*, 2015). Participants reported various positive experiences using The Companion (Kerssens *et al.*, 2015). For example, participants reported that The Companion helped them to reminisce about wonderful memories (Kerssens *et al.*, 2015). Additionally, caregivers stated that The Companion reminded them to give their spouse's their medication (Kerssens *et al.*, 2015). Caregivers also reported that they felt more secure leaving their spouse alone at home knowing that they had The Companion (Kerssens *et al.*, 2015). Lastly, the Companion helped persons with dementia to cope with their neuropsychiatric symptoms including sleep difficulties, depression and agitation (Kerssens *et al.*, 2015).

## **2.2.6 Monitoring persons with dementia**

Kinney *et al.* (2004) explored the use of various ICTs bundled together to monitor older adults with dementia in their homes. The technologies bundled together were: high-speed broadband

internet, a computer, a smart home management system equipped with a controller, cameras, sensors and a cell phone with text messaging service (Kinney *et al.*, 2004). Kinney *et al.* (2004) installed the monitoring technology in the homes of 19 families caring for an older adult with dementia for 24 weeks. Sensors were placed in various locations within each family's home and caregivers received a text message every time a sensor was triggered (Kinney *et al.*, 2004). For example, if a sensor was placed on a door, the caregiver would receive a text message alerting them that the door had been opened or closed (Kinney *et al.*, 2004). At the end of the 24-week period, caregivers were interviewed about their experiences using the monitoring technology (Kinney *et al.*, 2004). Caregivers reported both positive and negative experiences with the monitoring technology (Kinney *et al.*, 2004). For example, some caregivers reported that the monitoring technology gave them peace of mind, a greater feeling of security and helped them keep track of their relative with dementia (Kinney *et al.*, 2004). On the other hand, some caregivers reported that the monitoring technology made their lives more difficult because they felt that the text messages were annoying and they felt that they became too dependent on the technology to care for their relative with dementia (Kinney *et al.*, 2004). Additionally, some caregivers reported that the cameras made their relatives and friends feel nervous (Kinney *et al.*, 2004). Lastly, caregivers reported that the monitoring technology gave them more free time to spend on themselves (Kinney *et al.*, 2004).

## **2.2.7 Supporting autobiographical memory**

Another application of ICT in dementia care is supporting autobiographical memory. De Leo, Brivio and Sautter. (2011) asked one older adult with dementia to carry a smart phone with them during the day for 4 weeks. This smart phone took pictures every 5 minutes from 8am to 8pm (De Leo, Brivio and Sautter, 2011). These pictures were uploaded to a secure server at night and then combined into a slideshow which was copied onto a DVD and mailed to the participant once per week (De Leo, Brivio and Sautter, 2011). In addition to the DVD, the participant also received a satisfaction survey and a test to measure their ability to recall past events (De Leo, Brivio and Sautter, 2011). Overall, the participant was satisfied with the intervention (De Leo, Brivio and Sautter, 2011). They reported that they did not mind carrying the smart phone with them and that the slideshows helped them to recall some memories (De Leo, Brivio and Sautter, 2011).

## **2.2.8 Improving well-being**

Leng *et al.* (2014) tested the effect of iPad applications on the well-being of 6 older adults with dementia. Older adults with dementia participated in 4 group activities: 2 iPad activities (not described by the authors) and 2 non-iPad activities (cooking and art/craft) over a 2-day period (Leng *et al.*, 2014). This study used a mood and engagement (ME) value to measure well-being of participants during the group activities (Leng *et al.*, 2014). Leng *et al.* (2014) found that older adults with dementia had higher ME scores (indicating higher well-being) during both iPad activities compared to cooking. However, there was no difference in ME scores (well-being) between art/craft and either of the iPad activities (Leng *et al.*, 2014).



## 3. Methodology and Theoretical Framework

***Chapter summary:** Chapter 3 describes the methodological tradition that I have chosen for my thesis. This chapter also describes the research setting and describes how the data was collected and analyzed including the interview questions and the coding scheme for my analysis. I will also describe the specific research method chosen for my thesis i.e. qualitative content analysis. I will also describe the conceptual framework that was used to guide the data collection and data analysis of my thesis. In addition, I will describe how reliability and validity are achieved in qualitative research. Lastly, I will discuss ethical considerations related to my thesis.*

---

### 3.1 Methodological tradition

The methodological tradition chosen for this thesis is the qualitative research tradition. The qualitative research tradition has various defining characteristics (Yilmaz, 2013). For example, in qualitative research knowledge is socially constructed and reality is not static nor fixed (Yilmaz, 2013). As such multiple realities exist because different realities are constructed by different cultural groups based on their own world views and value systems and these realities can be interpreted in multiple ways (Yilmaz, 2013). Qualitative research is also holistic, flexible or emergent (Yilmaz, 2013). The goal is to understand the larger picture or process under investigation (Yilmaz, 2013). Additionally, the goal of qualitative research is to answer ‘what’, ‘how’ and ‘why’ in terms of *quality* instead of *quantity* (amount, intensity or frequency) (Yilmaz, 2013). The qualitative research tradition also postulates that processes, events, situations, individuals and their behaviour are context-dependent, unique and largely non-generalizable (Yilmaz, 2013). It also postulates that individuals are intentional and creative beings who actively construct their social world and make meaning in and through their activities (Yilmaz, 2013). It investigates the relationships within a culture, system or face-to-face interactions among people in a particular social setting (Yilmaz, 2013). It also stresses the importance of understanding a particular social setting instead of trying to make predictions about that setting (Yilmaz, 2013). It also postulates that situations, events, processes and behaviour are context-dependent and change over time (Yilmaz, 2013). Moreover, qualitative research requires the researcher to become the research instrument (Yilmaz, 2013). Therefore, it is crucial for the researcher to establish close contact with the participants during data collection in order to obtain detailed, rich, complex and extensive descriptions of the events being studied (Yilmaz, 2013). Lastly, it involves informed consent decisions and ethical considerations (Yilmaz, 2013).

### 3.2 Research setting

This research study was conducted at a nursing home in Lagos, Nigeria. This nursing home was established in 2015. The vision of this nursing home is to create a haven and a happy community for older adults. Additionally, the vision of this nursing home is to be a haven where the highest quality of care is given to the older adults for them to spend their days in comfort. Lastly, the nursing home’s mission is to provide professional care to the older adults in the most compassionate and caring way for their social, physical and health needs.

### 3.3 Data collection

Semi-structured interviews will be conducted with clinic managers (n=2), nurses (n=2) and older adults with dementia (n=2). All individuals will be asked a set of pre-determined interview questions (see below) and further probing questions will be asked during the interviews to further explore their personal experiences using ICT tools for persons with dementia.

## **Interview questions: Managers**

### *Introductory questions*

1. Can you tell me a bit about yourself? How long have you managed at this nursing home?

### *Organization-related questions*

1. Can you tell me a bit about your organization? How many staff are employed at this nursing home? How many older adults are you currently caring for and how many have dementia?
2. Can you describe the management structure of this nursing home?
3. Can you tell me who decides which technological devices are used in this nursing home and how these decisions are made?
4. How is this nursing home funded (e.g. government or privately owned)?

## **Interview questions: Nurses**

### *Introductory questions:*

1. Can you tell me a bit about yourself? How long have you been a nurse and how long have you worked at this nursing home?

### *ICT-related questions (human-technology questions)*

1. Can you tell me about any technological devices that you are currently using with your clients with dementia?
  - a. What do you use these tools for (e.g. location tracking etc.)?
  - b. Can you describe the features of the tools that you are currently using?
  - c. Can you describe the quality of the system? For example, is it easy to use, reliability, secure, flexible?
2. Can you describe a situation where you used this device with one of your clients with dementia?
3. How do you feel about using ICT tools with your clients with dementia? Are you satisfied with the system? Or are there features you think can be improved?

4. Can you describe the service provided by the company that supplies the device? For example, what kind of technical support is provided by the company?
  - a. Are you satisfied with the quality of the service provided? Is the level of technical support adequate for your needs or is there any additional support you would like to receive?
  - b. Can you describe the quality of the information produced? For example, is the information complete, timely, accurate, reliable and relevant to your needs?
5. Can you discuss the benefits of using this technology with your clients with dementia?
6. Can you discuss the challenges/barriers of using this technology with your clients with dementia?

## **Interview questions: Dementia patients/clients**

### *Introductory questions*

1. Can you tell me a bit about yourself? Can you tell me your age? How long have you had dementia? How long have you been a resident at this nursing home?

### *ICT-related questions (human-technology questions)*

1. Can you describe how you use this device? How often do you use this device? Which activities do you use this device for?
2. Can you describe a situation where you used this device?
3. What do you like about using this device?
4. What do you dislike about using this device?

## **3.4 Qualitative content analysis**

Qualitative content analysis is a data analysis method designed to condense large amounts of data text by putting the data into categories in order to understand the data better through inference and interpretation (Wildemuth, 2016). There are many forms of “text data” including verbal, print or electronic (Hsieh and Shannon, 2005). Text data can be obtained from many sources including narrative responses, interviews, focus groups, open-ended surveys, observations, articles, manuals or books (Hsieh and Shannon, 2005). Qualitative content analysis focuses on the characteristics of language with a special emphasis on the content and contextual meaning of the text (Hsieh and Shannon, 2005). The goal of qualitative content analysis is to move beyond simply counting words to examining language in more detail in order to classify large volumes of text into an efficient number of categories that have similar interpretations or meanings (Hsieh and Shannon, 2005).

