

# **Benefits of Technology for residents in the elderly home – A Systematic literature review**

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## **BACHELOR'S THESIS**

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### **Abstract**

It is a common knowledge and scientifically proven that as people grow old, they tend to lose their cognitive ability and functionality, which require frequent or occasional assistant from their families or hired caregivers. This gave rise to the concept of elderly homes or nursing homes where families take their old family members to facilities where they have constant supervision and care at a fee. The concept of nursing homes or elderly homes is mostly common in developed economies such as Finland. Therefore, this study which adopted systematic literature review is aimed to gather knowledge that would lead to the understanding of how nurses can use technology to improve the well-being of the residents in the elderly home. Results revealed that the mostly common technologies adopted by elderly homes include Active and assistive living (AAL), robotics technologies, care robots, companion robots, telehealth, remote monitoring, information, and communication technologies. Furthermore, technologies adopted in elderly homes help enhance wellbeing through interconnectedness, social stimulation, societal re-integration, autonomy acquisition, and capacity stimulation. In addition, the study determined that effective adoption of technology for residents in elderly homes is faced with challenges such as lack of proper technology, accessibility, inclusion, security, privacy, ethical concerns, absence universal standards, and human-centric designs.

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# 1 INTRODUCTION

New technologies are changing the way people globally are living their lives each day from financial security and ordering pizza as well as in other sectors. In this regard, technology has found ways of impacting the healthcare industry more than ever before (Pulsipher, 2021). Technologies refer to systems, devices as well as methods which are because of scientific knowledge being employed for practical purposes. All types of technologies provide nurses and residents with different types of tools to enhance and boost nurse-patient relationships as well as outcomes (Kamal, 2021). Further, the use of technologies in the transformation of healthcare services is truly exciting and using mobile technologies to enhance elderly home care in addition to supporting patient choices through timely provision of high-quality information (Kamal, 2021).

According to Su et al. (2020), a rapidly increasing number of technology-based innovations are used in the support of health and quality of life in nursing home residents. In the same vein, nursing homes and nursing facilities provide longer-term support and services for individuals living with disabling and chronic conditions that are unable to live independently at home alone. Some of the elderly people taken into elderly homes are mostly 65 years and above with some experiencing hypertension, Alzheimer's disease while some live with depression (Harris-Kojetin et al., 2019).

Therefore, with the advent of emerging technologies in the healthcare sector which many healthcare institutions have adopted, the benefits of technology use by nurses and residents in elderly homes is not known. This is despite the fact that technologies are argued to result in better outcomes for both patients and healthcare providers. Therefore, this research proposes to fill the gap as identified. The motivation for this topic is how the life of the elderly can be made easier through technology and future technologies to come to the aim.

## **2 BACKGROUND**

This chapter talks about reviewed previous studies on the topic technology and its relevance to the elderly in nursing homes as well as challenges and possible future advancement can that be brought into elderly care. An evaluation of literature to explore the most common technologies used in the residents of the elderly home is done. Furthermore, the chapter review past studies relating to how the technologies adopted in elderly homes improve the well-being of the individuals living in those residents.

### **2.1 Technology**

In general term, technology is techniques, processes, and methods adopted to offer and obtain the service to realize an objective (Yousef, 2009). According to Yousef (2009), technology has various elements including digital communication, digital access, digital commerce, digital security, digital health and wellness, digital right and responsibilities, digital etiquette, and digital literacy. However, Wahab et al. (2012) described technology as the application of the scientific knowledge to practically help humans in their daily activities or manipulation of the human environment. In that regard, Wahab et al. (2012) argues that the advancement of technology has made work easy in various aspects of human life and industries. In the context of elderly homes, the adoption of technology has improved the quality of interpersonal and technical care. Santana-Mancilla and Anido-Rifón (2017) associated technical care to the application of technological and science aspects to the management of elderly people's wellbeing. As such, Santana-Mancilla and Anido-Rifón (2017) notes that technology extends the quality of care to the provision of care and maximization of health benefits while minimizing risk. Therefore, this research take technology as all the processes and sources that can be used in elderly homes to help maintain quality wellbeing for the elderly and make the work of caregivers convenient.

### **2.2 Elderly home settings**

The elderly home or retirement home as commonly known, is a multi-residence facility or house used for accommodating the elderly (Lê et al., 2012). Similarly, Bernard et al. (2007) described elderly homes as dwelling place for elderly people who needs assistance and cannot live independently. Typically, the housing facility has different individual rooms and additional facilities that include recreational activities, rooms for gatherings, meals, and hospital care. The elderly home can be paid for like an apartment or bought on

the same basis. Essentially, each couple or person living in the facility has a suite or room styled like an apartment or suite. Securing a place at an elderly home can be done through payment in the form of rent or bought in perpetuity the way it is done with condominium (Carros et al., 2020). According to Carros et al. (2020), elderly homes or retirement homes are suitable for senior people who want to live independently with regular assistance from trained caregivers more so with the daily living activities.

An elderly home is different from a nursing home based on medical care given (Lê et al., 2012). Admission to an elderly home is open to the country's senior citizens who cannot go on with their lives due to lack of a caregiver, loneliness, neglect, or old age factors (Lê et al., 2012). Most of the elderly group suffers from mental issues such as dementia, which makes them need additional support and health services. Although elderly homes do not provide twenty-four-hour nursing care, they are expected to offer at least two of the key services including assistance with bathing, meals, dementia care program, incontinence care, administering medicine, and ensuring that services of a nurse, doctor, or pharmacist are always available (Carros et al., 2020). Therefore, providing at least two of these services qualifies a facility as a retirement home or elderly home.

### **2.3 Types of technologies used in elderly homes**

Older people are a heterogeneous group with different lifestyles, preferences, and needs implying that caregivers must use technologies that satisfy these varieties (Bäcckman et al., 2020). According to Bäcckman et al. (2020), staying healthy and fit is one of the most significant aspects to the elderly besides ensuring quality of life. Thus, many technologies have been advanced to help caregivers provide the best care to the elderly. In most cases, management of elderly homes or caregivers have often adopted robotic technology as well as Active and Assistive Living (AAL) to improve the quality of care provided to residents of elderly homes.

According to Shishehgar et al. (2018), robotic technology is used by caregivers in the elderly homes to help older adults gain independence and better care. For instance, Shishehgar et al. (2018) note that robotic technology or approach is used in areas such as shower chairs, and robotic wheelchairs to prevent older adults from falling. Similarly, Bäcckman et al. (2020) recognize that robotic technology has also been applied in elderly homes as a way of offering support to the caregivers. Bäcckman et al. (2020) found that old people feel that they can control their shower situation when using shower chair, thereby

gaining independence. More importantly, robotic technologies such as shower chair has improved work situation for care staff leading to reduced risk of injuries (Bäceman et al., 2020). In another study, Bemelmans et al. (2012) revealed that caregivers in elderly homes have greatly adopted socially assistive robots to improve the well-being of the older people. However, the study by Bemelmans et al. (2012) also noted that there have been ethical concerns raised over the use of socially assistive robots among the elderly. For instance, some have argued that using socially assistive robots reduce human interaction for the elderly leading to an increased sense of isolation (Bemelmans et al., 2012). Similar to socially assistive robots, companion robots have also received attention in most research studies when evaluating various aspects of the elderly's independent living such as falling or bathing. In a systematic review undertaken by Shishehgar et al. (2018), it was revealed that companion robots have been used in elderly homes to assist older adults with sleeping or emotional contact problems.

