The Influence of Personal Knowledge Management on Individual Health Care Decision-making: An Action Learning Approach

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Abstract

Background: Making effective health care decisions is important. Despite the large volumes of information available, individuals often face personal limitations evaluating this information and making optimal decisions. Personal knowledge management has been suggested as a method of addressing information barriers and improving decision-making. Personal knowledge management has, however, been mostly applied within an education context, in order to improve individuals' learning performance. From the available literature in this area, very limited research or significant conceptual development has been undertaken on personal knowledge management and its influence on decision-making, particularly in the health care context.

Aims and Significance: This study examines an effective personal knowledge management strategy for older adults (aged between 46 and 75) with limited computer/technological skills by answering the following questions: *How do older adults access and evaluate information and knowledge for health care decision-making? How can personal knowledge management help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making? How effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making?* The aim of this study is to provide an understanding of the use of action learning and personal knowledge management pertaining to older adults' health care decision-making. Examples of relevant health care concerns include, diabetes and obesity or other issues of this nature, but are exclusive of severe health issues, such as cancer. The findings will offer educators and researchers an understanding of ways to help these individuals to navigate the world of information regarding critical personal decision-making, with specific reference to health care.

Method: To investigate this issue, a qualitative study was conducted using action learning with thematic and grounded theory coding techniques. New Zealand patient health care support groups and churches provided a source of older adults with health-related issues as volunteers. Participants were asked to practice personal knowledge management strategies, focusing on their personal health-related issues after each learning session. In the following session, the issues or experiences that the participants encountered whilst conducting their self-practice

exercises, within their groups were discussed.

Findings: This study found that the older adult participants in this study used Google, Facebook closed groups, YouTube, online videos, health care support groups, family and medical professionals as information sources before embarking upon this training program. To evaluate alternative treatment options, these participants rely predominantly on family, friends, medical professionals and their personal life experience for decisions. This study found that major factors that negatively impacted older adults' effective information interpretation and decision-making include: barriers to accessing accurate and relevant health care information and knowledge, barriers to computer-based technology use, and humanistic barriers. The findings suggest that a four-stage personal knowledge management strategy could help older adults (with limited computer/technological skills) to overcome the barriers to effective information interpretation, and making informed health care decisions.

Finally, this study suggests some practical training/learning techniques for older adults. For instance, major individual health-related issues of the older adults within the pre-training program need to be confirmed, followed by a warm welcome prior to the commencement of the training program. I learned that it is important to pre-diagnose participants' abilities in learning and computer-based technology before designing the training program. This can help to develop an appropriate training program for a specific cohort.

Conclusions: The findings of this study contribute to the development of an academic understanding of personal knowledge management conceptualisation in the consumer decision-making field, with the aim of improving older adults' information and knowledge management processes. This study serves as a vantage point for further empirical research in personal knowledge management and older adult education and training.

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"With man this is impossible, but with God all things are possible" (Matthew 19:26)

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Yi-Mei Huang

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Notice and List of Publications

During my PhD, I published papers in peer review journal, online and printed local newspapers, and local and international conferences. The contents of these publications are mainly from this thesis. Therefore, similarities can be observed between it and other published work. Although I try to rephrase and quote my published work, a few similarities may still be noticeable. These publications are listed below and are cited in this paper when needed:

Peer Review Journal Articles:

1) Huang, Y. M., Pauleen, D. J., Scahill, S., & Taskin, N. (2018). A PKM–based decision-making training program for personal health care: An action learning approach. *International Journal of Knowledge Management, 14*(3), 101-114.

Media Articles:

2) Huang, Y. M. (2017, March, 23). Overcoming health care information overload. *Rodney Times.* Retrieved from https://cdn2.neighbourly.co.nz/images/publication-pdfs/58d1be49d547f2.39656760.pdf?170410

3) Yi-Mei, H. (2017, March, 20). How do you make an informed medical decision in the age of the internet. *Stuff*. Retrieved from https://www.stuff.co.nz/national/health/90611044/how-do-you-make-an-informed-medical-decision-in-the-age-of-the-internet

Conference Presentations and Symposiums:

4) Huang, Y. M (2017). The influence of personal knowledge management on individual decision-making in health care medical treatment. In *Proceedings of the New Zealand Information Systems Doctoral Consortium,* Victoria University of Wellington, New Zealand.

5) Huang, Y. M., Pauleen, D., Scahill, S., & Taskin, N. (2016). T*he influence of personal knowledge management on individual decision-making in health care medical treatment.* Paper presented at the 27th Australasian Conference on Information Systems University of Wollongong, Australia.

6) Huang, Y. M. (2016). *The influence of personal knowledge management on individual decision-making in health care medical treatment*. Paper presented at the 19th Annual Waikato Management School Student Research Conference, University of Waikato, New Zealand.

7) Huang, Y. M. (2015). *The influence of personal knowledge management on consumer decision-making in health care.* Paper presented at the PhD Symposium, Massey Business School PhD. Palmerston North, New Zealand.

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Chapter 1 Introduction

1.1 Chapter Overview

This chapter sets the scene for this thesis by reviewing the problem statement and the study objectives and outlines the research questions. The significance of the study is discussed. Lastly, a chapter summary is provided.

1.2 The Research Problem

According to the NZ Ministry of Health (2016), the percentage of New Zealand older adults is growing faster than the younger population. Many of the older adults in New Zealand live with illness. For instance, in 2017, 10 to 20% of New Zealanders aged between 46 and 75 years were diagnosed with diabetes, while 32% of adults were diagnosed with obesity (NZ Ministry of Health, 2016). Individuals are encouraged to participate in their own health care decisions made by health care professionals to improve health care services and treatment outcomes (Vahdat, Hamzehgardeshi, Hessam, & Hamzehgardeshi, 2014). In one study nearly two-thirds of older adults will seek information from outside of the medical professional arena (such as from the internet, friends or relatives, books, newspapers, television, radio, books, or magazines) to learn about health care for their conditions (Dean et al., 2017). Health care information seekers search for formal treatment options in a similar way to how they search for information on satisfying their other needs (Aldridge, 2000), for instance, by considering the best value for their money in purchasing a product (Bin, Chew, & Shin, 2015; Boyett & Boyett, 2003).

With the rapid development of social media, however, individuals are subjected to huge volumes of health care information and there is a sense that people can be overloaded with information (Klerings, Weinhandl, & Thaler, 2015). Individuals may feel bombarded by material when reading through literature or other sources of health care information and may have a difficult time decoding what is truth and what is not. Common sources of information include media, email, advertising, pamphlets, magazine articles and web-based sources of information, as well as different recommendations from their physician or other health care providers. Failure to manage information and knowledge might hinder older adults' health care decision-making, and they may

not know what to do about their situation.

Consumer decision-making has been investigated by researchers over the past 70 years. It was led by economists Nicholas Bernoulli, John von Neumann and Oskar Morgenstern, who in 1944 started to examine consumer behaviour from an economic perspective (Richarme, 2007). Yoon, Cole, and Lee (2009) define consumer decision-making as the process and outcomes related to the problem solving process. In the health care context, consumer decision-making is an on-going process comprising complex cognitive, perceptual, affective, behavioural, and relational components by which individuals select an acceptable solution or a salient alternative concerning a health-related issue (Strohschein, Bergman, Carnevale, & Loiselle, 2011).

Frand and Lippincott (2002) suggested that one way to improve decision-making is by managing information overload. Information overload is where the user has received more information than is needed, and more than they can readily assimilate (Kulyk, Kosara, Urquiza, & Wassink, 2007). Information overload is not only caused by the rapid increase of information being produced, but an enormous amount of contradictory information (Gouveia, Daradkeh, & Selimi, 2015) and a lack of methods by which to process different kinds of information (Abram, 2008). Personal knowledge management (PKM) may be one way to reduce the problem of information overload and navigation, be it print-based or electronic information and knowledge (Frand & Lippincott, 2002) and help improve decision-making. PKM is a conceptual framework that blends technology, personal skills, processes, and methodology (Jefferson, 2006) for the purpose of enhancing an individual's information literacy and improving their knowledge (Zhou, Wang, & Ju, 2014).

PKM may help decision-making in several different ways. One way is through the systematic use of information technology to manage the knowledge an individual has. Fathizargaran (2012) stated that the use of technology can assist an individual to store and retrieve information more easily and faster, helping individuals deal with a mass of unstructured information and reducing information overload. Another way PKM may assist with decision-making is through the development of critical thinking skills (Harold, 2010). Critical thinking is an essential skill for health care decision-making which helps individuals to think clearly and rationally about what to do or

what to believe (Sharples et al., 2017). PKM helps individuals to discover and value information that means something to them, resulting in a growth in personal knowledge (Benitez & Pauleen, 2009). Also, PKM might help improve collaborative capabilities to enrich an individuals' knowledge and improve their decision-making effectiveness. Through individuals participating in knowledge sharing and decision-making processes conveying their knowledge and experience to others (Fathizargaran, 2012) to make up the gap between knowledge and thought (Avery, Brooks, Brown, Dorsey, & O'Conner, 2001).

However, PKM is still an under-explored or under-researched area. Judging from the available literature in this area, very limited research or significant conceptual development has been undertaken on PKM and its influence on decision-making. Throughout the literature, PKM studies have been mostly carried out in education with the aim of using computer-based technology to improve individuals' learning outcomes, which may not be of benefit to older adults with lower levels of computer/technological skills. A recent survey showed that in New Zealand, 25% of adults lack basic computer skills or have no experience with computers (Clark & Huang, 2018). To fill the gaps between PKM and older adults learning skills, this study seeks an appropriate PKM strategy to help older adults with limited computer/technological skills to find and use information more effectively and to make informed health care decisions.

Making effective decisions is important, yet, decision-making abilities may decline with age due to physiological, molecular, morphological, and functional levels (Sproten, Diener, Fiebach, & Schwieren, 2010). From a review of the available literature, I found that very few studies discussed methods to develop older adults' decision-making abilities to make informed health care decisions. To close this gap, I seeks to focus on the ways PKM can help older adults (with limited computer/technological skills) to make health care decisions through the management of their information and knowledge processes in an information-rich environment.

1.3 The Research Objectives

The main objective of this study is to investigate an effective PKM strategy to help older adults with limited computer/technological abilities manage information and knowledge to make

informed health-related decisions. As part of the study, I developed a training program based on action learning principles to help individual older adults learn to access and manage an over-abundance of information and knowledge to assist them to make well-informed decisions for themselves. Through involving older adults in an action learning process, and reflecting on their experiences in PKM to address their real life issues, the study is expected to achieve the following objectives:

- To develop and evaluate an action learning-based face-to-face training program for older adults with limited computer/technological abilities;
- To investigate and evaluate PKM strategies in personal health care decision-making.

1.4 The Research Questions

Responding to the main inquiry of the research objectives, the research was guided by the following research questions:

- How do older adults access and evaluate information and knowledge for health care decision-making?
- How can PKM help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making?
- How effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making?

1.5 The Significance of the Study

Individuals try to find meaning in the masses of information they have access to and then attempt to integrate this information into their decision-making processes (Cheong & Tsui, 2011). PKM may assist in maintaining and updating knowledge (Gorman & Pauleen, 2011) and may support older adults to better manage their knowledge processes when confronted with complex health care decisions in an information-rich environment. There has been relatively little research and limited conceptual development carried out on the concept of PKM (Cheong & Tsui, 2011; Zumitzavan & Michie, 2015) and particularly in health care. It appears the relationship between PKM and decision-making has gained little attention. With this in mind, this study aims to fill this

gap by investigating an effective PKM strategy to help older adults manage health care information and knowledge through well-informed and well-considered decisions in an information-rich environment.

The results of the training program evaluation may add to the field of health care and training development by providing a training/learning model for older people. Improving older adults' decision-making in health care through the application of a PKM training program may be beneficial in various ways. First, this study will benefit current and future researchers seeking a conceptualisation of PKM; in particular the academic disciplines of health care consumer behaviour and decision-making. Second, the results will help educators and practitioners determine the skills needed for successful seniors' training and activities. Third, this study is expected to help those working in health care industries to better understand the older consumer's decision-making process and factors that influence the process. Finally, this thesis is expected to provide new insights for PKM utilization to help older adults manage information and knowledge when confronting health care decisions in an information-rich environment.

1.6 Personal and Professional Perspectives

This study is conducted with older adults from several churches. Churches have always been a part of my life since I was a child. The most enjoyable thing for me in church when I grew up was to listen to older people's stories. Listening to these stories gave me and still gives me a better understanding of what is happening in their lives and the real world - what is bothering them in their lives and what they really need. By listening to their stories, I found that the topic of health care is always on their minds. Information overload is the most common issue they face when they are seeking health-related information. I found that in my church, older adults generally have less education and very limited computer/technological skills, which might hinder the way they manage the health care information and knowledge they receive. I have heard and felt their anger, depression, disappointment, confusion and frustration.

Many churches provide resources and include health as part of their mission or ministry, delivering government-funded health programs to support people with health-related issues (Braithwaite,

Taylor, & Treadwell, 2009; Campbell et al., 2007). This support cannot help older people to resolve the issues of health care information overload they often face. This spurred my interest in seeking ways to help older adults (those with limited education computer/technological skills) to navigate the world of information when it comes to critical personal health care decision-making. As I am not an expert in the fields of PKM and health care decision-making, action learning has been chosen for this study. In action learning, the role of the facilitator is as a guide rather than a subject expert, and to learn with participants rather than teach them (Owens & Rutherford, 2007). The feature of action learning provides me an opportunity to generate knowledge and learn together with these older adults without imposing pedagogical teaching. I hope to use the results of this study to further my work in education training that benefit local communities.

1.7 Definition of Terms

In this thesis, five terms are commonly used: *health care*, *information overload*, *consumer decision-making*, *older adults*, and *personal knowledge management* (PKM). These are defined as follows:

***Health care*:** "A state of physical, mental, and social well-being and not merely the absence of disease or infirmity" (World Health Organization, 2011, p. 57).

***Information overload*:** The information user has received more information than is needed or more than they can readily assimilate (Kulyk et al., 2007; Straub-Morarend, Marshall, Holmes, & Finkelstein, 2011). In this thesis, information overload refers to the amount of potentially available health-related information that may lessen an individual's health care decision-making effectiveness.

Consumer decision-making: Health-related decisions that are made by health care consumers. In this study, consumer means older adults who have potential health-related issues or desire information relating to general wellbeing are interested in learning and seeking solutions. Decision-making refers to individuals selecting an acceptable solution from among choices concerning health care issues (Higgs, Jones, Loftus, & Christensen, 2018).

***Older adults*:** According to Shiny and Chellappan (2019), old age refers to ages nearing or surpassing the life expectancy of human beings. Terms referring to old age include old people, the elderly (worldwide usage), seniors (American usage), senior citizens (British and American usages), and older adults (in the social sciences) (Krapek, 2016). For the purposes of this study, older individuals are referred to as older adults aged 50 and older (Knutson, Elsworth, & Beck, 2006).

Personal knowledge management: The ability as an individual to grow one's knowledge and value of information through technology, personal skills, processes, and methodology for the purpose of the individual achieving an optimized health care decision (Huang, Pauleen, Scahill, & Taskin, 2016).

Action learning: Action learning is an approach used to support the learning and development of professionals through reflecting on people's experiences to address real life issues (Trehan & Rigg, 2015).

***Grounded theory approach*:** Grounded theory is a robust and well established methodology for generating knowledge and understanding (Glaser & Strauss, 1967). According to Glaser and Strauss (1967), there are four key components to grounded theory, which are, constant comparison, theoretical sensitivity, theoretical sampling, and theoretical saturation. Constant comparative method is a qualitative research method in social sciences through a process of coding and analysing of data at the same time to 'ground' the theory (Atabek, 2013). Theoretical sensitivity is the conceptual ability allowing a researcher to recognise what is important in the data (Galdas, 2006; Guthery, 2010). It includes resources of the technical literature, and professional and personal experience which orient researchers and provides a perspective for theoretical insights (Ng & Hase, 2008; Strauss & Corbin, 1990). Theoretical saturation is "the phase of qualitative data analysis in which the researcher has continued sampling and analysing data until no new data appears" (Bakhtiari, Jacobsen, Strange, & Helles, 2014, p. 29). These components of grounded theory present clear guidelines on how to analyse qualitative data, and provide structure and direction, and grounded theory is considered as a rigorous method for researchers

(Lichtman, 2011). In this study, “grounded theory approach” is defined as methods of theoretical saturation and constant comparison, which I used as a guide to know when to stop sampling for this study and to analyse data through the learning cycles for RQ2.

1.8 Structure of the Thesis

This thesis contains six chapters: Chapter 1 introduces the nature of the research problem and Chapter 2 presents the initial review of the literature and a conceptual model based on the literature. Chapter 3 and Chapter 4 describe the research methodology and research methods employed for the study. Chapter 5 presents the research findings and discussion. In Chapter 6, I discuss the implications, contributions, limitations, future research and reflects on the research. The six chapters contain the following:

Chapter 1 provides an overview of the research problem, objectives, and the research questions. The significance of this study is highlighted. Additionally, the key concepts of information overload, decision-making, and PKM are introduced and discussed. In the last two sections of the chapter, definition of health care, information overload, consumer decision-making, PKM and other terms commonly-used in the thesis is provided as well as a structure for the study.

Chapter 2 summarizes the research literature pertaining to health care, information overload, consumer decision-making, PKM, and the relationship between PKM, information overload, and consumer decision-making. The definition of health care and the New Zealand health care systems are discussed. Then, the issue of information overload in health care, the history and theory of decision-making literature, and a review of PKM are provided. Finally, the relationship between PKM, information overload, and consumer decision-making literature is discussed. The purpose of this literature review is to outline the scarce research that has been undertaken on PKM and decision-making, particularly in health care contexts. A conceptual model was developed based on the literature review which guides this study. The chapter concludes by linking the specific research questions to elements of the conceptual model.

Chapter 3 describes the research methodology, my philosophical stance and reasons for selecting the qualitative research methodology employed in the study, and in particular the

approach of action learning, as well as the thematic and grounded theory coding techniques for this thesis. Relevant examples of the combination of action learning and grounded theory studies across various fields are critiqued.

Chapter 4 focuses on the methods of data collection and analysis. A PKM-based decision-making action training program and the sampling strategy used to select research participants are introduced. This is followed by data analysis using a qualitative thematic and grounded theory coding techniques. A description of rigor, credibility, and validity of the data, as well as ethical considerations of this research project are also considered in this chapter.

Chapter 5 presents and discusses the findings of the study in detail including the methods participants used to access and evaluate information and knowledge before training, as well as the issues they faced. This is followed by a four-stage PKM strategy grounded in data, participants' comment on issues related to this training program, and my reflection as a researcher, a facilitator, and a co-learner in this study. Appropriate representative comments from participants are included throughout the chapter to present the findings and compare with the literature.

Chapter 6 provides a conclusion for this study. This chapter reviews the research problem and objectives, and the key findings. This includes my reflections as a researcher, facilitator, and co-learner in relation to this study. Implications and contributions derived from the findings of the study are presented, and the main limitations and findings of the study as well as proposed suggestions for further research are highlighted. A concluding statement about this study is also summed up in this chapter.

1.9 Summary of the Chapter

This chapter outlined the research problem and the objectives of the study. The research questions were provided. The significance of the study was also explained followed by definitions of the terms that are used throughout the study and an outline of the structure of the thesis.

The next chapter consists of a literature review which explores previous research in the areas of health care, information overload, consumer decision-making, PKM, and the relationship between PKM, information overload, and consumer decision-making. This is followed by chapters on the conceptual model, methodology, method, findings, and discussion. Conclusions are presented at the end of this thesis.

Chapter 2 Literature Review

2.1 Chapter Overview

The literature was reviewed in an attempt to discover the impact of information overload in health care decision-making, and the concept of PKM throughout the development of this thesis. The resources related to the topic of this study were collected from Massey University Library databases such as Web of Science, Scopus, Google scholar, Discover. To increase the likelihood of finding relevant materials, I used the search terms 'Information overload', 'decision-making', 'personal knowledge management', To narrow the search, I linked with the original search terms such as 'health care', 'older adults' and 'action learning'. The initial literature review was undertaken to enable the PhD proposal to be completed as part of the requirements of the PhD confirmation process. This review was then updated as part of the final thesis write-up. The literature was also reviewed in a second stage, during the data interpretation process.

This chapter comprises five sections: health care context, information overload, consumer decision-making, PKM, and the relationship between PKM, information overload, and consumer decision-making. In the first section, an initial review of health care definitions is undertaken and the New Zealand health care system is presented. In the second section, the concept of information overload and issues in health care fields are discussed. The third section presents a review of the literature on decision-making in health care. The history, theories and previous studies on decision-making as well as the factors that are involved in the decision-making process are identified and discussed. This is followed by the fourth section a review of PKM literature. Finally, the last section relevant prior literature to support a discussion on PKM, information overload, and consumer decision-making in health care is reviewed. A summary is provided at the end of the chapter.

2.2 Health Care Context

Consumer health care decision-making is the context for this study. In this section, health care definitions are reviewed and the New Zealand health care system is described. The difficulties older adults may face in health care decision-making are also discussed.

According to the World Health Organization (2011), health care can be defined as “a state of physical, mental, and social well-being and not merely the absence of disease or infirmity” (p.57). Health care includes a wide range of systems such as primary care (i.e., the basis of the health system with teams of general practitioners, nursing staff and other paramedical professionals), secondary care (i.e., specialist outpatient care), and tertiary care (i.e., highly specialized consultative health care and mainly offered in public hospitals) (Mabidi, 2013; Wallentin, Wettermark, & Kahan, 2018).

The health care system in New Zealand has changed significantly over the past few decades. Cumming et al. (2014) reported that New Zealand essentially had a full public health care system in the early 20th century. Then in the last three decades, New Zealand created a neoliberalist driven mixed public-private system for delivering health care. In the public health care system, New Zealand citizens or permanent residents receive care which is largely free of charge (Ashton & Marshall, 2007). Under this model, consumers have little or no choice of specialists or hospitals in the public system and may also face long waiting lists (Ashton & Tenbensel, 2010). In the private health care system, on the other hand, people have more options when choosing to pay for their own care from a private specialist and/or private hospital (Ashton & Tenbensel, 2010). Yet, many older adults may be unable to access needed services via private health care systems due to the high cost of private health care.

Deciding on a course of health care treatment is a complex process. Most health care interventions have risks and potentially harmful side effects. Coulter, Parsons, and Askham (2008) claim that patients (or health care consumers) play an important role in choosing appropriate treatments for their ill health. Therefore, it is essential for health care consumers to have appropriate information and knowledge when considering their treatment decisions (Leatherman & Warrick, 2008). The treatment options usually have pros and cons for the individuals involved, as well as for their families (AcademyHealth, 2007). Yet, many older adults may have difficulty in choosing between the alternative treatment options due to a lack of ability in processing information and knowledge. The process of health care decision-making then may

become physically and emotionally stressful (Van Loendersloo, Van Wely, Repping, Bossuyt, & Van der Veen, 2013).

The role of the doctor is to present a set of appropriate treatment options and support the patient (or health care consumer) in choosing an approach, and the patient should be the decision maker (AcademyHealth, 2007). Yet, in one study 59% of patients (or health care consumers) were unknowledgeable about their medical treatment and were feeling pressured to select a particular option (O'Connor et al., 2003). Although O'Connor et al. (2003) suggested that people are gathering information, clarifying their values, and seeking support and information from others when making health-related decisions, with the rapid growth of media, individuals are often subject to more information than they need and have difficulty absorbing the information they acquire (Bawden & Robinson, 2009). The difficulty in processing information can be particularly negative, impacting on older adults' health care decision-making.

To sum up, choosing among health care options can involve a complex and stressful decision-making process, which includes accounting for risks and harmful side effects. Excessive health care information, which people cannot absorb, may result in ambiguity and difficulty in making decisions. The available literature, however, has not comprehensively addressed the issue of overwhelming information with individuals making health care decisions. More research is needed in this field to explore the issue as well as ways to help individuals to deal with large amounts of information for health-related decisions.

In the next section of this chapter, information overload literature is discussed.

2.3 Information Overload

Information overload is a central concept within this thesis and a definition is provided and the literature reviewed. As outlined previously, information overload seems to be a major issue that impacts on individuals' information processing abilities when making health care decisions. In this section, four aspects of information overload are reviewed. This includes definition, causes, effects, and solutions for dealing with information overload, based on the existing literature.

2.3.1 What is Information Overload

The term information overload was first mentioned in a book on management by Gross in 1962 (Spira, 2011). In 1970, it was popularised by Toffler, who defined information overload as the difficulty for an individual in making decisions in an excessive information environment. The term information overload has since been studied and defined by many different authors. For instance, Hakim, Erwin, Eng, Galinium, and Muliady (2014, p. 1) in an IT study defined information overload as "the exponential growth of the data" (p. 1) that leads to difficulty in managing. An IS study by Hoq (2016, p. 1) defined information overload as "an overabundance of information" (p. 1) that causes distress in information users. Within the health care context, information overload has been defined as an individual receiving more information than they need, which results in judgment difficulty and inefficient health care decision-making (Kumar & Maskara, 2015; Roy, 2010). Jiang and Beaudoin (2016) defined information overload as an individual's work efficiency in using information obstructed by the amount of information that is available to them. Table 2-1 outlines a range of definitions of information overload.

Table 2-1: Information Overload Definitions

Fields	Information Overload Definition	Authors
Organisation	The difficulty of an individual making decisions in an excessive information environment in a limited time.	Toffler (1970)
	An overabundance of relevant information that cannot be absorbed or being burdened with a large amount of unwanted information.	Edmunds and Morris (2000)
Marketing	Perception of having too much information to deal with when making a purchasing decision.	Chen, Shang, and Kao (2009)
	A mental negativity people encounter in the information search process while evaluating large amounts of information.	Özkan and Tolon (2015)
Information science	An overabundance of information that causes distress to information users.	Hoq (2016)
Information technology	The exponential growth of the data that leads to an information explosion and difficulty managing.	Hakim et al. (2014)
Health care	Having more information than one can assimilate, thus hindering decision-making and judgment.	Roy (2010)
	Difficulty a person has in comprehending issues and making judgments that are caused by the presence of too much information.	Kumar and Maskara (2015)

	A state of affairs where an individual's efficiency in using information in their work is hampered by the amount of relevant and potentially useful information available to them.	Jiang and Beaudoin (2016)
	An individual receiving too much health care information to process.	Crook, Stephens, Pastorek, Mackert, and Donovan (2016)

To sum up, information overload can be seen as individuals having too much information available to them, which potentially lessens an individual's judgment and ability to process information for decision-making. Hoq (2016) states that when information is received beyond an individual's ability to process, it may lead to confusion and difficulty in setting priorities or remembering preceding information.

2.3.2 Causes of Information Overload in Health Care

The causes of information overload have been discussed by different authors in various domains. For instance, Eppler and Mengis (2004) reviewed the concept of information overload in organisation science, accounting, and marketing domains. They report that the causes of information overload include too much information, multiple sources of information, difficulty in managing information, and irrelevance or unimportance of information. Sanen and Jamaluddin (2015) investigated the problems and challenges of individuals' information management. They reported that the causes of information overload included the duplication and transmission of information on the Internet, contradictory and inaccurate information, and lack of a method for comparing and processing information.