Qualitative content analysis can be conducted using one of three approaches: 1) the inductive approach, 2) the deductive approach and 3) the abductive approach (Graneheim, Lindgren and Lundman, 2017). Firstly, the inductive approach, also known as the data-driven approach,

involves searching for patterns in the data (Graneheim, Lindgren and Lundman, 2017). Using this approach, researchers search for similarities and differences in the data which are then described using categories and/or themes (Graneheim, Lindgren and Lundman, 2017). This approach allows the researcher to convert the data into a theoretical understanding of the phenomenon being studied (Graneheim, Lindgren and Lundman, 2017). During this process, the data moves from specific and concrete to general and abstract. One limitation of the inductive approach is that it may produce surface level descriptions and broad summaries (Graneheim, Lindgren and Lundman, 2017). Secondly, the deductive approach, also known as the concept-driven approach, involves using the data to test existing theories, models or frameworks (Graneheim, Lindgren and Lundman, 2017). During this process, the data moves from general and abstract to concrete and specific (Graneheim, Lindgren and Lundman, 2017). One limitation of the deductive approach is the fact that researcher may only develop categories or themes based on the established theory or model only and therefore they risk missing new categories or themes that may be present in the data (Graneheim, Lindgren and Lundman, 2017). Lastly, the abductive approach, also known as the complementary or combined approach, involves using a combination of the inductive and deductive approach (Graneheim, Lindgren and Lundman, 2017). Using the abductive approach may result in a more comprehensive or complete understanding of the phenomenon being studied (Graneheim, Lindgren and Lundman, 2017).

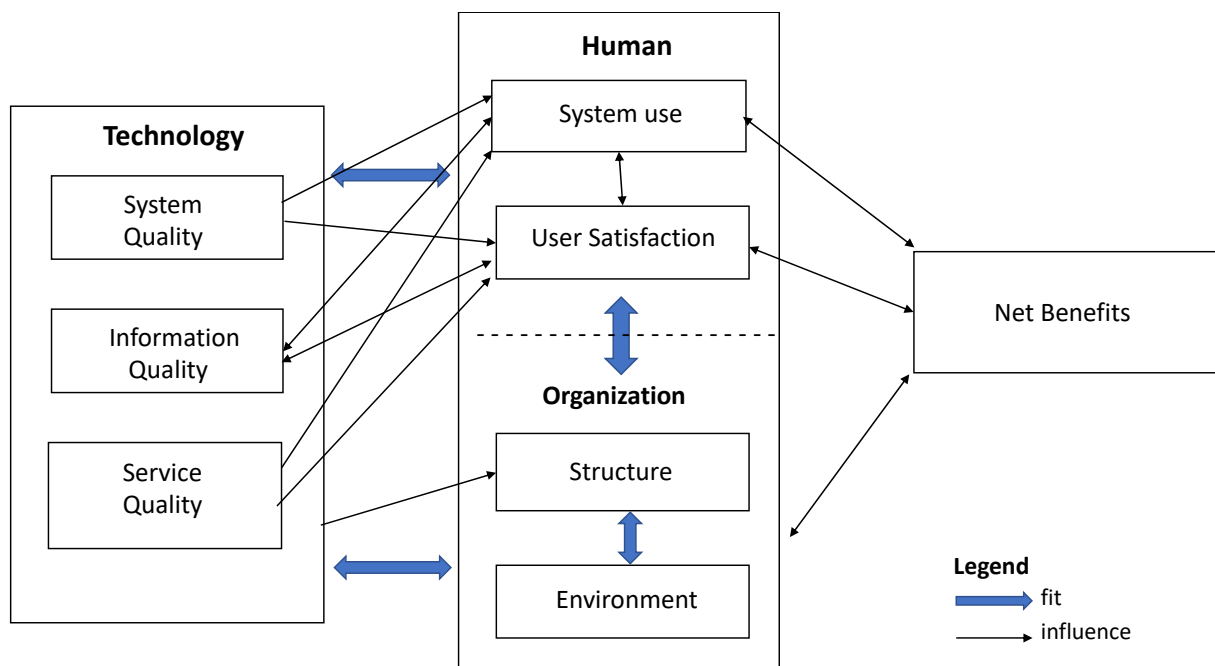
I used the deductive approach to analysis my data. The framework that I chose to guide my data analysis was The Human-Organization-Technology fit (HOT-fit) framework (described below) to generate my initial coding scheme.

### **3.5 Human-Organization-Technology fit (HOT) Framework**

The Human-Organization-Technology fit (HOT-fit) framework was chosen for this study (Yusof *et al.*, 2008). The Human-Organization-Technology fit (HOT) fit is both framework and model for determining and measuring the complex variables for the success of an IS in healthcare sector. This framework emerged from the information systems (IS) and the health information systems (HIS) literature (Yusof *et al.*, 2008). According to the HOT-fit framework, the net benefits of HIS are determined by three types of factors: 1) human factors, 2) organization factors and 3) technology factors and each of these factors consist of various dimensions (Yusof *et al.*, 2008). Human factors consist of two dimensions: 1) system use and 2) user satisfaction (Yusof *et al.*, 2008). Organization factors also consist of two dimensions: 1) organizational structure and 2) organizational environment (Yusof *et al.*, 2008). Lastly, technology factors consist of three dimensions: 1) system quality, 2) information quality and 3) service quality (Yusof *et al.*, 2008).

The premise of this framework is that there must be “fit” between human, organization and technology factors (Yusof *et al.*, 2008). This framework states that there are bidirectional relationships between: 1) information quality and system use, 2) information quality and user satisfaction, 3) organizational structure and organization environment, 4) organizational structure and net benefits and 5) organizational environment and net benefits (Yusof *et al.*, 2008). Additionally, there is a unidirectional relationship between organizational structure and system use (Yusof *et al.*, 2008) (see figure 1 below). In the HOT-fit framework, the concept of “fit” refers to the ability of the HIS, human (e.g. HIS stakeholders and clinical practices) and the setting to align with each other (Yusof *et al.*, 2008). Therefore, “fit” can be assessed based on the compatibility between the factors: human-organization, human-technology and organization-technology using various measures such as the system’s ease of use, system

usefulness, system flexibility, user attitude, user satisfaction, user training, organizational culture, planning and management (Yusof *et al.*, 2008).



**Figure 2: Diagram of the Human-Organization-Technology fit (HOT-fit) framework for evaluating Health Information Systems (HIS) (Adapted from Yusof *et al.*, 2008).**

In the following sections, I will discuss each dimension of figure 2 in more detail.

### 3.5.1 Technology dimensions

#### *System quality*

System quality measures inherent characteristics of HIS such as user interface and system performance (Yusof *et al.*, 2008). Measures of system quality include: ease of use, ease of learning, reliability, completeness, availability, system flexibility, system security, response time and usefulness (Yusof *et al.*, 2008). Ease of use determines whether the users (e.g. health care professionals) consider the HIS as convenient, satisfactory and pleasant to use (Yusof *et al.*, 2008). Availability refers to the amount of time that the system is working and flexibility refers to the ability of the system to adapt to a health care setting and integrate with other systems (Yusof *et al.*, 2008). For example, Meiland *et al.* (2012) tested an ICT system that supported memory in older adults with dementia by providing pop-up reminders as well as date/time indicators (Meiland *et al.*, 2012). The ICT system also made it easier for older adults with dementia to contact their relatives and friends through picture dialing (Meiland *et al.*, 2012). In this study, both older adults and their caregivers were satisfied with the quality of the ICT system. They found the device easy to use and they also stated that they liked the size of the touch screen, the size and number of buttons and the size of the text (Meiland *et al.* 2012).

#### *Information quality*

Information quality is determined by various factors including information completeness, timeliness, consistency, availability, accuracy, reliability, legibility and relevancy (Yusof *et al.*, 2008). Information quality is very subjective, it is assessed from the user's perspective (Yusof *et al.*, 2008). For example, Olsson *et al.* (2013) tested an ICT system that tracks and trace the location (GPS Technology) of older adults with dementia (Olsson *et al.* 2013). The ICT system was designed that if the older adult walked further than 500 meters their spouse or other caregiver automatically received a message with a map of their location" (Olsson *et al.* 2013). In this study, both older adults and their caregivers were satisfied with the quality of information of the ICT system. The participants reported that the PPAP made them feel safer and reduced their fears of their loved ones getting lost (Olsson *et al.*, 2013).

## ***Service quality***

Service quality refers to the amount of support provided by the HIS service provider whether the service provider is internal or external to the health care organization (Yusof *et al.*, 2008). Service quality is measured by how quickly the service provider responds to system problems as well as assurance, empathy and follow-up provided by the service provider (Yusof *et al.*, 2008). For example, Torp *et al.* (2008) tested an ICT system that is an Education and social support system called Assisting Carers using Telematics Interventions to meet Older Persons' Needs (ACTION) (Torp *et al.* 2008). The ICT system "ACTION" service was designed to provide education and support to caregivers e.g. through online discussion forum" (Torp *et al.* 2008). In this study, both the spouse and their caregivers were satisfied with the service quality of the ICT system.