Active and Assistive Living (AAL) is another technology that deploys Information and Communication Technology (ICT) to provide assistive technologies for supporting the elderly in their daily routines within the retirement homes (Bobillier Chaumon et al., 2014). According to Bobillier Chaumon et al. (2014), AAL can be described as home-based device or system that support various activities of the older people by enabling individuals to undertake tasks, they would not be able to perform. Further, Bobillier Chaumon et al. (2014) explain that AAL technologies increase the safety and ease with which old people can perform tasks that they would consider challenging in the absence of such technologies. In their study, Bechtold et al. (2013) note that AAL are beneficial because they increase the individual autonomy of the older adults as well as improving their social participation. The benefits associated with AAL technologies has attracted attention of many researchers. For instance, Aloulou et al. (2013) conducted a study in Singapore where they explored how AAL technologies helped or improve the wellbeing of old people with dementia living in nursing and elderly homes. The study revealed that AAL technologies play essential role in enhancing the quality of care and minimizing stress for caregivers looking after the elderly. However, Bechtold and Sotoudeh (2013) argue that there are trade-offs that need to be considered as the technology is adopted, such as threat to privacy, replacing human assistance, and other side effects.

Although its adoption is still very low, Lindeman et al. (2020) note that remote monitoring or telehealth as another technology used in elderly homes to improve quality of care and wellbeing of the older adults. Notably, Lindeman et al. (2020) telehealth and remote

monitoring is meant to help to improve the convenience with which caregivers deliver care to the elderly. Telehealth combined with remote monitoring help caregivers to manage and monitor the well-being and health of elderly adults. Accordingly, Schulz et al. (2016) point out that telehealth and remote monitoring is beneficial to caregivers who operate or provide care in multiple elderly homes because they can manage and monitor the wellbeing of their care recipients from a distance. In addition, Lindeman et al. (2020) assert that caregivers can access and receive the support they need regardless of their location, through platforms like video conferencing, online forums, and chatbots among others. In other words, caregivers in different elderly homes can learn about best practices in terms of providing the best care for the elderly as well as improving their wellbeing (Lindeman et al., 2020).

## **2.4 How technology enhance the well-being of old adults in elderly homes**

In the face of progressive loss of interactional and intellectual capacities for the old adults, most researchers have explored the extent to which new technologies are improving the wellbeing and quality of life for the old adults living in elderly residence. For instance, Bobillier Chaumon et al. (2014) set to determine whether ICT can play a role in improving the life and wellbeing of elderly adults residing in home care units. After adopting qualitative methods to interview 17 residents with a mean age of 87, the researchers found that information and communication technologies play a significant role in the context of social stimulation and interconnectedness (Bobillier Chaumon et al., 2014). Bobillier Chaumon et al. (2014) found that technology improves the situational determinants that are external to the old adults such as standard of living, hobbies, social support, but also improves the positional determinants that are internal and related to personality.

The results from the study by Bobillier Chaumon et al. (2014) reflects the argument of Bagnall et al. (2006) asserting that technologies are leading the old adults to open up and increasingly become reintegrated in the society. This assertion corresponds to Bobillier Chaumon et al. (2014)'s findings about technology improving the situational determinants that are external to the elderly persons. In this regard, Bagnall et al. (2006) argued that being part of social network or taking part in social activities aided by technology is believed to minimize old adults' withdrawal and self-isolation. For example, some technologies enable old adults to turn friends and family into feasible source of material



and moral support (Bagnall et al., 2006). Similarly, Sellen et al. (2006) note that caregivers in elderly homes have been using “Whereabouts Clock” to support family awareness among elderly adults. In another study by Leonardi et al. (2008), it was revealed that technologies have improved the quality of life and wellbeing of the elderly through virtual openness and social connectivity towards the outside world. Particularly, Leonardi et al. (2008) argue that elderly homes used to be perceived as isolation centers or shelters where old adults live but technology has changed this perspective because it brings the outside world to them and vice versa.

Bobillier Chaumon et al. (2014) found that the innovative systems and technologies used by caregivers in elderly homes enable the old adults to gain autonomy through restoration of self-confidence. A study conducted by Blit-Cohen and Litwin (2004) show that caregivers who allow elderly adults under their care to use various information and communications technologies enable them to consider their aging from a different perspective. Essentially, Blit-Cohen and Litwin (2004) determined that elderly adults with fragile minds tend to show greater chance of coping with their weakness when connected to the internet compared to others who are less connected. Correspondingly, Bobillier Chaumon et al. (2014) supported the assertion by noting that when caregivers adopt communication technologies in their care, the self-esteem of the elderly is boosted while depression reduces. The study conducted by McDonnell and Grimson (2010) indicate that technology is most effective in improving the wellbeing and quality of life for the elderly when used as a complementary activity to support residents to be more active. Therefore, adoption of technology in elderly homes residents is beneficial because it helps stimulate the capacity of the old adults (McDonnell & Grimson, 2010). The same assertion is supported by Otjacques et al. (2010) as they conclude that the adoption of technology in the residence of elderly adults help stimulate or maintain their capacity, which often diminishes as they get older.

Although Clark et al. (2012) did not focus on elderly adults residing in retirement homes instead studied the effectiveness of technologies used in promoting wellbeing of older adults living independently, the result was still like those obtained from studies concentrating on elderly homes. In that regard, Clark et al. (2012) found that lifestyle intervention technologies are effective in improving the wellbeing of elderly adults living independently. Based on the results from these studies, regardless of their place of residence technology plays a significant role in improving the quality of life and wellbeing of old adults. However, Bobillier Chaumon et al. (2014) note that the benefits of

technology towards improving the wellbeing of old adults living in elderly homes have been called into question by other studies pointing out that the risks of such technologies outweigh the advantages. For instance, Slegers et al. (2008) carried out a longitudinal analysis on the effects of internet adoption and its benefits in improving wellbeing of old adults. The study showed no positive or negative results but highlighting the associated risks such as privacy, reduced human interaction, and ethical concerns among others.

## **2.5 Challenges associated with adopting technology for residents in elderly homes**

Lindeman et al. (2020) alludes that the emergence of new technologies and its continued adoption in elderly homes have been accompanied by several cultural, social, technical, and ethical issues compounding into challenges. For instance, Bender et al. (2014) identified access and inclusion as the main challenges facing the adoption of technology to help improve quality of life and wellbeing of the older adults. The researchers argue that most effective technology are only accessed by older adults and caregivers in elderly homes considered to have strong socioeconomic status (Bender et al., 2014). Furthermore, Bender et al. (2014) points out that although the adoption of technology is increasing among residents in elderly homes for both older adults and caregivers, access and inclusion is dependent on technology type, socioeconomic status, and cultural context. Similarly, Yoon et al. (2018) identified access and inclusion as a major challenge facing the adoption of technology among older adults in elderly homes. Essentially, Yoon et al. (2018) explained that adoption and access to good technology is reduced in elderly homes found in minority race or ethnic and low-income neighborhoods. Therefore, access and inclusion are major challenges affecting effective adoption of technology for residents in elderly homes.