In the health care context, a study by Al-Madi (2017) suggested that factors leading to information overload included the ineffective managing of information strategies by people, missing information, lack of proper technology, insufficient time to understand the information, unimportant or irrelevant information, and lack of ability to fully understand the clinical opinions provided by medical professionals. Furthermore, Jensen et al. (2017) in a study on information-seeking behaviour of patients reported that the problem of having too much information at hand was made worse by a multiplicity of competing formats and channels. Information overload occurs when

individuals have difficulty using the amount of relevant, and potentially useful information available to them (Chae, 2016). Roberts, van Wyk, and Dhanpat (2016) argued that collaborating with others might cause information overload as individuals can receive too many opinions from others or too many people are involved in decision-making. Table 2-2 outlines the causes of information overload identified by different authors.

Table 2-2: The Causes of Information Overload

Fields	Causes	Authors
Information science	Too much information, multiple sources of information, difficult to manage information, irrelevance or unimportance of information, and lack of time to understand information.	Eppler and Mengis (2004)
Information technology	Information filter failure.	Kearns, Frey, Tomer, and Alman (2014)
Information management	Duplication and transmission of information on the Internet, contradictory and inaccurate information, and lack of a method in comparing and processing information.	Sanen and Jamaluddin (2015)
Organisation	Receive too many opinions from others or too many people are involved in decision-making.	Roberts et al. (2016)
Health care	Individuals have difficulty using the amount of relevant, and potentially useful information available to them.	Chae (2016)
	Missing information, lack of proper technology, insufficient time to understand the information, unimportant or irrelevant information, and lack of concern regarding the clinical opinions provided by medical professionals.	Al-Madi (2017)
	Too much information at hand.	Jensen et al. (2017)

To sum up, the available literature shows that some causes of information overload broadly overlap, such as having too much information, multiplicity of sources of information, lack of ability in managing information, inaccuracy of information, and time constraints. These studies indicate that the cause of information overload are related not only to the quality and amount of information, but also the level or ability of an individual in terms of their personal information and knowledge management skills. It can be concluded from the causes highlighted above that information overload could lead to severe issues that would affect not only healthcare organisations, but also individuals.

2.3.3 Effects of Information Overload

Information overload has been found to lead to negative effects on individuals' cognition according to several authors. For instance, an education study by Shachaf, Aharony, and Baruchson (2016) suggested that too much information will influence an individual's judgment when identifying reliable and relevant information. This makes information seeking time-consuming and decreases individual decision-making ability (Hoq, 2016). A consumer behaviour study by Zhang, Zhao, Lu, and Yang (2015) investigated user behaviour in social networking services, and found that too much information will cause confusion for users (Özkan & Tolon, 2015). Indeed, receiving information beyond the individuals' ability to process may lead to confusion and impact on the quality of decision-making (Hoq, 2016).

In the health care setting, the effect of information overload has been widely discussed. In an investigation of the Internet information-seeking behaviour of patients with chronic illness, Josefsson (2007) claimed that accessing online medical information can bring almost unlimited information, increasing the risk of information overload, and causing individuals to be confused, frustrated and disempowered. Prinsloo (2017) reported that information overload can cause an individual to feel lost or overwhelmed by the situation, and information becomes an obstacle rather than a help, even if the information may be useful. Individuals may realize that using information sources may yield useful information, but they may question their own ability to access information sources or perform searches correctly (Prinsloo, 2017). Individuals question their ability to access information causing anxiety when trying understanding or utilise information (Bawden & Robinson, 2009). Table 2-3 outlines the effects of information overload identified by different authors.

Table 2-3: The Effects of Information Overload

Fields	Effects	Authors
Marketing	Causes confusion affecting decision-making.	Özkan and Tolon (2015)
Education	Decreases an individual's judgment when seeking to identify reliable and relevant information.	Shachaf et al. (2016)
Information science	Makes information seeking time-consuming and decreases individual decision-making ability.	Hoq (2016)
Health care	Individuals feel confused, frustrated and disempowered.	Josefsson (2007)
	Anxiety in understanding or utilising information.	Bawden and Robinson (2009)
	Reduce the quality of decision-making.	Hall and Walton (2004)
	Reduce the productivity of individuals (health care consumers).	Kolusu (2015)
	Individual feels lost or overwhelmed by the situation, and information becomes an obstacle rather than a help.	Prinsloo (2017)

Previous studies focused on the effects of online information and indicated that information overload is a major barrier to health care literacy in terms of reducing an individual's understanding of health care information leading to poor decision-making. These studies, however, lack discussion on the effects of information overload by other resources, such as medical centres and television. Information overload causes frustration, anxiety, and stress, and decreases individuals' (health care consumers') judgment in identifying reliable and relevant information. Overcoming this issue is important in an individuals' ability to effectively deal with the relevant information available to them.

2.3.4 Solutions to Information Overload

Previous studies offered several potential solutions for managing information overload in different areas of research. For instance, Gatzioura and Sànchez-Marrè (2015), in a consumer behaviour study, suggested that recommended systems (such as recommending similar items according to information seekers' behaviour over time) can help to overcome the current limitations while providing more insight into user preferences and item selection patterns through information

retrieval and filtering. Sonal and Kamal (2016) claimed that context-aware recommender systems can avoid information explosion on the web by providing more relevant and accurate predictions for the user. In a computing setting, Imran, Castillo, Diaz, and Vieweg (2015) suggested computational methods to overcoming information overload is a process of classifying, filtering, extracting, aggregating, ranking, and summarizing.

In organisational settings, Simperl et al. (2010) stated that developed tools such as an active knowledge workspace and semantic Media Wiki information sharing platform can help knowledge workers share and deliver information and manage their informal processes. In fact, technology such as computers help to access Internet information, yet, human filters can help rate the importance of information by its relevance to reduce the number of unnecessary messages (Melinat, Kreuzkam, & Stamer, 2014). Indeed, Hoq (2016), in an education study, suggested that focusing on an individual's development, such as information management skills, information literacy, and information processing skills can reduce the issue of information overload.

In a health care setting, Kumar and Maskara (2015) assessed the impact of information overload on medical professionals. They reported that providing an educational course that explains how to handle information overload, training on E-learning mode, and use of knowledge mining tools and decision-support may solve the problem of information overload for medical professionals. In this regard, Kolusu (2015) argued that using updated health care knowledge, computer-based decision support systems, and focusing the mind on one task at a time to help health care professionals cope with the problem of information overload. On the same matter, Green (2016) proposed the READ portal (research, evidence, and analysis for health care decision makers) knowledge management system as a solution for health care managers, which gathers information from numerous high-quality sources and presents it in one easy to access setting. Table 2-4 provides an overview of solutions for managing information overload in various fields.

Table 2-4: Solutions for Managing Information Overload in the Various Fields

Field	Purpose of the study	Solutions for managing information overload	Authors
Marketing	To generate meaningful recommendations to provide more insight into consumer decision-making behaviour.	Recommender systems tools and techniques for information retrieval and filtering.	Gatzioura and Sànchez-Marrè (2015)
	To introduce fuzzy trust into context-aware recommender systems to address the problem of sparsity while maintaining the quality of recommendations.	Context-aware recommender systems to avoid information explosion on the web and provide high quality personalized recommendations.	Sonal and Kamal (2016)
	To identify various personalization aspects in e-commerce websites and investigate their effect on consumer satisfaction and decision-making.	Personalized services which provide customized information, presentation, and structure of the website based on the need of the consumer to handle the problem of information overload in e-commerce markets.	Desai (2016)
	To investigate consumer decision processing approaches in information overload retail environments.	Consumer imagination constructing a simulation of consumption which can help avoid the frustration and difficulty associated with processing high levels of information, and help to handle information overload.	Ketron, Spears, and Dai (2016)
Computing	To investigate methods for processing social media information.	Computational methods to process information from social media.	Imran et al. (2015)
Education	To analyse the causes of information overload and provide suggestions for overcoming this problem.	– Develop information management skills; – Achieving information literacy; – Educating end-users in information processing techniques; – Deliver information in a convenient way and format; – Apply information and communication technologies.	Hoq (2016)

Organisations	To improve knowledge workers' productivity.	Develop tools such as active knowledge workspace and the semantic Media Wiki to help knowledge workers share and deliver information as well as manage users' informal processes.	Simperl et al. (2010)
	To review the problems of enterprises with information overload and how it can be solved by using modern approaches.	– Human filters to rate the importance of information by its relevance, such as personal sphere of contacts in the network, or create a profile of relevant topics for each user, or assessment by an open jury to rank online, tag emails according to personal purposes to reduce the number of unnecessary messages, and use people who have specific skills in particular fields. – Technical solution such as using computers for an adequate supply of information. – Management supports the users' self-esteem motivation and commitment management.	Melinat et al. (2014)
	To introduce and test a structured online team's adaptation procedure that enables virtual teams to reduce information overload.	A structured online team adaptation, which includes: 1) individual situation awareness, 2) team situation awareness, and 3) plan formulation.	Ellwart, Happ, Gurtner, and Rack (2015)
	To provide a profound facet of web Personalization for the business owners to satisfy the customers.	Personalization strategies like content-based filtering, rule-based filtering, collaborative filtering, and hybrid filtering are effective solutions to information overload.	Kumar and Desai (2016)
Health care	To examine the effects of information overload on modern health care systems.	Uses social media as a platform to provide a service based on information logistics principles to deal with the problem of information overload.	Golshan (2012)

	To provide an overview of interactive and integrative solutions for knowledge discovery and data mining.	Human–computer interaction and knowledge discovery and data mining, which is a synergistic combination of methodologies and approaches of two areas.	Holzinger and Jurisica (2014)
	To discuss the issues faced by patients, health care practitioners, and systematic reviewers and give an overview of proposed solutions to the problem of information overload.	– Develop continuous professional development course; – E-Learning mode of training; – Use of knowledge discovery tools to deal with information overload, such as using WaX, decision-support, and so on.	Kumar and Maskara (2015)
	To explore the perceived degree of information overload along with coping skills used by health care professionals.	– Keep updating health care knowledge; – Using Computer-based decision support systems; – Focus mind on one task at a time.	Kolusu (2015)
	To help health care managers overcome the effects of information overload.	Uses a knowledge management system - research, evidence, and analysis for health care decision makers, as well as a portal's structured approach to purposeful information dissemination helps to deal with information overload.	Green (2016)
	To explore lower secondary school science teachers' perceptions and reported practices related to teaching critical appraisal of health claims.	Critical appraisal may help health care professionals and lay people to handle health care information overload, by a sophisticated understanding about science that represents a considerable departure from individuals' familiar ways of thinking and doing.	Nordheim, Pettersen, Flottorp, and Hjälmhult (2016)

In general, there is no perfect solution for the problem of information overload. From the available literature, the solutions proffered in information overload studies have mostly focused on health care professionals and computer-based technology. Technology can play an important role in helping handle the issue of information overload, such as using the knowledge management system to help health care managers to evaluate information for decision-making (Green, 2016). To date, the solutions for health care consumers are still very limited; in particular for older adults. To close these gaps, this study tends to seek a possible solution that may help older health care consumers to overcome the issues of information overload.

In this section I have reviewed the issue of, and potential solutions for, managing information overload. Since the research objective is to investigate an effective PKM strategy to help older adults with limited computer/technological abilities manage information and knowledge to make informed health-related decisions in the next section of this chapter, the decision-making literature is discussed.

2.4 Consumer Decision-making

To understand the current thinking on how consumers make health care decisions, four areas of the consumer decision-making literature are critiqued. The first is the historical decision-making literature followed by theories of decision-making in health care. A review of previous consumer decision-making studies in various fields including health care settings is also discussed.

2.4.1 The History of Consumer Decision-making

Decision-making has been discussed by researchers over the past 70 years. According to Buchanan and O'Connell (2006), decision-making was led by economist Nicholas Bernoulli, John von Neumann and Oskar Morgenstern as a formal explanation of consumer decision-making beginning about 300 years ago. The term ‘decision-making’ is a replacement descriptor for “resource allocation” and “policymaking”. As stated by Professor William Starbuck of the University of Oregon (as cited in Buchanan & O’Connell, 2006, p.32), policy making is endless and resources can always be allocated, while “decision” implies the end of consideration and the

beginning of action. Barnard (1938) separated personal from organisational decision-making to explain why some employees act in the firm's best interest rather than in their own interest.

In 1947, the first book about decision-making was published by Barnard and Simon. They noted that decision-making lies at the heart of administration within organisations and that the administrator must act rationally. This book covers a wide range of topics related to decision-making, including human behaviour, cognitive abilities, management techniques, and criteria for assessing accuracy and efficiency. Subsequently, decision-making has been discussed in different fields such as politics, economics, health care, and mathematics.

Later, in 1957, Simon further claimed that the concept of decision-making assumes that individuals' decisions are limited by framing effects, heuristics, influence of prior expectations, and emotions. From the alternatives, individuals make satisfactory choices rather than optimal ones (March & Simon, 1958; Tyburski, 2017). According to Al-Abri and Al-Balushi (2014), patient satisfaction with regard to the choices they have made can be evaluated by patient expectations of ideal care and their perceptions of real care received. Simon (1955) stated that due to time constraints and cognitive limitations, it is not possible for people to consider all existing decision outcomes and then make fully reasoned, purely rational choices. A satisfactory choice requires less time and less cognitive exertion, yet it should be good enough to suit an individual's needs (Lim & Simon, 2011).

By the mid-1950s, technology was beginning to be designed to improve human decision-making. Buchanan and O'Connell (2006) stated that in the mid-1950s, scientists produced early computer models of human cognition to help researchers understand how the brain makes decisions and enhance the decision-making process of individuals within organisations. In the late 1960s, technology-based decision support systems began to appear in large companies and were specifically targeted at meeting the manager's needs. For instance, Ferguson and Jones (1969) investigated a production scheduling application running on an IBM 7094 by using a computer aided decision system. Over the next few decades, technology was used to support managers in

making decisions about investment, pricing, advertising, and logistics decisions (Buchanan & O'Connell, 2006).

In 1970, the concept of a fuzzy decision theory was introduced. In fuzzy decision theory, decision-making refers to the use of fuzzy mathematics to deal with complex decisions (Bellman & Zadeh, 1970). Fuzzy decision-making methods are particularly useful for firms needing to make recruitment decisions, as the concepts of individual ability, work attitude, and personality are vague (Afshari, Nikolić, & Ćoćkalo, 2014). So far, Fuzzy decision theory has been applied in the fields of engineering, economics, management, and societal problems (Coroiu, 2015).

In 1978, the economist Selten (1978) further elaborated that decisions can be made based on different levels of rationality, and he proposed a three-level theory of decision-making: routine, imagination, and reasoning. On the routine level, day-to-day decisions are made without any conscious effort. On the imagination level, decision-making involves procedural decisions. On the reasoning level, decision-making involves both past experience and logical thinking to analyse the situation in a rational way (Selten, 1978). Selten's theory has been widely recognized and has influenced scholars in various fields, such as social sciences (especially economics), biology, engineering, political science, computer science, and philosophy (Höhn, 2010).

In the last few decades, technology has continued to mature, and become a powerful tool in influencing and changing consumer behaviour. Technology has changed consumer perspectives toward products and services as well as the process of decision-making (Young, Hwang, McDonald, & Oates, 2010). Ashman, Solomon, and Wolny (2015) claim that the old decision model (such as Engel, Kollat, and Blackwell's decision-making model) is still valid, but can be extended or re-evaluated based on the new participatory technology environment. Different devices and methods are used at different stages of the decision-making process to complement each other (Ewerhard, Sisovsky, & Johansson, 2019). Table 2-5 provides a timeline of the long, rich and diverse history of decision-making.

Table 2-5: A History of Decision-making

Year	People, events, research, and aspects	Author (year)
1938	Separated personal from organisational decision-making to explain why some employees act in the firm's best interest rather than in their own interest.	Buchanan and O'Connell (2006)
1944	John von Neumann and Oskar Morgenstern started to examine the basis of consumer decision-making.	Richarme (2007)
1947	The first book about decision-making was published by Barnard and Simon	Barnard and Simon (1947)
In the mid-1950s	Scientists produced early computer models of human cognition to help researchers understand how the brain makes decisions and enhance the decision-making process of individuals in the organisational context.	Buchanan and O'Connell (2006)
1957	Decision makers are limited by bounded rationality which human behaviour is intendedly rational but only limitedly so due to cognitive deficits.	Simon (1957)
In the late 1960s	Technology-based decision support systems began to appear in large companies and specifically targeted at the manager's needs.	Buchanan and O'Connell (2006)
1970	Decision-making refers to the use of fuzzy mathematics to deal with some complex decisions	Bellman and Zadeh (1970)
1978	Decisions were seen to be made on different levels of rationality.	Selten (1978)
In the last few decades	Technology changed consumer perspectives on products and services as well as the process of decision-making.	Young et al. (2010)

To sum up, consumer decision-making has been discussed by researchers over the past 70 years. Decision-making was first introduced in business settings. Afterward, the concept of decision-making was modified and applied in different fields, such as economics, health care, and mathematics. For instance, in the context of health care, consumer decision-making was explained as limited by bounded rationality, which assumes that patients tend to make satisfactory rather than optimal decisions. Previous decision-making studies in various fields are all deeply involved in trying to gain a better understanding of how consumers make decisions. Technology has been suggested to be extended or re-evaluated in decision-making processes. As such, it will continue to be an important research area in all the above fields.

2.4.2 Consumer Decision-making Theories

In this section, I outline major decision-making theories and assumptions commonly applied by researchers to discuss and underline the processes of consumers' decision-making. The definition and theory of decision-making that have been used in previous health care studies are also discussed and applied to develop the PKM-based decision making training program for this study.

In the early and mid-20th century, decision-making was seen as involving "an alternative (or choices), values (worth, utility, or attractiveness), uncertainties (or probabilities) and possible consequences (or outcomes)" (Pierce & Hicks, 2001, p. 268). Decision-making integrates the process of an individuals' beliefs with their behaviour (Hughner & Kleine, 2004) and is an important aspect of an individual's overall life experience (Clark, Closs, & Hughes, 2009; Dykes, Esbensen, Hallberg, & Thomé, 2004). In the health care context, decision-making is an on-going process comprising complex cognitive, perceptual, affective, behavioural, and relational components by which individuals select an acceptable solution or a salient alternative concerning health care issues (Strohschein et al., 2011).

According to Ashman et al. (2015), the consumer decision model (also known as the EKB model) that was originally proposed by Engel, Kollat, and Blackwell in 1995 has long been a core theory of consumer behaviour. The EKB model proposes a sequential process of decision-making consisting of need or problem recognition, information search, evaluation of alternatives, and decision-making (Figure 2-1) (Engel, Kollat, & Blackwell, 1973). The EKB model assumes that after obtaining sufficient information an individual can generate and evaluate multiple options and make decisions (Engel et al., 1973). The criteria for evaluating options are formed by the consumer's decision perspectives and outcome expectations, and these criteria are expressed as individual preferences (Hsieh, 2018).

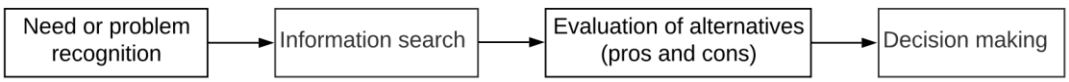


Figure 2-1: Consumer Decision-making Process (Engel et al., 1973)

Engel et al. (1973)'s decision-making model has been most commonly applied in consumer decision-making studies, with the aim of identifying the best decision-making approach based on an individual's current situation. For instance, in the context of health care the EKB model has been used to explain factors influencing patient decision-making in choosing private or public hospitals (Bamfo & Dogbe, 2017). This study proposes an action learning approach to help individual older adults' health care decision-making. The use of other decision-making theories would have made it difficult in designing for such a study as action learning for older adults' health care decision-making. EKB model spells out clear stages that provide a systematic way to design this study's training sections for older adults making health care decisions. Furthermore, to date, very few studies have applied the EKB model in the context of health care decision-making. To close this gap, the EKB decision model proposed by Engel et al. (1973) was used to provide a systematic way to design this study's training sections for older adults making health care decisions.

Normative decision theory was proposed by Vroom and Yetton (1973) to offer a model of decision-making for organisations. Vroom and Yetton's decision theory is rooted in an economic theory that seeks to determine satisfactory decisions in a particular circumstance (Siminoff & Step, 2005). According to Siminoff and Step (2005), normative decision theory has been most commonly applied to health care decision-making studies. For instance, in a health care management decision-making study, Fitzgerald, Dadich, and Lum (2007) adopted the normative model to explain the process of emergency or unplanned surgical cases decision-making process related to hospital personnel. In a study of paediatric oncology by Sung and Regier (2013) the normative model was adopted to illustrate how the results may be useful for patient care decision-making. The normative model assumes that consumers are carefully defining the problem and clarifying their preferences, gathering as much information as possible, considering the pros and cons of all possible alternatives, evaluating and selecting from the alternatives (Boehnke & Bar-Tal, 1998; Vroom & Yetton, 1973; Wood, 2012). Individuals evaluate how judgments should be made and how good outcomes should be achieved (Thompson & Dowding, 2002). The normative decision theory is synonymous with a rationale or deliberate process of selecting among

alternatives (Stone, Chaparro, Keebler, Chaparro, & McConnell, 2017). Vroom and Yetton (1973) theory emphasises the importance of evaluating and weighing the available information to determine the optimal decision. The method of evaluating information and knowledge from previous studies are therefore discussed and applied to the training program. This is further discussed in section 4.2.

Edwards (1954) proposed a behavioural decision theory, which has two interrelated facets, normative and descriptive (Slovic, Fischhoff, & Lichtenstein, 1977). The normative theory proposes how optimal decisions should be made (Marx & Weber, 2007), while the descriptive theory aims at describing the decision maker's beliefs and values and the manner in which individuals incorporate them into their decisions (Im, 2001). Behavioural decision theory presumes that consumers are adaptive decision makers (Shao, 2006) and the theory is concerned with people's actual judgments and choices (Montibeller & Durbach, 2013). Behavioural decision theory identified important aspects of health care decision heuristics that may lead to decision-making biases that violate normative principles (Norman, van der Vleuten, & Newble, 2012). These aspects provide understanding of persistent and hard-to-change basis that violate normative principles in health care decision-making.

Sheth, Newman, and Gross (1991) proposed a theory of consumption values, which includes functional, conditional, social, emotional and epistemic. The functional value is presumed to be the main factor driving consumer choices (Kim, Gupta, & Koh, 2011). It refers to financial or mental rewards that consumers gain from products (Yuan & Wu, 2008). Moliner (2009) health care studies show that functional value has a significant influence over consumer satisfaction, trust and loyalty. Conditional value is in essence the presence of several elements, which tends to improve its functional value (Hallem & Barth, 2011). Social value is directed and focuses on influencing other people and has indirect effects on consumer behaviour (Wang, Po Lo, Chi, & Yang, 2004). Emotional value refers to the feeling or emotional reaction that consumers gain during and after experiencing products (Yuan & Wu, 2008). Emotions not only are a direct result of the judgment of a product, but they also influence the cognitive perception (Ittersum, 2002). Epistemic value refers to the surprise or novelty aspect of a product, a product's capacity to

arouse curiosity, offer novelty or satisfy a desire for knowledge (Sheth et al., 1991), such as the computer and the Internet. Technology has changed the way health care consumers seek knowledge and their decision-making process (Hallem & Barth, 2011) since technology (such as the Internet) has become widely recognised and experienced. These different types of values involve different attitudes toward individual health care and treatment decision-making (Chalamon, Chouk, & Heilbrunn, 2010).

Table 2-6 outlies the health care decision-making theories applied in previous studies.

Table 2-6: Health Care Decision-making Theories and Assumptions in Previous Studies

Patient decision-making in	Decision-making theory and assumptions	Authors
Alternative health behaviours	Health belief model: 1) the value placed by an individual on a particular outcome; 2) the individual's estimate of the likelihood that a given action will result in that outcome.	Maiman and Becker (1974)
Clinical medicine	Bayes theorem (also known as heuristics and biases): diagnostic decisions are revisions of opinions based on a prior knowledge of conditions that may be relevant to the event.	Elstein and Schwarz (2002)
Health care	Theory of naturalistic decision-making: individuals use their experience to make decisions; specifically, relying heavily on observation in the real world because of time pressures, uncertainty, ambiguous or changing goals, and other complexities.	Baker, Ginsburg, and Langley (2004)
Nursing	Theory of evidence based decision-making: all decisions involve choosing from a series of discrete options and evaluating them through an assessment of the available information (using the process of clinical judgment).	Thompson, Cullum, McCaughan, Sheldon, and Raynor (2004)
Women's cancer screening	Women's cancer screening decision is influenced by effects of emotion, prospect theory, optimism bias and framing.	Ackerson and Preston (2009)
Contraceptive	Normative decision theory: decision makers have all the information they need to make decisions, including knowledge of all alternatives, and implies that consumers are rational decision makers.	Cowan, Dowie, French, and Wellings (2013)
Medical treatments	Statistical decision theory: cost-effectiveness analysis is a statistical utility to understand the conditions when choosing optimal treatments	Walczak et al. (2015)

To sum up, consumer decision-making has been emphasized and extensively discussed over several decades in various fields, such as health care and marketing. A number of models were developed to provide an essential understanding of the consumer decision-making process and emphasized material aspects such as quality and price. However, these models do not explain all factors influencing individual consumer decision-making, such as experience (Lambert et al., 2005; Morton, Tong, Howard, Snelling, & Webster, 2010; Noseworthy, 2013) and cognitive bias (Ittersum, 2002; Strohschein et al., 2011). In this regard, Constantinides and Fountain (2008) stated that technology (such as Web 2.0) can directly influence consumer decision-making. Yet, these types of models are not related to technology but to fundamental conceptual and operational issues. With this in mind, the training program design has implanted the Engel, Blackwell, and Miniard's consumer decision-making model within a computer-based technology application.

2.4.3 Consumer Decision-making in Health Care

Consumer decision-making theory has been applied in health care to understand strategies used by patients in their decision-making, and factors affecting their decisions. For example, in an in-vitro fertilization (IVF) study, Lass and Brinsden (2001) reported that the treatment success rate and the general practitioner's or a consultant's recommendations had a positive influence on consumer decision-making around IVF medical treatment. Marcus (2005) further investigated factors affecting people's choice of medical treatment clinic using an Internet-based survey, which was offered to people who had attended many different clinics. Their findings demonstrated that clinic service quality was the most important factor for people choosing a treatment centre. Additionally, they also reported that the doctor's clinical recommendations, treatment cost, distance from home, and special expertise of the clinic were other important factors that affected people's decisions. Some authors (Brandes et al., 2009; Gameiro, Boivin, Peronace, & Verhaak, 2012) stated that emotional burden (stress) affects health care consumer decision-making in regards to the discussion of treatment options.

Additionally, there are other factors that influence consumer decision-making surrounding treatment. For instance, according to Puts et al. (2015), older adults have higher risks in treatment

than younger people due to age and general health difference. Thus, older adults are faced with more difficult treatment decisions than younger people. Furthermore, sometimes people are uncomfortable discussing their health issues with medical professionals of different racial or cultural backgrounds (Searight & Gafford, 2005) or they lack information and time for discussion to ask questions of professional staff (Doherty & Doherty, 2005). Other authors have claimed that the accessibility and quality of information are the most important factors in consumer decision-making (Guillemette, Laroche, & Cadieux, 2014; Kolstad & Chernew, 2009). Barker, Broadbent, Gosai, Jackson, and Wheeler (2014) reported that information received from health care professionals has a positive influence on patient treatment decision-making. Their research examined health care professionals' (doctors and midwives) attitudes and perceptions of medicine and found that the personal attitudes of health care professionals giving advice (i.e., information received) are one factor that may influence decision-making. Fagerlin, Wang, and Ubel (2005) examined factors influencing individuals' decision-making in health care. They suggested that people's decisions are typically influenced by "individuating information", such as anecdotes, when they make decisions or judgments in health care. In a health care literature review by Kolstad and Chernow (2009), evidence suggested that consumers tend to choose health care providers which have better performing plans and high-quality information. For instance, in the in-vitro fertilization (IVF) context, information is helpful in counselling couples on decisions relating to IVF treatment options (Sunkara et al., 2011).