## **3.5.2 Human dimensions**

### ***System use***

System use refers to the frequency and breadth of HIS functions and inquiries (Yusof *et al.*, 2008). One of the most common measures of system use is the use of system outputs such as reports (Yusof *et al.*, 2008). System use is influenced by the person who uses the system, their knowledge, training, expectation, belief, acceptance or resistance towards the system (Yusof *et al.*, 2008). User knowledge refers to their computer skills and literacy (Yusof *et al.*, 2008). User expectation refers to the anticipation of enhanced patient care as a result of HIS use (Yusof *et al.*, 2008). Resistance to HIS use may be due to people-oriented factors (e.g. age, gender and values), system-oriented factors (e.g. user interface) and interaction-oriented factors (e.g. job insecurity) (Yusof *et al.*, 2008). For example, Kerssens *et al.* (2015) tested an ICT system that managed neuropsychiatric symptoms called ("The Companion") (Kerssens *et al.* 2015). "The Companion" primes persons with dementia to carry out important activities such as drinking water by providing verbal reminders and pictures of the activity" (Kerssens *et al.* 2015). In this study, both the spouse and their caregivers were satisfied with the system use of the ICT system. They both reported that "The Companion" helped them to reminisce about wonderful memories and reminded them to give their spouse's their medication (Kerssens *et al.*, 2015).

### ***User satisfaction***



User satisfaction refers to the user's evaluation of their experience with the system and their assessment of the impact of the system (Yusof *et al.*, 2008). User satisfaction is influenced by the user's perceived usefulness of the system and their attitudes towards the system (Yusof *et al.*, 2008). As a result, user satisfaction is very subjective (Yusof *et al.*, 2008). For example, Begum *et al.* (2013) tested an ICT system called Assistive Robot (Begum *et al.* 2013). The ICT system "the assistive robot" delivered the a specific sets of prompts to help the client and also showed a video to demonstrate each of the audio prompts (Begum *et al.*, 2013). In this study, both older adults and their caregivers were satisfied with the use of the ICT system. It was reported that 3 of the 5 older adults with dementia and all the caregivers found the prompts from the robot helpful for example making a cup of tea (Begum *et al.* 2013).

### 3.5.3 Organization dimensions

#### *Organizational structure*

Organizational structure refers to various aspects of the organization including the type and size of the organization as well as the hierarchy, culture, management, politic, autonomy, planning, strategy, control systems and communication of the organization (Yusof *et al.*, 2008).

#### *Organizational environment*

The organizational environment can be examined through its financing source, politics, government, localization, competition, communication, type of populations being served and inter-organizational relationship (Yusof *et al.*, 2008).

### 3.5.4 Net benefits

Net benefits of a system capture both the positive and negative effects on the user (Yusof *et al.*, 2008). Net benefits can be assessed from the perspective of a single user, a group of users, an organization or an industry (Yusof *et al.*, 2008). Net benefits of a system on a single user include increased effectiveness, efficiency, decision quality and error reduction (Yusof *et al.*, 2008). Net benefits from the perspective of the organization include reduced costs and improved efficiency of patient care delivery (Yusof *et al.*, 2008).

### 3.5.5 Application of the HOT-fit framework in previous studies

The HOT-fit framework has been used to evaluate the electronic medical records (EMR) system at a hospital (Erlirianto, Ali and Herdiyanti, 2015). In this study, the HOT-fit framework was used to develop a questionnaire which was then administered to staff at the hospital who used the EMR system (Erlirianto, Ali and Herdiyanti, 2015). The main categories for the questionnaire were human, technology and organization which were derived from the HOT-fit framework (Erlirianto, Ali and Herdiyanti, 2015). All the variables in the questionnaire were also developed using the HOT-fit framework (Erlirianto, Ali and Herdiyanti, 2015). The results from questionnaire were then used to examine the relationships between the different concepts in the framework (Erlirianto, Ali and Herdiyanti, 2015). For example, the results of this study showed that information quality and service quality have significant positive impacts on user satisfaction (Erlirianto, Ali and Herdiyanti, 2015). This study also found that organization environment has a significant positive impact on net benefits of the EMR system (Erlirianto, Ali and Herdiyanti, 2015).



The HOT-fit framework was also used to identify factors that influence the success of a hospital information system (Rumambi, Santoso and Setyohadi, 2017). In this study, a questionnaire was developed using the dimensions of the HOT-fit framework such as system quality, information quality, service quality and user satisfaction (Rumambi, Santoso and Setyohadi, 2017). This study found that information quality, service quality, system quality, user satisfaction, usage, structure, environment and net benefit were factors that influenced the success of the hospital information system (Rumambi, Santoso and Setyohadi, 2017).

### 3.6 Coding scheme based on the HOT-fit framework

This table below is a preliminary coding scheme based on the HOT-fit framework. Codes were created for each category and sub-category.

Category	Subcategory	Code
Technology	System quality	ease of use
		ease of learning
		reliability
		completeness
		availability
		system flexibility
		system security
		response time
		usefulness
	Information quality	completeness
		timeliness
		consistency
		availability
		accuracy
		reliability
		legibility
		relevancy
Service quality	Amount of support provided	
	Follow-up	
Human	System use	User knowledge
		User training
		User expectation
		User belief
		User acceptance
		User resistance
	User satisfaction	Perceived usefulness
Attitude towards the system		

Organization	Structure	type
		size
		hierarchy
		culture
		management
		Politic
		autonomy
		planning
		strategy
		Control systems
		Communication systems
	Environment	Financing source
		Politics
		Government
		communication
		Type of population
Net benefits		effectiveness
		Efficiency
		Decision quality
		Error reduction
		Cost reduction

**Table 1: Preliminary coding scheme based on the HOT-fit framework. Source: Author**

### 3.7 Data analysis procedure

Transcripts from my interviews with the clinic managers, nurses and persons with dementia were analysed using the coding scheme above. After the first round of coding, there may be sections of the transcripts that do not fit into any of the categories in the coding scheme (Hsieh and Shannon, 2005). These sections were analysed again to determine whether a new category should be created or whether they belonged to a subcategory of an existing code (Hsieh and Shannon, 2005). Once coding of the transcripts was completed, the HOT-fit framework was used to report and discuss the findings. For example, quotations from the interviews were linked to the framework. Additionally, I discussed the extent to which my findings support the HOT-fit framework. If new categories were created after the initial coding scheme, I will discuss why these new categories were created.

I will now describe each step of the qualitative content analysis process that I followed in more detail.

#### Step 1: Prepare the data

Once the interviews have been conducted, they will be transcribed into written text in preparation for coding (Wildemuth, 2016).

## **Step 2: Define the unit of analysis**

The unit of analysis is defined as the basic unit of text that will be coded (Wildemuth, 2016). In qualitative content analysis, the unit of analysis is usually individual codes/themes (Wildemuth, 2016). Therefore, a unit of analysis may be a single word, a phrase, a sentence or paragraph (Wildemuth, 2016). In addition, a section of text may represent more than one code/theme (Wildemuth, 2016).

## **Step 3: Develop categories and a coding scheme**

As mentioned above, the initial coding scheme for my study will be generated from the HOT-fit framework and new codes will be created if there is any text that does not represent any of the existing codes.

## **Step 4: Test your coding scheme on a sample of text**

The coding scheme is tested for clarity and consistency using a small sample of the data (Wildemuth, 2016). During this step, problems regarding the codes may arise and should be resolved through discussion with the research team (Wildemuth, 2016).

## **Step 5: Code all the text**

Once the coding scheme has been tested, it is then applied to the interview transcripts (Wildemuth, 2016).

## **Step 6: Assess your coding consistency**

Each interview transcript should be coded more than once to ensure greater accuracy and consistency. This is important because we are more likely to make mistakes as time goes on due to fatigue. Therefore, coding more than once provides the opportunity to check your work for errors (Wildemuth, 2016).

## **Step 7: Draw conclusion from the coded data**

This step involves closer examination of the coded data in order to explore patterns in the data and explore relationships between the codes/themes (Wildemuth, 2016). This is a crucial step in the analytic process which requires strong reasoning skills (Wildemuth, 2016).

## **Step 8: Report your methods and findings**

Throughout my study, I will carefully record all decisions and analytic processes. I will report all decisions made during the coding process. I will also include quotations which represent the codes in my coding scheme. When reporting my findings, I will also provide both description and interpretation of my findings.

## **3.8 Reliability & Validity in qualitative research**

In quantitative research, reliability refers to the degree to which an instrument consistently measures a variable every time it is applied to the same participants under the same

experimental conditions (Yilmaz, 2013). However, in qualitative research, the terms *dependability* and *auditability* are used instead of reliability.

**Dependability** refers to the degree to which study data is stable over time and conditions (Polit and Beck, 2014). Dependability is achieved if the study findings/data are replicated when the study is repeated using the same or similar participants within the same or similar context (Polit and Beck, 2014). In qualitative research there are often changes in concepts, hypotheses and even the research focus (Bitsch, 2005). Therefore, it is important to keep track of these changes in a detailed and comprehensive manner in order to ensure dependability of the study (Bitsch, 2005). Dependability can be achieved by generating an audit trail and by practicing reflexivity throughout the entire study (Houghton *et al.*, 2013). An audit trail is a comprehensive written document which describes all the decisions made and the procedures conducted throughout the study (Lietz and Zayas, 2010). The audit trail should include contextual background information and the rationale explaining how all the methodological decisions were made (Houghton *et al.*, 2013). An audit trail helps other researchers to follow all the steps taken throughout the research process which helps them to understand how the study results were obtained (Houghton *et al.*, 2013). In addition to keeping an audit trail, researchers should also practice reflexivity. Reflexivity requires the researcher to acknowledge the fact that his/her actions and decisions will always influence the context and meaning of the phenomena being studied (Lietz and Zayas, 2010). Reflexivity is not a single action, it is a process that occurs throughout the entire research process (Lietz and Zayas, 2010).