Chung et al. (2016) identified ethical concerns, security, and privacy as some of the challenges associated with technology adoption in elderly homes. The researchers explain that ethical questions raised on technology adoption relates to who has the person to access personal and health information of the older adults, informed consent for sharing information, and whether the elderly adults have cognitive ability to understand what they are getting into with regards to the technology (Chung et al., 2016). Accordingly, Lindeman et al. (2020) opine that potential conflicts arise when there is a difference between caregiver and care recipient in terms of privacy preferences, especially if one

wants to prefer passive monitoring but the other is opposed to the option. In addition, Lindeman et al. (2020) report that concerns have been raised over the protection of personal data collected from the elderly adults living in retirement homes. Notably, futuristic concerns have been raised over the possible emotional attachment of the older adults to an artificial intelligence caregiver (Lindeman et al., 2020).

According to Majumder et al. (2017), lack of standards for developed technology presents a challenge towards its adoption towards improving the wellbeing of elderly adults. In the absence of universal standards, many platforms, systems, and devices remain solutions with limited usability since interoperability is lacking. The challenge is mostly experienced by caregivers who work in multiple elderly homes because diversity of technology makes it challenging to offer effective and efficient support (Lindeman et al., 2020). Another challenge associated with technology adoption in elderly homes is lack of human-centric design (Lindeman et al., 2020). Particularly, Lindeman et al. (2020) argue that technology developers are unable to come up with appropriate and most suitable devices because they lack ready-made caregivers to act as test group couple with user ageism further distancing developers from their target audience. Therefore, lack of standards and human-centric design are major issues affecting the effectiveness of technology adoption in elderly homes

### **3 AIM AND RESEARCH QUESTIONS**

In this chapter detail the aim of the study and the research question that this study directs to answer at the end

#### **3.1 Research aim**

The aim of this research study is to gather better knowledge and understanding of the benefits of technology for the elderly and how nurses can improve the wellbeing among elderly residents with the use of technology.

#### **3.2 Research question**

Further, this research will be guided by the following research question:

1. How can technology enhance the wellbeing of elderly people in the elderly home?
2. What are some of the challenges associated with adopting technology for residents in elderly homes?

## 4 THEORETIC FRAMEWORK

The study has adopted Eriksson's 1992 Caritative caring theory as the framework in order to offer a theoretical background for the current study. Since the study's main focus concerns how and whether technology adopted by elderly homes help improve the level of care for the residents of the elderly homes or nursing homes. It is common knowledge that encompasses fulfilling individual needs through professionalism and better understanding of the care recipient. These are the same premise under which Caritative care theory is developed because it concerns itself with guiding nurses and care givers on how to offer better care while considering various ethical practices relevant to the circumstance such as charity, love, and caritas (Alligood, 2017). Therefore, this theory is suitable for providing a theoretical underpinning for the current research.

### 4.1 Caritative care theory

The core substance of Caritative care theory is about caring by tending, learning, and playing in faith, love, and hope beginning with love, kindness, mercy, compassion and caring relationship between the care giver and the recipient (Alligood, 2017). Thus, the theory is developed based on four key or main concepts including nursing, human being, health, and environment. In relation to human being, the theory believes or asserts that human being is an entity body, spirit, and soul (Alligood, 2017). The theory of caritative caring states that: *"Caritative caring means that we take 'caritas' into use when caring for the human being in health and suffering. . . Caritative caring is a manifestation of the love that 'just exists.' . . . Caring communion, true caring, occurs when the one caring in a spirit of caritas alleviates the suffering of the patient."* (Eriksson, 1992c, pp. 204, 207)

This theory maintains that taking care of other human beings is a holy endeavor that brings dignity, which means that taking as an obligation and performing with love. In terms of nursing, the theory asserts that caring professions has always been inclined towards ministering and helping those who need it or suffering (Alligood, 2017). Considering nursing as a concept of Caritative caring theory, Eriksson asserts that naturally care is about to tend, learn, and play in the spirit of love, faith, and hope (Alligood, 2017). The development of the theory is also inspired by the environment as a core concept in which the theory maintains that the ethos of caring science consists of respect, love, charity, and honor (Alligood, 2017). In other words, the theory believes that ethos signifies people's inner space or environment where they feel safe and comfortable. In terms of

health, the theory contends that freshness, soundness, and wellbeing where being healthy implies holiness and wholeness (Alligood, 2017).

Although the theory is based on the four concepts, the inner core of caritative caring theory consists of thoughts of mercy, love, and compassion (Bergbom et al., 2022). In other words, mercy, compassion, and love are considered the primary objects of knowledge in caring science. The primary motive and idea are to relieve suffering and encourage as well as protect life and health of the care recipient (Eriksson, 2018). Moreover, the theory contends that caring also entails sharing and healing, which assumes caring relationship where listening takes center stage making it possible to demonstrate compassion and kindness (Gaut & Boykin, 1994). Based on the theory, true caring emanates from compassion and informs the motive of an individual because it relates to sensitivity to suffering by helping reduce or eliminate the suffering. The caritative caring theory is mostly based on ethics in which ethics precedes the ontology implying that caring actions or situations are inferior to ethos and ethics (Bergbom et al., 2022). The theory perceives as an action of mercy that implies, to a certain degree, sharing life space with another individual (Karlsson, 2017). To that effect, the aim of caring and sharing relationship is to alleviate suffering and promote health.

The theory also consider friendship as a significant element when undertaking natural caring as Eriksson relied on various philosophers such as Spinoza, Aristoteles, Fromm, and Alberoni (Eriksson, 2018). Eriksson believes that including friendship as part of natural caring is based on its relation to devotion and health including tenderness, sympathy, and love as kindness and compassion (Bergbom et al., 2022). Besides friendship, Eriksson contends that care and caring are both science and art and adopted Brain-Hand-Heart model (Bergbom et al., 2022). The theory maintains that caring encourages individuals' health and humanity, and it implies having a feeling of inner freedom, integration, wholeness, and growth (Bergbom et al., 2022). In this regard, Eriksson assumes that human being is part of the body, spirit, and soul and this view encompasses human being's holiness and dignity. Therefore, caring is about healing and supporting a movement towards wholeness and integration, which entails co-operation, caring care, and cure of souls.

In a nutshell, the theory claims that true caring is grounded on compassion in which the carer invites the other person and forms the basic structure, while hope, love, and faith are the primary food or the fundamental of caring as caring communion constitutes the context of caring (Eriksson, 2018). Based on the idea of natural caring, caritative notion consists of

both faith and hope as well as comprises the core of all relationships and care between people. Furthermore, the caring fabric is always the same and manifests in various forms of learning, tending, and playing. Therefore, these concepts are interconnected in a caritative pattern, manifesting as well as suffering.