McKnight, Choudhury, and Kacmar (2002) found that information was positively related to consumer trust and helped the consumer make choices. However, too much information leads to worse decisions and stifles individuals' ability to choose (Layug, Thomas, & Carter, 2014), as sometimes people do not have enough capacity to evaluate information and their understanding is severely limited (Covello & Merkhoher, 2013). As previously outlined, consumer health care decision-making is influenced by numerous complex and inter-related factors. Availability of health care information resources are a crucial factor when individuals are confronting health-related decisions (Jones, 2014). Table 2-7 presents a summary of the key literature in the field of consumer decision-making across different sectors of health care.

Table 2-7: Key Literature on Individual Health Care Decision-making

Decision-making in the health care context	Factors influencing consumer decision-making	Sample	Authors
Midwifery	Economic, social, and medical	Women aged from 26 to 41	Manley (2005)
	Past experience, cultural influences, trust, word of mouth	Women who have had babies previously or were pregnant	Noseworthy (2013)
	Emotion and satisfaction	Primiparous and multiparous childbearing women	Carlton, Callister, and Stoneman (2005)
Treatment decision	Individuating information (such as anecdotes)	Prospective Jurors and Detroit-Wayne county metropolitan airport passengers	Fagerlin et al. (2005)
	Consumer (or patient) attitudes, surgeons recommendation	Women aged 79 years and younger	Katz et al. (2005)
	Experiences of others	Literature review	Morton et al. (2010)
	Quality and trust	General practitioners	Jamshed et al. (2012)
Medical	Attitude, perceptions and Information received from health care professionals.	Midwives and medical staff	Barker et al. (2014)
Long-term-care	Individuals' experiences, weighed information (includes spiritual, emotional, and social)	Residents of a long-term-care facility	Lambert et al. (2005)
End-of-life care	Cultural	Literature review	Searight and Gafford (2005)
Web-based health advice/information	Trust	Women aged from 41 to 60	Briggs, Fishwick, Harris, and Sillence (2007)
	Income and sex	Online information seekers aged from 18 to 65 or older	Rice (2006)
Life insurance	Information quality	Literature review	Kolstad and Chernew (2009)
	(Consumer) loyalty and satisfaction level, (company) service quality, and ease of procedures	Literature review	Mahajan and Kavita (2013)

	Affordability and cost, network, product and consumer service (quality)	Literature review	Layug et al. (2014)
Primary care physician	Information obtained and self-awareness	People aged 18 or older include: patients in physician offices, people employed by the local university, and patrons of the local mall	McGlone, Butler, and McGlone (2002)
Written drug information	Information document (i.e. information quality), patient (i.e. an individual's character) and their environment.	Literature review	Koo, Krass, and Aslani (2003)
Health care	Quality and cost	Health care providers	Firminger, Greene, Hibbard, Hirsh, and Sofaer (2012)

The review showed that there are many reasons influencing patient decision-making such as past experience, cultural influences, trust, word of mouth, emotion and satisfaction. Individual's attitudes, surgeon recommendations, trust, income and gender were found to be the most important factors influencing older adults' decision-making. Yet, knowledge around making optimal treatment decisions is still an under-explored area. Thus, more studies are needed to allow development of understanding and support for older patients

To sum up, health care research to date has focused on the factors that influence individual decision-making, such as service quality, cost and information quality. These studies, however, failed to explain the methods used by individuals for accessing and evaluating this information (such as service quality, cost and quality information). Furthermore, it was found that the health care decision-making literature, particularly from the perspective of individuals, was limited. To close the gaps, this PhD study aims to investigate the methods used by older adults to access and evaluate health care information and knowledge for their health care decision-making.

So far, the individual decision-making literature has been reviewed. An explanation of the PKM history and theory is necessary, since the objective of this study is to investigate whether PKM

strategies can help older adults make informed personal health care decision-making. In the next section of this chapter personal knowledge management literature is discussed.

2.5 Personal Knowledge Management (PKM)

PKM has been developing as a concept for almost two decades and studies have focused on developing learning abilities in the education sector and within organisations. PKM is perceived to be a novel approach with no uniform interpretation or application. In the following section a review of the PKM literature is provided.

2.5.1 What is PKM?

The concept of PKM still has no agreed-upon definition. The literature points toward PKM being related to the management of individual learning, information, and knowledge. According to Frand and Hixon (1999), PKM is a process in which individuals organize and integrate information that they believe is important and which becomes part of their personal knowledge base. The authors stated that PKM attempts to utilize technology and helps individuals manage their information. For instance, numerous authors (Razmerita, Kirchner, & Sudzina, 2009; Safar & Alkhezzi, 2014; Stocker & Müller, 2013) utilized computers to help individuals to gather, classify, store, search, retrieve, and integrate information in order to transform large amounts of information in an effective manner. However, Jefferson (2006) argued that the concept of PKM blends technology, personal skills, processes, and methodology. Jefferson stated that technology enables individuals to efficiently organize their personal information. However, individuals must have personal skills to allow information to be retrieved in an efficient manner (Avery et al., 2001; Grundspenkis, 2007; Hobbie, 2010; Jefferson, 2006; Tsui, 2002).

PKM provides a conceptual frame upon which methods can be developed to enhance individual learning capability. PKM focuses on the importance of individual growth and learning that involves the development of capabilities for generating, storage, dissemination and application of personal knowledge (Fang, 2017), and enables individuals to apply a set of learning skills to lifelong learning for information processing, knowledge application and decision-making (Cheng, 2015).

Bevan and Fairman (2014) argued that PKM is a method whereby an individual uses their networks and other sources of knowledge to help with effective thinking. Social networking (such as Blog, WiKi, Facebook, Google and Twitter) allows individuals to communicate and share their knowledge with others to improve learning and cognitive abilities. Zhao, Cao, and Guo (2007) stated that only 20% of knowledge occurs in formal study processes as in school classes, with 80% occurring through informal study processes. This may include chatting with friends, watching movies or interaction through social networks; all these are informal learning activities which enhance the efficiency of PKM (Zhao et al., 2007).

PKM is an emerging concept that is essential to help individuals become more effective in learning. PKM focuses on the critical role of the individual in the knowledge management process (Razmerita et al., 2009). PKM has been defined in different ways by various authors in regard to different purposes. Table 2-8 outlines the interpretation of the PKM concept by scholars and is grouped according to different fields.

Table 2-8: PKM Definitions

Categories	Fields	PKM Definition	Authors
Technology-based	Academic	PKM is a set of techniques used to integrate and utilize knowledge.	Garner (2011); Zhuang (2013)
		PKM happens as a result-oriented, systematic and self-dependent way of handling and manipulating information and knowledge.	Thaul (2014)
		PKM is the core of knowledge management that individuals use to process, methods, strategies, practices, and tools in order to capture, develop, save, organize, disseminate, communicate, collaborate, and share their knowledge with others. It is a new kind of knowledge management that can enhance an individual's information literacy and improve their knowledge	Safar and Alkhezzi (2014); Zhou et al. (2014); Fang (2017)
	Enterprise computing	PKM is a collection of processes that individuals need to carry out in order to gather, classify, store, search and retrieve knowledge in their daily activities.	Tsui (2002)
	Web 2.0 tools	PKM is a process that allows individuals to better manage their knowledge and interaction when collaborating and exchanging knowledge with others.	Razmerita et al. (2009)
	Marketing	PKM is a corresponding idea that indicates a collection of processes that classify, store, search, receive and implement knowledge in everyday activities.	Sztangret (2013)
Human skills-based	Academic	PKM is a means of enhancing individuals' competency in learning instructional design and assessment skills.	Cheng (2015)
	Organisation	PKM is problem-solving activities with specific cognitive, information, social and learning competencies.	Wright (2005)

Knowledge-based	Academic	PKM is a process that individuals use to organize and integrate information that they believe is important and becomes a part of their personal knowledge base. PKM consists of technology, personal skills, and methodologies.	Frand and Hixon (1999); Darvish, Ahmadnia, and Qryshyan (2013)
		PKM is a set of understandings, skills, and abilities that allows individuals to survive and prosper in a complex and changing environment.	Gorman and Pauleen (2011)
		PKM is the individual application of ideas and scientific methods in order to manage personal knowledge effectively.	Li, Guo, Zhi, Han, and Liu (2013)
		PKM is the process of subjective initiative that people consciously practice for objective, independent, planning.	Ma and He (2013)
	Organisation	PKM is knowledge management at an individual level, with the goal to better support personal knowledge activities.	Jafari, Akhavan, and Nikookar (2013)
		PKM is a process that individuals use to transfer knowledge into daily situations while working in organisations	Harold (2013); Zumitzavan and Mumi (2014)
		PKM is the individual application of ideas and approach to KM.	Han, Chang, and Chen (2015)
Combinations-Technology and human skills	Academic	PKM is a set of seven skills: retrieving, evaluating, organizing, analysing, presenting, securing, and collaborating around information with an integrated approach to technology.	Avery et al. (2001)

		PKM is a process of discovering and valuing information that means something to individuals which results in the expansion of the individuals' personal knowledge.	Benitez and Pauleen (2009)
	Organisation	PKM is a theoretical frame that blends technology, personal skills, processes and methodology that help individuals' decision-making and problem solving to be more effective.	Jefferson (2006)

In the age of the Internet, people are bombarded with information. The development of technology has made information more available than ever before (Edmunds & Morris, 2000). There are obvious benefits from easier access to information, but Deb (2014) found that people spend a lot of time going through irrelevant information to find what they need. One study suggests over two-thirds (68%) of their sample would like to spend less time organizing information (Wire, 2008). This indicates that people are affected by the vast amount of resource available and waste much of their time trying to find useful information.

PKM assists in providing individuals with a better understanding of information and helps aid and enhance an individual's ability to accomplish personal goals. The PKM concept emphasises the process of evaluating information and transforming it into valuable knowledge. Cheong and Tsui (2010) claimed that the main purpose of PKM is to provide an effective method for individuals to organize, merge and enrich their knowledge base.

To sum up, based on the literature review, PKM is a method to enhance learning and critical thinking skills which create knowledge to help individuals make more effective decisions. Technology assists with PKM to help individuals manage information and knowledge more effectively. For the purpose of this study, I am defining PKM as an ability by which an individual can grow their knowledge and the value of information through technology, personal skills, and processes in order to achieve, in relation to this study, optimized health care decisions. With this in mind, computer-based technology (such as the Internet and computers) was designed as a part of training to assist with individuals' PKM for health care decision-making; for instance, searching for information by online search engines, such as Google or Yahoo.

Some authors (Avery et al., 2001; Grundspenkis, 2007; Hobbie, 2010; Jefferson, 2006; Tsui, 2002) have argued that individuals must have the pre-requisite personal skills to allow information to be processed, filtered, structured, stored, secured and shared, since technology is only able to support individuals and help retrieve information. With this in mind, one of the goals of this study's training program design is to enhance individual's abilities to make optimal health care decisions and continue to create knowledge. Successful PKM skills might help empower individuals to apply

their personal knowledge to deal with problems and spend less time on irrelevant information.

2.5.2 PKM Background

Pauleen (2009) stated that the roots of PKM are multidisciplinary, and personal information management (PIM) is one of the more apparent antecedents to PKM. PIM was first introduced by Bush in 1945 as a tool for the collection, storage, and organisation of personal information (Bush & Think, 1945). In the 1980s, PIM was seen as a support tool for management of such things as appointments and scheduling, to-do lists, phone numbers and addresses (Chen, 2009). In recent years, PIM has come to be seen as a fundamental aspect of Computer-based activity (Benitez & Pauleen, 2009), which often refers to technology such as web pages and email messages, used every day to complete personal daily tasks (Abdalla & Frank, 2011; Jones & Bruce, 2005). PIM is a highly individual and creative tool used personally (Bergman, Boardman, Gwizdka, & Jones, 2004; Diehl, Holman, Karrer, & Borchers, 2006) in order to record, track and manage certain types of personal information (Bourne, 2012; Ducheneaut & Bellotti, 2001) in a work environment (Barreau, 1995). The function of PIM is to help individuals to manage their own information (Boardman, 2004). PIM are activities individuals perform such as receiving and creating, saving, retrieving, using and distributing information (Shujuan, 2013). PIM allows individuals to deal with fragmented information and create their own knowledge libraries to achieve personal goals and obligations in life (Karger & Jones, 2006). However, PIM fails to engage in knowledge sharing and the handling of information overload (Jones, Bruce, Klasnja, & Jones, 2008), while PKM surmounts the problem of dealing with overwhelming amounts of information with the support of tools and techniques (e.g., computers and knowledge management systems) (Jefferson, 2006). PKM combines the advantages of knowledge management and PIM and resolves disadvantages.

According to Gorman and Pauleen (2011), knowledge management (KM) is another antecedent to PKM. There are multiple disciplines of KM antecedents by various authors. For instance, Baskerville (1998) stated that the antecedents of KM are strategic information systems, quality management, organisational behaviour, information economics, artificial intelligence, and organisational culture. Armistead (1999) claimed that the academic antecedents of KM are philosophy, social science, economics, and the physical sciences. In the second half of the 20th

century, technology has been adapted and introduced to KM to enhance the process of information within organisations (Davenport & Cronin, 2000).

The study of KM covers a broad range of fields, such as information systems, economics, strategic management, organisational behaviour, psychology, linguistics, cognitive science, philosophy, anthropology and sociology (Cheong & Tsui, 2010). However, the implementation of successful KM remains a challenge and the focus has shifted to PKM methods (Barth, 2005; Razmerita et al., 2009). This shift has brought researchers to focus on PKM to explore the human dimension of KM (Apshvalka & Wendorff, 2005). KM is about organisational knowledge processes (Bhatt, 2001), and knowledge that individuals use within an organisation (Sanchez, 2004), whereas PKM focuses on individuals' productivity and their ability to acquire and use knowledge (Jefferson, 2006). In light of this, PKM has been described as a bottom-up approach to KM (Jefferson, 2006; Pollard, 2008). Table 2-9 compares the different elements, functions, focus, and value of KM, PIM, and PKM.

Table 2-9: Difference between KM and Information Management, PIM, and PKM

Context	KM and Information Management	PIM	PKM
Technology	Such as data mining, multimedia, collaboration, and the web, web data management, multimedia systems, and collaboration systems (Bertino, Khan, Sandhu, & Thuraisingham, 2006)	Such as Microsoft Outlook, email or web bookmark management (Buttfield-Addison, 2014; Uden, 2011)	Such as Web 2.0 includes formal and informal communication, collaboration and social network tools (for example, Facebook, wikis and blogs) (Razmerita et al., 2009).
Process	Capture/locate knowledge, create knowledge, transfer/share knowledge, and apply knowledge (Seufert, Back, & von Krogh, 2003).	Information keeping, management and exploitation (Whittaker, 2011).	Get/retrieve, understand/analyse, share, and connect activities (Ismail & Ahmad, 2011).
Method	Designing an organisation's goals, structures, and processes so that the organisation can learn and create value for its consumers and communities (Firestone, McElroy, Gorelick, & Tantawy-Monsou, 2005).	The methodology of PIM refers to how individuals handle, categorise and retrieve information (Jones & Thomas, 1997).	Provides individuals with information technology skills and KM skills (Yaniv, 2005).
Functions	Improve organisation performance and sharing information (Kolekta, Baboo, Machaka, & Chandran), aims to facilitate the KM processes in organisations e.g. knowledge generation, codification and transfer, and broader diversification of KM processes (Antonova, Gourova, & Nikolov, 2006)	Help individuals to manage resources in their personal information (Gormley & Gormley, 2012).	Resolve information overload problem, support decision-making, problem solving, sharing knowledge, improve learning skills (Davies et al., 2006; Jefferson, 2006; Li & Liu, 2008)
Focus on	Organisational knowledge (Razmerita et al., 2009).	Personal information collection (Elsweiler, Mandl, & Azzopardi, 2009).	Individual knowledge (Razmerita et al., 2009).
Value for	Organisational	Individuals	Individuals and organisational

To sum up, KM and PIM are antecedents of PKM. Fundamentally, PKM has evolved from KM and PIM. The difference between KM and information management, PIM, and PKM is the focus:

KM and information management focus on organisational knowledge, PIM focuses on personal information collection and PKM focuses on individual knowledge (Razmerita et al., 2009).

2.5.3 The PKM Literature

The study of PKM was first undertaken by Frand and Hixon (1999) when they introduced a workshop for students in an MBA program at UCLA, Anderson School of Management to help students manage information overload. They developed a PKM strategy that consisted of teaching individuals traditional KM (borrowing heavily from traditional library science) and applying it to PIM tools (i.e., computers) to integrate or relate information. They reported that PKM is a concept that accounts for the storage and integration of information that individuals feel is important so that it becomes part of their personal knowledge base (Frand & Hixon, 1999). PKM provides a strategy for transforming information into something that can be systematically applied and that expands individuals' personal knowledge (Frand & Hixon, 1999). However, Frand and Hixon focused on the processing of PIM but failed to address the importance of interpersonal knowledge activities (collaborating). To address this gap, Avery et al. (2001) further developed a PKM framework to include collaborating around securing and presenting information, and focused on seven PKM skills (retrieving, evaluating, organizing, analysing, presenting, securing, and collaborating) to integrate information technology to help students learn at Millikin University. They asserted that in the technology age, PKM skills can emphasize problem solving knowledge work. Similarly, Wright (2005) reported that people's learning effectiveness can be enhanced if they are aware of their PKM skills.

Abdullah and Talib (2012) argued that the existing PKM models (Grundspenkis, 2007; Smedley, 2009; Wright, 2005) typically focus on supporting knowledge creation and sharing, but do not consider how different initiatives and activities are linked at the individual level. They proposed a PKM model based on PKM technology that facilitates knowledge sharing in a collaborative environment of school teachers to help enhance teachers' management performance. They revealed that PKM skills are related to individual-level knowledge acquisition, storage, dissemination, and application. Indeed, PKM is a personal approach to learning in a social world (Benitez, Pauleen, & Hooper, 2013). PKM is not only the managing of acquired knowledge but

more importantly the creation of new knowledge (Zhao, 2009). For instance, Zhao (2009) conducted a survey on teachers' PKM competency and presented a framework of Web 2.0 (i.e., PKM tools) to support teachers exercising their PKM skills. indeed, Web 2.0 is a platform that allows users to interact, collaborate and to exchange knowledge, such as, blogs, wikis, and Facebook (Pozgaj & Vuksic, 2011). Zhao's study concludes that Web 2.0 provides a series of effective tools and platforms to develop individuals' PKM competency to create and manage their knowledge. These studies, however, have not provided a comprehensive understanding of how computer-based technology supports older adults' personal knowledge. There is a lack of empirical studies that investigate whether technology supports all three types of interactions in an e- learning environment (Huang & Nakazawa, 2010).

PKM allows individuals to exercise their competencies via analysis or collaboration and once people know how to control their KM process, they can merge information into their personal knowledge. However, while PKM scholars have focused on education to help improve students' learning abilities, little empirical research or significant conceptual development of PKM has been done in health care decision-making (Huang et al., 2018). More research is needed in the field of health care. Table 2-10 provides an overview of PKM studies in the area of learning effectiveness.

Table 2-10: The PKM Literature

Special issues of PKM in learning environment	Main ideas	Benefit/Value for	Authors
How to better manage information and knowledge effectively?	Provide a framework for individuals to use their technology (laptop computer) to manage the information they encounter and to transform it into knowledge.	Individuals	Frand and Hixon (1999)
	Technology has facilities to store information and is useful for PKM.	Small groups	Garner (2011)
	Developing six PKM systems that provide more personalized interfaces and functional options for individuals.	Individuals	Jing, Yahui, Ning, and Xin (2012)

	Introduce a PKM model to improve knowledge acquisition, storage, dissemination, and application.	Individuals	Abdullah and Talib (2012); Zhuang, Hu, Xu, and Tian (2011)
	Taking advantage of the PKM features and the advantages of PKM tools to enhance teachers' teaching abilities.	Individuals	Lan (2013)
	PKM provides a new management mode to combine social network with technology to achieve processing, storage and accumulation, sharing and exchange, usage and innovation, and provides strong support for learning.	Individuals	Hai-Zhi, Hong-Tao, and Xue-Yan (2011)
How to improve problem solving skills?	Developed PKM framework to emphasize learning-to-learning information skills: retrieving, evaluating, organizing, collaborating, analysing, securing and presenting information.	Individuals	Avery et al. (2001)
	Define, design and validate an advanced concept to support the contemporary learning processes.	Individuals	Thaul (2014)
	Through the PKM concept and its technological and educational devices	Organisations	Schmitt (2018)
The benefit of PKM	PKM is a concept that allows universities to maintain and develop their intellectual capital in the form of explicit knowledge.	Organisations	Grundspenkis (2012)
	Assess the reaction-based satisfaction level of students in regard to using PKM tools in their studies.	Organisations	Safar and Alkhezzi (2014)
How to improve learning skills?	Gain a better understanding of current status of PKM adopted by students with Web 2.0 tools.	Individuals	Liu (2011)
	PKM competencies (retrieving, organizing, collaborating, analysing, presenting and securing) aid individuals in better understanding elicitation, collection, analysis, modelling, and validation of knowledge in a learning process.	Individuals	Cheng (2012)

	Improve individual students' competitive ability in employment.	Individuals	Ma and He (2013)
	Identifies group features of social network platforms as the prime locations for networking and learning.	Individuals	Mushonga (2014)
How can Web 2.0 (PKM tools) improve the learning process in PKM?	Web 2.0 provides a series of effective tools and platforms to develop individuals' competencies.	Individuals	Frand and Hixon (1999) Pettenati, Cigognini, Guerin, and Mangione (2009)
	Web 2.0 enables formal and informal communication, collaboration and social networking tools to facilitate interaction, collaboration and exchanges knowledge.	Organisations Individuals	Pozgaj and Vuksic (2011); Razmerita et al. (2009) Mondahl, Rasmussen, and Razmerita (2009)
	Web 2.0 helps individuals to manage their knowledge more systematically.	Individuals	Ma, Wang, and Ye (2011)
How to help individuals making effective health care decisions?	Implementation of PKM in individual health care decision-making.	Individuals	Huang et al. (2018)

To sum up, personal skill and assisted technologies have been widely used in PKM to help individuals manage their knowledge base and collaborate with others. These studies have found that PKM allows individuals to exercise their competencies and manage information via analysis or to share their knowledge by collaborating with others. These studies suggest that once individuals know how to control their KM processes, they can merge information into their personal knowledge. Up until now, PKM studies have been carried out primarily in the field of education. Also, there has been very little empirical research or significant conceptual development of PKM in the context of health care decision-making. To close these gaps more research is needed and this study looks at how PKM can be used in individual health care decision-making.

2.6 The Relationship between PKM, Information Overload and Consumer Decision-making

Information overload is a commonly recognized issue in health care studies. Information overload is mainly caused by the quality and amount of information, and the level or ability of an individual's PIM skills. Information overload can lead to frustration, anxiety, and stress, decreasing an individual's judgment in identifying reliable and relevant information leading to poor decision-making. Yet, there is no perfect solution for the problem of information overload; particularly in health care settings. To fill the gaps, this study seeks a possible solution that may help individual health care consumers to overcome the issues of information overload.

Consumer decision-making has been discussed by scholars for over half a century. In the context of health care, consumer decision-making was explained by Simon (1957) as being limited by bounded rationality, which assumes patients tend to make satisfactory decisions rather than optimal. A number of models were developed to provide an essential understanding of the consumer decision-making process, such as the Howard-Sheth model of consumer behaviour, Sayeki (1986) behavioural decision theory, and the Sheth et al. (1991) model of consumer values. In the context of health care, normative decision theory has been most commonly applied to health care decision-making studies (Siminoff & Step, 2005). The decision-making model of Engel et al. (1973) provides a systematic way to design "major topics" of training sessions. The details of the training program design are described in section4.2.

PKM has been suggested as a solution to overcome information barriers allowing for more effective decision-making, through the use of technology, personal skills, processes and methodology (Gorman & Pauleen, 2011; Jefferson, 2006; Zhao, 2009). PKM integrates KM technologies and PIM skills. PIM is an activity in which an individual stores personal information for later use (Bergman, Beyth-Marom, & Nachmias, 2008). PIM activities include information seeking, keeping, organisation and maintenance (Jones & Bruce, 2005). PIM transforms data into information, and it deals with past knowledge (Cheong & Tsui, 2011), while KM is a process that provides the decision makers with useful tools. For instance, the Internet (technology) can provide unprecedented opportunities to access information and enhance communication among decision

makers (Jadad, Haynes, Hunt, & Browman, 2000). Social media comprise tools with Internet access that can open an online exchange of information through conversation and interaction and support an organisation's decision-making (Yates & Paquette, 2011). Mohammed and Jalal (2011) revealed that more effectively implemented information technology, human resource, and knowledge sharing to assist with KM can have a positive impact on decision-making.

Furthermore, Gorman and Pauleen (2011) state that sound evaluation, organizing and analysing skills enable the decision maker to improve decision quality, while collaborating skills help to share knowledge more effectively. Thus, developing PKM skills can lead to more effective cognition, communication, social networking, collaboration, problem solving, creativity and lifelong learning, and it also helps individuals better understand information and knowledge, and that allows for more effective decision-making. Dorsey (2001) highlighted that PKM skills include retrieving, evaluating, organizing, collaborating, analysing, presenting, and securing information.

In this study, PKM is defined as an ability by which an individual can grow one's knowledge and the value of information through technology, personal skills, and processes in order to achieve an individual's optimized health care decision. PKM is the evolution of KM and PIM. KM focuses on organisational knowledge and PIM focus on personal information collection while PKM focuses on individual knowledge (Razmerita et al., 2009). In a quantitative study, Jain (2011) examined the impact of PKM on individuals' knowledge management and productivity within organisations. In their results PKM increased an individual's work productivity by solving information overload, and enhancing knowledge-based and informed decision-making. As such, I believe that PKM plays a moderating role in stimulating the relationship between information overload and individual health care decision-making by offering alternative methods for overcoming information barriers (information overload). However, although PKM has been broadly studied in the education field, very little empirical research or significant conceptual development of PKM has been done in health care decision-making; particularly in older adults. To fill the gaps, in this study I used PKM to strengthen the decision-making model proposed by Engel et al. (1973). A qualitative empirical study where an action learning approach was used in this study to explore older adults' opinions and experience of PKM in regards to health care decision-making.

The conceptual model related to information overload, PKM, health care decision-making, and research questions of this study are shown in Figure 2-2. The conceptual model grounded in data is further modified and discussed in section 5.3.1.

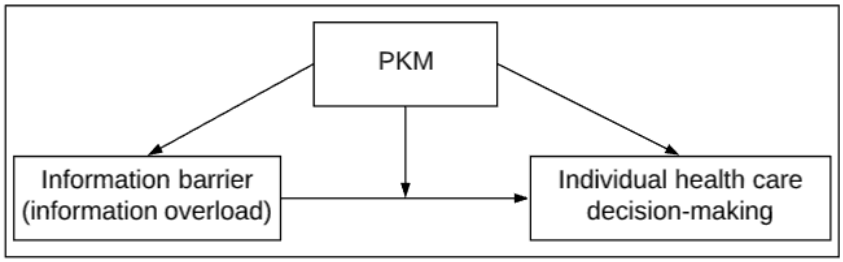


Figure 2-2: The Conceptual Model of This Study

RQ1: How do older adults access and evaluate information and knowledge for health care decision-making?