**Auditability** is the degree to which study procedures are documented enabling someone outside the study to follow and critique the study procedures (Lietz and Zayas, 2010). Unlike quantitative research which recommends strict adherence to study procedures, qualitative research allows and actually encourages flexibility in study procedures (Lietz and Zayas, 2010). For example, interview questions should be revised if they are not producing quality data (Lietz and Zayas, 2010). In addition, proposed sample sizes should be increased or decreased based on data saturation (Lietz and Zayas, 2010). Methods for ensuring auditability of a study include keeping an audit trail and participating in peer debriefing (Lietz and Zayas, 2010). As stated above, an audit trail is a comprehensive written document which describes all the procedures and decisions made throughout the entire research process (Lietz and Zayas, 2010). The audit trail should include contextual background information and the rationale explaining how all the methodological decisions were made (Houghton *et al.*, 2013). An audit trail helps other researchers to follow all the steps taken throughout the research process which helps them to understand how the study results were obtained (Houghton *et al.*, 2013). The audit trail should also demonstrate that the researcher was engaging in reflexivity throughout the study (Lietz and Zayas, 2010). Engaging in reflexivity means that the researcher acknowledges the fact that his/her actions and decisions will always have an impact on the context and meaning of the phenomena being studied (Lietz and Zayas, 2010). Reflexivity is not a single action, it is a process that occurs throughout the entire research process (Lietz and Zayas, 2010). Some researchers may provide a disclosure statement where they acknowledge their own bias and the potential impact of their bias on the findings of their study (Lietz and Zayas, 2010). On the other hand, peer debriefing involves consulting with peers who are experienced in the methodology that you are using (Lietz and Zayas, 2010). Presenting your research decisions and procedures to your peers allows you to gain feedback in order to improve the quality of your study (Lietz and Zayas, 2010). Peer debriefing is also beneficial because it helps to generate new ideas and identify problems with the methodology (Lietz and Zayas, 2010).

In quantitative research, validity refers to the ability of an instrument to measure what it was designed to measure (Yilmaz, 2013). However, in qualitative research, the term *trustworthiness* is used instead of validity. **Trustworthiness** (rigor) refers to the degree of confidence in the methods, data and interpretation used to ensure the quality of a study (Polit and Beck, 2014). Trustworthiness is divided into various criteria including credibility, transferability, confirmability (Lincoln and Guba, 1985) and authenticity (Guba and Lincoln, 1994). I will describe each of these criteria below.

**Credibility** refers to the level of confidence in the truth value of the study data as well as the interpretations of the data (Polit and Beck, 2014). Credibility is most similar to the concept of internal validity (i.e. whether or not there is a casual relationship between the treatment and the outcome (Yilmaz, 2013)) in quantitative research (Connelly, 2016). When assessing the credibility of a study, the reader should determine whether the study was conducted using standard procedures that are appropriate for the research design of the study (Connelly, 2016). Methods used to ensure credibility include triangulation, member checking and thick description. Triangulation involves using two or more sources of information (data triangulation) or using two or more persons to analyze the same data (observer triangulation) (Lietz and Zayas, 2010). Data triangulation may involve collecting data at various time points or utilizing multiple data collection strategies such as focus groups, observations or interviews (Lietz and Zayas, 2010). On the other hand, observer triangulation involves utilizing more than one researcher to analyze the data to ensure that important ideas are not missed and to ensure that data is analyzed in a consistent way (Lietz and Zayas, 2010). Member checking involves verifying your research findings by gaining feedback from your research participants (Lietz and Zayas, 2010). Member checking can be achieved by selecting some of the research participants to be involved in the data analysis process or by distributing a draft of the findings to some research participants to determine the degree to which they agree with the findings (Lietz and Zayas, 2010). Although member checking is considered very valuable by many qualitative researchers, there are several factors that can make member checking very challenging. For example, it may be difficult to locate research participants after data collection has been completed. Additionally, member checking assumes that a sample of your research participants' experiences are similar enough that they will all agree to the findings that the researcher presents (Lietz and Zayas, 2010). Thick description refers to deep, dense, detailed accounts of a phenomenon being studied with particular emphasis on the context in which the phenomenon occurs (Lietz and Zayas, 2010). The goal of thick description is to create realistic statements that allow the readers to feel as though they have experienced or could have experienced the events described by the researcher (Lietz and Zayas, 2010). From the perspective of the reader, credibility is achieved if they are transported to the setting/situation where the events occurred (Lietz and Zayas, 2010). One method used to obtain thick descriptions is prolonged engagement with research participants which involves performing multiple interviews or by spending long periods of time observing research participants in order to capture the complete picture of their experiences (Lietz and Zayas, 2010).

**Authenticity** refers to the degree to which researchers faithfully and fairly show different realities (Polit and Beck, 2014). Study data is considered to be authentic if it takes readers on a vicarious journey into the lives'/experiences' of the study participants and heightens the readers' awareness of the issues or phenomena being described (Polit and Beck, 2014). Authenticity can be achieved by selecting appropriate participants based on the research questions and then providing rich, detailed descriptions of the participants' experiences (Schou *et al.*, 2012). Authenticity is divided into five dimensions: fairness, ontological authenticity, educative authenticity, catalytic authenticity and tactical authenticity (Shannon and Hambacher,

2014). Fairness involves assessing all the different viewpoints and determining if each viewpoint has been represented in a fair manner (Shannon and Hambacher, 2014). Fairness is attained when all stakeholders involved are empowered to use their voice and are encouraged to take part in the consensus building process (Shannon and Hambacher, 2014). Authenticity is also attained when the researcher has the ability to present various different perspectives and depth of understanding in a manner that fairly represents each perspective (Shannon and Hambacher, 2014). Other processes that are essential for ensuring fairness are prolonged engagement with stakeholders, persistent observation of research participants, member checking and practicing reflexivity (Shannon and Hambacher, 2014). The second authenticity dimension is ontological authenticity which is evaluated by determining the extent to which research participants become more aware of how complex the social environment is (Shannon and Hambacher, 2014). The third authenticity dimension called educative authenticity is evaluated by determining the degree to which research participants have gained a greater awareness and respect for other people's viewpoints (Shannon and Hambacher, 2014). The fourth authenticity dimension called catalytic authenticity is evaluated by determining if the research process caused the stakeholders to take action (Shannon and Hambacher, 2014). Lastly, the fifth authenticity dimension called tactical authenticity is evaluated by determining whether the research process caused a redistribution of power among the stakeholders (Shannon and Hambacher, 2014).

In qualitative research the concept of *transferability* is similar to the concepts of external validity and generalizability in quantitative research (Bitsch, 2005). Transferability refers to the degree to which research findings can be applied or 'transferred' to a different setting other than the setting where the data was collected or with different research participants (Bitsch, 2005). A qualitative research cannot claim that their research findings are transferable to other settings (Shenton, 2004). Judgments about the transferability of research findings must be made by the reader (Shenton, 2004). However, qualitative researchers are responsible for providing enough contextual information about the setting where the data was collected in order to help readers determine whether or not the findings can be transferred to their context (Shenton, 2004). Qualitative researchers should provide *thick description* to help the reader determine whether or not the findings can be transferred to their context (Shenton, 2004). The following information should be provided to help readers determine if the findings are transferable to their context: 1) the number of organization that participated in the study along with their locations, 2) any restrictions in the kinds of people who contributed to the study data, 3) the number of participants, 4) the data collection methods that were utilized, 5) the number and length of data collection sessions such as interviews and 5) how long was data collection carried out (Shenton, 2004).

The concept of *confirmability* is similar to the concept of objectivity in quantitative research (Bitsch, 2005). Confirmability considers the biases and prejudices of the researcher (Bitsch, 2005). In terms of confirmability, steps must be taken to ensure that the research findings are a true reflection of the research participants' ideas and experiences instead of the preferences and characteristics of the researcher (Shenton, 2004). Triangulation (i.e. utilizing two or more sources of data or utilizing two or more individuals to analyze the same data) is one method that helps to ensure confirmability of the research findings by reducing the impact of researcher bias (Shenton, 2004). An important criterion for determining confirmability is the degree to which the researcher is transparent about their biases or predispositions (Shenton, 2004). Therefore, researchers should state their beliefs that underpinned any decisions made and methods chosen throughout the entire research process (Shenton, 2004). Qualitative researchers should also state their reasons for choosing a particular approach instead of any alternative



approaches that could have been chosen instead as well as explaining the weaknesses of the approach that they ultimately chose (Shenton, 2004). Additionally, an audit trail (i.e. a written document which describes all the decisions made and the procedures conducted throughout the study) is another tool used to ensure confirmability of research findings (Shenton, 2004).

### **3.9 Ethical considerations**

Conducting a research study entails that the data and the source of origin must be protected. This phenomenon is extremely important when conducting a quantitative content analysis, which entails different forms of data (Bengtsson, 2016). This research study had interactions involving people, which includes individual interviews, email correspondence and skype videos. An important component when conducting qualitative interviews is the ethical considerations. This allow the researcher to predict potential impact that their research may have and to steer their research in the direction to off-set concerns of participants. Another reason is that, it will improve the quality of outcomes (Ok and MacIntosh, 2014).