## 4.2 Key assumptions of Caritative care theory

Human being: Eriksson's theory talks about the concept of human being consisting of the body, soul and spirit although not all human beings have acclaimed such idea and the human being a fundamental religious being. She maxim that the human being is a holy entity which is then connected to human dignity which means that through love we attend to people, and we all live for each other. Eriksson makes emphasis on why it is essential to recognize the human being's ontological context. The human being is understood to not be in a complete state but changes as time passes by. She perceives the freedom of human beings to be an aspect of developing linking it to Kierkegaard's (1843/1943) notion of free choosing freely in different stages of human being that is esthetic, ethical and religious stages and deems that the establishment of human being's freedom is the power of transcendency. The human being is reliant on one another, and it is within the relationship him and some kind of God that comprises himself and his being (Alligood, 2017).

Nursing: in the initial works of Eriksson, her principal idea of fundament caring is founded on love and charity, or caritas. Caritas consists of caring, and caring is strongly formed on caritas and according to Eriksson, caritas is the main gist of doctrine and growing in all the forms of huma relation. Eros and agape are the rudimentary for of love and they are put together in caritas, which breeds generosity in human being's life whereas expressions are done through joy. Eriksson believes that caring is natural and is built on the gist of motherliness which means purgative and nutrition as well as impulsive and love without condition. Fundamentally, caring that exists between the patient and the nurse signifies an incitement including confirmation that the other party is welcomed always, and Eriksson calls it "*the act of caring*"

Environment: Eriksson believes the ethos caring is love and charity and respect and integrity of the human being not forgetting his dignity and that ethos is the head of all caring. Ethos can be defined as home or a space where the human being senses as home and it is through ethos that all decent caring and learning is seen. Ethos and ethics are seen as one in the caring culture and belong to each other and ethos means that we are all alive

for a specific purpose, Eriksson believes. Ethos previews the important values in caring culture which are the basics of ethics and ethical actions

Health: Health is described by Eriksson as soundness, freshness and welfare and it indicates that you are intact in body, soul and spirit. Regarding her idea of the human being, she created various premises with regards to substance and laws of health and health being movement and assimilation is how she perceives it. *“The health premise is a movement comprising various partial premises: health as movement implies a change; a human being is being formed or destroyed, but never completely; health is movement between actual and potential; health is movement in time and space; health as movement is dependent on vital force and on vitality of body, soul, and spirit; the direction of this movement is determined by the human being’s needs and desires; the will to find meaning, life, and love constitutes the source of energy of the movement; and health as movement strives toward a realization of one’s potential.”* (Eriksson, 1984). A movement is made when the human being’s inner capacity is affected that turn into various aspects of health as doing, being and developing to be whole. (Alligood, 2017).



## **5 METHOD**

This chapter addresses the methods used in undertaking the research. It explains how the research was performed, the methods used, and describes the procedures used in data collection and analysis to meet its aims. The research aims at unveiling how nurses can utilize technology to improve the well-being of elderly residents. The chapter is organized into different sections such as research design, qualitative research, data collection, and data analysis.

### **5.1 Qualitative research**

This study is qualitative research and will employ the techniques of qualitative research design for nursing research outlined by Polit and Beck (2020). In this case, the study will adopt a descriptive qualitative study. According to Polit and Beck, descriptive qualitative studies are descriptive in nature and are mainly utilized in examining nursing and healthcare-related phenomena. This research tradition has been recognized as essential and appropriate for research questions that focus on discovering the what, who and where of experiences or events and acquiring insights from informants concerning a phenomenon that is not well understood.

In employing this qualitative research tradition, researchers try not to infiltrate their data in any interpretive depth. Instead, they present the findings as comprehensive summaries of events or a phenomenon in everyday language that makes sense to readers (Polit & Beck, 2020). In this background, this research tradition is appropriate for this study as it will help answer the question, “What are the benefits residents get from technology in the elderly home? And “What are the challenges associated with the use of technology in the elderly home care?” The findings will be presented as comprehensive descriptive summaries explaining how technology benefits the elderly in-home care, the challenges encountered in implementing these technologies, and ways of resolving them.

### **5.2 Research Design**

The research design refers to the strategy used to address the research problem. Dulock (1993) defines the research design as the plan created to answer the research question, which is the central purpose of the design. The research is trying to find how nurses can harness technology to improve the well-being of elderly residents. It uses a descriptive

research design to obtain qualitative and quantitative information to describe the situation. Descriptive research has different definitions, such as an approach used to describe characteristics of a given area of interest systematically, an approach used to discover associations between variables, the approach used to provide an accurate portrayal of a particular phenomenon, and an approach used to answer the research questions based on the current events (Lans & Van Der Voordt, 2002). It was the ideal approach for the study as the researcher cannot manipulate or control the variables, unlike in experimental research (Lambert & Lambert, 2012).

A descriptive research design is adopted in this research to describe how nurses can use technology to improve the well-being of individuals in elderly homes. The paper is entirely based on a theoretical basis as the researcher collects the data, analyses it, and presents the findings in an understandable way. It is used to explore the variable on the benefits of technology in elderly homes. The research primarily describes the research aim to allow the readers to understand the phenomenon. The literature review reveals that independence is a challenge to the elderly (Bergland & Wyller, 2004). They are prone to falls, trips, forgetting to take medications, and being unable to carry out their daily activity, which shows a need to investigate how technology can be used to increase their independence.

### **5.3 Data collection**

On the other hand, it is crucial for a researcher to employ the most helpful tool in the collection of data that results in reliable and credible data which meets the objectives and aims of the study. In this regard, this research proposes to use secondary data that will be collected from recently published journal articles in PubMed, Academic Search Elite, CINAHL, and MEDLINE through crucial word searching, thus yielding recent past studies on exploring benefits of technology for residents in elderly homes. Various factors will be considered in the selection process of the journal articles for this research project, such as relation, assessable, trustable, language, and year of publication.

Data collection is divided into two categories: primary and secondary data collection methods. The primary data is obtained directly from the source through observations, experiments, or surveys. The secondary data is available information collected by someone else.

Secondary data is information that has previously been gathered by other researchers and can be accessed via different platforms (Smith, 2008). In contrast, primary data is collected

directly from the source (Hox & Boeijs, 2005). The secondary data from the study is gathered in electronic and print form using the internet and online computer databases. The secondary data can exist as raw data or interpreted data (Johnston, 2017). The raw data is known as archival data and exists in the original form, such as minutes, records, and accounts of development. The interpreted data is known as survey data, collected for a certain purpose. The research is based on interpreted data with a plan to review the data and arrive at conclusions relevant to the benefits of technology on elderly residents. It allows the researcher to categorize and summarize the data to answer the research question on how the nurses can use technology to promote the well-being of the elderly population.