RQ2: How can PKM help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making?

RQ3: How effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making?

To sum up, this section summarized the key terms of and the relationship between information overload, decision-making, and PKM in this study. Previous studies provide limited solutions for the issue of health care information overload, and very little empirical research or significant conceptual development of PKM within the field of health care; particularly in older adults. A conceptual model was built based on the literature review. Three research questions were developed to fill the gaps in knowledge around information overload, PKM and health care decision making. An action learning training program was used to assist with answering the research questions.

2.7 Summary of the Chapter

In this chapter, five sub-sections were reviewed: health care context, information overload, consumer decision-making, PKM, and the relationship between PKM, information overload and consumer decision-making. In the first sub-section, an initial review of the literature in the context of health care was presented. This was followed by a review of information overload. Then the third sub-section dealt with a literature review of consumer decision-making in general followed by consumer decision-making specifically in health care. The history, theories and previous studies on decision-making were discussed. It was posited that consumer health care decision-making might be a normative or behaviour-based decision process. The factors involved in the decision-making process were identified and reviewed. In the fourth sub-section, the concept of PKM was debated with respect to KM and PIM, process and methodology. PKM was defined as a set of problem solving skills and methods of managing information and knowledge at an individual (personal) level through technology to achieve an objective. Finally, the last section summarized and discussed the relationship between PKM, information overload, and consumer decision-making, a conceptual model of this study was also presented in this chapter.

From this broad-ranging review of the literature, it can be concluded that PKM represents a potentially important new way for individual decision-making. It can also be concluded that the application of PKM within the health care field has not yet been adequately examined. To close these gaps, this study is designed to investigate whether PKM strategies can help older adults with limited computer/ technological abilities to manage information and knowledge to make informed health-related decisions. A PKM-based decision-making training program was specially designed for this study and is further described in 4.2 section.

Chapter 3 Research Methodology

3.1 Chapter Overview

This chapter describes the research methodology used to direct the study and where data collection, analysis, and interpretation are stated. First, the philosophical basis of alternative research paradigms and the researcher's philosophical stance are described. Second, the methodology and specific methods that have been adopted in this study are explained. In particular, the use of action learning, thematic coding and grounded theory approaches as research methods are introduced and justified. Following this the principles of combining action learning and grounded theory approaches used in this study are presented, followed by a summary of Chapter 3.

3.2 The Choice of Research Methodology and Methods

Methodology is a strategy or plan of action which lies behind the choice and use of particular methods (Scotland, 2012). A qualitative methodology with an interpretive perspective for data collection and analysis was adopted to answer the following research questions: *How do older adults access and evaluate information and knowledge for health care decision-making? How can PKM help older adults with limited computer/ technological abilities manage their information and knowledge for health care decision-making? How effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making?*

According to Moon and Blackman (2014), in the social sciences, research design is based on the researcher's philosophical assumptions (ontology, epistemology, and methodology). What is the researcher's approach to the nature of the world and reality (ontology)? How can the researcher justify his/her belief (epistemology)? What philosophy of methods are used to investigate the research questions (methodology)?

There are many research paradigms characterised by their ontological, epistemological and methodological dispositions to describe the researcher's philosophical position. According to

Creswell (2007) and Maxwell (2012), paradigms such as post-positivism, positivism, constructivism, pragmatism, realism, advocatory/participatory, interpretivist, feminism, phenomenology, postmodernism, and critical theory are categories at the most abstract and general level. Positivist, critical and interpretive have been described as the three main philosophical traditions for conducting research (Scotland, 2012).

Positivist ontology position assumes that an external and objective reality is out there to be found (Long, White, Friedman, & Brazeal, 2000). Positivists believe that most social problems can be understood and treated through objectively correct scientific methods (McLaughlin & Muncie, 2012), which test new theories or test existing hypotheses by using instruments, and quantitative methods in an effort to increase the predictive understanding of phenomena (Mukherji & Albon, 2009; Myers, 2013).

Critical ontology position assumes that social reality is historically constituted and is produced and reproduced by people (Yolles, 2000). Yet, critical researchers' ability is constrained by various forms of social, political, and cultural domination (Ke, 2011). Critical research focuses on the oppositions, conflicts and contradictions in a contemporary society, which means that it should help to eliminate the cause of alienation and domination (Ke, 2011), and acquire knowledge via observable phenomena to provide credible data and facts, and focus on explaining within a context (Wahyuni, 2012).

Interpretative ontology position assumes that reality is constructed by people's perceptions (Costa, Prior, & Rogerson, 2010). Interpretivists believe that knowledge of reality is only obtained through social constructions such as language, consciousness and shared meanings (Horn & Steen, 2006). Interpretive methodologies focus on the reconstruction of data from memory based interviews to evoke the disclosure of relevant information (Dimbath, 2013), and understand phenomena through the meanings that people assign to them (Ke, 2011). Table 3-1 outlines the ontological, epistemological and methodological bases of alternative research paradigms based on the above mentioned.

Table 3-1: Basic Philosophical Belief of Alternative Research Paradigms

	Research Paradigms		
Fundamental beliefs	Positivist	Critical	Interpretive
Ontology: the position on the nature of reality	External, objective and independent of social actors	Historically constituted produced and reproduced by human thoughts and beliefs or knowledge of their existence	Socially constructed, multiple, holistic, and contextual
Epistemology: the study of knowledge and justified belief	Knowledge generated: Nomothetic, time-free, context independent, findings true	Observable phenomena to provide credible data and facts and focus on explaining within a context	Focus on the details of reality and situation behind these social phenomena and subjective meaning
Possible research methodologies	Quantitative approach	Qualitative approach	Qualitative approach

Based on Costa et al. (2010), Dimbath (2013), Ke (2011), Long et al. (2000), McLaughlin and Muncie (2012), Mukherji and Albon (2009), Myers (2013), Wahyuni (2012), and Yolles (2000)

The interpretive and critical paradigms are more commonly associated with a qualitative research approach and positivist with quantitative. In this study, the nature of reality (ontology) is individuals confronting an information-rich environment when they make health care decisions. I want to understand how PKM supports individual older adults' health care decision-making through systematic ways to merge information into their personal knowledge. However, there has been relatively little research and limited significant conceptual development carried out on the concept of PKM (Cheong & Tsui, 2011; Zumitzavan & Michie, 2015) and particularly in health care. An interpretive qualitative paradigm allows me to explore in detail how context shapes meaning, behaviour and experience (Greyling, 2016), and gain a rich and textured view of the concerns that are presented by participants (Kamwaria & Katola, 2012). Accordingly, the interpretive qualitative paradigm was used as a philosophical and methodological approach for this study.

Interpretative qualitative methods are recognised for use in health care settings. For instance, Sneesby, Satchell, Good, and Van Der Riet (2011) in their study on the views of death and dying held by health care workers, used focus groups with a sample of 15 participants to help develop a set of concepts and categories related to their area of interest (end of life). Jackson and Griffiths

(2014) in their study on nurses' infection prevention behaviour took an interpretative qualitative approach using in-depth interviews to explore nurses' infection prevention behaviour and understanding of risk and contagion. Marx et al. (2011) in their study on patient education used group discussion, which they claim is an interpretative qualitative learning method that offers participants the opportunity to discuss their sickness experiences and helps the researcher to gain insights into the patients' issues.

The aforementioned interpretative qualitative approach allowed me to seek out older adults' PKM experience regarding health care decision-making. The action learning approach with different learning sets was chosen for data collection for this study. The action process involves a small group composed of four to eight people (Marquardt, 2014). Individuals, including the facilitator/ researcher, learn from one another through group discussions, trial and error, discovery learning from real life issues and critical reflections on the experience (Zuber-Skenitt, 1993). The reasons for adopting action learning for this research are discussed in section 3.3.1.

My thesis focuses on the experiences of older adults' PKM in confronting an overwhelming information environment when making complex health care decisions. I developed a PKM-based decision-making training program to provide participants with some of the knowledge and skills they need to be able to discuss their experiences with regards to health-related decisions. The training program provides the participants and me with a learning opportunity allowing for flexible training, and structured questions in a relaxed and informal group atmosphere (Dunphy, Proctor, Bartlett, Haslam, & Wood, 2010; Eison, 2010). Thematic and grounded theory coding techniques were chosen for this study to provide qualitative analysis of the data. Thematic coding is similar to the early stages of grounded theory, but its focus is on the experience of the participants, rather than as a precursor to theory development (Rivas, 2018). Grounded theory coding extends the analysis beyond thematic explication, and emphasises the link between data collection and data analysis to generate concepts and categories (Douglas, 2003; James, 2013). These techniques are discussed further in sections 4.5.1 and 4.5.2.

To answer the first and third research questions (How do older adults access and evaluate information and knowledge for health care decision-making? How effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making?), qualitative thematic coding (Auerbach & Silverstein, 2003) was chosen for data analysis. Thematic coding allows capture of major thematic ideas in the original text, which allowed me to identify participants' original methods of accessing and evaluating information and knowledge and key issues regarding this training program (Gibbs, 2018). This technique provided me a clear understanding of what needed to be refined in terms of program structure, content, and delivery.

To answer the second research question (How can PKM help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making?), grounded theory coding techniques (Glaser & Strauss, 1967) were chosen for data analysis. I needed to capture participants' opinions and experiences of the utility of PKM by involving action learning processes. Interpretive studies assume that people create and relate their own subjective and intersubjective meanings when they interact with the world around them. "Interpretive researchers thus attempt to understand phenomena through accessing the meanings participants assign to them" (Orlikowski & Baroudi, 1991, p. 5). Grounded theory coding allows for the analysis of data to explain the dynamic and ambiguous areas of the research questions (Pauleen, 2001). This helped me to create knowledge and avoid importing existing theory into the data analysis. Thus the second research question might benefit from these techniques.

To sum up, a qualitative methodology with an interpretive perspective, specifically action learning, was chosen for this study for the purpose of investigating an effective PKM strategy to help older adults with limited computer/technological abilities manage information and knowledge to make informed health-related decisions. To answer the first and third research questions, a simple qualitative thematic coding was chosen to identify participants' methods of accessing and evaluating information and knowledge before training and the key issues regarding this training program. To answer the second research question, grounded theory approach was used to

capture participants' main concern of the utility of PKM by involving action learning processes. The method of combining action learning and the grounded theory coding technique is further discussed in section 3.4.

In the following section, action learning, thematic and grounded theory approaches are discussed and further justified as to why they were found to be suitable methods to address the research questions.

3.3 Action Learning and Grounded Theory Approaches

To help older adults with limited computer/technological abilities to manage their information and knowledge for health care decision-making, action learning was chosen as the method for this study. As I am not an expert in the fields of PKM and health care decision-making, the nature of action learning is such that it provided me with the opportunity to generate knowledge and learn with participants. Action learning allowed me to explore an effective PKM strategy for older adults' health-related decision-making without imposing pedagogical paradigms. Grounded theory coding techniques were chosen for data analysis, as it has been suggested that these are appropriate data analysis methods for an action learning study and help the researcher to create knowledge and avoid importing existing theory into the data analysis.

Action learning and grounded theory coding techniques are further described in section 3.4. This is followed by an explanation of the logic for combining and integrating action learning and grounded theory approaches.

3.3.1 Action Learning

Action learning "is a basic concept of action research" (Zuber-Skerritt, 1995, p. 214). Action research is a methodology of intervention that associates the research and the practice in a process. Action research implies actors participating together with the researchers to understand the reality, identify collective problems and seek solutions in real situations (Sousa, Cascais, & Rodrigues, 2015), and collecting trustworthy data on multiple perspectives of particular groups (Schmuck, 2008). It involves action, evaluation and critical reflection by a group of participants

(Koshy, Koshy, & Waterman, 2010), taking action and creating knowledge of the action in question (Ojanperä, 2015).

The theory of action research was pioneered by Lewin (1946), in his paper "Action Research and Minority Problems". Lewin stated that knowledge should be created from problem solving in real life situations using the spiral steps of planning, action, observing and reflecting. Throughout the literature, researchers have had different positions with respect to action research. In the late 1940s, action research was seen as an application to social science research that could help solve social conflicts. Lewin (1946) claims that action research is a procedure that allows people to improve their productivity. In the 1950s, the idea of action research was taken up by academics who deemed it to be a valid educational research methodology (Shumsky, 1956). In the 1960s, action research was seen as a method for offering unskilled industrial workers a strategy for reform (Thorsrud, Trist, & Emery, 1964). In the 1980s, action research became more commonly used in the health care context and was seen as a theoretical basis in experimental research design (Robotham & Frost, 2005). From the available literature, there are various action research approaches, such as action science, action inquiry, participatory action research, and action learning (Checkland & Holwell, 2007). Table 3-2 outlines the terms/forms of action research methodologies.

Table 3-2: Terms of Action Research Methodologies

Terms	Description	Fields	Authors
Action science	"an informal, qualitative, formative, subjective, interpretive, reflective, and experimental model of inquiry in which all individuals involved in the study contributed". In action research, action science places a central emphasis on the spontaneous, tacit theories-in-use that participants bring to practice and research.	- Education - Human behaviour	Gabel (1995, p. 1); Schon (1989)
Action inquiry	a spiral of cycles which allows knowledge to be created in and for action. The process of action inquiry transformational learning leads individuals and organisations to better assess current dangers and opportunities of the present moment, such as personal dilemmas and life crises.	- Management; - Leadership	Ellis and Kiely (2000); Torbert and Torbert (2004)
Participatory action research	a form of action research in which professional social researchers operate as full collaborators with people in studying and transforming to investigate social reality and build skills and capacity. Participatory action research changes or improves a situation involving people who are most affected in the process through an idea of intervention and based on reflection, data collection, and action aimed at evaluating the effectiveness of the intervention.	- Organisations (High-tech manufacturing company, labour industrial cooperatives, and university); - Government services and affairs; - Community; - Nursing	Greenwood, Whyte, and Harkavy (1993) Crane and O'Regan (2010); Hall (1985); Hoare, Levy, and Robinson (1993); McGarvey (2007); Mekki (2015)
Action learning	a cyclical process of 1) planning: setting up a new project or developing a program; 2) implementing the plan (action): of a new project or program; 3) reflection: evaluation of a project or program; 4) learning: learn in the process. The learning cycle often involves a small group composed of four to eight people that are called an action learning 'set'. The group members work together and meet regularly to help explore solutions to real problems through a highly structured, facilitated team process of reflection and action.	- Organisations (church-related); - Organisational commitment	Britton (2002); Joyce (2012); Krishna and Marquardt (2007)

Action learning has been commonly applied in health care environments to improve conditions and practices of patient care (Koshy et al., 2010). Action learning is often used to support the

learning and development of professionals through reflecting on their experiences to address real life issues (Trehan & Rigg, 2015). Action learning was adopted in this study as the problem of information overload in personal health care-related decision-making is a real life issue (Hibbard & Peters, 2003; Jones, 2004). The principles of action learning can help to achieve improvement and transformation across a broad range of applications and disciplines, including professional training programs (McGill & Brockbank, 2003). An efficient training program enables individuals to acquire knowledge and skills for application in their lives (Treven & Potocan, 2005). The strategy was developed through the action learning training program. In this study, the focus of the training is to help older adults deal with large amounts of information more effectively through the use of PKM strategies. Through the training experience, participants provided insights of effective strategies in developing their personal knowledge management. The developed PKM strategy is based on methods developed from action learning and opportunities provided for older adults to grow their knowledge and the value of information through technology, personal skills and processes, and ultimately to achieve optimized health care decision-making by the individual. Action learning also provides a relevant learning opportunity for research participants and the researcher (Pauleen, Corbitt, & Yoong, 2007). In action learning, the role of the facilitator is to act as a guide rather than a subject expert, and they learn with participants rather than teach them (Owens & Rutherford, 2007). This feature of action learning provided me an opportunity to generate knowledge and learn together with participants to develop PKM strategies regarding health-related decisions. Therefore, action learning is the appropriate method for me to learn with this group of people (older adults with less education and limited computer/technological skills) without imposing pedagogical teaching.

3.3.2 Grounded Theory Data Analysis Techniques

There are multiple interpretations of what constitutes grounded theory and in this section these different ideological stances and the key components are outlined. The variation of grounded theory adopted for this study is also described and the reasons for its adoption are discussed.

3.3.2.1 What is Grounded Theory

Grounded theory was first introduced by Glaser and Strauss (1967) in the book *The Discovery of Grounded Theory* in which they suggested that grounded theory is a general inductive research methodology for generating knowledge and understanding. The aim of grounded theory is to identify significant findings from the data by using a rigorous set of comparative techniques to capture the complexities of the context in which the action unfolds.

Grounded theory through data analysis primarily in the form of transcripts or literature is broken down into codes. Codes are constantly compared and collected together to form meaningful categories (the main concerns of the participants). Categories are refined until substantive theories or conceptual hypotheses are developed. The process of grounded theory is not obstructed by the development of research problems, theoretical understanding or literature review (Jones, Kriflik, & Zanko, 2005). On the contrary, the researcher has freedom to enter the field and discover the main concerns of participants and analyse ways to resolve these problems (Jones et al., 2005). These features provide a rigorous process for researchers to check, refine and develop their ideas and intuitions (Charmaz, 1995).

According to Glaser and Strauss (1967), constant comparison, theoretical sensitivity, theoretical sampling, and theoretical saturation are four key components of grounded theory. The components constant comparison and theoretical saturation were adopted to examine the PKM conceptual model of this study. Features of grounded theory such as theoretical saturation and constant comparison were used to present clear guidelines for analysis of qualitative data and provide structure and direction (Lichtman, 2011). Theoretical saturation is a criterion that tells the researcher when sampling (per category) can be stopped. Theoretical saturation is “the phase of qualitative data analysis in which the researcher has continued sampling and analysing data until no new data appears” (Bakhtiari et al., 2014, p. 29). Constant comparative method is a qualitative research method in social sciences through a process of coding and analysing of data at the same time to ‘ground’ the theory (Atabek, 2013). Glaser and Strauss (1967) indicated that the constant comparative method involves comparing incidents applicable to each category (described in the previous paragraph) and integrating categories and their properties. Throughout

the constant comparative method, the researcher continually sorts through the data collection, analyses and codes the information, and reinforces themes generated (Kolb, 2012).

3.3.2.2 Different Versions of Grounded Theory Approach

There have been several versions of grounded theory developed since the early work of Glaser and Strauss (1967). Exploring the difference between grounded theory versions is essential guidance for selecting the most appropriate approach to study (Cooney, 2010) as the principles and operations of this method can impact on the research process and affect the result (Babchuk, 1996). Accordingly, it is important to state the version when adopting the grounded theory approach (Cooney, 2010).

According to Alammar, Intezari, Cardow, and Pauleen (2018), there are three main types of grounded theory approach to data analysis: Glaserian grounded theory (Glaser & Strauss, 1967), Straussian grounded theory (Strauss & Corbin, 1990) and constructivist grounded theory (Charmaz, 2006).

Glaserian grounded theory (or classic grounded theory) is the original version of grounded theory approach to data analysis and holds that theory should simply emerge from the actual data (Cooney, 2010). Glaser (2001) asserts that "all is data" (p.145), which means that all existing data from interviews, observational data, and surveys, and indeed whatever is occurring in the research, all can be used in the comparative process (Glaser, 2001).

Straussian grounded theory was reformulated from the original grounded theory (Cooney, 2010). According to Van Niekerk and Roode (2009), Straussian grounded theory is more prescriptive than the original grounded theory as it conforms to traditional research methods and requirements of faculties. Unlike the classic grounded theory, in the Straussian approach, the researcher can investigate predetermined research questions and problems (Strauss & Corbin, 1994). However, it has been pointed out that the main concern of the subjects could be missed through preconception with this variant (Van Niekerk & Roode, 2009).

Constructivist grounded theory was reformulated from the original grounded theory by Charmaz (2006). Charmaz (2008) stated that constructivist grounded theory provides researchers a setting

to clarify their expectations and research actions. Constructivist grounded theory assumes that data and theories are constructed by the researcher rather than discovered. Constructivist grounded theory researchers engage themselves in the research analytical process and requires expertise in the field of inquiry (Charmaz, 2008).

To sum up, different versions of grounded theory have been developed based on the original classic grounded theory. These include Glaserian grounded theory, Straussian grounded theory, and constructivist grounded theory. These modified versions of grounded theory provide a systematic guideline for data analysis: classic grounded theory remains the original method of data analysis, while other versions developed their own way of data analysis.

In the next section, the reasons for adopting classic grounded theory coding techniques for this study are justified.

3.3.2.3 Glaserian Versions of Grounded Theory Approach

There are several reasons why the classic grounded theory (Glaserian version) is appropriate for this study. First, classic grounded theory has been suggested by some qualitative scholars (Breckenridge, 2010; Chametzky, 2016) as an appropriate method for novice researchers. Classic grounded theory is a simple procedural method formulated to generate theoretical themes out of qualitative data (Glaser & Strauss, 2009). Moreover, the classic grounded theory approach is more useful than other types of grounded theory to novice researchers narrating in detail what is actually happening in the data (Chametzky, 2016).

Second, classic grounded theory has been reformulated to make it more suitable for action, being denser, richer, and more completely grounded in data than other grounded theory versions (Simmons, 2011). Classic grounded theory reduces the confusion resulting from the diversity and inconsistency of other grounded theory approaches (Alammar et al., 2018).

Third, the study data collection was done through an action learning training program. Grounded theory has been suggested as an appropriate data analysis approach for an action learning study and has been applied in various fields of qualitative interpretative studies, such

as in information systems (Pauleen & Yoong, 2004), health care (Greenall, 2006; Kerr, 2006), and education (Keown, 2009; McAlpine, 2014). This is further discussed in section 3.4.

Finally, the main objective of this study is to investigate an effective PKM strategy for older adults to manage complex health care issues through well-informed decisions in an information-intensive environment. Classic grounded theory provided a more open perspective on data analysis, remaining true within this project, placing emphasis on induction and explanatory conceptual understanding of phenomena (Charmaz, 2006; Cooney, 2010). Table 3-3 outlines the reasons for adopting the classic grounded theory version as the approach to data analysis in this study.

Table 3-3: Reasons for Adopting Classic Grounded Theory Version for Data Analysis

Main reason	Suggested by
Classic grounded theory is an appropriate method for a novice researcher to elaborate on (and clarify) what researchers said.	Breckenridge (2010); Chametzky (2016)
Classic grounded theory reduces the confusion resulting from the diversity and inconsistency of other grounded theory approaches	Alammar et al. (2018)
Classic grounded theory is an appropriate data analysis method for an action learning study.	Pauleen and Yoong (2004); Greenall (2006); Kerr (2006); Keown (2009); McAlpine (2014)
Classic grounded theory emphasises induction and the explanatory conceptual understanding of phenomena.	Cooney (2010)

3.4 The Combination of Action Learning and Grounded Theory

The method of combining action learning and grounded theory is not new and has been used in various domains of qualitative interpretative studies, including information systems (Pauleen & Yoong, 2004), health care (Greenall, 2006; Kerr, 2006), and education (Keown, 2009; McAlpine, 2014). In the health care context, several authors (Greenall, 2006; Mohatt et al., 2004; Teram, Schachter, & Stalker, 2005) employed grounded theory within an action learning cycle to explore sensitive and complex health care situations and patient behaviour. For instance, Greenall (2006) investigated factors that impact on patient behaviour in using medicine. Greenall stated that

grounded theory enables the researcher to gather opinions from different perspectives in health care (such as health care workers, patients, and community support teams), while action learning helps gather data and to reflect on these for further planning and action. Table 3-4 shows some examples of the combination of action learning and grounded theory that have been used in qualitative interpretative studies

Table 3-4: Combinations of Action Learning and Grounded Theory Studies

Field	Objective of the study	Combinations of action learning and grounded theory	Outcomes	Authors
Education	To explore the dynamics of mentoring as a route to personal and organisational learning.	Using grounded theory and participatory action research to develop tools to aid mentoring.	Led to the early development of theoretical understanding of the dynamics of the formal mentoring relationship.	Hale (2000)
	To develop a workable approach to teacher development and learning.	Applied grounded action learning to guide the design of action learning modules for teachers to investigate implementing professional development.	Identified elements that appear to be necessary in education.	Keown (2009)
	To extend the research method of grounded theory into a generative approach.	Utilized grounded action learning to guide the structure of a learning process for a group of diverse learners to learn how to learn.	Help other researchers disclose their own realities, to scrutinise them, to draw on other bodies of knowledge and to apply their learning in new behaviours.	McAlpine (2014)
	To present a method for applying the constant comparative method of grounded theory.	Used grounded theory literature to synthesize an approach for conducting constant comparative methods with multiple researchers. Applied action research to formulate a deliberate ten-step method for coding data, creating meaning, and structuring an exploratory model that represents findings.	Developed a model of a ten-step roadmap for building consensus in a community of geographically separated researchers.	Olson, McAllister, Grinnell, Walters, and Appunn (2016)

Information System	To develop a deeper understanding of the issues facing virtual team facilitators as they implement and facilitate virtual teams.	Used an action learning framework to generate data while using grounded theory approaches to analyse the data.	Identified the steps a virtual team facilitator undertakes when building relationships with virtual team members.	Pauleen (2001)
	To describe how two research methodologies, grounded theory and action learning can combine to produce a rigorous yet creative and flexible method for IT study.	Developed a method of *grounded action learning* to guide the design of the training program and used it to generate data.	Generated relevant data and analysed it in an appropriate manner.	Pauleen and Yoong (2004)
Health care	To identify protective and recovery factors in Alaska Native sobriety.	Used grounded theory, analysed the data and consensual data analytic procedures within a participatory action research framework.	Generated heuristic models of protection and recovery from alcohol abuse among Alaska Natives.	Mohatt et al. (2004)
	To investigate the experiences of female survivors of childhood sexual abuse with physical therapy.	Data analysis by grounded theory constant comparative method while using participatory action research to emphasize equal interest in participation and action.	Integration of grounded theory and participatory action research to empower clients to inform professional practice.	Teram et al. (2005)
	To explore the issues that define and control data quality in the national health data collections and the mechanisms and frameworks that can be developed to achieve and sustain good data quality.	Utilized grounded theory coding technique and constant comparison method for the analysis of qualitative data through the learning cycle.	Provide a structured and interactive cycle of learning and improving through participatory observation.	Kerr (2006)

	To explore the barriers that currently exist to patient-driven treatment within the field of mental health care.	Represents action learning research using grounded theory.	Emerged themes illustrated the importance of participatory treatment and coaching.	Greenall (2006)
Organisation	To understand and enhance the sustainability efforts of local governments.	Emergent research questions from each action research cycle fed into the subsequent cycles along with the analytical categories that the grounded theory approaches had produced.	Findings provide strong support for the prototype tailored outside information.	Su (2005)

Action learning allows for a creative and flexible approach to gathering data (Pauleen & Yoong, 2004), while grounded theory coding offers systematic strategies that synthesize sampling, analysis and coding that are perceived as rigorous and still permit the researcher to remain flexible and creative (Andrews, Higgins, Andrews, & Lalor, 2012; Jones & Alony, 2011). The combinations of action learning and grounded theory have reportedly worked well together in exploring patient decision-making (Greenall, 2006). This method looks to be a promising method in establishing and answering this study research question: *How can PKM help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making?* Figure 3-1 illustrates an explicit procedure of data analysis using grounded theory coding techniques through the action learning study. This is further discussed in Chapter 4 and 5.