It is of utmost importance that identity of participants is kept private and thereby, each participant was made aware when the data collection was conducted through the guidelines of Bengtsson (2016) and Patel and Davidson (2012). I obtained consent from the nursing home director to conduct the interviews. Consent was also obtained from all research participants before commencing each interview. The informed consent form was given to all the participants to read and sign before commencing each interview. The data collected during the interviews was stored securely on my laptop which is password protected. Interviews were audio-recorded; however, these audio files were deleted after they were transcribed in order to protect the identity and privacy of all research participants. All identifiable information such as participant names were removed from the transcripts to ensure privacy of all research participants. Lastly, in the final paper, all participants were only identified through pseudonyms e.g. dementia patient 1 and nurse 1. It was made known to the participants that participation is on a voluntary basis not mandatory. Furthermore, a participant could at any time, without repercussion, withdraw from the research study and its information withdrawn or deleted from the records (Good Research Practice, 2011).

Most importantly, originality of the interviews must be ensured, and the participant's responses maintained and not lost during note taking process. Therefore, at the end of the interview session, the key points discussed were reiterated to the participants to ensure that nothing had been misconstrued (Ok & MacIntosh, 2014; Yiannis, 2018).



## 4. Empirical findings

**Chapter summary:** Chapter 4 describes the research findings including a description of the research participants, a description of the ICT devices used at the nursing home and a description of the themes that emerged from the interviews including usability, benefits and challenges of using these ICT devices.

---

### 4.1 Participant characteristics

Two nurses were interviewed for this study. The nurses have been working at the nursing home for 3 and 4 years respectively. Two managers were also interviewed, one senior manager and one manager from the medical team. The senior manager has been working at the nursing home for 4 years while the manager on the medical team has been working at the nursing home for 3 years. Lastly, I interviewed two older adults with dementia. One older adult was 72 years old, was diagnosed with dementia 1 year ago and has been a resident at the nursing home for the past 3 years. The other older adult was 70 years old, was diagnosed with dementia 2 years ago and has been a resident at the nursing home for the past 2 years.

**Research Question 1:** *What types of ICT tools are used by older adults with dementia, their caregivers and/or their health care providers?*

### 4.2 Description of ICT tools

Two ICT tools are currently used at this nursing home a GPS tracker and an ADL assistant. The GPS tracker has 3 main functions a tracking function and 2 call functions. For the tracking function, the device uses signals from GPS satellites to send position coordinates to a secure website using a mobile phone network. The nurse can then log into a secure website where they can see the patient's exact position and a map of their route. For the first call function, the nurse's phone number is programmed into the device and this allows the patient to easily contact the nurse by just using one button. The second call function allows the nurse to press a single button and get in contact with the patient without requiring the patient to press any button. The second ICT tool used at the nursing home is an ADL (activities of daily living) assistant which consists of a stationary touch screen device, mobile device and sensors that support communication, daily activities and memory in persons with dementia. The main functions of this device include picture dialing, pop-up reminders (e.g. time to take your medication), date/time indicators, a music player and help/emergency button.

### 4.3 Themes

#### 4.3.1 Human

**Research Question 2:** *How are ICT tools used by older adults with dementia, their caregivers and/or their health care providers?*

#### System use

System use refers to the frequency and breadth of HIS functions and inquiries (Yusof *et al.*, 2008). One of the most common measures of system use is the use of system outputs such as reports (Yusof *et al.*, 2008). System use is influenced by the person who uses the system, their knowledge, training, expectation, belief, acceptance or resistance towards the system (Yusof *et al.*, 2008). One older adult with dementia stated that she goes for a walk about 3 to 4 times per week and she takes the GPS tracker with her to help her keep track of where she is going “I mostly use the GPS Tracker and I use it when I go out for short walks in the afternoon..... about 3 to 4 times a week..... I use it for walks to help me keep track (dementia patient 1).” Another older adult described using an ADL assistant “the device that I like and that I use the most frequently is the ADL assistant device. This is a nice little device which helps me with my normal daily activities..... One of the functions is picture dialling, so they set up pictures of my children and grandchildren as well. Then, I can easily call them using their faces on their picture because I don't really have to remember their numbers (dementia patient 2).” This individual also use the ADL assistant as a music player and as a reminder to take her medication “the device reminds us to take our medications everyday as well. That’s helpful as well, and I like the music players as well, just in the afternoon after lunch when I listen to music (dementia patient 2).”

***Research Question 3: What are the benefits and challenges of using ICT from the perspective of older adults with dementia, their caregivers and/or their health care providers?***

## **User satisfaction: Perceived usefulness**

User satisfaction refers to the user’s evaluation of their experience with the system and their assessment of the impact of the system (Yusof *et al.*, 2008). User satisfaction is influenced by the user’s perceived usefulness of the system and their attitudes towards the system (Yusof *et al.*, 2008). Both nurses were fairly satisfied with the GPS tracker and the ADL assistant. For example, one nurse liked the user interface of the ADL assistant “the touch screen that has been very good, and the font size is also very good and can be adjusted to their needs as well” (nurse 2). Additionally, the older adults with dementia were also satisfied with the ICT tools that they used. For example, one older adult with dementia said that she liked the GPS tracker because it is light weight and makes her feel safer when she takes a walk: “one thing that I like about this device it's light and I can attach it to my clothing..... It's like a safety net and I have the independence but if I need some help, then I know its there (dementia patient 1).” With regards to the ADL assistant, the older adult with dementia stated the device is easy to use, the buttons are a good size and the text on the device is easy to read “I like that it's very easy to use. The buttons are nice good sizes, I don't have to struggle to read (dementia patient 2).”

## **User expectation**

User expectation refers to the anticipation of enhanced patient care as a result of HIS use (Yusof *et al.*, 2008). There were several aspects of the ICT tools that did not meet the users’ expectation. For example, the dementia patient stated that she wished the ADL assistant had a longer battery life “the battery life, it only last about 3 hours. So, having it longer would be useful instead of having to charge as much (dementia patient 2)”. The nurse also stated that the battery life of the ADL assistant is not long enough “One of the challenges..... it's the battery life could be a bit longer..... it's..... time consuming to have to remember to charge

the device very frequently” (nurse 2). Additionally, the dementia patient also stated that she wished the ADL assistant had a larger selection of music to choose from “one of the things is the music, I wish there were more choices to the music that I want to listen to but hopefully as it develops, they add more music to it (dementia patient 2).” The nurse also commented on the limited music selection on the ADL assistant, “it will be nice to have a bit more choices for music because everyone loves different kinds of music” (nurse 2). With regards to the GPS tracker, the dementia patient stated that sometimes the GPS tracker has signals problems which prevents her from taking a walk “sometimes, we might have issues with the signal on the device, so I may not be able to go out for walk..... so that's a bit inconvenient because I look forward to the walks (dementia patient 1).” Another feature that did not meet the needs of the users was the range of the GPS tracker. Both the nurse and the patient with dementia stated that the range of 500 meters is not enough.

## 4.3.2 Technology

### System quality

System quality measures inherent characteristics of health information systems (HIS) such as user interface and system performance (Yusof *et al.*, 2008). Measures of system quality include: ease of use, ease of learning, reliability, completeness, availability, system flexibility, system security, response time and usefulness (Yusof *et al.*, 2008). In my study, the nurses stated that both the GPS tracker and the ADL assistant are easy to use. One nurse said that the GPS tracker is “pretty easy to use, it’s straightforward” ..... and the website “It’s very easy to navigate as well” (nurse 1). Another nurse stated that the ADL assistant “is easy to use and it’s reliable..... the size of the buttons on the touch screen and the font, I believe it’s appropriate, it’s big enough for people with dementia (nurse 2)”. A nurse also stated that the GPS tracker is secure: “the device ..... sends the position of the person to a secure website and then..... I can log into the secure website and see exactly where the person is (nurse 1).” In terms of system reliability, one nurse stated that the GPS tracker is not 100% reliable “it’s not reliable 100% of the times ..... we do have problems with the connection on the phone side or on the GPS the tracker side (nurse 1).”

### Service quality

Service quality refers to the amount of support provided by the HIS service provider whether the service provider is internal or external to the health care organization (Yusof *et al.*, 2008). Service quality is measured by how quickly the service provider responds to system problems as well as assurance, empathy and follow-up provided by the service provider (Yusof *et al.*, 2008). One of the nurses stated the service provided with the GPS tracker is good, “there’s a call line that you can call for technical support..... they are pretty responsive to calls if we need any support with the device that we can't figure out on our own (nurse 1).” Another nurse stated the service provided with the ADL assistant is also good, “the technical support team is pretty good so we can call them especially during the day and will get the help that we need (nurse 2).” A nurse also stated that the company helped with the initial set up of the ADL assistant, “when we initially purchased the device..... one of the services available is a technician from the company came in and what they did is help set up the device and deliver the manuals (nurse 2).” With regards to the company that supplies the ADL assistant, one of the nurses said, “if there was a problem with the device itself like a physical problem, they also sent a technician as well to help fix that (nurse 2).”