Secondary data was adopted for the study as it is hard to directly ascertain the benefits of technology to the older adults using primary research alone. Thus, combining primary and secondary data ensure that each source of data complement and supplement one another. The study involves two major variables, technology, and older adults, which shows a need to look at the relevant documents in the context. Much information is documented, which is of good quality, easily accessed, and has adequate data sets. It makes it possible to make unforeseen discoveries, such as using technology to improve the well-being of older adults. Secondary data may be costly to acquire, dealing with complex data sets and lack of control over the quality of the data (Johnston, 2017). Combining data from different data sets, using freely available data and computerized data, was used to counter the issues presented by secondary data. The secondary data made it possible to assemble the information needed, develop findings, develop conclusions, and make recommendations.

### **5.3.1 Data collection process**

The research collects the data from published publications through the internet, government and non-government archives, and libraries. The online data is gathered from the internet. The method was ideal for the study as the internet provides a lump sum of free research resources. Online data simplifies the data gathering process. The data from the government and non-government archives provide insights into the technologies that older adults can use and their associated benefits. There is a challenge in getting this data as it is not always readily available, and the data can be gathered from a few sources. The research also gathered data from the public and private libraries, which serves as a valid data source for the research. Researchers donate the dissertation copies to public and private libraries, especially in academic research, which is stored in both soft and hard copies. The research

gathering process uses three distinct approaches, namely the internet, government, and private archives and libraries, to complement the data gathering process.

## **5.4 Data analysis**

Data analysis refers to discovering useful information from the gathered data (Kenny et al., 1998). It is useful in summarizing the collected data involving its interpretation through logical and analytical reasoning. The data gathered will be analyzed using content analysis. Content analysis is used to determine the presence of certain themes, words, and concepts within the data (Drisko & Maschi, 2016). It is relevant in analyzing the relationships and meanings of the themes, words, and concepts. The concepts used in data analysis entail the use of technology in older adults, the benefits of technology among the elderly population, and the use of technology by health care professionals in improving the outcomes of older adults.

The data analysis for the study begins with selecting the content to be analyzed using the concepts mentioned above. The first step of analyzing the data is identifying the sources of data and collecting the information. The major concepts are considered when collecting the data from the publications to capture the relevant information. The second step entails determining the coding categories. The data is categorized into the benefits of technology among the elderly and how nurses can harness technology to benefit older adults. The third approach is coding two categories which are aimed at finding out how technology can be used to promote the well-being of the elderly residents. The fourth stage is checking the validity and reliability of the data, which entails checking if the phrases are part of the categories and if the data conforms to the expected standards. Lastly, the data is presented by organizing it in a way the recipient easily understands it. This part is characterized by revising the results, arranging the data in a chronological sequence, and presenting it in a report using descriptive analysis.

The content will be presented in different categories linked to the major categories or the research objectives. The research has a single aim: to investigate how the caregivers can utilize technology to promote the well-being of older adults. However, it will also uncover the benefits of technology on older adults, including how it can ease the care providers' work and increase the independence and well-being of older adults. The results section entails detailed information on the different factors gathered through which the conclusions will be established. It will also provide a basis for making recommendations for the study,

which is relevant for future research and the development of policies concerning the phenomenon.

## **5.5 Advantages of systematic literature review**

The systematic literature review is beneficial because it reduces the implicit researcher bias by using broader search strategies, consistent inclusion/exclusion criteria, and the predetermined search strings. This is supported by Pickering and Byrne (2014) by noting that systematic literature review makes it possible for the researcher to look for studies broader subject and network area. In addition, the systematic literature review allows for proper deconstruction of the research questions from the beginning of the study ensuring that the process is constantly concentrated on the aim leading to better chances of developing clear and objective-based answers (Fisch & Block, 2018). Furthermore, systematic literature review concentrates on evidence, impact, validity, and casualty. Finally, systematic review encourages the researcher to participate with other studies in taking a more consistent and critical look at the subject through synthesis of the empirical evidence already in existence as opposed to preconceive knowledge (Fisch & Block, 2018).

## **5.6 Literature search strategy**

The search for past studies investigating the benefits of technology for residents in elderly home was undertaken by relying on databases such as ProQuest, ScienceDirect, Emerald, ResearchGate, Wiley, Web of Science, and Elsevier among others. In the search for the articles, the researcher used words and phrases such as “elderly homes,” “benefits of technology,” “technology in elderly homes,” and “benefits.” Using these phrases and words separately, the search revealed 3567 results in total and this prompted the researcher to combine the phrases and words in order to narrow down the results. After combining the words and phrases, the results were narrowed down to 150 journals and books that covered the subject of benefits of technology for elderly homes or something related to the subject. The table 1 below illustrates the number of articles and books found in each database.

<b>Keywords Combination</b>	<b>Databases</b>					
	<b>Wiley</b>	<b>Emerald</b>	<b>ScienceDirect</b>	<b>ResearchGate</b>	<b>ProQuest</b>	<b>Elsevier</b>
Benefits + elderly homes	0	10	8	3	2	0
Technology + elderly homes	1	8	5	2	3	1
Benefits + technology + elderly homes	0	61	9	6	5	1
Benefits of technology + elderly home	0	12	11	3	2	2
<b>Sub-total:</b>	<b>1</b>	<b>91</b>	<b>33</b>	<b>14</b>	<b>7</b>	<b>4</b>
<b>Total:</b>						

*Table 1: Results from the searches and abstraction procedure*

The research relied on the titles and abstract of the research articles to ascertain the relevance of the papers to the current research and those deemed irrelevant were left out. In

the subsequent process referred to as the inclusion/exclusion criteria to end up with the final 35 research articles used in the study.

## 5.7 Inclusion/exclusion criteria

The researcher used various restriction criteria to further narrow down the research articles to 35 past studies for final use. Firstly, the search results were restricted to research articles published in the past 18 years. That is, the literature that were included were published between the year 2004 and 2022. This implies that the researcher sought to have recent information and data relating to the benefits of technology for elderly homes and the information published before 2004 was considered outdated. Therefore, the data or findings existing in research articles published before 2004 were considered irrelevant to the study. Secondly, the researcher used language as an inclusion/exclusion criterion as articles that were published in English language were include while those reported in non-English language were excluded. Thirdly, peer review was also used as a criteria as peer-reviewed articles were included while non-peer review was excluded. In addition, the researcher used abstract as a criteria implying that articles highlighting methodologies, findings, and objectives in their abstract were included. The results obtained from each of the databases are illustrated in table 2 below:

<b>Database</b>	<b>Number of articles</b>
Emerald	9
ScienceDirect	15
ProQuest	2
ResearchGate	7
Elsevier	1
Wiley	1
<b>Total</b>	<b>35</b>

Table 2: Results from application of the inclusion/exclusion criteria

The research adopted the Prisma flow chart to detail the process followed to eliminate the irrelevant research articles. The Prisma chart is as presented in figure 1 below.