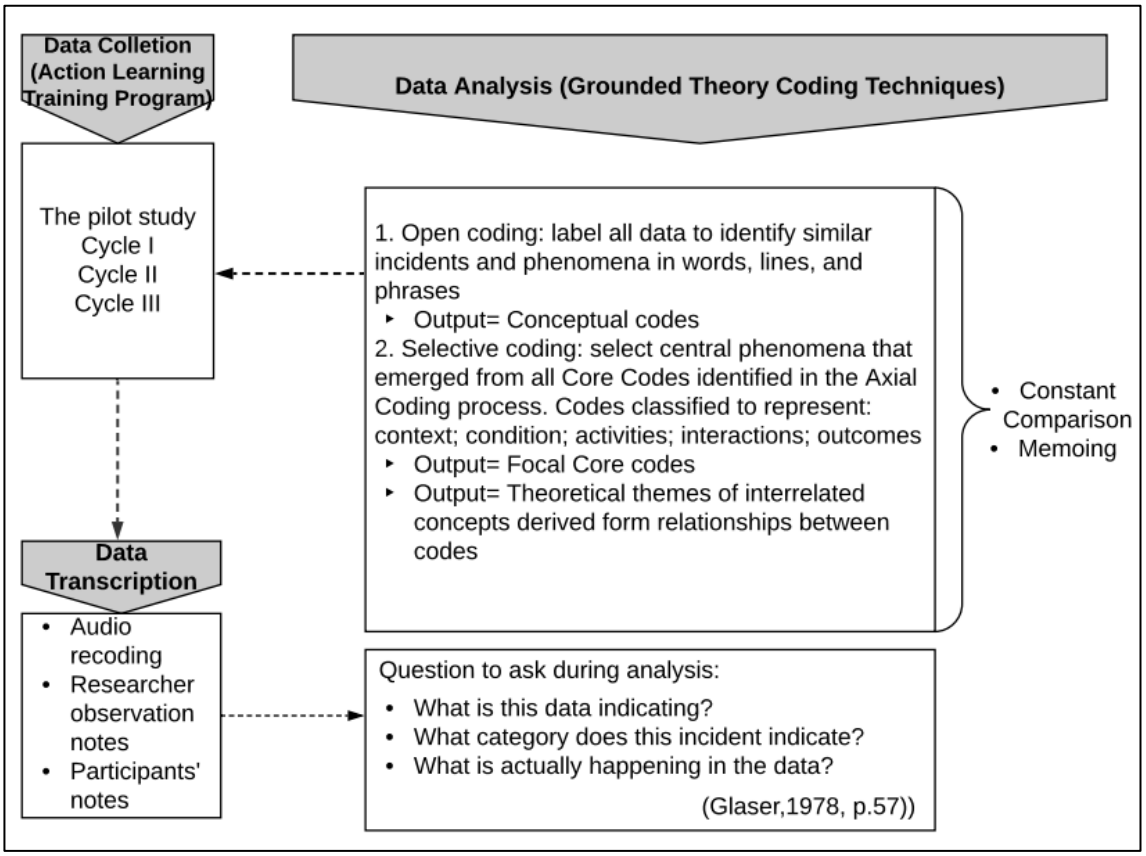


Figure 3-1: The Combination of Action Learning and Grounded Theory

In this study, data were collected during the action learning training program (the pilot study, and the three formal learning cycles), which explored participants' opinions and experiences of PKM

regarding health-related decisions. The discussion questions (Table 4-8) presented in the training program were developed to reflect the literature on information overload, PKM, health care decision-making and answers to this study's research questions. Several methods of data collection were used in this study: informal discussions (i.e., general discussions and self-disclosures about matters related to PKM), which were audio-recorded; my observation notes; and participants' notes.

Classic grounded theory coding techniques (open coding, selective coding, and theoretical coding) were used to analyse the data. To help me focus on patterns among incidents, two questions suggested by Glaser (1992) were front-of-mind for me throughout the analytic process: What is this about? What is actually happening in the data?

The constant comparative method provided me with an established set of procedures for conducting the data analysis (Pauleen, 2001). Each session in the training program included both data collection data interpretation (coding). The data collection and analysis processes were repeated for each subsequent action learning training cycle, comparing emerging categories with those from the previous cycles. The action learning cycles were continued with different action learning sets (purposive sampling) until theoretical saturation was reached, that is, the learning phases and evaluating produced little change in any of the categories, especially the conceptual category which in this study occurred at the completion of cycle III. Emerging concepts from the data were then compared and contrasted with the literature to refine and generate theoretical themes (this is further discussed in section 5.3). A PKM strategy was then developed for older adults (with limited computer/technological abilities) to manage information and knowledge in order to make informed health-related decisions.

3.5 Summary of the Chapter

This chapter provides an overview of the methodology and methods used for this study by discussing the philosophical assumptions to ontology, epistemology, and methodology. The reasons for using qualitative research methodology were discussed. Thematic and grounded theory were considered appropriate and had undergone evolutionary changes as research

methods to assist with the action learning study used in this research. The principles of combining action learning and grounded theory were also described.

In Chapter 4, methods that have been applied in relation to data collection are presented. In particular the process and development of an action learning training program, and data analysis of qualitative thematic and grounded theory coding techniques are discussed.

Chapter 4 Research Methods

4.1 Chapter Overview

Chapter 3 described the general research methodology that directs the collection, analysis, and interpretation of research data. In Chapter 4 the methods are presented including the design of the PKM-based decision-making action learning training program, sampling strategy, as well as the process of data collection and analysis (Figure 4-1). This is followed by aspects of study rigour including: credibility, dependability and conformability, and consideration of ethical issues. A summary is then provided at the end of this Chapter.

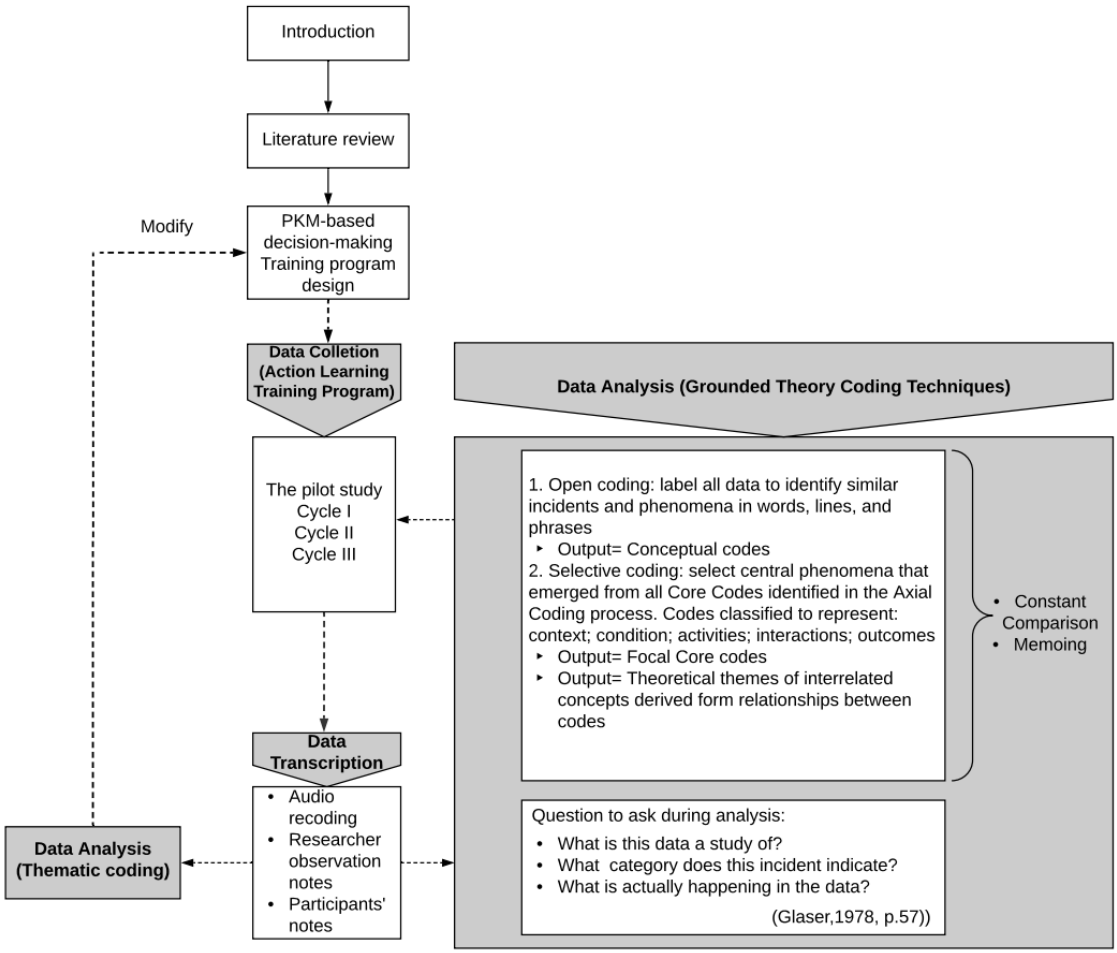


Figure 4-1: The Procedure of Data Collection and Analysis

4.2 The Training Program Design

The main objective of this study is to investigate an effective PKM strategy for older adults to manage complex health care issues through well-informed decisions in an information-intensive environment. To answer the research questions: '*How do older adults access and evaluate information and knowledge for health care decision-making? How can PKM help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making? How effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making?'* A PKM-based decision-making action learning training program was specifically designed based on the desire to explore participants' (older adults) opinions and experiences of PKM regarding health-related decisions.

4.2.1 What Is An Older Adult?

The definitions from the literature of older adults' age vary significantly and there appears to be little consensus and considerable overlap. Knutson et al. (2006) state that older adults should be classified as those who are 50 years or over, while some researchers suggest that older adults are people who are 55 years and older (Dionigi, 2015; Fang, 2017; Margolis & Verdery, 2017). Lian and Yen (2014) argue that people aged over 60 can be defined as older adults, yet, a lower age is also sometimes accepted. There are no definitive boundaries between what is considered "young" and what is considered "old" (Czaja, Boot, Charness, & Rogers, 2019). Older adults often are more susceptible to disease, injuries, syndromes, and sickness more than younger people due to degeneration (Singh & Kaur, 2015). Accordingly, this study defined an older adult as an individual aged 50 and older in order to contribute to getting a better insight concerning aging perspectives on health care decisions.

4.2.2 The Training Design of Older Adults in Previous Studies

Older adults may benefit from the training to maintain quality of life and independence in old age. For instance, Mateos et al. (2016) suggests that memory workshops enhance performance in older people's everyday tasks. Cotten, Yost, Berkowsky, Winstead, and Anderson (2016) developed a training program that uses various types of technology for older adults in continuing

care retirement communities. Turunen et al. (2019) developed computer-based cognitive training for older adults to maintain cognitive functioning and reduce the risk of dementia. These studies suggest that cognitive abilities decline with age which may affect older adults' learning abilities..

An appropriate training duration may help reduce this negative effect of aging. Taha, Czaja, and Sharit (2016) developed a three session e-learning training program for older adults' who were job-seeking. Wennberg et al. (2014) designed an online attention workout training program for older adults to help improve their attention-related skills in a community-dwelling. They claim that six weeks is a reasonable timeline for older trainees and for the implementation of a training program. Some scholars working on training for older adults have argued that a five week training session once a week for two hours is sufficient to produce effective learning for older adults (Campbell, 2004, 2005; Campbell, Harris, & Wabby, 2002). It is essential to spread the training program out over a longer period of time for the older adults' training. Especially those with lower cognitive abilities, as they may benefit from having more time to train and more time to rest between sessions (Taha et al., 2016). Accordingly, the program design for this study set a five-week training session that met once a week for two hours.

4.2.3 Factors for Determining the Training Program Design

Four factors were considered in determining the design and implementation of a PKM-based decision-making action learning training program. First, very little research had been conducted on PKM in decision-making and almost nothing in the field of health care. Chow, Teare, and Basky (2009) claim that people need more knowledge if they are to play a greater role in the health care decision-making process. Zuber-Skerritt (2005) suggests that action learning can be used to help with knowledge creation and knowledge management of people's lives. Furthermore, action learning can be used as a practical guide for application in situations where personal knowledge can contribute to problem solving for individuals (Zuber-Skerritt, 2005). To help older adults with limited computer/technological abilities manage information and knowledge to make informed health-related decisions, the learning sets included older people recruited from New Zealand patient health care support groups and church members.

Second, I wanted to understand the influence of personal knowledge management on an individual's health care decision-making. People in the group wanted to learn about how to manage information and knowledge to assist in making their own health care decisions (RQ2). As described in Chapter 3, action learning provides a learning opportunity for participants and the researcher to work together on real life issues and so action learning is appropriate for this study.

Third, as thematic and grounded theory coding techniques were used for data analysis, the research framework had to be fundamentally well-matched with the data analysis. An action learning framework "is fundamentally compatible with grounded theory approaches" (Pauleen & Yoong, 2004, p. 138); while thematic analysis is a flexible method that can be applied within a broad range of research paradigms (Paus, 2015).

Finally, consistent with academic and professional researchers' suggestions, action learning provided an appropriate method for studying PKM and health care decision-making and to generate appropriate data collection opportunities and data for this study, as well as to refine the training sessions (RQ3).

4.2.4 Nilson's Training Book

According to Kathman and Kathman (2000), an effective training program identifies the order of training. Caffarella and Daffron (2013) suggest Nilson (1989) "training program workbook and kit" as a general guideline to planning programs for adult learners. The training program workbook and kit are based on sound training principles that help to build a systematic approach to training, concentrating on the particular needs of trainees (Nilson, 1989). The book provides a breakthrough application to program design and delivery (Yamashita, 2004). Accordingly, this study used Nilson (1989) guideline to plan and implement a training program tailored for older adults' needs.

According to Nilson, an effective training program design should include five elements: 1) background, which helps the trainer understand the brief history of participants. To understand this study's participants basic background, a 'participant demographics information' with survey questions (Appendix A) was developed based on the suggestion by numerous information system

and information and knowledge management authors (Lee, Li, & Merrier, 2010; Liaw, Chen, & Huang, 2008; Phang et al., 2006); 2) introduction, which describe the rationale behind the training program. This includes stating the training issues, and potential solutions to the problem and how the proposed training program might help solve it; 3) Proposed training, which describes the target trainee population, learning objectives, major topic, and training materials needed; 4) accountability, which describe the program budget and delivery schedule; 5) projected benefits, which describe the outcomes of the training program; and 6) a training manual checklist suggested by Nilson (1989) was used to ensure the quality of the pilot program design.

The major topics cover the knowledge and skills that participants are going to learn in the training program. In this study, the major topic sessions are design based on Engel et al. (1973)'s decision-making model. Engel, Blackwell, and Miniard's decision-making model has been most commonly applied in consumer decision-making studies, with the aim of identifying the best decision-making approach based on an individual's current medical situation. Engel et al. (1973)'s work describes a rational of decision processes which includes: need or problem recognition, information search, evaluation of alternatives, and decision-making. They assert that decision makers gathering sufficient information then generate and evaluate multiple options to make decisions. The criteria for evaluating options are made by individuals' perspectives and outcome expectations and preferences.

Decision-making is an active, cognitive process involving the assimilation of information. Fehrenbacher and Djamasbi (2017) claim that the purpose of sound decision-making is to make good judgments, and to use cognitive resources that facilitate this. They assert that poor judgment and inadequate information results in poor cognitive decisions. As previously discussed in Chapter 2 of this thesis, PKM might help individual decision-making by improving knowledge management capabilities to create personal knowledge. Strategies of information and knowledge management suggested by numerous authors (Addor & Smutko, 2007; Bickel & Jantz, 2004; Davidson, 2009; Droste, Dintsios, & Gerber, 2010; Grace et al., 2011; Lu, Zhang, Ruan, & Wu, 2007; Luokkala, 2014; Metzger, 2007; Rebernik & Bradač, 2008; Schütte, 1998; University of Wisconsin-Green Bay, 2014; Wang et al., 2012; Xie, Goh, & Ranjan, 2002) were used to assist

with the process of Engel et al. (1973)'s decision-making for individual's PKM. Two versions of training manuals were designed for this training program. A training manual is a booklet or book of instructions that ensures consistency in the presentation of the training program (Oballa, Mengich, & Nyambati, 2017). The difference between these two versions is I revised the context to make it more reader friendly in the trainee version as suggested by Nilson (1989), to make it easy for older adults to comprehend it, while the facilitator version contains more training details. Table 4-1 provides a brief overview of the original training program design.

Table 4-1: PKM–Based Decision-making Training Program (Original Version)

PKM – based decision-making training program
Session One
Strategy for clarifying information needs and credible sources search
Session Two
Strategy for management and judging information and knowledge
Session Three
Strategy for stimulating and determining alternative sources of information and knowledge
Session Four
Evaluate and revise information and knowledge strategies
Session Five
Lifelong learning and training program reflection

Session one began with an introduction of the procedures associated with the program by me. Thereafter, a dialogue by each of the participants on the health-related issues requiring treatment decisions and method of information gathering. This was followed by an open discussion in sessions two, three, and four involving participants and me on sharing knowledge and strategy about how PKM might be implemented to help participants manage information and knowledge, so that participants can benefit from the discussion and make informed health-related decisions. PKM is an ability by which an individual can grow their knowledge and the value of information through technology, personal skills, and processes in order to achieve optimized health care decisions. Thereafter, the training program was evaluated by participants and brought to a close by me at the end of each cycle, with modifications noted for the next learning cycle (this is further discussed in section 5.4).

Power point slides and a copy of the trainee version training manual (Appendix B) were used in each session of the training program. Sheets of A4 paper were provided to participants for making course notes. The training manual provided PKM strategies to help participants manage their own information and knowledge. Participants were asked to practice PKM strategies with a focus on their particular health issue after each session. In the following session, they would discuss with their learning group issues or experiences that they encountered while doing their self-practice exercises. For instance, session one addressed information needs and strategies of information gathering. After this session, participants were expected to practice strategies they had learned, shared and discussed with their group members (including the researcher/me) at the next session. By doing so, participants would be engaging in 'action' within the context of their own PKM and health-related decision-making.

To determine the appropriateness and value of the training program/manual design, weekly training sessions were amended in a systematic manner, and the program was evaluated at the end of each cycle and revised as necessary before the next cycle. I observed all training sessions and recorded all dialogue (including comments, questions, feedback and discussions) that reflected on the process, and then reviewed transcripts to understand whether any modifications were required for the next learning cycle. Qualitative open-ended questions seeking to assess the effectiveness of the training were asked at the end of the training program (session five of each cycle). This included participants' post–training self-evaluation concerning their confidence in decision-making, increased PKM skills, and the extent to which they now felt they could apply new knowledge and skills in their health-related decisions. Two open-ended questions were also asked to provide an evaluation of the training program (Can you describe in anyways how the program has had an impact on your decision-making ability and information and knowledge management skills? What would you recommend in order to improve the next training program?). The details of evaluating the training program is further discussed in section 5.4. Table 4-2 provides a brief overview of the final modified training program design.

Table 4-2: PKM–Based Decision-making Training Program (Modified Version)

PKM – based decision-making training program
Session One
Strategy for clarifying information needs and credible sources search
Session Two
Strategy for information and knowledge management
Session Three
Strategy for developing critical thinking skills
Session Four
Strategy for stimulating and determining alternative sources of information and knowledge
Session Five
Lifelong learning and training program reflection

Table 4-3 outlines the details of the final modified version of the training sessions.

Table 4-3: Detailed Program of Training Sessions (Modified Version)

PKM – based decision-making training program	
Session One	
1. Pre-program introduction with each participant	20 minutes
2. Individual discussion on the issue of information and knowledge gathering	30 minutes
3. Open discussion on needs and methods of information and knowledge gathering	40 minutes
4. Example of information and knowledge gathering strategies	30 minutes
5. Self-practice exercise for Session One	
Session Two	
1. Revision and introduction of Session Two schedule	10 minutes
2. Individual discussion on Session One progress report/issues	40 minutes
3. Open discussion on methods of managing and judging information and knowledge	50 minutes
4. Example of information and knowledge management methods	20 minutes
5. Self-practice exercise for Session Two	
Session Three	
1. Revision and introduction of Session Three schedule	10 minutes
2. Individual discussion on Session Two progress report/issues	40 minutes
3. Open discussion on methods of information and knowledge sharing	40 minutes
4. Example of information and knowledge sharing methods	30 minutes
5. Self-practice exercise for Session Three	
Session Four	
1. Revision and introduction of Session Four schedule	10 minutes
2. Individual discussion on Session Three progress report/issues	40 minutes
3. Open discussion on methods of evaluation and alternative information and knowledge	40 minutes
4. Example of evaluation and alternative information and knowledge methods	30 minutes
5. Self-practice exercise for Session Four	
Session Five	
1. Revision and introduction of Session Five schedule	10 minutes
2. Individual discussion on Session Four progress report/issues	40 minutes
3. Open discussion on this training program issues	40 minutes
4. Lifelong learning - A summary of all the training session conclusions and recommendations	15 minutes
5. Evaluate the training program	15 minutes

Theoretical saturation was used to decide when the research project was done. Theoretical saturation is a criterion that tells me when sampling (per category) can be stopped. The learning cycle was continued until no additional data, coding, or sorting contributed to answer the research question (Glaser & Strauss, 2009; Yoong, Pauleen, & Gallupe, 2007) (i.e., RQ2 *How can PKM help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making*).

4.3 Sampling and Participants

A purposive sampling technique was applied to identify and engage participants who are consumers of health care. According to the World Health Organization (2011), health care can be defined as "a state of physical, mental, and social well-being and not merely the absence of disease or infirmity" (p.57). From this definition, it is reasonable to suggest that someone without a "real health issue" might still desire information relating to general wellbeing and could benefit from this training. Thus, participants needed to want to find health-related information but were not required to have a health condition per se to be included in the study. Purposive sampling is also called qualitative sampling, or nonprobability sampling (Teddlie & Yu, 2007). Purposive sampling focuses on particular characteristics of a population (Raza, Kazmi, & Zia-ur-Rehman, 2012) and has been commonly applied in health care studies. For instance, Niva and Skär (2006) undertook a qualitative study of older adults home environment for occupational performance, conducted with a purposive sample of five older adults with a wide range of classifications of medical conditions. Similarly, Peddie, Van Teijlingen, and Bhattacharya (2005) in a qualitative study of women health care decision-making conducted with a purposive sample of 25 women with a wide range of classifications of medical conditions. A purposive sampling provides an appropriate method to identify and engage potential participants of this study.

In this study, purposive sampling was used to identify and engage participants for the pilot study and the three formal learning cycles. Older people aged 50 and older with health-related conditions (such as diabetes and obesity or other issues of this nature, but exclusive of severe health issues, such as cancer), and had experienced the feeling of confusion and were struggling with the large amounts of health care information available were recruited.

Prior to starting this study, it was approved by the Massey University Human Ethics Committee (MUHEC) (Appendix C) and adhered to its ethical principles throughout the research project. The process of participant recruiting and data collection began in August 2016 and ended in September 2017 approximately one year later. I initially contacted New Zealand health care support groups' and church administrators, to make an appointment with their CEO/Manager/pastors to gauge their interest in referring members to this study. An invitational letter (Appendix D), information sheet (Appendix E) and participant consent form (Appendix F) were then distributed to members through administrators after receiving permission. As required by patient health care support group leaders and church managers, several public presentations on this program were made in health support meetings and church boardrooms. People who were interested in this program after the presentation then contacted me themselves or through the patient health care support group leaders and church administrators. Precise characteristics inclusion/exclusion criteria (mentioned in participant information sheet) were then used to further explore potential participants before the training program. Churches provide resources to support people with health issues. Many churches include health as part of their mission or ministry, and deliver health programs via government funding for these activities (Braithwaite et al., 2009; Campbell et al., 2007). Thus, the church members provided a diverse group of people with a variety of health-related issues for this study.

4.4 Data Collection Process

The data collection was done through an action learning training program to explore participants' Insights and experiences of PKM regarding health-related decisions. Krishna and Marquardt (2007) suggest that the learning cycle should involve a small group composed of four to eight people that are called an action learning 'set'. In order to fulfil this requirement, four to six people were initially recruited for the pilot study and the three formal learning cycles. A face-to-face interview with each participant was held before training. The training program was held five times in each cycle, once every week, two hours per session. Informal discussions where audio-recorded and notes (my observation notes and participants notes) were used throughout the action learning sessions with each participant's permission.

The pilot study was held in September of 2016. In this study, the data collected from the pilot participants was incorporated into the main study. The purpose of the pilot study was to improve my skills and techniques as a researcher, and to determine the effectiveness of the design and to understand what, if any, modifications were required in the first cycle of an ongoing four-cycle study. Five participants were selected from a local church in New Zealand. The health-related topic that participants chose for the program practice session included topics such as obesity, heart health, and infant health. The changes made from the pilot to the formal program and the changes made within the formal program were all incremental, and of similar kind changes (the details of changes are described in Section 5.4.1). Therefore, after seeing all the data and results, the pilot program data was incorporated into the main study. A summary of participant demographics of the pilot study is provided in Table 4-4.

Table 4-4: Demographic Characteristics of the Pilot Study

Participant	Gender	Age between	Academic qualification	Occupation	Experience with computers	Experience with the Internet
1	Female	46-55	High school	Self-employed	Experienced	Some experience
2	Female	66-75	High school	Retired	Some experience	No experience
3	Female	56-65	High school	Self-employed	Some experience	Experience
4	Female	66-75	High school	Retired	Some experience	Some experience
5	Male	46-55	High school	Self-employed	Experienced	Some experience

There was a total of four females and one male participant. All but two under 56 years old (aged 46 and 48). The inclusion criteria of this study (see participant information sheet) was people aged 50 and over; live in the Auckland area; English speaking; have general health-related issues (e.g., diabetes or high body weight); and feel confused and are struggling with large amounts of information they obtained when making health-related decisions. The two participants aged 46 years are slightly under 50, but met all of the other selected criteria and also lacked experience with the Internet, which is similar to the main characteristics of the average participant except

their age, and thus it doesn't change or invalidate the data. Therefore, the two participants aged under 50 were recruited. All participants had graduated high school and were either self-employed or retired. All respondents stated that they had some experience with computers, though one participant claimed to have had no experience with the Internet at all. By the end of the session, a total of two participants dropped out of the program citing time constraints. Figure 4-2 illustrates the changes in the number of participants during the cycle I training program.

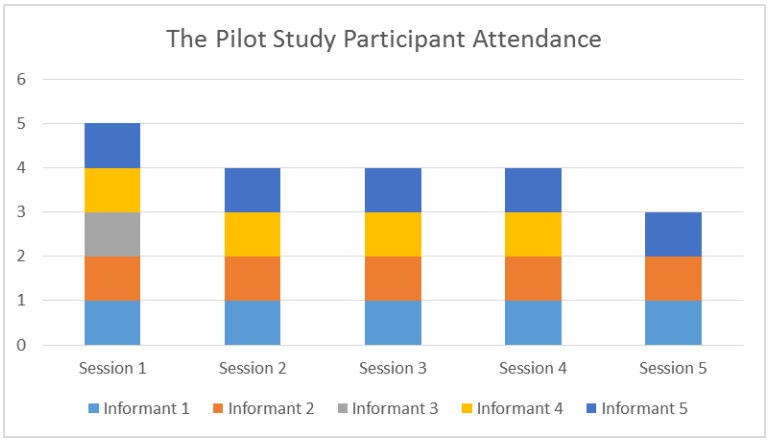


Figure 4-2: Participant Attendance in the Pilot Study

Cycle I participant recruitment began in early February 2017. The purpose of cycle I was to explore PKM in the context of an individual's health care decision-making and to confirm or modify the conceptual categories (details show as 4.5.2). Six people volunteered to participate in the training from a single health support group. An action learning training program modified from the pilot study was offered to these six participants (Details of the training program modification is discussed in 5.4.1. The cycle I data collection was completed by the 30th of March 2017. Table 4-5 outlines a summary of the cycle I participant details.