## 4.3.3 Organization

### Organization structure

Organizational structure refers to various aspects of the organization including the type and size of the organization as well as the hierarchy, culture, management, politic, autonomy, planning, strategy, control systems and communication of the organization (Yusof *et al.*, 2008). In terms of the size of the organization, there are 26 employees, 40 older adults and 8 older adults have dementia. The management structure of this nursing home is divided into four sections, “we have the management team, medical team, Caregiving team and housekeeping team..... the management team comprises of the CEO and the senior managers, they oversee the overall management of the organization..... the medical team is responsible for the management of the patient care.....the Caregiving team are directly involved with the patient care while the housekeeping team is involved with the facility including the cleaners, securities” (senior manager). Planning and decisions about using ICT tools occurs in a cascading manner starting with the caregiving team who interact directly with the patients everyday, then to the medical management team and then to the senior management team. The medical manager said “initially the decision to go with the technological devices starts with the caregiving team because they work directly with the patients, so they know what the patients’ needs are..... from there, they discuss with the medical team..... Then, we move up to the management and decisions are made on the types of devices to go with by looking the costs, durability, costs of maintenance of the devices, reliability etc” (medical manager).

### Organization environment

The organizational environment can be examined through its financing source, politics, government, localization, competition, communication, type of populations being served and inter-organizational relationship (Yusof *et al.*, 2008). This is a privately-owned nursing home. The nursing home also has investors and receives donations from charities.

### Net benefits

Net benefits of a system capture both the positive and negative effects on the user (Yusof *et al.*, 2008). Net benefits can be assessed from the perspective of a single user, a group of users, an organization or an industry (Yusof *et al.*, 2008). One of the main benefits of both the GPS tracker and the ADL assistant is that they both give patients a greater sense or autonomy/independence. One nurse made the following comment about the ADL assistant: “I like the system..... because it’s gives some of autonomy back to the patient, they have more independence to do certain things on their own or they can do stuff with small reminders (nurse 2)”. A nurse also commented that the GPS tracker gives the patients more independence “they also feel less nervous going out on their own feeling that they may get lost. So those are the most benefits, the sense of freedom and the peace of mind that comes with the device (nurse 1).”

## 5. Discussion

***Chapter summary:** Chapter 5 provides a brief summary of the main findings of my thesis. This chapter also discusses how my findings relate to previous research. Lastly, I will discuss the limitations of my research.*

---

The objectives of this qualitative study were to determine: 1) what types of ICT tools are used by older adults with dementia and their caregivers (i.e. nurses), 2) how these ICT tools are used by older adults with dementia and their caregivers and 3) what are the benefits and challenges of using these ICT tools. To answer these questions, I interviewed two nurses, two managers and two patients with dementia residing in a nursing home. The ICT tools used at this nursing home are a GPS tracker and an ADL assistant. Both the nurses and the older adults with dementia agreed that the GPS tracker and the ADL assistant were easy to use. The nurse and the dementia patient stated that the GPS tracker made them feel safer during walks. Additionally, the dementia patient stated that the GPS tracker gives her a greater sense of freedom because she can take walks independently. However, one of the main problems with the GPS tracker is that it is not 100% reliable. Sometimes there are signal problems which prevent dementia patients from going for their walks. With regards to the ADL assistant, the dementia patient stated that she liked the device because it makes it easier for her to call family and friends using the picture dialing function. This individual also enjoys listening to music of this device. However, both the dementia patient and the nurse stated that the battery life of the device is too short and that they would like a larger selection of music.

The findings of this study are consistent with the findings from previous studies of similar ICT devices. For example, Olsson et al. (2013) also studied the use of a GPS tracker and found that older adults with dementia and their caregivers (their spouses) felt more secure and felt less worried about getting lost when using the tracker. Another study by Pot, Willemse and Horjus. (2012) also found that using a GPS tracker made older adults with dementia feel safer, supported and protected when going outside on their own. In this study, older adults with dementia also reported that the GPS tracker gave them more freedom (Pot, Willemse and Horjus, 2012). Pot, Willemse and Horjus. (2012) also reported that the GPS tracker reduced arguments between older adults with dementia and their spouses about going outside of their own. Olsson et al (2013) also found that older adults with dementia enjoyed the increased freedom they had when using the GPS tracker. In the Olsson et al (2013) study, one participant stated that during the summer she enjoys spending time at her cottage and she uses the GPS tracker to find her way back to the cottage whenever she goes outside to pick berries and mushrooms. In my study, older adults with dementia also reported that the GPS tracker gave them more freedom. Additionally, a study by Landau et al. (2009) also reported that when GPS is used for older adults with dementia, their caregivers have greater peace of mind and worry less about the safety of their loved one with dementia (Landau *et al.*, 2009). Meitland et al (2012) tested a device similar to the ADL assistant called a Day navigator and also found that the device was easy to use. In this study, participants liked the size and sensitivity of the touch screen, the font size as well as the size and number of buttons on the device. Participants in their study also liked the pop-up reminders and the picture dialing function (Meiland *et al.*, 2012).

Like previous studies, my study also found that despite the benefits of using ICT devices there were also some challenges. For example, in my study research participants stated that sometimes they experienced connection problems with the GPS tracker which prevented them from going for a walk. In addition, participants stated that they wished that the range of the

GPS tracker was greater than 500 meters. Similar challenges with using ICT devices have been reported in previous research. For example, when Pot, Willemse and Horjus. (2012) tested a GPS tracker in older adults with dementia, participants also complained about connection problems and the short battery life of the device.

## **5.1 Limitations**

The main limitation of my study is the small sample size of six participants (2 managers, 2 nurses and 2 older adults with dementia). Due to the ongoing pandemic, it was very difficult to my research because research that is directly related to the pandemic is given greater priority during this time. Another limitation of this study is the gender distribution of the research participants. Although I invited both men and women to participate in this study, 5/6 of the persons who agreed to participate in this study were women.



## 6. Conclusion

*Chapter summary: Chapter 6 contains my final remarks including a brief summary of the overall findings of my research. I will also discuss the contribution that my research makes to the current body of research. Lastly, I will make recommendations for future research.*

---

The aim of this study is to examine and discuss the existing ICT tools used in the healthcare sector for older adults with dementia, the benefits and challenges of using these ICT tools from the perspective of older adults with dementia and their health care providers. The perspectives of older adults with dementia and their health care providers was obtained using semi-structured interviews. The study was conducted using qualitative content analysis, the empirical data was collected from six respondents, before being subjected with content analysis and coded with the framework. The empirical findings were discussed with the Human-Organization-Technology fit (HOT-fit) framework. The Human-Organization-Technology fit (HOT) fit is both framework and model for determining and measuring the complex variables for the success of an IS in healthcare sector. This framework emerged from the information systems (IS) and the health information systems (HIS) literature (Yusof *et al.*, 2008).

In conclusion, older adults with dementia and their caregivers (i.e. nurses) perceived the GPS tracker and the ADL assistant as user-friendly and helpful for supporting activities of daily living. In particular, the GPS tracker provided greater peace of mind when older adults with dementia went outside on their own. The GPS tracker also gave older adults with dementia more freedom. The ADL assistant provided useful pop-up reminders and older adults liked the picture dialing and music player functions. However, there are some problems that need to be worked out such as the short battery life of the ADL assistant and connection problems and short signal range of the GPS tracker.

### 6.1 Research Contribution

Most of the current research on the use of ICT devices by older adults with dementia and their caregivers have been conducted in North America and Europe. This study provides data on the use of ICT devices by older adults with dementia and their caregivers in Nigeria, Africa. Currently, health ICT research in Africa is limited however, it is slowly becoming more common.

For example, Idoga *et al.* (2019) conducted a cross-sectional survey among health care providers in north-central Nigeria to identify and evaluate factors that influence their intention to use a cloud-based health center (CBHC). The CBHC is a web-based application that patients can log into and see their medical data, enter their symptoms and book an appointment with their doctor (Idoga *et al.*, 2019). The CBHC is used collaboratively by the patient, their doctor and other health care providers (Idoga *et al.*, 2019). Patients can either log into the CBHC on their personal electronic devices or log in using a device at their community health center (Idoga *et al.*, 2019). This study found that knowledge about cloud-based health, performance expectancy, IT infrastructure and social influence significantly impact health care providers' acceptance and use of the cloud-based health center (Idoga *et al.*, 2019). Additionally, Olok, Yagos and Ovuga. (2015) conducted a cross-sectional survey of doctors working in various hospitals across northern Uganda to determine their attitudes and use of ICT tools (Olok, Yagos and Ovuga, 2015). This study found that most doctors had positive attitudes towards ICT; they believed that ICT tools were suitable for their needs and



were easy to learn (Olok, Yagos and Ovuga, 2015). The most significant factor that impacted ICT use among doctors was their ICT skills (Olok, Yagos and Ovuga, 2015). Other factors that impacted ICT use were lack of availability and access to ICT as well as lack of time to access and use ICT tools (Olok, Yagos and Ovuga, 2015).

Lastly, Farahat, Hegazy and Mowafy, 2018) conducted a mixed methods study (cross-sectional survey and focus groups) to examine ICT use by health care providers in Egypt. This study found that approximately half of the physicians reported having ICT tools in their workplace and that they were trained to use them (Farahat, Hegazy and Mowafy, 2018). However, none of the physicians conducted community-based research with ICT tools (Farahat, Hegazy and Mowafy, 2018). Most of the physicians in this study believed that insufficient funds have been allocated for ICT utilization in primary care; they also believed that there is poor commitment by policy makers to utilize ICT (Farahat, Hegazy and Mowafy, 2018). Additionally, 74.2% of physicians reported that their workplace has no central network and 85.7% of them reported that there is no maintenance of the ICT equipment at their workplace (Farahat, Hegazy and Mowafy, 2018).