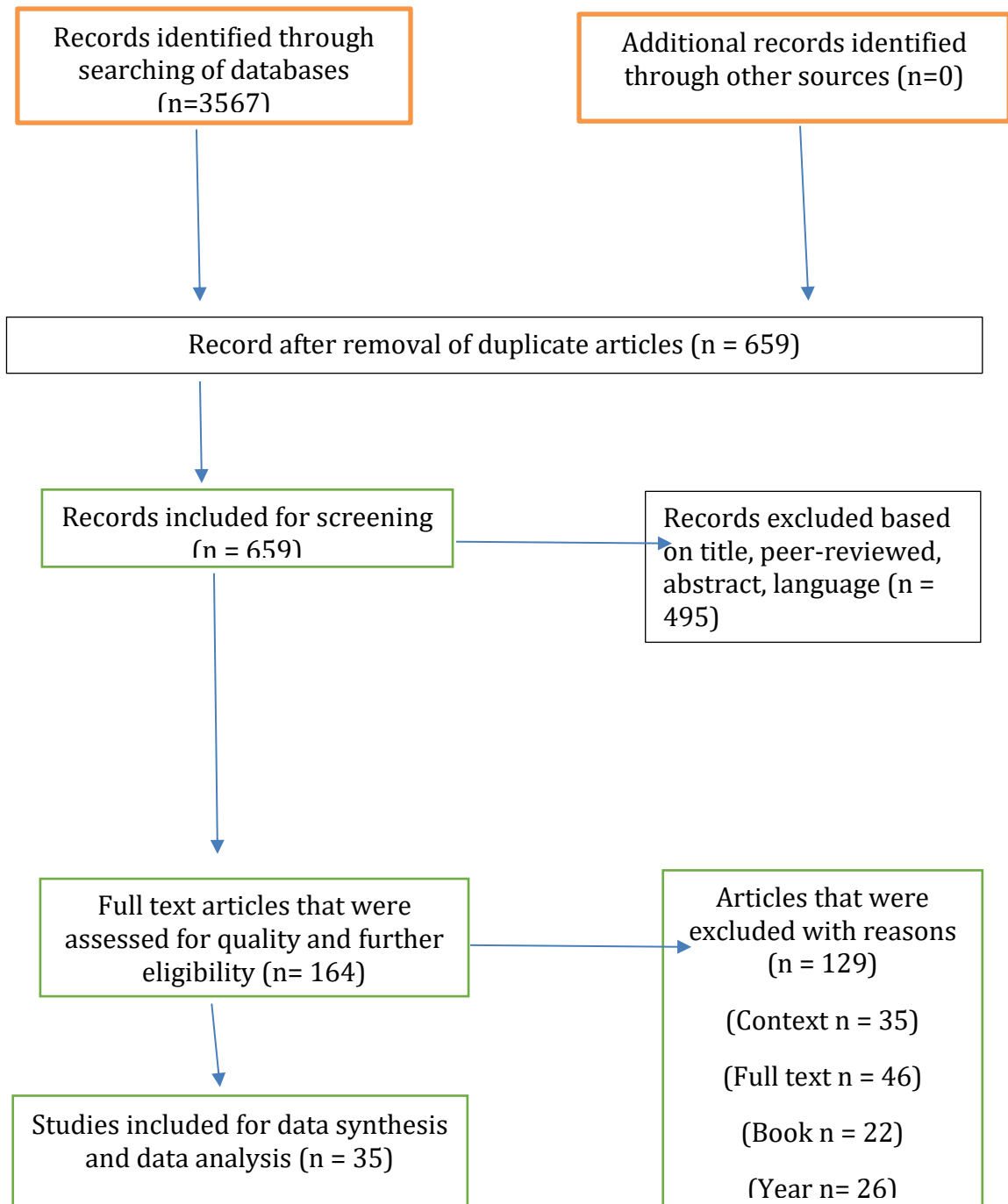


Figure 1: Prisma flow chart of the six steps followed during systematic literature review



## 5.8 Ethical consideration

Ethical consideration entails advance evaluation and scrutiny of a research plan in the light of the ethical practices generally followed in a particular science discipline, with special emphasis on the prevention of any harm that the study or its findings might cause to the subjects of research. This research will follow the guidelines for responsible research conduct described by the Finnish National Board on Research Integrity TENK. From a research integrity point of view, the premises for the responsible research conduct regarding qualitative research include: first, the research will follow the principles endorsed by the research community, such as meticulousness, integrity, and accuracy in conducting the study and in presenting, evaluating, and recording the research findings. Secondly, the researcher will ensure that the methods for collecting data and evaluation and research conform to scientific criteria and are sustainable ethically. Additionally, when publishing the study findings, the results will be communicated responsibly and openly, which is intrinsic to scientific knowledge dissemination. Finally, the researcher will take due account of the achievements and works of other researchers through respecting their work, acknowledging, and citing their work appropriately, and giving their achievements the weight and credit they deserve in performing the researcher's own study and publishing its results (Finnish National Board on Research Integrity TENK, 2021).

Research ethics entail the principles that guide the research practices. The research utilized secondary data and primary data which shows a need for obtaining ethical approval especially for primary data. Using secondary data is an ethical practice as it maximizes the value of the public investment, ensures replicability, and reduces the burden (Tripathy, 2013). In addition, the results must promote transparency and integrity. The benefits of the research must outweigh its risks. The ethical considerations began from the design of the study. The primary data does not cause any physical or emotional harm to the participants, the researcher tries to remain unbiased and avoids interfering with the data collection process through personal opinions. The study investigates how nurses can use technology to improve the well-being of the elderly. The research aims at the public good as it will be beneficial in increasing the quality of life of the elder population.

The research follows the guidelines outlined by the Finnish National Board on Research Integrity TENK for conducting the research. The research transparently communicates the results. Since the research involves secondary data, different steps are taken to avoid plagiarism. Plagiarism relates to submitting another person's work as one's work, which can sometimes be unintentional. To counter this, the research properly cites the original

work in presenting the ideas published elsewhere. The data is presented per the information gathered through primary and secondary data collection methods without manipulating, falsifying, or mispresenting the results which can lead to research misconduct. The proper presentation of the research is meant to uphold the credibility and integrity.

## **6 ANALYSIS AND RESULTS**

This chapter concerns itself with analyzing and discussing the results as obtained in the literature review section. In other words, the chapter discusses the results or the findings with their implications to the relevant stakeholders. The analysis and discussion are undertaken in line with the research questions. This implies that the chapter begins with analysis and discussion of the results related to types of technologies used in elderly homes followed by the way the said technologies improve the well-being of old adults residing in elderly homes. Finally, the chapter focuses on the results relating to challenges associated with adopting technology for residents in elderly homes.

### **6.1 Types of technologies used in elderly homes**

Based on the literature reviewed, most of the studies identified AAL and robotic technologies as the most common types of technologies adopted in elderly homes in order to improve the care of older adults. In particular, Bäckman et al. (2020) and Portugal et al. (2015) noted that robotic technologies and AAL are becoming popular and common in elderly homes. The results showed that other studies such as those conducted by Shishehgar et al. (2018) and Bemelmans et al. (2012) yielded similar results by identifying assistive technologies and robotics as the most common types of technologies used in elderly homes for the improvement of quality of life. These results suggest that majority of technology being advanced and developed for the betterment of elderly adults' life takes the form of robotics and assistive living. For instance, the robotics technologies can take the form of robotic wheelchair and shower chair as suggested by Shishehgar et al. (2018) in their study.