Table 4-5: Demographic Characteristics of the Cycle I Study

Participant	Gender	Age between	Academic qualification	Occupation	Experience with computers	Experience with the Internet
6	Female	56-65	High school	Private sector employee	No experience	No experience
7	Female	56-65	High school	Retired	Experienced	Some experience
8	Female	56-65	High school	Private sector employee	Some experience	Some experience
9	Female	56-65	University	Government employee	Experienced	Some experience
10	Female	66-75	University	Retired	No experience	No experience
11	Female	56-65	High school	Retired	Some experience	Some experience

There were a total of six female participants whose average age was 65 years. Four participants completed high school and two had tertiary qualifications. In this study, education was not a criteria for recruiting participants, also the two participants (average age 65 years) who had tertiary qualifications but were relatively computer illiterate were included as it made no sense to exclude them. Therefore, the two participants (average age 65 years) with tertiary qualifications were recruited, as the two participants also met all of the selection criteria. All participants were either employed or retired. Four respondents stated that they had some experience with computers. Two claimed to have no experience with computers and the Internet. By the end of the training session, a total of three participants had dropped out of the training citing family issues. Figure 4-3 illustrates the changes in the number of participants over the five training sessions.

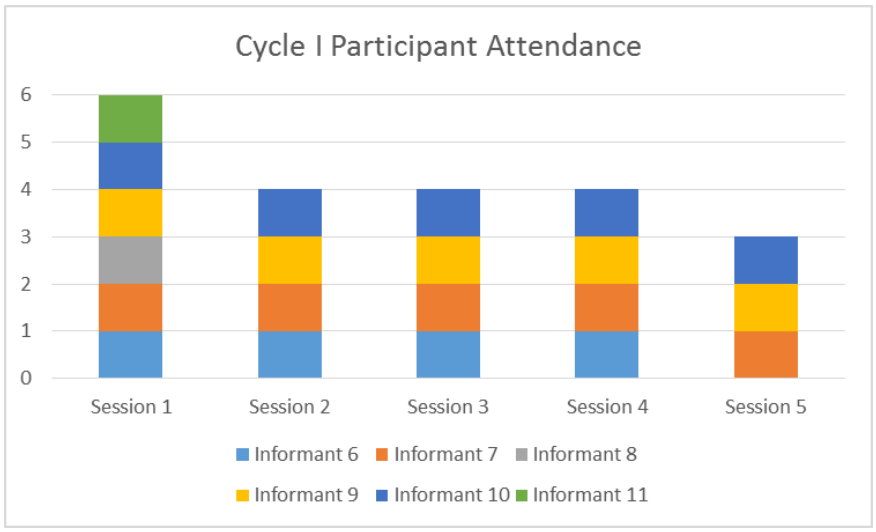


Figure 4-3: Cycle I Participant Attendance

Cycle II participant recruitment began in early March 2017. The purpose of cycle II was too deeply explore the conceptual categories that are associated with the core category. A total of six people from a local church in New Zealand volunteered to participate in the training. However, the process of cycle II recruitment was extraordinarily difficult, and it took approximately five months to recruit sufficient participants to start the program. Unfortunately, three volunteers dropped out of the program whilst waiting for the training group to start. Three were confirmed and maintained their attendance through the five session training cycle. Cycle II data collection was completed by the 13th of August 2017. The demographic details of the participants who completed cycle II are outlined in Table 4-6.

Table 4-6: Demographic Characteristics of the Cycle II Study

Participant	Gender	Age between	Academic qualification	Occupation	Experience with computers	Experience with the Internet
12	Male	56-65	High school	Government employee	Some experience	No experience
13	Male	56-65	High school	Private sector employee	Some experience	Some experience
14	Male	46-55	High school	Private sector employee	Some experience	Some experience

There was a total of three male participants whose average age was 60. None of these participants had tertiary qualifications and all were employed. All respondents stated that they had some experience with computers, though one participant claimed to have had no experience with the Internet.

Cycle III participant recruitment began at the same time as cycle II in early March 2017. The purpose of cycle III was to ascertain whether the categories and the relationship between them were not substantially altered. A total of four people from a local church in New Zealand volunteered to participate in the training. Table 4-7 outlines a summary of cycle III participant details. The cycle III data collection was completed on the 20th of September 2017.

Table 4-7: Demographic Characteristics of the Cycle III Study

Participant	Gender	Age between	Academic qualification	Occupation	Experience with computers	Experience with the Internet
15	Male	56-65	High school	Retired	Some experience	Some experience
16	Male	56-65	High school	Unemployed	Some experience	Some experience
17	Male	56-65	High school	Retired	Some experience	Some experience
18	Female	56-65	High school	Retired	Some experience	Some experience

There was a total of three male and one female participants whose average age was 63 years. No participants had tertiary qualifications. One out of three was unemployed while three were retired. All respondents stated that they had some experience with computers and the Internet. By the end of the session two participants had dropped out of two participants had dropped out of the program citing time constraints. Figure 4-4 illustrates the changes in the number of participants during the five training sessions.

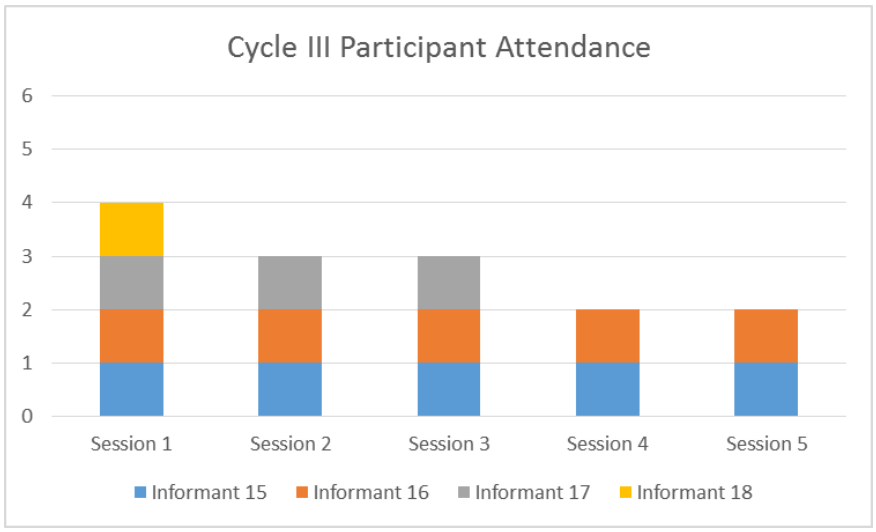


Figure 4-4: Cycle III Participant Attendance

Based on the data collection, there were a total of eighteen participants (aged between 46 and 75 years) in a total of four training cycles (the pilot study and three formal learning cycles). A total of seven participants dropped out of the program during the training sessions. The collected data from the participants who dropped out of the program was used in this study. This is consented by the participants who dropped out of the program. Figure 4-5 illustrates an overview of demographic information of this study.

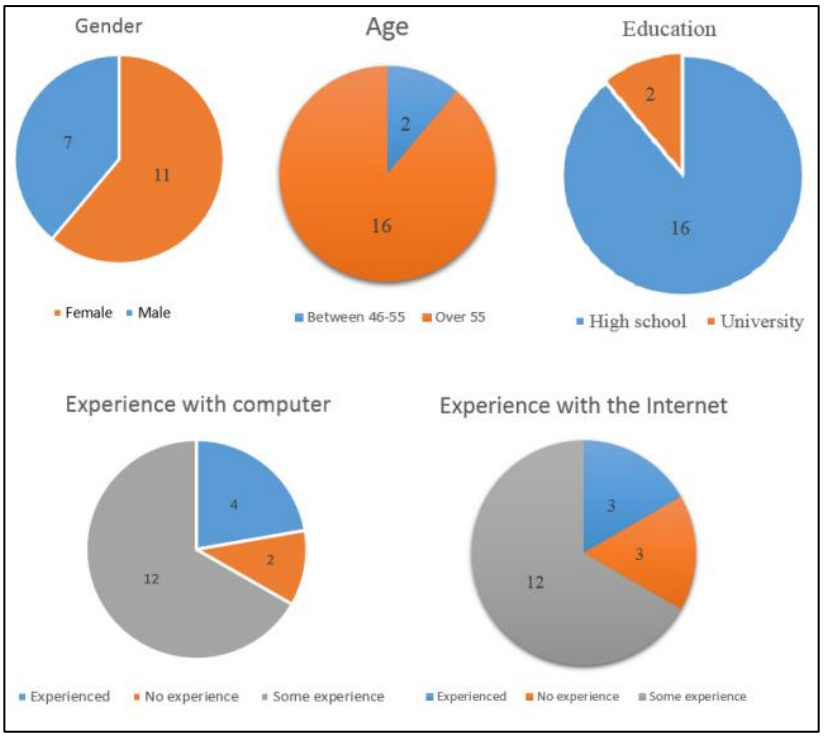


Figure 4-5: An Overview of Demographic Information of This Study

Based on the data, approximately 61 % of the participants are females, nearly 89% were over the age of 55 and attended high school. About 67% that had some experience with computers and the internet.

4.5 Data Analysis Process

This section explains the process of data analysis by thematic and grounded theory coding techniques (open coding, selective coding, and theoretical coding). The data collected from the action learning training program was used for different purposes (see Table 4-8). First, data collected from the first 14 discussion questions (from Q1 to Q14) were analysed twice. In order to answer the first research question of this study (*How do older adults access and evaluate information and knowledge for health care decision-making*), the first 14 discussion questions (from Q1 to Q14) were analysed by thematic coding techniques. To answer the second research question of this study (*How can PKM help older adults with limited computer/ technological abilities manage their information and knowledge for health care decision-making*), the same data

set was then re-analysed by grounded theory coding techniques. Moreover, to answer the third research question of this study (*How effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making*), data collected from the last two questions (Q15 and Q16) were analysed by thematic coding (Braun & Clarke, 2006) for evaluating and refinement of the training program.

Table 4-8: Application of Questions and Analysis Approach

Discussion questions	Purpose	Data analysis approaches
Q1: Can each of you tell the group a little bit about what has motivated you to participate? Q2: What is the issue you face when investigating health information? Q3. What do you think are the most important things/information people need to discover when making treatment decisions? Q4: How do you collect the information you think you need, and what is the biggest issue for you in finding information? Q5: What methods of information gathering are working for you and what is not? Q6. How did you decide positive and negative information? Why did you pick this? What is the source? Do you think the source is credible and why? Q7: What methods would you use to organize or manage information and knowledge? Q8: What methods of organizing information and knowledge are working for you and what is not? How do you feel about the process of organizing information and knowledge you have used? Has anyone helped you with managing information and knowledge?	To answer research question 1	By thematic coding
Q9: How would you assess the information you have found to help you select the best option for your medical treatment? Q10: what methods have worked for you in selecting the best option for your medical treatment? Why did you use this particular method? Q11. What was your criteria/consideration for choosing the best decision option? Q12: What methods would you use to share information or discuss with others? Q13: what methods have you used to share information or discuss with others? Why did it or did it not work for you? Q14: What have you learnt about from this program? What has worked for you, and what has not?	To answer research question 2	By grounded theory coding technique
Q15: Can you describe in any ways the program has had an impact on your decision making ability and information and knowledge management skills? Q16: What would you recommend in order to improve the next training program?	To answer research question 3 (related to training program evaluation)	By thematic coding

To gain an overall understanding of the participants' main concerns, the audio-recordings from the training program were listened to before being transcribed verbatim. The audio recordings were transcribed using an online software package called 'Transcribe' and reviewed as a word document by me. The purpose of the first data readings was to become more familiar with the collected data. Thus, no coding was done at this stage. The transcription was then inputted to data analysis software (QSR NVivo^{TM}). This software allows researchers to assign one or more conceptual codes (known as free nodes in NVivo^{TM}) to each line, sentence, or paragraph of the transcript. QSR NVivo^{TM} software was used throughout the coding process to gain a thick and rich understanding of the data and to facilitate management of codes and their relationships. However, I encountered difficulty transcribing the pilot study session one data, because the participants were talking simultaneously during the training session. From session two of the pilot, it was suggested that participants talk individually. This significantly changed and improved audio transcribing accuracy and was less time-consuming to type.

4.5.1 Thematic Coding Process

Thematic coding is a method commonly used in qualitative data analysis (Gibbs, 2007). Thematic coding emphasizes, pinpoints, examines and identifies conceptual issues within data (Guest, MacQueen, & Namey, 2011) that are important to the description of a phenomenon. Thematic coding can be applied to any framework that meets the requirements of research epistemology (Braun & Clarke, 2006). Thematic coding was used for the training participant evaluations, the capture of major thematic ideas in the original text, and to change the discussion questions throughout the learning cycle. For example, a discussion question: "How will you evaluate information you have obtained to help you select the best option for your medical treatment?" was reworded to: "How would you assess the information you have found to help you select the best option for your medical treatment?" in order to simplify it and avoid confusion. Thematic coding was also used to answer the first and third research question (*How do older adults access and evaluate information and knowledge for health care decision-making; and how effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making*), a qualitative thematic coding guideline (Table 4-9)

proposed by Braun and Clarke (2006) was used for data analysis. Grounded theory analytic techniques were not used for answering the first and third research questions.

Table 4-9: Phases of Thematic Analysis

Step	Phase	Description of the process
1	Familiar with data	Transcribing data, reading and rereading the data, noting down initial ideas.
2	Generating initial codes	Ascribing systemised codes to similar and interesting data, and grouping them according to the codes.
3	Emerging themes	Organizing codes into themes, gathering all data relevant to each theme.
4	Reviewing themes	Reassessing the themes and generating a thematic 'map' of the analysis.
5	Naming themes	Refining the themes through further analysis to generating clear definitions and names for each theme.
6	Writing the report	Final analysis of selected extracts related to research questions and literature, producing a scholarly report of the analysis

Based on Braun and Clarke (2006, p. 87)

Based on Braun and Clarke (2006) thematic coding techniques, after familiarization with raw data through transcribing, reading and rereading the data, and noting down initial ideas, I organized transcriptions into relevant research questions, and grouped it into relevant codes. In order to produce initial ideas that reflected the research questions (RQ1 and RQ3), the techniques were used throughout the data. Referring to the initial ideas mentioned in the second phase of the thematic analysis, I removed some codes that did not match the ideas. In the third phase, I merged some themes based on similar ideas repeated in the transcript. For instance, the first 14 discussion questions (from Q1 to Q14) were asked to provide ways participants access and evaluate information and knowledge for their health care decision-making; and the last two open-ended questions were asked to provide evaluation of the training program at the end of each cycle: Can you describe in anyway if and how the program has had an impact on your decision-making ability and information and knowledge management skills? What would you recommend in order to improve the next training program? In this stage, I started to find the links between similar codes to create sub-themes when collected data are coded. Table 4-10 shows an example of sub-themes developed in the third phase.

Table 4-10: Example of Thematic Coding

Informant's quote	Codes	Sub-themes
“We didn't have a good explanation about the whole program first before we started in the sessions. We needed like an introduction into it” (Participant 1).	Unable to recall information from the introduction	Memory restriction
"By the time I have to do it again at my age, I have forgotten what to do" Participant 3).	Difficulty in remembering course material	
"You can't use all of the methods all the time. Because you don't always have time" (Participant 1).	Time-constraints affected completion of self-practice exercises	Difficulty in completing the amount of self-practice exercises
"I didn't really do web pages this week. Because I didn't have any time to look it up" (Participant 1).	Time-constraints affected completion of self-practice exercises	
"One of them I might look at on the Internet. I knew that is going to take a long time" (Participant 4).	Self-practice exercises is time-consuming	
“My homework was not quite done, because just to do one search took a whole hour just to do that. So that was only one positive and one negative. So to do five was five hours to get through the information” (Participant 5).	Self-practice exercises is time-consuming	

In the fourth phase, I reassessed the sub-themes and emerged sub-themes under main themes by the allocated data to generate a thematic map of the analysis. In the fifth phase, I refined the main themes and thematic map through further data analysis and determined what aspect of the data each main theme captures. For example, the developed main themes drawn from the last two discussion questions were used to capture participants’ common issues in this training program. Any necessary changes were made to the training program before the next learning cycle. Figure 4-6 illustrates an example of thematic map and identified themes.

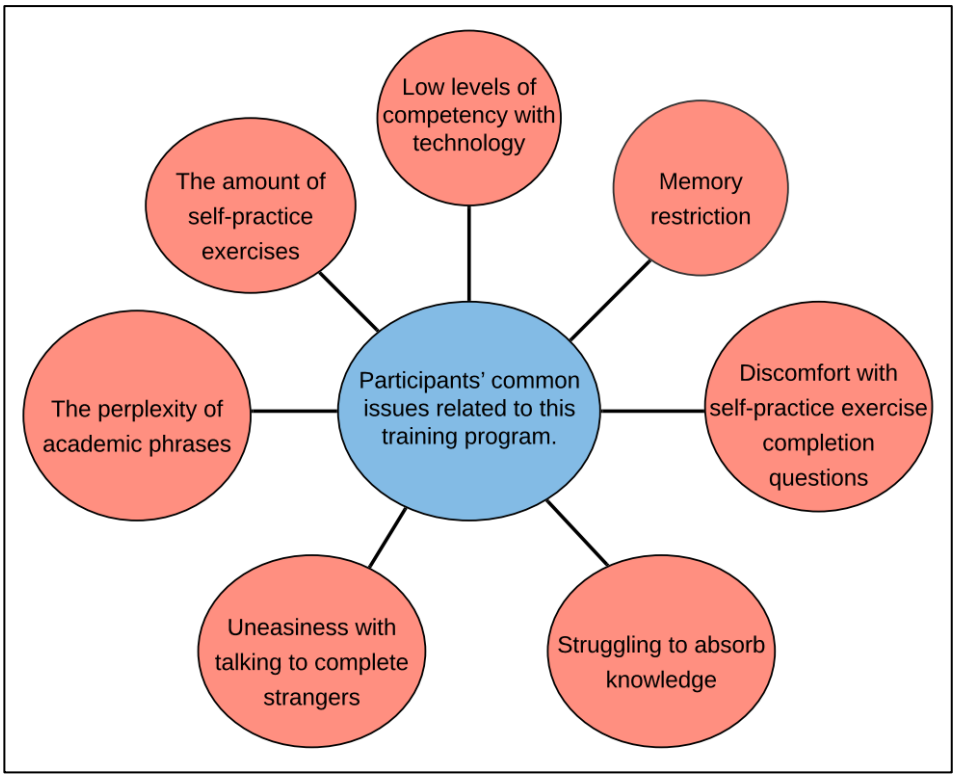


Figure 4-6: An Example of Thematic Map and Identified Themes

Braun and Clarke (2006) state that a thematic analysis is a process that "reflects reality". The transcripts are reflective of the realities lived by participants and their initial ability of information management, as well as their experience regarding the training program. During the sixth phase, participants comments related to the research questions and literature were finally recorded for each theme. The findings of the analysis are further discussed in sections 5.2.1, 5.2.2 and 5.4. The finalised themes and thematic map developed is presented in Appendix G.

4.5.2 Grounded Theory Coding Techniques

To answer the second research question '*how can PKM help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making,* Grounded theory coding techniques were used in arriving at themes from the data (the first 14 discussion questions) collected from action the learning training program (Figure 4-7). The techniques include open, selective, and theoretical coding and constant comparative analysis. In the phase of open coding, codes and categories are less conceptual and abstract then during selective coding when data is delimited and focuses on the core categories (Intezari & Pauleen,

2018).

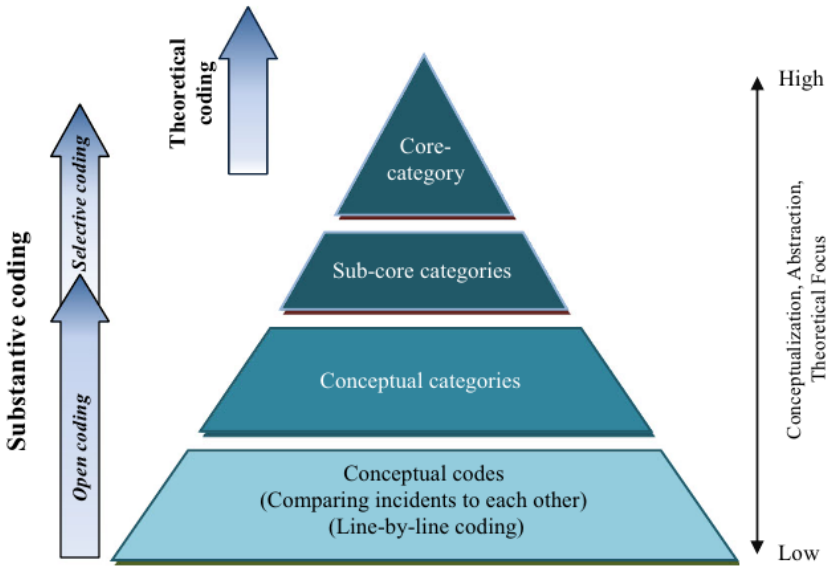


Figure 4-7: Classic Grounded Theory Coding Techniques (Intezari & Pauleen, 2018, p. 35)

Memo notes and some mappings were made while listening to the audio-recordings and reviewing transcriptions to record my thoughts and ideas. Glaser (1978) states that memos are "the theorising write-up of ideas about codes and their relationships as they strike the analyst while coding" (p. 83). Following are two examples of the memos that were written when transcribing the pilot study Participants 1 and 5 comments:

> *"The participant believes that price and time are the biggest factors influencing people's health care decisions. She mentions 1) can she afford it and 2) will it fit her time management, are two most important factors influencing her decisions" (memo, 10 September 2016).*

> *"This information suggests that advertising is a key factor for deciding trustworthy information" (memo, 15 September 2016).*

After initial familiarisation with the interview content and transcription thereof, the data coding (grounded theory techniques) began. To confirm the codes, identify whether saturation has been

achieved and lessen the chance of missing important codes or significant details in data, Glaser (1978) and Charmaz (2006) suggest to be open-minded when reading through the transcripts. The pilot and cycle I transcripts were examined line-by-line to make sense of the data without injecting my assumptions, biases, or motivations (Stol, Ralph, & Fitzgerald, 2016). Glaser (1978) posits that line-by-line analysis leads to the early stages of the coding process, and so appropriate open codes were assigned to each line, sentence or paragraph. To help me focus on patterns among incidents, three questions suggested by Glaser (1992) were front-of-mind for me throughout the analytic process: "What is this data indicating? What category does this incident indicate? What is actually happening in the data?" These three open coding guidance questions are stipulated by the classic work of Glaser (1978, p. 57) as simple "formal, neutral, not preconceived" questions with which to begin to start coding. Table 4-11 shows an example of open coding.

Table 4-11: Sample of the Initial Coding

Participant's quote	Open coding
You're just a mother with a child. You know, waiting for help.	Lack of knowledge guidance
Then you ring 111, and say "Can you see if there is anything wrong with my child?" or as you go to the doctor, then you say "Okay, your baby has had six nappies a day changing for five weeks. It is not natural. "Each milk they shouldn't have six nappies, and then the guy said "It's okay, they have enough fat on their body. They can survive for ten days."	Seek health care solution Consulting medical professionals
When you argue "Excuse me, are you a father? Do you have any children?" and they said "No, we don't". I said "Okay, fine. I want a person who is a father or mother to come here to give me a prescription, thank you."	Difficulty in finding the right information Lack of confidence in medical professionals Distrust
That's what I did. He was too young. He didn't know what you were talking about. My issue is you don't have experience in this situation so don't talk to me about that. I want somebody who has been there.	Difficulty in finding the right information Information accuracy Lack of confidence in young medical professionals

However, assigning codes was sometimes a challenging task, as the data could be understood

in different ways. More than one code could be allocated used to explain what is going on in the data (Chametzky, 2016; Intezari, 2013; Pauleen, 2001). I had to rely on my own interpretation (please see Limitations in Chapter 7) while consulting with project supervisors. Chametzky (2016) suggests that it is acceptable and necessary to examine raw data several times during analysis. By doing so, the data overlooked initially will become apparent.

Over-coding was another issue. Jones (2007a) claims the issue might be caused by qualitative data analysis software–Nvivo^{TM}, as the software does not have the sensitivity that the researcher does. Yet, the problem might be solved as the degree of coding skills increase significantly within the researcher's mind, coding will become more specific and accurate (Blismas & Dainty, 2003).

The name of the codes was based on the participants' comments and my knowledge. At the end of cycle I, the codes were compared and sorted into higher-level codes (i.e. conceptual codes). Participants' comments were compared and attached to a specific code. New codes were created when the quotations did not fit. As the conceptual codes began to accumulate, it was necessary to revise them for the purpose of clarifying the concepts. The number of conceptual codes altered over the process of data gathering and analysis.

From the codes that continued from the pilot study to cycle I was able to begin to construct conceptual categories, which were then confirmed or modified by comparing and grouping them under "more abstract explanatory terms" (Strauss & Corbin, 1998, p. 114) into higher-level codes (i.e. conceptual categories). The conceptual categories altered in the process of analysis while merging into each other or new categories created. Seven conceptual categories that addressed RQ2 were eventually identified: 'barriers to access', 'accuracy and relevance', 'barriers to computer-based technology use', and 'humanistic barriers', gathering 'credible information and knowledge', management information and knowledge by 'computer-based technology or non-computer-based technology', evaluation information and knowledge via criteria and tools', as well as 'new working and sharing via social media or face-to-face'. Figure 4-8 illustrates an example of developing conceptual categories. The full list of conceptual codes and the conceptual categories are presented in Appendix H.

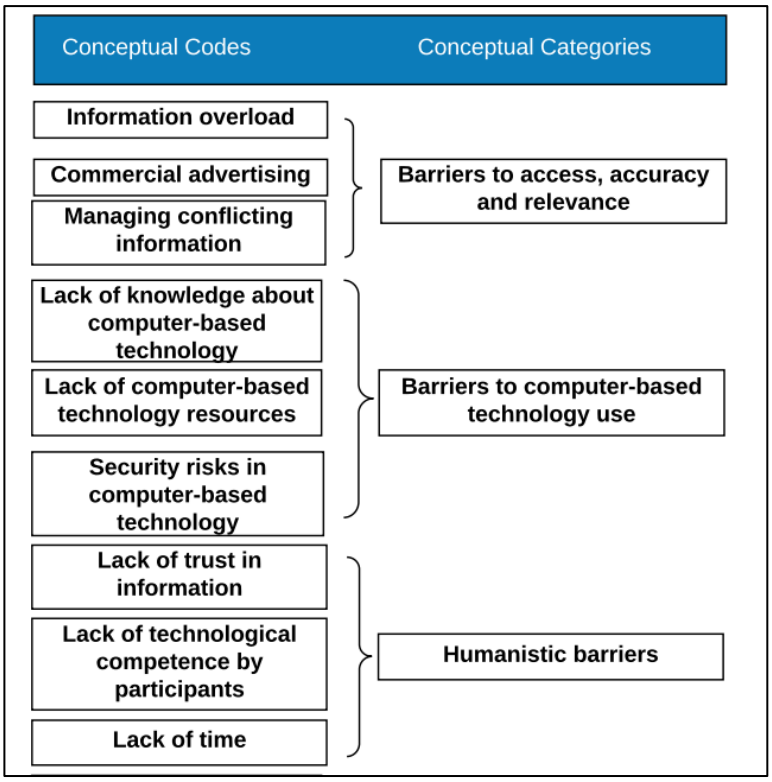


Figure 4-8: An Example of Developing Conceptual Categories

As data was analysed more purposively, sub-core categories began to emerge, and it became clear that newer and higher levels of relationships and abstractions were forming, and the theoretical themes were eventually built (Figure 4-9).