## **6.2 Future research**

Future research should be done with larger sample sizes in order to gain a larger range of perspectives and experiences of older adults with dementia and their caregivers who use ICT devices. Additionally, future research should try to recruit more men in order to determine whether men's views about using ICT devices differ from women's views. Lastly, future research should address the current problems associated with using these ICT devices such as connection problems, short battery life and extending the range of the GPS trackers beyond 500 meters.

## 7. References

Abaidoo, B. and Larweh, B. T. (2014) 'Consumer Health Informatics: The Application of ICT in Improving Patient-Provider Partnership for a Better Health Care', 6(2), p. 188. doi: 10.5210/ojphi.v6i2.4903.

Alpert, J.M., Krist, A.H., Aycock, R.A. and Kreps, G.L., 2017. Designing User-Centric patient portals: clinician and patients' uses and Gratifications. *Telemedicine and e-Health*, 23(3), pp.248-253.

Andreasen, P., Lonnroos, E. and von Euler-Chelpin, M. C. (2014) 'Prevalence of depression among older adults with dementia living in low- and middle-income countries: a cross-sectional study', *The European Journal of Public Health*. Narnia, 24(1), pp. 40–44. doi: 10.1093/eurpub/ckt014.

Appireddy, R., Khan, S., Leaver, C., Martin, C., Jin, A., Durafour, B.A. and Archer, S.L., 2019. Home virtual visits for outpatient follow-up stroke care: cross-sectional study. *Journal of medical Internet research*, 21(10), p.e13734.

Begum, M., Wang, R., Huq, R. and Mihailidis, A., 2013, June. Performance of daily activities by older adults with dementia: The role of an assistive robot. In *2013 IEEE 13th International Conference on Rehabilitation Robotics (ICORR)* (pp. 1-8). IEEE.

Bengtsson, M., 2016. How to plan and perform a qualitative research study using content analysis. *NursingPlus Open* 2(1), pp. 8-14.

Bitsch, V. (2005) 'Qualitative Research : A Grounded Theory Example and Evaluation Criteria', *American Journal of Agricultural Economics*, 1(Spring), pp. 75–91.

Brahmbhatt, D. and Cowie, M. (2019) 'Remote Management of Heart Failure: An Overview of Telemonitoring Technologies', *Cardiac failure review*. Card Fail Rev, 5(2), pp. 86–92. doi: 10.15420/CFR.2019.5.3.

Connelly, L. M. (2016) 'Trustworthiness in Qualitative Research', *MEDSURG Nursing*, 25(6), pp. 435–436.

Cuijpers, P. (2005) 'Depressive disorders in caregivers of dementia patients: A systematic review', *Aging & Mental Health*. Taylor & Francis Group , 9(4), pp. 325–330. doi: 10.1080/13607860500090078.

De Leo, G., Brivio, E. and Sautter, S.W., 2011. Supporting autobiographical memory in patients with Alzheimer's disease using smart phones. *Applied neuropsychology*, 18(1), pp.69-76.

Dorsey, E. R. and Topol, E. J. (2016) 'State of Telehealth', *New England Journal of Medicine*. Edited by E. W. Campion. Massachusetts Medical Society, 375(2), pp. 154–161. doi: 10.1056/NEJMra1601705.

Erlirianto, L. M., Ali, A. H. N. and Herdiyanti, A. (2015) 'The Implementation of the Human, Organization, and Technology-Fit (HOT-Fit) Framework to evaluate the Electronic Medical

Record (EMR) System in a Hospital.’, *Procedia Computer Science*, 72, pp. 580–587. doi: 10.1016/j.procs.2015.12.166.

Farahat, T. M., Hegazy, N. N. and Mowafy, M. (2018) ‘Information and communication technologies in primary healthcare facilities in Egypt’, *Primary Health Care Research & Development*. Cambridge University Press, 19(1), p. 88. doi: 10.1017/S1463423617000470.

García-Lizana, F. and Sarriá-Santamera, A. (2007) ‘New technologies for chronic disease management and control: a systematic review.’, *Journal of telemedicine and telecare*. SAGE PublicationsSage UK: London, England, 13(2), pp. 62–8. doi: 10.1258/135763307780096140.

Gerlach, L. B. and Kales, H. C. (2018) ‘Managing Behavioral and Psychological Symptoms of Dementia’, *Psychiatric Clinics*, 41(1), pp. 127–139. doi: 10.1016/j.psc.2017.10.010.

Good Research Practice, 2011. *The Swedish Research Council’s report*. [Online] Available at: <<http://vr.se/download/>>, [Accessed 18 July 2020].

Graneheim, U. H., Lindgren, B.-M. and Lundman, B. (2017) ‘Methodological challenges in qualitative content analysis: A discussion paper’. doi: 10.1016/j.nedt.2017.06.002.

Guba, E. G. and Lincoln, Y. (1994) ‘Competing paradigms in qualitative research. In N. Denzin & Y Lincoln (Eds.), *Handbook of qualitative research*’, in. Thousand Oaks, California: Sage, pp. 105–117.

Holtz, B. and Lauckner, C. (2012) ‘Diabetes Management via Mobile Phones: A Systematic Review’, *Telemedicine and e-Health*, 18(3), pp. 175–184. doi: 10.1089/tmj.2011.0119.

Houghton, C., Casey, D., Shaw, D. and Murphy, K., 2013. Rigour in qualitative case-study research. *Nurse researcher*, 20(4).

Hsieh, H.-F. and Shannon, S. E. (2005) ‘Three Approaches to Qualitative Content Analysis’, *Qualitative Health Methods*, 15(9), pp. 1277–1288. doi: 10.1177/1049732305276687.

Idoga, P.E., Toycan, M., Nadiri, H. and Çelebi, E., 2019. Assessing factors militating against the acceptance and successful implementation of a cloud based health center from the healthcare professionals’ perspective: a survey of hospitals in Benue state, northcentral Nigeria. *BMC medical informatics and decision making*, 19(1), p.34.

Iljaž, R., Brodnik, A., Zrimec, T. and Cukjati, I., 2017. E-healthcare for diabetes mellitus type 2 patients—a randomised controlled trial in Slovenia. *Slovenian Journal of Public Health*, 56(3), pp.150-157.

Irizarry, T., Dabbs, A. D. and Curran, C. R. (2015) ‘Patient Portals and Patient Engagement: A State of the Science Review’, *Journal of Medical Internet Research*. JMIR Publications Inc., 17(6). doi: 10.2196/JMIR.4255.

Kampmeijer, R., Pavlova, M., Tambor, M., Golinowska, S. and Groot, W., 2016. The use of e-health and m-health tools in health promotion and primary prevention among older adults: a systematic literature review. *BMC Health Services Research*, 16(5), p.290.

Kerssens, C., Kumar, R., Adams, A.E., Knott, C.C., Matalenas, L., Sanford, J.A. and Rogers, W.A., 2015. Personalized technology to support older adults with and without cognitive impairment living at home. *American Journal of Alzheimer's Disease & Other Dementias®*, 30(1), pp.85-97.

Kinney, J.M., Kart, C.S., Murdoch, L.D. and Conley, C.J., Striving to Provide Safety Assistance for Families of Elders: The SAFE House.

Landau, R., Werner, S., Auslander, G.K., Shoval, N. and Heinik, J., 2009. Attitudes of family and professional care-givers towards the use of GPS for tracking patients with dementia: an exploratory study. *British Journal of Social Work*, 39(4), pp.670-692.

Leng, F.Y., Yeo, D., George, S. and Barr, C., 2014. Comparison of iPad applications with traditional activities using person-centred care approach: impact on well-being for persons with dementia. *Dementia*, 13(2), pp.265-273.

Lietz, C. A. and Zayas, L. E. (2010) 'Evaluating Qualitative Research for Social Work Practitioners', *Advances in Social Work*, 11(2), pp. 188–202. doi: 10.18060/589.

Lincoln, Y. and Guba, E. G. (1985) *Naturalistic inquiry*. Newbury Park, CA: Sage.

Lundberg, S. (2014) 'The results from a two-year case study of an information and communication technology support system for family caregivers.', *Disability and rehabilitation. Assistive technology*. United Kingdom, 9(4), pp. 353–358. doi: <http://dx.doi.org/10.3109/17483107.2013.814170>.

Mariño, R. J., Marwaha, P. and Barrow, S. (2016) 'Web-based oral health promotion program for older adults: Development and preliminary evaluation', *International Journal of Medical Informatics*. Elsevier, 91, pp. e9–e15. doi: 10.1016/J.IJMEDINF.2016.04.002.

Meiland, F.J., Bouman, A.I., Sävenstedt, S., Bentvelzen, S., Davies, R.J., Mulvenna, M.D., Nugent, C.D., Moelaert, F., Hettinga, M.E., Bengtsson, J.E. and Dröes, R.M., 2012. Usability of a new electronic assistive device for community-dwelling persons with mild dementia. *Aging & mental health*, 16(5), pp.584-591.

Moffatt, J. J. and Eley, D. S. (2010) 'The reported benefits of telehealth for rural Australians', *Australian Health Review*, 34(3), pp. 276–281. doi: 10.1071/AH09794.

OK, D & MacIntosh, R. (2014). *Research Methods for Business and Management : A Guide to Writing Your Dissertation*, Goodfellow Publishers, Limited, Oxford.