Besides assistive and robotic technologies, the findings or results also indicated that companion or care robots have also become common in elderly homes. The results were obtained from the study by Rantanen et al. (2018) and mentioned in the systematic review undertaken by Shishehgar et al. (2018). Based on these results, it can be argued that the identified technologies are popular in elderly homes because they do not only assist the elderly adults but also help personnel to offer better care and foster safety. Information and communication technology (ICT), telehealth and remote monitoring were also identified as some of the common technologies adopted in elderly homes (Bobillier Chaumon et al., 2014; Lindeman et al., 2020; Schulz et al., 2016). Based on these results, it would appear that technologies developed and adopted in elderly homes are designed with the aim of

helping the elderly adults with communication, companion, and care. Besides directly helping the elderly adults have a quality life, the technologies are also developed to increase convenience for the caregivers as they provide care to the elderly adults.

These results are significant and relevant to various stakeholders, especially the health practitioners, decision-makers, and academics. For instance, the findings of this study are relevant to the health practitioners operating or running the elderly homes because they help them understand some of the technologies that are most effectively in improving the quality of care for the elderly adults. Moreover, these results are also significant and relevant to the policy makers because they can be used to suggest and legislate the best technologies that should be adopted as best practice. In addition, the academicians including teaching and student fraternity can use the result from this study to single out a specific area that need further research. For example, further studies can be undertaken from the perspective of care or companion robots in relation to improving elderly care.

## **6.2 How technology improves the well-being of old adults in elderly homes**

Based on the results of the review, technology improves the wellbeing of old adults through interconnectedness, social stimulation, and re-integration in the society. A review of a study by Bobillier Chaumon et al. (2014) revealed that technology enhance the wellbeing and quality of life elderly adults through interconnectedness and social stimulation. In other words, the technology makes it possible for elderly adults to connect with others through communication networks and technologies. The adoption of technology in the elderly homes is viewed as an effective solution towards bridging the gap between demand and supply of care as well as development of elderly care services. In accordance with Caritative care theory, human being is spirit, body, and soul, implying care require more caring responsibilities. The aspect of socially stimulating and interconnecting the elderly adults improve their dignity, which corresponds to the tenets of caritative care theory. Furthermore, the results showed that the technology adopted in elderly homes improve the wellbeing of elderly adults by allowing them to be part of the society through social networks that reduce isolation and withdrawal usually experienced by the old population (Bagnall et al., 2006; Bobillier Chaumon et al., 2014; Leonardi et al., 2008).

The results from the review also demonstrated that technologies adopted in elderly homes also enhance wellbeing of elderly adults through gaining autonomy and stimulation of capacity. The technologies help the old adults gain autonomy through restoration of self-confidence in which the adults can gain some of their functionality without the constant assistance of the caregivers (Blit-Cohen and Litwin, 2004; Bobillier Chaumon et al., 2014). This implies that the technologies such as robotic wheelchair and shower chair enable elderly adults to be able to perform some activities by themselves thereby enhancing self-confidence and autonomy. Correspondingly, caritative care theory maintains that suffering is one of the aspects of effective caring that nurses must recognize and introducing technologies that reduce functional decline guarantees the same. Moreover, the technologies were also found to stimulate the mental and physical capacities of the older adults residing in elderly homes (McDonnell & Grimson, 2010; Otjacques et al., 2010). The findings seem to suggest that technology adoption in elderly homes enable the elderly adults to regain some of their mental and physical functionalities. It is common knowledge that elderly adults tend to lose functions in their body and mind, the adoption of technology allows them to regain some of these functions or capacities.

The results in relation to how technologies enhance wellbeing of adults in elderly homes are relevant to managers or supervisors of the elderly homes as well as policy makers. For instance, the results present supervisors of these facilities with an opportunity to understand the extent to which technology improve the quality of care offered to the elderly. As such, they can ensure that the relevant technologies are adopted and implemented effectively. Furthermore, this result is also relevant to policy makers because they can rely on it develop policies aimed at helping people regain some their lost functions.

### **6.3 Challenges associated with adopting technology for residents in elderly homes**

In line with literatures reviewed, technology has not been adopted effectively in elderly homes as facilities lack proper technology while others do not have access to the same technology due to their social status such as being situated in rural or low-income communities. This implies that adoption of technology in elderly homes have not been fully realized because various challenges. For instance, access and inclusion have been identified as major challenges hindering effective adoption of technologies in elderly

residents (Bender et al., 2014; Yusif et al., 2016; Yoon et al., 2018). These studies determined that majority of elderly facilities with state-of-the-art technologies are located in neighborhoods with strong socio-economic stats. Furthermore, access to technology for elderly adults and their caregivers is dependent on technology type, cultural context, and socio-economic status.

Ethical concerns, privacy, and security were also identified as challenges that are hindering successful and effective adoption of technology for residents in elderly homes (Chung et al., 2016; Lindeman et al., 2020; Tan and Taehagh, 2021). The adoption of technology in elderly homes have been limited and brought many questions relating to who has the authority to access health and personal information of the residents using these technologies. More importantly, the elderly adults do not have cognitive ability offer informed consent that delegate their rights to health professionals or caregivers. Furthermore, the data reviewed suggested that ethical concerns is a subject that is yet to be dealt with fully when developing these technologies. In addition, results from previous studies have shown that caregivers and care recipients may have different preferences concerning privacy then the question becomes whose decision is superior in cases where one wants passive monitoring while the other prefer active monitoring. Notably, emotional attachment to artificial intelligence has also been identified as another futuristic challenge to the adoption of technology for residents in elderly homes.

Absence of universal standards has been quoted as a challenge that faces the effective adoption of technologies for residents in elderly homes (Majumder et al., 2017; Lindeman et al., 2020). In particular, absence of universal standards on devices, systems, and platforms implies that they have low usability since they cannot be transferred and used successfully in another setting. It is even more challenging for caregivers because they must undergo training for different technologies and yet they can just be trained once assuming there were universal standards. The technology developed so far for use in the elderly homes have been faulted for lacking human-centric design (Lindeman et al., 2020; Huelat and Pochron, 2020). This is a challenge to the effective adoption of these technologies because the views and opinions of caregivers who are supposed to operate them are not considered during the design process. More importantly, user ageism also creates a distance between the developers and the elderly adults since it is difficult for the designers to understand the needs of their target. Based on the results, the development of assistive technologies in elderly homes should take a human-centric approach and universally acceptable.

The results have significant implications to the technology developers and elderly home managers. For instance, the results enable the developers to understand the need to incorporate caregivers and health professionals during their technology designs to increase usability and interoperability. In addition, elderly home managers also benefit from this result because it allows them to understand the need to purchase and use technologies that are universally acceptable and increased usability.

## **7 CONCLUSION**

This chapter focuses on providing conclusions based on the findings and in line with the research questions. In other words, the conclusions constitute as the answer to the research questions. Furthermore, the chapter also offers limitations related to the study and any suggestions that need to be considered by future researchers investigating the same issue.