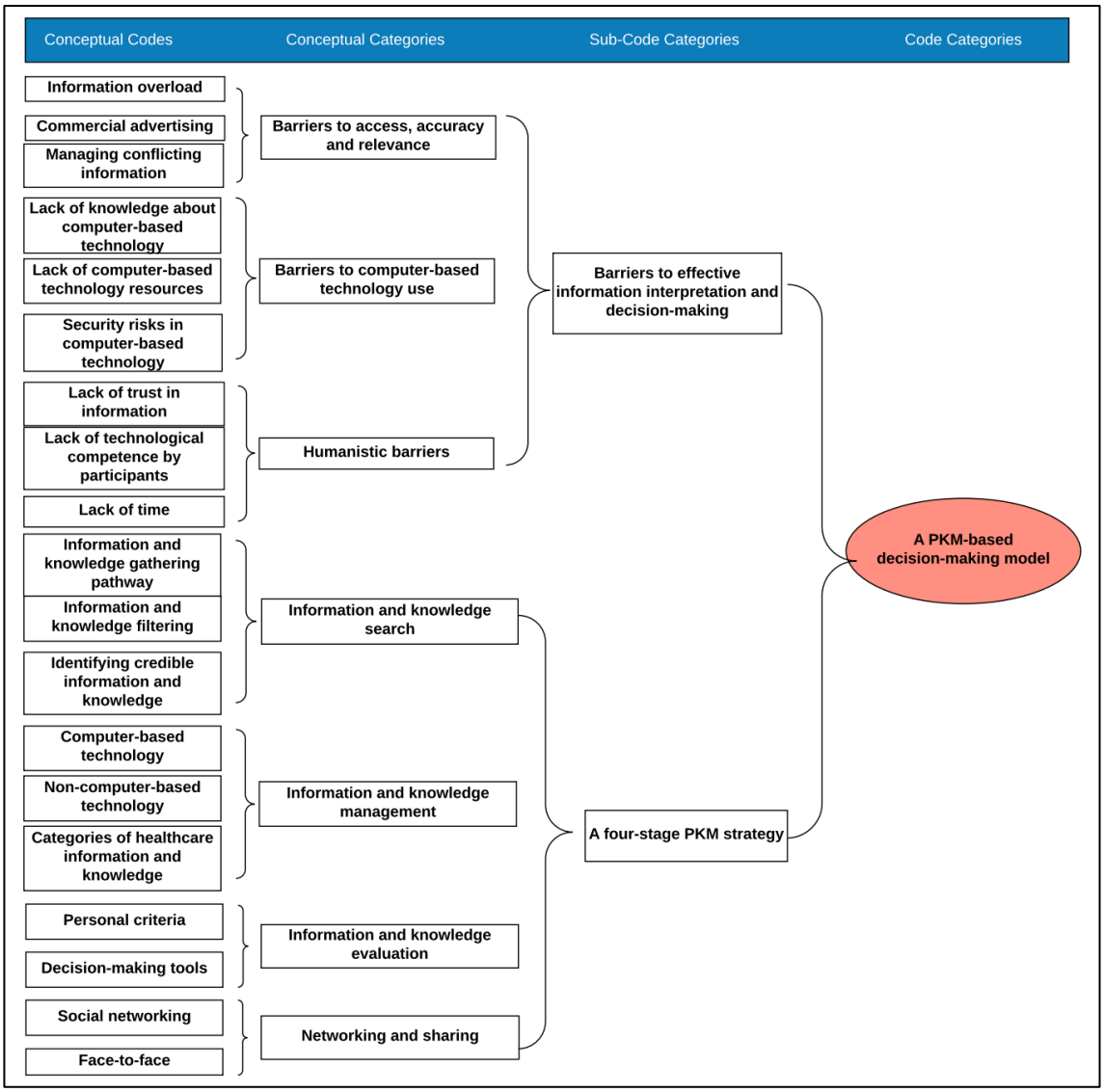


Figure 4-9: The Main Conceptual Categories and Sub-Core Categories

As a set of categories were identified, cores were undoubtedly emerging, thereby during and after cycle II there was no longer any need to code everything into data, but rather to be selective (Chametzky, 2016). There is no difference between open coding and selective coding. The researcher is still comparing ideas, incidences, codes with one another, and recording ideas and codes based on the data (Chametzky, 2016). The difference is that in this stage coding becomes more abstract and conceptual which is associated with the core category (Glaser, 1978, p. 94).

As data analysis continued, it became clear that the core category along with the sub-core categories and the conceptual categories and the relationships between them were not being

substantially altered. At that stage, theoretical saturation was reached and data collection could be concluded, which in this study was the end of cycle II. In order to check the theoretical saturation, cycle III was used to ensure that no additional data was found (i.e. no new properties of a category could be developed).

4.6 Rigor, Credibility, and Validity of the Data

Golafshani (2003) and Shenton (2004) state that examination of trustworthiness is essential for ensuring credibility in qualitative research since qualitative concepts of validity and reliability cannot be addressed in the same way as in quantitative forms due to the difference of the nature of the research progress. Reliability/trustworthiness is a concept of the validity in a qualitative study, as "there can be no validity without reliability, a demonstration of the former [validity] is sufficient to establish the latter [reliability]" (Lincoln & Guba, 1985, p. 316). To establish the trustworthiness of qualitative research, Lincoln, and Guba (1985) suggest four criteria as credibility, transferability, dependability, and conformability for establishing trustworthiness, which are outlined in Table 4-12.

Table 4-12: Qualitative Credibility Criteria for Establishing Trustworthiness

Criteria	Interpretation
Credibility	Establish prolonged engagement with participants and build trust with triangulation of information from various sources (i.e., interviewing and observation) and methods; Peer debriefing ensures no researchers' biased opinions and reflects on research procedures with a colleague or another person or an informed associate.
Transferability	Applying research results to other contexts and enabling audiences to identify similarities in the research setting with other settings.
Dependability	Auditable to describe the processes of data collecting and analysing, and the means for readers to follow the study.
Conformability	Provide raw data, such as electronically recorded material, written field notes, documents and records for an audit trail by readers.

Adopted and Modified From Lincoln and Guba (1985)

The research has met this criterion to add trustworthiness to answer the research questions.

To achieve credibility:

1) This study has ensured data collection from several sources including free discussions, personal notes, and self-practice exercise. These have provided for instrumental triangulation where data was taken at different times (time triangulation) and from different people (source triangulation).
2) This study engaged in peer debriefing with academic colleagues in both private and public forum (academic conferences) to ensure there were no biased opinions from me and to reflect on research procedures.

To achieve dependability and conformability:

1) This study has provided a clear description of the research procedure in the data collection and analysis, as well as the specifications of present action learning as well as thematic and grounded theory coding techniques.
2) Participants' reflective notes and discussions were recorded to represent their ideas and thoughts.

To achieve transferability:

1) Issues discussed during the pilot study were modified as a guide for the formal study.
2) This study engaged older people (aged between 46 and 75 years) with their health care needs as research participants, to increase the applicability of the research findings to other health care settings.
3) This study included rich descriptions of the research to allow for the reader to evaluate the applicability of the study's findings to other contexts (Cronin, Coughlan, & Smith, 2014).

4.7 Ethical Considerations

In the design and implementation of this research project, there were several ethical issues considered. These ethical considerations are discussed as follows.

Informed Consent

An invitational letter (Appendix D:), information sheet (Appendix E:) and participant consent form (Appendix F) were distributed to each of the potential respondents, through New Zealand patient health care support groups' and church administrators. The invitational letter explained the nature and purpose of the research as well as an invitation to participates. The information sheet described the research project, participants' criteria and participant's rights in regard to the training program. Program disclaimer and Massey University Human Ethics Approval (Appendix C) information were also highlighted in an invitational letter, information sheet, and participant consent form. The information sheet was incorporated to a hard copy version to obtain informed consent from the participants. People who agreed to participate in the study were asked to sign a consent form. It must be pointed out that in the participant consent form, the participants were informed that the training program would be with an audio recording, and no medical advice would be provided, but only a training program on information and knowledge management.

Privacy, Security and Confidentiality

For the reasons of privacy, security, and confidentiality, all respondents were used anonymously through identification codes (e.g. Participant 1) in their description and reporting of the results. All study data, including the audio recordings, transcripts, and participants notes were stored and transferred to the researcher's computer with a password protected PC.

To ensure this research project thoroughly addressed the above ethical concerns, a full ethics application was submitted to the Massey University Human Ethics Committee (MUHEC) and I discussed these ethical concerns with study supervisors and MUHEC committee Massey University Human Ethics Approval (Appendix C) was obtained and complied with throughout the research project.

4.8 Summary of the Chapter

This chapter outlined the development of an action learning-based training program used for data collection, and investigates an effective method to help older adults manage information and

knowledge so as to make informed decisions. This was followed by a description of sampling techniques used for this study. The process of data collection and analysis were then presented. A description of rigor, credibility, and validity of the data to ensure the trustworthiness of the research findings were discussed. Finally, the study's ethical considerations were presented at the end of the chapter.

The process of data collection and analysis was continued until theoretical saturation is reached, and all concepts were well developed to answer the second research question, which in this study was completion of cycle III. A total of eighteen participants were used to test the training content and delivery, as well as to generate relevant data for answering the research questions.

To identify participants' methods of accessing and evaluating information and knowledge before training and the key issues regarding this training program, a qualitative thematic coding (see 4.5.1) was used in the pilot study and in the three formal learning cycles. Through continued cycles of evaluation and ongoing modification, the training program was refined, to operate more efficiently and effectively in subsequent cycles.

Grounded theory coding techniques (open, selective coding, and theoretical coding) were used to depict the process of data analysis in this study (RQ2). The coding techniques explained how the codes developed based on raw data, how the categories emerged over different coding phases (i.e. open coding and selective coding). The conceptual categories and the sub-core categories were identified and interpretively explained by participants' comments.

In the next chapter, the categories that emerged during the coding process are presented. Some participants' quotes that were relevant to the categories are provided.

Chapter 5 Findings and Discussion

5.1 Chapter Overview

This study focuses on the ways PKM can help older adults (with less education and limited computer/technological skills) make more informed decisions around their health care. Participants were drawn on a voluntary basis from New Zealand patient health support groups (such as diabetes and obesity or other issues of this nature, but exclusive of severe health issues, such as cancer) and church members. Participant recruitment targeted older people with limited computer/ technological skills. In Chapter 3, the research methodology that directs the collection, analysis, and interpretation of research data, were explained and justified. In Chapter 4, specific methods for data collection and analysis were described; in particular, a PKM-based decision-making training program combining action learning, with thematic and grounded theory coding techniques.

This section reports on the findings and discussion that is grounded in data. Regarding RQ1 and RQ3, thematic coding techniques proposed by Braun and Clarke (2006) were used to identify participants methods of accessing and evaluating information and knowledge before training, and to determine the value and effectiveness of the program design and understand any modifications required. Regarding RQ2, the grounded theory coding techniques proposed by Glaser and Strauss (1967), was adopted to explore people's opinions and experiences of PKM regarding health care decision-making. The techniques include open, selective, and theoretical coding and constant comparative analysis.

In the next section, the methods participants used to access and evaluate information before training are outlined. This is followed by the barriers they encountered when facing health care decision-making, and a four-stage PKM strategy grounded in data. The reflections of the participants and my experience as a researcher and facilitator in this training program are then discussed. The categories in light of the PKM, health care, and decision-making literature; particularly in older adults is reviewed. Participants' quotes that are relevant to the developed categories are provided in this chapter. A summary is provided at the end of the chapter.

5.2 The Findings and Discussion Related to RQ1

This section presents the findings and discussion related to RQ1: how do older adults access and evaluate information and knowledge for health care decision-making? The purpose of RQ1 was to give me a starting point for this study, and to assess and understand the participants' abilities. Based on the thematic coding, the main theme ('methods participants used to access and evaluate information before training '), and four sub-themes ('access health care information and knowledge from the internet', 'access health care information and knowledge from medical professionals', 'access health care information and knowledge from family, friends, and personal life experience', as well as 'evaluating alternatives by asking family, friends, medical professionals opinions, and personal life experience') related to RQ1 were identified. The thematic Map and identified themes related to RQ1 are shown in Figure 5-1.

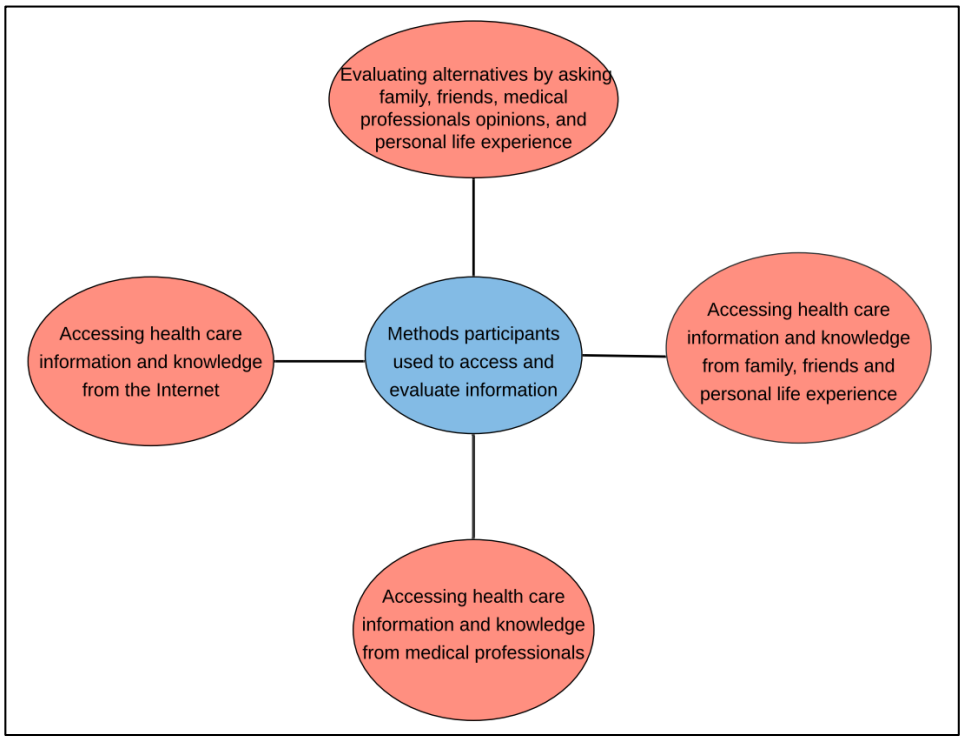


Figure 5-1: Thematic Map and Identified Themes Related to RQ1

As mentioned in Chapter 2, information seeking and evaluating are two processes that occur before individual health care decision-making takes place (Siminoff & Step, 2005). The identified

main theme and sub-themes report on the methods participants used before training and barriers they experienced when accessing and evaluating information and knowledge for health care decision-making. This is further discussed in the following sections.

5.2.1 Methods Participants Used to Access and Evaluate Information

Based on thematic coding data analysis techniques, the first main theme was developed from the data, which encompassed all methods participants used to access and evaluate information before training. In the following section the four sub-themes are discussed.

5.2.1.1 Accessing Health Care Information and Knowledge from the Internet

This study found that about 67% of participants had some experience with computers and the internet, yet only 50% of participants used the Internet as a primary source of information seeking. Google and Facebook were the most common information sources, followed by YouTube (online videos).

> *"I also belong to Treasure's web page. That's nappies for babies. They have a discussion group for people who have professional like Pediatric psychology and Pediatric nurse, and Pediatric doctor. So they have all that advice if you need help" (Participant 1).*

> *"I got the information online. When I was worried about the insulin I went online and had a look to see what different ones were available" (Participant 7).*

> *"The method of information gathering I used was Google. It's convenient. I haven't got time to go find a library (Participant 14).*

The number of older adults seeking online health care information has been continually increasing (Huang, Hansen, & Xie, 2012). Previous studies found that many factors drive older adults to search the Internet for health care information including self-diagnosing, knowing someone who has been diagnosed with the same medical condition, helping themselves to cope with their own medical condition, learning about new medications or course of treatment when being prescribed a new cure (Hardt & Hollis-Sawyer, 2007); as well as perceived barriers with attending health

care visits, disagreement with information provided by medical professionals and lack of time to ask questions (Criss et al., 2015). In this study, participants commented that, on the Internet health care information contains various medical resources and knowledge related to their personal conditions, which can help them understand their own health conditions and available treatment options. Google and Facebook were cited as the easiest and least time-consuming online resources to access relevant information. Facebook closed groups can reach out to a group of people who have the same health condition as themselves, and access information they need. YouTube videos that were tutored by medical professionals were utilized to gain various medical information, such as causes and treatment of tinnitus by the tinnitus clinic on YouTube. The availability of the Internet has improved, and older people are using them more and more proficiently. This is most likely because older people today have been exposed to the internet at work or before retirement (Stanziano, 2016).

5.2.1.2 Accessing Health Care Information and Knowledge from Medical Professionals

This study found that health care support group members tend to access information via medical professionals due to trust. All health care support group members agree that health care information and knowledge provided by their doctors is very informative. Their comments:

> *"I normally get my information from the hospital and a diabetes group on a Thursday once a month. I have had to do a lot of examinations concerning diabetes at the hospital. So I collected a lot of information. The doctors and nurses are very important, and so is the hospital" (Participant 6).*

> *"Generally, if I wasn't sure myself, I asked the best person I can trust with getting information. If it was a health problem probably it would have to be a doctor" (informant 7).*

> *"Doctors gave me all of the medication I needed in the hospital. I got my information from the doctor. (Participant 8).*

According to Francis (2013), health care support groups provide an opportunity for patients to share personal experiences, concerns, interests, coping strategies, and information related to

diseases or treatments. This study's participants commented that the best recommended resources they received from the group were health-related books and magazines. This study also found that health care support group members have more confidence and trust in a medical professional's knowledge than non-members. In one health care study, Gopichandran and Chetlapalli (2013) report that a patient's trust in information provided by medical professionals is influenced by their education level. Gopichandran and Chetlapalli claim that patients with lower educational attainment tend to trust medical professionals based on comfort and emotional assessment rather than perceived quality of care or behavioural competence. Yet, in this study, there were two participants with tertiary qualifications in the health care support group. Kim, Bae, Kang, Kim, and Lee (2018) argue that a patient's trust in medical professionals' information is based on the patient-physician relationships, an interaction of both parties. In this study, all health care support group members commented that they have regular meetings and a good relationship with their doctors.

5.2.1.3 Accessing Health Care Information and Knowledge from Family, Friends and Personal Life Experience

In contrast to health care support group members, this study found that non-members of health care support groups put more trust in lay people (such as family, friends and themselves) when seeking health-related information.

> *"I find it's quite good to ask older people because often their ideas are quite good because they have been around a long time (Participant 2).*

> *"How do I collect information, first of all I collect it in my head. So I connect to my body. I have lived in it for 40 or 50 years, and I know when it changes and what it's doing, so I collect information in my head. That's just tiredness or no I'm not feeling too well, and I have never been like this before, and so you go through this process in your head and see where it's going to (Participant 12).*

"We have medical insurance, so we can choose the best specialists in New Zealand which we did. But no one can tell us what she is suffering from. One phone call back home and we got the answer from my mum. Unbelievable." (Participant 17).

According to Tustin (2010), dissatisfied patients are more likely to seek and trust sources of information other than medical professionals. A recent health care study among US adults by Chu et al. (2017) further reports that older adults with less education and Internet skills are more likely to use family, friends, and co-workers as a source of health care information and knowledge. In this study's participants commented that older people's life experiences, as well as family are more trustworthy than medical professionals.

5.2.1.4 Making Decisions by Asking Medical Professionals Opinions, Family, Friends, and Personal Life Experience

The study found that participants do not evaluate the information they obtain. However, when making alternative health-related decisions, the methods participants used were almost the same as how they access the information. The methods include asking family, friends, and medical professional's opinions. This sentiment is reflected by the following comments:

"So the best decision for me, like you've got all these different pathways that you can go through. I will consult with the specialists to get a broad outline, but I will only use the one that I feel works best for me. So I will strategize and I will ask the experts" (Participant 9).

"I would definitely ask people's opinions when making medical decisions, particularly professionals" (Participant 12).

"In a medical decision, I guess the best thing to do is to find a medical professional like a nurse or doctor or a chemist to seek their advice. Because I don't' want to make it worse, I want to be healed, I want to be fixed, or I want the problem solved whatever the health problem is" (Participant 13).

I use my brain a lot. I weigh things up on different options. If it's something I don't know about then, usually I know someone, family or friends who know something about it (Participant 14).

This study found that the older adults in this study did not use the information they have obtained to make direct diagnostic or treatment decisions. Yet, the information is nonetheless useful in helping them to know what to expect and how to cope. This finding is not supported by the literature. This might be because understanding personal health can reduce negative effects of stressfulness (Schneiderman, Ironson, & Siegel, 2005). Patients want to be prepared so that they can understand and monitor the diagnoses and treatment decisions made by doctors (Xie, 2009). This might be a factor involved in older adults' efforts to seek information, although they do not plan to use it directly to make diagnostic or treatment decisions.

Another method participants used to evaluate alternative options were by their personal life experience. One participant commented:

"My first evaluation is my brain, what information have you already figured out what has happened before? I don't have time to switch on the computer or look up a file if something is happening like a burn or something like that"(Participant 16).

According to Biotechnology and Biological Sciences Research Council (2009), previous experiences can help with making complex decisions when presented with uncertain or confusing information. The report shows that learning from experience actually changes the circuits in the human brain so that people can quickly categorize and make decisions or perform appropriate actions on what they see. For instance, in a patient decision-making study, Benger and Jones (2008) report that patients previous experiences with waiting to be seen and then being referred to hospital may make patients more likely to choose calling an ambulance in the future. This study's participants commented that previous personal experiences can help them diagnose alternative health care decisions.

To sum up, based on the data, this study's participants used the Internet, medical professionals (or hospitals), family, friends, and their personal life experience to access health care information

and knowledge. They commented that the Internet pathway they used was mainly Google, health-related Facebook closed groups and YouTube videos. This study indicates that the methods participants used might be influenced by the environment they are involved in. For instance, this study found that health care support group members mainly collect information from their doctors. This group of people have trusted the information provided by medical professionals more than non-members. On the other hand, participants who were not health care support group members were mainly seeking information and knowledge from the Internet, family and friends, and generally lacked trust in medical professionals.

To evaluate the alternatives, this study found that all participants used similar ways to access health care information. All participants either prefer to rely on family or friends or medical professionals' opinions or their own personal life experience to choose alternative decisions. Although, they might not trust medical professionals information resources. According to Huang et al. (2012), this might be due to information seekers lacking the ability to evaluate health care information they have received. Figure 5-2 illustrates the methods and processes of this study's participants' health care decision-making.

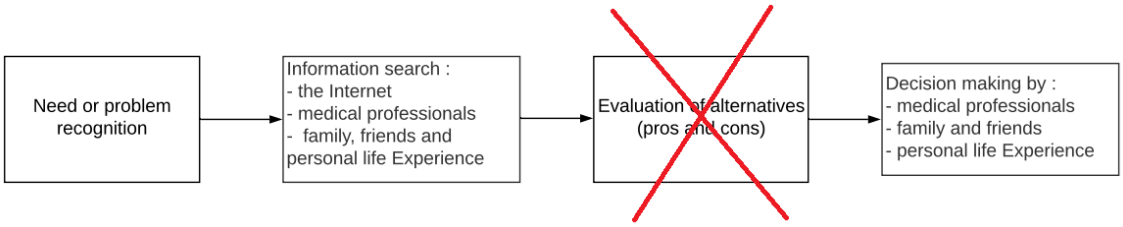


Figure 5-2: The Process of This Study's Participants' Health Care Decision-Making

The model illustrates the process of this study's participants' health care decision-making. According to Engel et al. (1973), the consumer decision-making process includes need or problem recognition, information searching, evaluation of alternatives, and decision-making. Yet, the findings of this study showed that older people do not evaluate information they obtain in the process of their health care decision-making. Solomon, Bamossy, Askegaard, and Hogg (2006) claim that Engel et al. (1973)'s decision-making model is a rational perspective, yet people may

not always behave rationally, thus consumers do not go through this sequence every time they make decisions.

The evaluation of information is the process of critically analysing information to determine its quality or value and credibility (Virjoghe, 2014). The information assessment process requires judgment criteria to determine the reliability, authenticity, credibility, and validity of the information (Virjoghe, 2014). Yet, the findings of this study show that participants lacked ability in evaluating health care information they obtained. This might be a factor as to why participants omitted the evaluation of the information stage.

In the next section, barriers that impact on participants' effective information interpretation and decision-making are discussed.

5.3 The Findings and Discussion Related to RQ2

This section presents the findings and discussion related to RQ2: how can PKM help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making? (A four-stage PKM strategy). Based on grounded theory coding techniques, the core category 'a PKM based decision-making model', and two sub-core categories ('barriers to effective information interpretation and decision-making' and 'a four-stage PKM strategy') as well as seven conceptual categories (barriers to access', 'accuracy and relevance', 'barriers to computer-based technology use', 'humanistic barriers', gathering 'credible information and knowledge', management information and knowledge by 'computer-based technology or non-computer-based technology', evaluation of information and knowledge via criteria and tools, as well as 'new working and sharing via social media or face-to-face') were identified. The identified elements report on barriers that exist for individuals that hinder effective health care information interpretation and health care decision-making, as well as a four-stage PKM strategy. Based on the findings, the conceptual model was revised and presented in this section.

In the following sections, the identified categories and their interrelationships in light of the PKM and health care decision-making literature are discussed.

5.3.1 A PKM Based Decision-making Model

The *PKM Based Decision-making Model* describes the issues and a potential solution associated with older adults' health care decision-making. *Barriers to effective information interpretation and decision-making* refers to those obstacles including barriers to access, accuracy and relevance, barriers to computer-based technology use, and humanistic barriers. The findings of this study suggest that these barriers have impacted on older adults' information and knowledge management, as well as their confidence in making health care decisions. The findings of this study also suggest that through the four stages of the PKM strategy, participants could potentially dissolve identified barriers and enhance their confidence when making health care decisions.

In the following sections, the sub-core category *Barriers to Effective Information Interpretation and Decision-making* is first introduced. This is followed by '*A four-stage PKM Strategy*', and the modified conceptual model which extends Figure 2-2 that is grounded in data.

5.3.1.1 Barriers to Effective Information Interpretation and Decision-making

Based on the grounded theory coding techniques, the sub-core category *Barriers to Effective Information Interpretation and Decision-making* was developed from the data, which encompassed all the factors that were experienced when assessing and evaluating information and knowledge for health care decision-making. From the literature review, the main concern was the issue of information overload negatively impacting on older adults' health care decision-making. However, after running the action learning training program and collecting and analysing data, eight additional important issues that impact individual health care decision-making were discovered. These barriers include commercial advertisement, managing conflicting information, lack of knowledge about computer-based technology, lack of computer-based technology resources, and security risks in computer-based technology, lack of trust in the information, lack of technological competence by participants, and lack of time. These issues are discussed in the following sections. These issues were grouped into three categories: barriers to access, accuracy and relevance, barriers to computer-based technology use, and humanistic barriers. Figure 5-3 illustrates, findings and barriers within individual (older adults) health care decision-making.