Olok, G. T., Yagos, W. O. and Ovuga, E. (2015) 'Knowledge and attitudes of doctors towards e-health use in healthcare delivery in government and private hospitals in Northern Uganda: a cross-sectional study', *BMC Medical Informatics and Decision Making*. BioMed Central, 15. doi: 10.1186/S12911-015-0209-8.

Olsson, A., Engström, M., Lampic, C. and Skovdahl, K., 2013. A passive positioning alarm used by persons with dementia and their spouses—a qualitative intervention study. *Bmc*

Patel, R. and Davidson, B., 2011. *Forskningsmetodikens grunder*. 4th ed. Lund: Studentlitteratur.

Polit, D. and Beck, C. (2014) 'Essentials of nursing research: appraising evidence for nursing practice.', in. Lippincott Williams & Wilkins.

Pot, A. M., Willemse, B. M. and Horjus, S. (2012) 'A pilot study on the use of tracking technology: Feasibility, acceptability, and benefits for people in early stages of dementia and their informal caregivers', *Aging & Mental Health*, 16(1), pp. 127–134. doi: 10.1080/13607863.2011.596810.

Powell, R.E., Henstenburg, J.M., Cooper, G., Hollander, J.E. and Rising, K.L., 2017. Patient perceptions of telehealth primary care video visits. *The Annals of Family Medicine*, 15(3), pp.225-229.

Purcell, R., McInnes, S. and Halcomb, E. J. (2014) 'Telemonitoring can assist in managing cardiovascular disease in primary care: a systematic review of systematic reviews', *BMC Family Practice*. BioMed Central, 15, p. 43. doi: 10.1186/1471-2296-15-43.

Ruggiano, N., Brown, E.L., Shaw, S., Geldmacher, D., Clarke, P., Hristidis, V. and Bertram, J., 2019. The potential of information technology to navigate caregiving systems: perspectives from dementia caregivers. *Journal of gerontological social work*, 62(4), pp.432-450.

Rumambi, F. R., Santoso, A. J. and Setyohadi, D. B. (2017) 'Identification of factors influencing the Success of Hospital Information System (SIRS) by Hot-Fit model 2006: A case study of RSUD Dr Samratulangi Tondano, Minahasa Regency, North Sulawesi.', *Proceedings - 2017 International Conference on Soft Computing, Intelligent System and Information Technology: Building Intelligence Through IOT and Big Data, ICSIIT 2017*, 2018-Janua, pp. 202–207. doi: 10.1109/ICSIIT.2017.38.

Sabayan, B. and Sorond, F. (2017) 'Reducing risk of dementia in older age', *JAMA - Journal of the American Medical Association*, 317(19), p. 2028. doi: 10.1001/jama.2017.2247.

Schou, L., Høstrup, H., Lyngsø, E.E., Larsen, S. and Poulsen, I., 2012. Validation of a new assessment tool for qualitative research articles. *Journal of advanced nursing*, 68(9), pp.2086-2094.

Schulz, R., Martire, L. M. and Schultz, R. (2004) *Family Caregiving of Persons With Dementia: Prevalence, Health Effects, and Support Strategies*, *American Journal of Geriatric Psychiatry*. doi: 10.1097/00019442-200405000-00002.

Shannon, P. and Hambacher, E. (2014) 'Authenticity in Constructivist Inquiry: Assessing an Elusive Construct', *The Qualitative Report*, 19, pp. 1–13.

Shenton, A. K. (2004) 'Strategies for ensuring trustworthiness in qualitative research projects', *Education for Information*, 22(2), pp. 63–75. doi: 10.3233/EFI-2004-22201.

Socialstyrelsen., 2016. *Tillståndet och utveckling inom hälso- och sjukvård samt tandvård*

*lägesrapport*. [Online] Available at: <<http://www.socialstyrelsen.se/>>, [Accessed 11 July 2020].

Tang, P.C., Ash, J.S., Bates, D.W., Overhage, J.M. and Sands, D.Z., 2006. Personal health records: definitions, benefits, and strategies for overcoming barriers to adoption. *Journal of the American Medical Informatics Association*, 13(2), pp.121-126.

Torp, S., Hanson, E., Hauge, S., Ulstein, I. and Magnusson, L., 2008. A pilot study of how information and communication technology may contribute to health promotion among elderly spousal carers in Norway. *Health & social care in the community*, 16(1), pp.75-85.

UNESCO Institute of Statistics (2020) *Information and communication technologies (ICT) / UNESCO UIS*. Available at: <http://uis.unesco.org/en/glossary-term/information-and-communication-technologies-ict> (Accessed: 4 February 2020).

Van der Flier, W. M. and Scheltens, P. (2005) 'Epidemiology and risk factors of dementia.', *Journal of neurology, neurosurgery, and psychiatry*. BMJ Publishing Group Ltd, 76 Suppl 5(suppl 5), pp. v2-7. doi: 10.1136/jnnp.2005.082867.

Van Der Flier, W. M. and Scheltens, P. (2005) 'EPIDEMIOLOGY AND RISK FACTORS OF DEMENTIA', *J Neurol Neurosurg Psychiatry*, 76, pp. 2–7. doi: 10.1136/jnnp.2005.082867.

While, A. and Dewsbury, G. (2011) 'Nursing and information and communication technology (ICT): A discussion of trends and future directions', *International Journal of Nursing Studies*, 48, pp. 1302–1310. doi: 10.1016/j.ijnurstu.2011.02.020.

Wildemuth, B. M. (2016) *Applications of Social Research Methods to Questions in Information and Library Science*. 2nd editio. ABC-CLIO, LLC.

World Health Organization (2010) *Population ageing, WHO*. World Health Organization. Available at: <https://www.who.int/features/qa/72/en/> (Accessed: 12 February 2020).

World Health Organization (2019) *Dementia*. Available at: <https://www.who.int/news-room/fact-sheets/detail/dementia>.

Yannis, G. (2018). *Stories and narratives*, in *The sage handbook of qualitative business and management research methods: methods and challenges*, SAGE Publications Ltd, 55 City Road, London, pp. 63-81, viewed 17 March 2020, doi: 10.4135/9781526430236.n5.

Yilmaz, K. (2013) 'Comparison of Quantitative and Qualitative Research Traditions: epistemological, theoretical, and methodological differences', *European Journal of Education*. John Wiley & Sons, Ltd (10.1111), 48(2), pp. 311–325. doi: 10.1111/ejed.12014.

Yusof, M.M., Kuljis, J., Papazafeiropoulou, A. and Stergioulas, L.K., 2008. An evaluation framework for Health Information Systems: human, organization and technology-fit factors (HOT-fit). *International journal of medical informatics*, 77(6), pp.386-398.



## **Appendix.**

### **Informed Consent Form for Master Thesis**

**Date:** April 2020.

**Title of the Research:** Innovative solutions for dementia care using ICT: A literature review and qualitative content analysis.

**Researcher:** Adeyinka Lawrence Adejo, Master Program in Informatics, Linnaeus University

Email: aa224zq@student.lnu.se

Phone: 6472349876

### **Purpose of the Research.**

To explore the ICT tools used by older adults with dementia, their caregivers and their health care providers. The aim of this study is to examine and discuss the existing ICT tools used in the healthcare sector for older adults with dementia, the benefits and challenges of using these ICT tools from the perspective of older adults with dementia and their health care providers.

### **Respondent part.**

Your participation in individual interview is needed. The interview is expected to be within thirty minutes. The aim is to express your perception or opinion on the existing ICT tools used in the healthcare sector for older adults with dementia, the benefits and challenges of using these ICT tools from the perspective of older adults with dementia and their health care providers. The answers you will provide, will help me understand the process of ICT tools, its current status, what are being currently used and benefits and challenges.

### **Confidentiality.**

Your identity, such as your name, professional title would be securely kept safe. Your contribution would only be used for research, would only be analyzed by me and would only be accessed by my Thesis supervisor. Furthermore, your participation in this research study is void of risks.

### **Benefits of the research.**

This research would give me more knowledge about the existing situation from your perception, how to improve the ICT tools currently used and for future research in health information system. You, as a participant would gain knowledge about different ICT tools used and how to improve the ones currently used to support older adults with dementia.

### **Participation and Withdrawal.**

Your participation is strictly voluntary. This means that you could withdraw at any time, you can have your contribution destroyed in its totality, at any time and completely without consequences. You also have the right to refuse to answer specific questions without having to justify to why.

### **Questions**

If you have any questions regarding the research or your participation, please contact Adeyinka Lawrence Adejo on phone: 6472349876 or by email: [aa224zq@student.lnu.se](mailto:aa224zq@student.lnu.se).

## Legal Rights

I agree to participate in the research study: 'Innovative solutions for dementia care using ICT: A literature review and qualitative content analysis' that is conducted by Adeyinka Lawrence Adejo. I understood its purpose and hereby allow my opinions to be noted and used in this study. Nonetheless, that I signed this form, my legal rights are still intact. I give my consent by signing below.

**Signature:**

**Participant:**

**Date:**

**Signature:**

**Researcher:** Adeyinka Lawrence Adejo

**Date:**

**Lnu.se**



**Linnæus University**  
Sweden

Faculty of Technology

SE-391 82 Kalmar | SE-351 95 Växjö

Phone +46 (0)772-28 80 00

teknik@lnu.se

Lnu.se/fakulteten-for-teknik