### **7.1 Types of technologies used in elderly homes**

Concerning the types of technology adopted in elderly homes, the study determined that AAL and robotic technologies are mostly used for residents in elderly homes. Since older adults need assistance with their functionality and mobility, robotic technologies become essential, thereby making them popular in elderly homes. Still on robots, elderly facilities are also increasingly adopting care or companion robots. The study has also ascertained that elderly homes adopt telehealth, remote monitoring, information, and communication technologies. In that regard, these technologies are developed with the goal of helping elderly adults with their communication, care, and companion. The technologies not only help improve the quality of life through improving functionality and mobility for elderly adults but also increase caregivers' convenience in process of offering their services.

### **7.2 How technology improves the well-being of old adults in elderly homes**

The study demonstrates that technology adopted in elderly homes help improves the well-being of the residents through social stimulation, interconnectedness, and re-integration into the society. The communication and information technologies identified above enhance the quality of life for elderly adults by allowing to connect with other people in the society making them socially stimulated as they feel as part of the society. More importantly, these technologies enable elderly adults feel as part of the society despite the feeling of isolation and withdrawal associated with elderly homes. In addition, the study determines that technologies adopted by elderly homes help improve the wellbeing of the residents through capacity stimulation and autonomy acquisition. In particular, the technology enables elderly adults to some activities by themselves without constant



assistance, thereby contributing to their autonomy and capacity stimulation. Since elderly adults tend to lose their functionality and capacity, technologies that help them regain these aspects of their life contribute to their wellbeing. Therefore, study has answered the first research question relating to how technology enhance well-being of the elderly individuals in elderly homes by concluding that the technologies help enhance wellbeing through interconnectedness, social stimulation, societal re-integration, autonomy acquisition, and capacity stimulation.

### **7.3 Challenges associated with adopting technology for residents in elderly homes**

The research illustrates that effective adoption of technology in elderly homes is faced with challenges such as lack of proper technology in some facilities and inaccessibility to the same technology in some areas synonymous with low income. Essentially, the study maintains that inclusion and accessibility are major concerns impeding the adoption of technology in elderly homes. Moreover, the research also ascertained that other challenges include security, privacy, and ethical concerns. In other words, the challenges relate to the extent to which personal information belonging to elderly adults are accessed, handled, and protected. Furthermore, the research determines that inability of technology developers to have universal standards for technology used in elderly residents and absence of human-centric design constitute as major challenges affecting effective adoption of technologies in these facilities. Thus, the research answered the second research question by concluding that effective adoption of technology for residents in elderly homes is faced with challenges such as lack of proper technology, accessibility, inclusion, security, privacy, ethical concerns, absence universal standards, and human-centric designs.

### **7.4 Limitations and future research**

The success of the study was made possible because of the suitability or effectiveness of some of the methods adopted. For instance, the use of systematic literature review method was good because the research relied on already-analyzed data from past studies and only synthesis was done in the current research. However, the study was limited because it only relied on secondary data gathered through systematic literature review. This denied the research to gain first-hand information about the phenomenon. Therefore, future studies should consider using both primary and secondary data because it will provide in-depth

information about the issue. Furthermore, the research was limited because only a few extant literatures were review due to the short timeline. Thus, future studies should consider collecting more literatures for synthesis.

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## Appendix 1

Author/Title	Country	Year	Purpose	Data collection/Method	Result
Bäcckman et al. Elderly and care personnel's user experiences of a robotic shower	Sweden	2020	To explore the experiences and expectations relating to robotic showers from the perspective of dual user.	Tier 1 involved interviewing 6 elderly people and 5 personnel.  Tier 2 entailed interviewing 5 elderly and 5 personnel.  A total of 21 participants were	The robotic shower was empowering to the elderly.  The experience of the robotic shower improved work conditions for the elderly and value for the elderly.

				interviewed.	
<b>Tan, S. and Taeihagh, A.</b>  Governing the adoption of robotics and autonomous systems in long-term care in Singapore	Singapore	2 0 2 1	To examine the adoption of new technologies such as autonomous and robotic systems in long-term care to meet the increasing social care demand in Singapore among elderly population in Singapore.	Primary and secondary data used.  Primary data collected from 25 key informants from the healthcare and long-term care sectors.  Interview was used.	Robotics take over the manual and routine care duties freeing up human workers to concentrate on more personalized and essential needs of the care recipients.

<p><b>Rantanen et al.</b></p> <p>The adoption of care robots in home care—A survey on the attitudes of Finnish home care personnel</p>	<p>Finland</p>	<p>2018</p>	<p>To examine the attitude of home care registered nurses, licensed vocational nurses and other social and health care professionals towards the introduction and application of robots in Finnish home care.</p>	<p>Primary data was collected from 200 home care workers in five different municipalities in 2016.</p> <p>Exploratory factor analysis, Pearson-moment correlation, one-way analysis of variance and linear regression analysis were used to analyze the data.</p>	<p>Personnel appreciated and emphasized the value of care robots in offering guidance and reminders as well as enhancing safety of the older people.</p>

<p><b>Powell et al.</b></p> <p>A national assessment of access to technology among nursing home residents: A secondary analysis</p>	<p>United States</p>	<p>2019</p>	<p>To report findings from secondary analysis of data obtained from the national nursing home study on information relating to technology adoption and access in elderly homes.</p>	<p>Regression and descriptive statistics were used to examine the relationship between information technology adoption residents' access to technology.</p>	<p>Residents' access to technology was a significant predictor of the IT sophistication in the respective nursing home.</p> <p>Residents and/or their representatives' use of electronic personnel health records and health records were significant predictors of overall IT</p>
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					sophistication.
<b>O'Sullivan et al.</b> Exploring attitudes of healthcare professionals towards ICT-based interventions for nursing home residents with dementia: a mixed-methods	Germany	2018	To identify expectations related to technology and inhibitions of healthcare professionals connected with intentions to use ICT-based non-pharmacological therapies.	Questionnaire was used to survey 205 healthcare professionals.  Semi-structured interview was used to collect data from 11 participants.	Majority of healthcare professionals showed high perceived usefulness.  Qualitative interview demonstrated high ICT acceptance in the workplace for health professionals in nursing homes.

approach					
<b>Huelat, B. &amp; Pochron, S. T.</b> Stress in the volunteer caregiver: human-centric technology can support both caregivers and people with dementia	United States	2020	To quantify points of stress for caregivers offering their services at home with the goal of reducing stress for them while simultaneously supporting quality of life for individuals with dementia.	The study used interview to collect from 15 participants. The participants were selected from six different memory care facilities.	“Finding available resources” was identified by home-based caregivers as the most significant source of stress. Facility-based caregivers had knowledge about technology and ready to use dementia-based technology.

<p><b>Bobillier-Chaumon et al.</b></p> <p>Can ICT improve the quality of life of elderly adults living in residential home care units? From actual impacts to hidden</p>	<p>France</p>	<p>2014</p>	<p>To examine the extent to which new technology environment can enhance the quality of life for the elderly.</p>	<p>Qualitative method was used among 17 residents of residential home care units.</p> <p>The adopted semi-structured interview and longitudinal observation.</p>	<p>Information and communication technologies (ICT) to certain extent play a vital role in connecting residents' world (isolated) and their families' world (including grandchildren)</p>
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