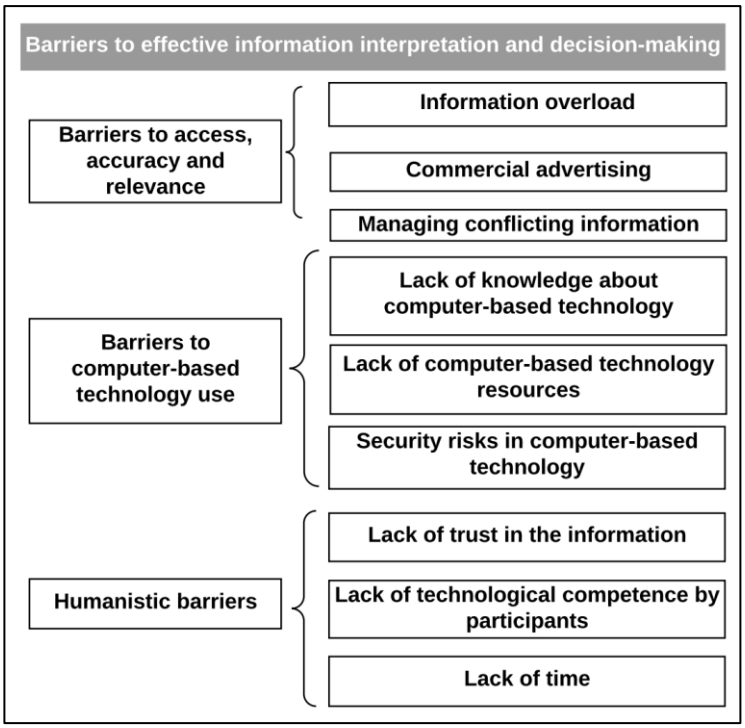


Figure 5-3: Barriers to Effective Information Interpretation and Decision-Making

5.3.1.1.1 Barriers to Access, Accuracy and Relevance

Health care information can provide individuals with a general understanding of their health condition and help them to know what to expect and to be prepared to better cope with their situation (Tan & Goonawardene, 2017). Gathering relevant, accurate, and validated information can lead to an optimal outcome enhancing patients' confidence in health care decision-making (Laugesen, Hassanein, & Yuan, 2015). However, many issues were identified by the study's participants relating to available health care information, which impacted their understanding of their health situation and affected their confidence in making decisions.

Information overload

All participants agree that information overload caused difficulty in seeking relevant and trustworthy information. This has a negative impact on their confidence in health care decision-making. This is demonstrated by the following two comments:

"When I use Google, remember you are talking to a computer dummy here, all it gave me was companies or whatever. When I went to flu medicine, there were over two hundred flu medicines. Hello! How did you get that? Most of the stuff that comes up is from companies, like pharmaceutical companies all that sort of stuff. So it was really difficult for me to find relevant information" (Participant 12).

"I had given up actually because I couldn't sort through all the information out there. What was true and what was just somebody trying to make money or whatever. So that's about it, really. To find the correct information is the biggest issue for me" (Participant 15).

Within the health care context, information overload has been defined as, information searchers receiving more information than their ability to process causing dysfunctional consequences (such as anxiety and stress) thus reducing the quality of their health care decision-making (Swar, Hameed, & Reychav, 2017). This study found that information overload is a serious obstacle to finding accurate and relevant health care information for participants; in particular a large number of available resources on the Internet (Sedgwick, Awosoga, Grigg, & Durnin, 2016). Benselin and Ragsdell (2016) suggest the reason people have difficulty in finding relevant information is because large amounts of information do not automatically lead to quality information. Excess information leads to confusion and frustration, reducing their understanding and judgment of health care information, such as treatments and diagnoses. This causes a failure to use the relevant information known to be available and leads to inefficient decision-making (Farhoomand & Drury, 2002).

Despite there being a large amount of available health care information and knowledge available, participants stated that the resources are only limited to general context, which does not have answers for specific questions they need.

"We can't find something that is specifically for us, there is general information like people's opinions about how to deal with it. You can't consult with a doctor over the

phone. The problem we are dealing with now, we can find general information on the websites, but it's not going to give us a 100 % answer" (Participant 17).

Diehl (2011) reported that adults with less education (such as high school diploma) are less likely to have the skills or knowledge to seek health care information on the Internet. The high literacy and computer skill requirements of health-related websites create problems for those with low education levels (Feinberg et al., 2016). Failure to use available and familiar technologies (such as web browsers) can make it difficult to find health care information on digital platforms such as the Internet (Feinberg, Greenberg, & Frijters, 2015). This results in participants spending more time searching for information but not getting the information they need. Eppler and Jeanne (2003) claim that people can only absorb a certain amount of information. They state that information provided beyond this point will confuse people and affect their ability to set priorities and information will no longer be integrated into their decision-making process.

Commercial advertising

Another common issue that hinders participants' decision-making was commercial advertising. Participants indicated that some health care information contains commercial advertising that impacts on their judgment for seeking health care information and knowledge that is relevant to them, as they are not sure whether the information can be trusted. One participant stated:

"I see everyone goes to Google. That's the main method of searching information everyone knows that, so I am going to sit on the computer and try to get all the information. There is too much information and lots of it is just someone trying to sell their products or advertise something. You are not sure if that's the right thing or just someone that commercially wants to push it. There is lots of information, lots of advertising stuff, lots of things that are not 100 % related to your (health care) questions" (Participant 17).

Advertising and promotions are strategies that health care industries use to develop and maintain relationships with patients (Solomon et al., 2016), and to provide a basic awareness and knowledge about the medical product or service (Rao & Rao, 2012). However, medical

advertisements have inevitably become over commercialised (Solomon et al., 2016), and have been found to negatively impact consumer behaviour. Huang (2000) states that health care advertisements encourage individuals to assess the benefits and risks of their health options and act as independent decision makers. Yet, health care consumers may be misled by medical advertisement due to a lack of medical knowledge and obscured product risks (Huang, 2000). Furthermore, Bruce et al. (2017) imply that commercial advertising often contains multiple creative formats in digital information, such as animation, sound, video, flash formats, floating images, and screen take-overs that lead to confusion about the quality of information. As reported by the study participants, the issues caused by commercial advertising profoundly impacted their judgment when seeking health care information.

Managing conflicting information

Another issue participants discovered in the context of health care, was encountering conflicting information from different sources. For instance, one participant states that it is confusing that available health care information and knowledge contains positive and negative effects on the same subject (such as chocolate). Another participant comments that health care information and knowledge might contain completely opposite suggestions from different countries. This is reflected in the following participant comments:

> *"A good one is chocolate is really bad for you or coffee is really bad for you. Then you get another one saying chocolate is really beneficial for you and coffee is really beneficial for you. You got some testimonies of people who tried it and it has worked for them as opposed to research found. That just can be very confusing" (Participant 12).*

> *"I just saw recently on the news some doctors in England saying the complete opposite to what the doctors in Australia were saying, who were doing research on exactly the same thing, and came to the opposite conclusions" (Participant 13).*

The findings supported by Penner (2016), posits that most people are unable to effectively treat their health, due to contradictory information they receive. In the context of health care, conflicting

information has been defined as contradictory information about medical issues from different sources (Carpenter et al., 2010; Elstad, Carpenter, Devellis, & Blalock, 2012). Patients can receive health care information through various sources such as physicians, media and the Internet (Carpenter et al., 2016). Health-related articles can vary in forms of authority, accuracy, and objectivity such as governments, medical professionals, lay 'experts', drug manufacturers, and patient organisations, with a lack of accuracy, balance and undeclared conflicts of interest (Hogue, Doran, & Henry, 2012; Tan & Goonawardene, 2017).

Conflicting information is not a new issue in health care. Current studies show that 80% of patients experience conflicting medication information (Carpenter et al., 2016). Similarly, Nagler (2014) examined conflicting information on health benefits and risks. This report shows that 72% of American adults have suffered medium to high exposure to conflicting nutrition information. Spittler (2011), in a breast cancer treatment decision study, reported that approximately two-thirds of women felt they had received conflicting opinions and were dissatisfied with the treatment options presented. Elstad et al. (2012) report other effects of conflicting information on individuals including decreased medication adherence, leading to worse perceptions of care among patients, increased anxiety, and decreased the ability to evaluate the reliability of information sources. This study found that conflicting information has negatively impacted on older adults' judgments, leading to a poor understanding of health care information.

5.3.1.1.2 Barriers to Computer-based technology Use – Knowledge, Resource, Security

The conceptual category of barriers to computer-based technology use refers to technological devices such as computers, laptops, or a memory stick as inadequate or inappropriate utilization. According to the findings, barriers to computer-technology use include a lack of knowledge about computer-based technology, lack of computer-based technology resources, and security risks in computer-based technology.

Lack of knowledge about computer-based technology

The findings of this study suggest that participants have very limited knowledge about computer-based technology. For instance, one participant states that she was confused about whether the

saved information and knowledge, opened from the computer hard drive or a memory stick (also known as a USB or a flash drive). Lack of knowledge about computer-based technology use has impacted on participants' confidence in using it and limited the methods that can be useful for managing information.

> *"I wasn't sure what I was getting was actually on the computer or whether it was what was on the USB stick. It's hard to tell when you put it into your machine. It didn't seem to be working very well. So I played with it for a while then I gave it away after that because it wasn't being very helpful. I was getting a little bit impatient with it because I couldn't be sure that it was actually recording anything on this USB stick. It must be, but I wasn't confident it was there" (Participant 7).*

Chien (2008) and Erber (2013) suggest that older adults generally have less computer-based technology experience than younger people, as they were not exposed to computers during their formal education and many of them have no experience in using technology. A lack of knowledge about technology makes re-fining information and knowledge more time-consuming. Technology is only a supporting tool and individuals must have information and skills to allow for managing inforamtion (Jefferson, 2006; Świgoń, 2013). Without sufficient information skills, individuals would not be able to categorize their knowledge base properly, and could result in several barriers for future retrieval and use (Zhang, Majid, & Foo, 2010).

Charness and Boot (2009) state that a lack of knowledge about technology is associated with aging. They state aging slows down the cognitive process, decreasing memory capacity and attention control. These changes slow down an individual's performance and result in errors when interacting with technology that was not designed with their abilities in mind.

Vaportzis, Giatsi Clausen, and Gow (2017) argue that technology often lacks instructions and guidance for older adults which impacts on the use of technology. When there are no instructions and guidance to help utilize technology, users may have different expectations that are not aligned with the nature of the tools (Fathizargaran, 2012).

This study found that the consequences of a lack of knowledge about technology has led to low confidence in using technology and limited the methods that can be useful for managing information. Furthermore, a lack of knowledge about technology makes refining information more time-consuming. These findings are supported by Rogers, Pratt, Brown, and Gambling (2010) in a study of confidence in the use of information management and technology among older people. Their results show that older adults are less confident in using information management technology. This issue can lead to a lack of knowledge about technology language and skills, and feeling frustrated and out of control (Kuerbis, Mulliken, Muench, Moore, & Gardner, 2017).

Lack of computer-based technology resources

Data shows that not all participants have computer-based technology (such as computer or laptop) resources for information and knowledge management. According to participants, their information and knowledge management productivity, efficiency, and flexibility are limited by the availability of the technology (such as computers or tablets).

> *"Managing health care information will be a lot of easier for me if I have an iPad" (Participant 2).*

> *"The biggest issue for me (in seeking information and knowledge) is we only got one computer. My wife hogs that and I hardly even get it, so in fact, I get starved of a lot of information I do need. Because I haven't got the equipment to pick it up, so I guess I know where to find the information, I just haven't been able to get the computer to find the information" " (Participant 12).*

In this study, 10% of participants report a lack of computer-based technology, such as computers and laptops to support the process of information gathering and management. Peterson, Dwyer, and Mulvaney (2009) investigated 100 patients aged 50 years and older in the use of computer and the Internet for medical care. Their report shows that people who have higher incomes and higher education are more likely to own a computer than those with lower income and education backgrounds. This study found that two participants who claimed to have no technological resources have either no income or work part-time, and both have a high school education.

Computer-based technology resources play an important role in effectively increasing people's knowledge and help in health-related decision-making (Jacobs, Amuta, & Jeon, 2017). Technology can enhance learning productivity, efficiency, and flexibility (Serdyukov, 2017). Technology such as computer access to the Internet offers a convenient entrance to an unprecedented level of information about a diverse range of health information sources (Gray, Klein, Noyce, Sesselberg, & Cantrill, 2005). The Internet is a medium of information enabling individuals to access information to enhance their learning effectively (Kumah, 2015). People who are unable to access technology face the risk of being excluded from possible education and benefits (Laabidi, Jemni, Ayed, Brahim, & Jemaa, 2014), such as a wide range of health care information and services. Similarly, in a health care study, Showell (2017) reports that a lack of computer and the Internet facilities will hinder an individual's access to available health and relevant resources, which leads to the risk of receiving a less effective health care outcome or service. This suggests that a lack of computer-based technology resources limited and obstructed participants from gathering and managing information and knowledge, including their ability to learn effectively.

Security risks in computer-based technology

According to the data, there is a high risk using computers or a memory stick for storing information for older adults. Participants noted that technology is unsafe and unpredictable as it can be hacked, crash or have a power failure. Devices such as a memory stick are easy to lose due to portability and size. In the following comments the participants list the security issues linked to computer-based technology:

> *"I don't use the computer much for storing information because the computer can crash or be hacked" (Participant 17).*

> *"I live in a rural area, we don't have constant power, and therefore when I want something and it's on the computer I'm buggered" (Participant 5).*

> *"I have got three USB that I couldn't find because I haven't used them for a while" (Participant 13).*

"It (USB) doesn't work for me because it is easy to lose the flash drive. Flash drives should come in a package or something with a label on it, so you know what's on that flash drive. They just have nothing" (Participant 15).

The findings of the study suggest that older adults have some concerns about security issues when managing information and knowledge by computer-based technology. Many of them lack confidence in their own knowledge of using online tools properly. Many participants commented that computers can be hacked, crash or have a power failure. Indeed, when computers crash, system congestion causes delays, causing dramatic consequences for users (Lazar, Jones, Hackley, & Shneiderman, 2006). These frustrations can cause personal dissatisfaction and loss of self-efficiency and hinder learning (Lazar et al., 2006). On this matter, Jacobson and Idziorek (2016) suggest that personal computers are easily hacked due to many attack tools on the Internet available for individuals. These tools require only limited computer skills, therefore, anyone can become a "hacker". A computer hack might expose personal health information to the public (Lynch & Duval, 2010).

Furthermore, the small size of a USB memory stick might be a downside to managing information and knowledge. This study's participants stated that USB memory sticks are very practical and can hold large amounts of information and are easy to carry around. Yet, USB memory sticks are easy to lose or forget due to its small size.

Data shows that social networking tools (such as WhatsApp an online discussion forum) might help older adults to share and discuss health care information and knowledge with others effectively. However, participants comment that due to difficulty in identifying people's identity, it might be a risk to share and discuss their health issues with strangers via social networking. One participant commented:

"Because with online discussion forums I don't really know who I am talking to. It might be somebody's name there, but it's just somebody who is online. A discussion forum quite often is just random people coming to the group, you don't know who is

there and who you're talking to so I found it's a bit disconcerting" (Participant 15).

This issue is supported by Cline and Haynes (2001), who claim that there is no or little peer review and no quality filter on the Internet, therefore anyone can claim to be a medical expert and mislead patients into believing their views. Also, Tayouri (2015) reports that sharing information or discussing with people via social media sites is risking personal information access by others (such as the websites' developers).

5.3.1.1.3 Humanistic Barriers - Trust, Competence and Time

The conceptual category of humanistic barriers refers to older adults' personal difficulties specific to themselves when making health care decisions. According to the findings, humanistic barriers include a lack of trust in the information, lack of technological competence by participants, and lack of time. Based on participant comments, the humanistic barriers led to difficulty in identifying trustworthy information, difficulty in ordering, keeping and organizing information, as well as limited effectiveness when seeking and sorting through information.

Lack of trust in the information

This study found participants have a lack of trust in the information provided by doctors. Most participants believe that their personal life experience is more trustworthy than health care professionals' information and knowledge. Participants commented:

"If a mother takes her child to the doctor and the mother disagreed with the doctor, I would take the mother's side anytime. She knows about the child more than the doctor. I've seen that happen so many times. So that kind of information just trust the mother, not the doctor" (Participant 12).

"As you go to the doctor, then you say "Okay, your baby has had six nappies a day changing for five weeks. It is not natural." Each milk they shouldn't have six nappies, and then the guy (doctor) said "It's okay, they have enough fat on their body. They can survive for ten days." When you argue "Excuse me, are you a father? Do you have any children?" and they say "No, we don't". I said "Okay, fine. I want a person (doctor) who is a father or mother to come here to give me a prescription, thank you."

That's what I did. He was too young. He didn't know what you were talking about. My issue is if you have not experienced my situation don't talk to me about that. I want somebody who has been there" (Participant 1).

Berry (2006) states that a patients' trust and confidence in health care professionals is built on communication, as it forms the basis of all future transactions. Yet, communication with older people is a challenge to health care professionals due to physical issues among the older people. Berry claims that many older people have problems with hearing loss and poor eyesight, which can cause problems in processing and understanding health-related information or questions. Lee and Lin (2011) suggest that when patients have low levels of trust in medical professionals, they may be less confident that their physicians will respect their views, listen to their concerns, and answer their questions honestly.

Lack of technological competence by participants

This study found that participants acknowledged that information and knowledge needs to be filtered and evaluated to detect the ones that are related to their own conditions. However, all participants in this study lacked technological competence in seeking, filtering, ordering, keeping, organizing and evaluating health care information that is relevant to them. For instance, most participants store online information and knowledge on Web browsers via their personal computer without a strategy. The participants comments suggest this leads to information overload when information and knowledge continues to accumulate, and is time-consuming when retrieving resources. This is reflected in the following comments:

"The biggest issue for me in seeking information is too much information I suppose. Too many things. Everyone has got the best thing so you don't really know whether it's good or not to be honest, because there is so much information, you don't really know what is what" (Participant 14).

"Maybe I did not use the right word to search because I don't have the knowledge to get the information I need" (Participant 18).

> *"Web browser bookmark, it's good for saving websites. You need to go back obviously. It does work for me, but the problem is I tend to have a lot of bookmarks. If you want to see a lot of bookmarks, you should look at my son's. I mean you go to his bookmark page, favourite page. You push the button and it goes about half an hour before it reaches the bottom. That sort of thing happens to me too. I tend to get a lot of bookmarks" (Participant 15).*

According to several authors (Benitez et al., 2013; Jones, 2007b; Jones & Marchionini, 2011), these abilities (filtering, ordering, keeping and organizing) relate to personal information management (PIM) skills. Jones and Marchionini (2011) define PIM as a set of activities that individuals use to acquire or create, organize, maintain, retrieve, use and distribute the information needed to fulfil their daily goals. Benitez et al. (2013) define PIM as a set of activities individuals perform to store information for later use. These definitions indicate that PIM is about an individual's ability to manage information and knowledge for easy re-finding to complete daily tasks.

PIM provides an opportunity to put information in an order to make it easier and less time-consuming to retrieve when it is needed (Benitez & Pauleen, 2009). PIM often associates with information management tools in acquiring, organizing, keeping and retrieving personal information (Sedghi, Abdolahi, Azimi, Tahamtan, & Abdollahi, 2015). Balekundargi (2016) states that with numerous available information management tools, an individual usually chooses devices based on their confidence in and knowledge of the devices. This study found that some participants use multiple information management tools (such as a file folder, filing cabinet, journal, computer desktop, Dropbox, cloud, and USB sticks) for storing health care information they need. However, participants feel overwhelmed when information continues to accumulate, and commented that it is time-consuming when retrieving resources. Teevan, Jones, and Bederson (2006) imply that a lack of ability to put information into order in a manner to help retrieve resources becomes challenging. This might be due to people having little or no information about these tools and the ways they are used (Sedghi et al., 2015).

Furthermore, the findings of the study show that older adults have difficulty in identifying trustworthy information when seeking information. The findings align with the findings of patient information-seeking behaviour by Huang et al. (2012), which report that due to limited knowledge and experience of the Internet, older people may find it more of a challenge searching online for information, than younger adults. Medlock et al. (2015) investigated older adults who used the Internet for seeking health care information, 118 participants with an average age of 72 years were recruited. Their results showed that the use of the Internet for health care information seeking decreased slightly with age, yet it was not associated with gender, education and health status. In this study, 18 participants took part aged between 46 and 75. Four out of 18 participants had no experience with the Internet, while the rest of them had only some experience with online searching. All participants commented that they have difficulty in filtering both internet and traditional sources of information.

Lack of time

According to the data, a lack of time is a crucial issue touching individuals' personal knowledge development for health care decision-making. Participants commented that the issue has limited their effectiveness when seeking and sorting through information:

> *"I found sometimes it's quite hard to actually find the time to actually sit down and do it because going through a website you have to read a lot. You don't have time to read" (Participant 1).*

> *"I was looking for information that makes sense to me, credible to how or what I thought it should have been. I didn't actually read who wrote the paper or anything else. Um... I didn't get to the bottom page because you know it's just too long" (Participant 5).*

The findings of this study suggest that a lack of time has limited participants' capability to seek and sorting a large amount of information. This has impacted on their personal knowledge development. The result is in line with earlier literature where Mouzughi (2009) found that individuals need to invest a lot of time to update knowledge, yet 60% of people report that they

do not have enough time to read information that is given to them, which impacts on their knowledge management. Knowledge is highly personal and needs to be gained over a long period of time through an individual's learning experience (BenMoussa, 2009; Mårtensson, 2000). Yet, lack of time has been identified as the key barrier for those developing personal knowledge.

Searching and reading health care literature are essential activities for optimizing the quality of decision-making. Lack of time prevents individuals from seeking information (Flynn & McGuinness, 2011; Gordon, Meindl, White, & Szigeti, 2018), and increases the chances of failure in an information seeking episode (Sarka, Wang, & Shah, 2017). For instance, Cleveland and Ellis (2015) state that a lack of time leads an individual to search far less information, which forces them to stop information seeking sooner, and to prefer easily accessible knowledge sources. They indicate that nearly 72% of the knowledge seeking articles cited lack of time as a major inhibitor in the search for knowledge. Lack of time might lead individual's to have limited information and not consider all possible solutions before making decisions (Gordon et al., 2018).

To summarize, nine key barriers were found to exist with individual health care decision-making. These include: three elements relating to the barriers of access, accuracy and relevance, being 'information overload', 'commercial advertising', and 'managing conflicting information'; three elements relating to the barriers of computer-technology use being 'lack of knowledge about computer-based technology' and 'lack of computer-based technology resources', and 'security risks in computer-based technology'; and three elements relating to the humanistic barriers are 'lack of trust in the information', 'lack of technological competence by participants ', and 'lack of time'.

According to the data, these barriers lead to confusion, frustration, and time consumption in an individual's information and knowledge management, causing difficulty in identifying credible and relevant information and knowledge, hindering their confidence in learning and making decisions that relate to their health-related conditions. Table 5-1 summarizes barriers identified by previous studies, the difference between the literature and findings from this study is also discussed at the end of this section.

Table 5-1: Comparison Findings of Previous Studies and This Study

	Previous studies						This study
Barriers	Fields	Method of data collection	Samples	Countries	Findings/relevant statements	Author (year)	Findings
Information overload	Health care (clinical)	Face-to-face survey	Undergraduate students	Canada	Information overload negatively impacts on students perceptions of their critical thinking and clinical decision-making ability at the point of care.	Sedgwick et al. (2016)	Information overload can lead to a lack of time-to locate information, difficulty in judging the accuracy of information, causing confusion.
	Health care (general)	Online survey	Online health information searchers aged between 18 and 44 with at least high school education background	N/A	Online health care information overload negatively impacts on the psychological ill-being of information seekers and their behavioural intention to continue the use of online health information searching.	Swar et al. (2017)	
	Business	Face-to-face interview	Business managers	Australia, Hong Kong, America, and the United Kingdom	Information overload negatively impacts on knowledge workers work performance, such as time, decision quality, productivity, leading to frustration, tiredness, and stress.	Farhoomand and Drury (2002)	
	Business	Online survey and semi-structured interview	Internet users aged between 18 and 70	N/A	Information overload affects all ages of people. Yet, young people are primarily affected by information literacy levels while older adults aged over 70 are affected by technology.	Benselin and Ragsdell (2016)	

	Information management	Literature review	Previous studies	N/A	The causes of information overload include too much information, multiple sources of information, difficulty managing information, irrelevance or unimportance of information, and a lack of time to understand information.	Eppler and Jeanne (2003)	
Commercial advertising	Health care (prescription drugs)	Literature review	Previous studies	America	Health care consumers may be misled by medical advertisement due to a lack of medical knowledge and obscured product risks.	Huang (2000)	Health care information contains commercial advertisements that can lead to older adults having difficulty in identifying valuable and relevant information.
	Health care (medical ethics)	Literature review	Previous studies	N/A	Patients are easily influenced and trust any promise in health care advertising.	Solomon et al. (2016)	
	Business	Face-to-face survey	People aged between 18 and 57	India	Commercial advertising impacts on individual consumption of goods and services, consumption habits, lifestyle and quality in decision-making.	Rao and Rao (2012)	
	Information literacy	Literature review	Previous studies	Australia, America, and Sweden	Advertising leads to confusion about the quality of information and negatively impacts on students' confidence using information.	Bruce et al. (2017)	
Conflicting information	Health care (childhood vaccination)	Literature review	Previous studies	N/A	51.3% of chronically ill patients are less adherent to their medications due to receiving conflicting medication information.	Carpenter et al. (2010)	Inconsistent information can lead to time-consumption when locating

	Health care (breast cancer)	Online survey and focus group	Women breast cancer survivors	America	Two-thirds of women are dissatisfied with the treatment options presented due to conflicting opinions they had received.	Spittler (2011)	information, difficulty in judging the accuracy of information, causing confusion
	Health care (arthritis)	Telephone Interview	Patients with arthritis	N/A	Patients with arthritis who receive conflicting information are likely to increase alongside the proliferation of medication information on the Internet.	Elstad et al. (2012)	
	Health care (health-related)	Telephone Interview	800 residents of the hunter region	Australia	Medicine information from a wide array of sources which can lack accuracy, balance and undeclared conflicts of interest.	Hogue et al. (2012)	
	Health care (Nutrition)	Online survey	Adults aged 18 and older	America	People reported greater levels of nutrition confusion due to contradictory information in the media.	Nagler (2014)	
	Health care (Nursing)	University of San Francisco Sample business plans and grant proposals	The graduate nursing students	California	People are unable to effectively treat their health, due to contradictory information they received.	Penner (2016)	
	Health care (arthritis)	Online survey and telephone interview	Previous studies	N/A	Conflicting health information is increasing in amount and visibility, as evidenced most recently by the controversy surrounding the risks and benefits of childhood vaccinations.	Carpenter et al. (2016)	

Lack of knowledge and experience in computer-based technology	Health care (radiotherapy Treatment)	Online survey	the radiographic population	N/A	The confidence in using information technology can be influenced by aging.	Rogers et al. (2010)	Lack of knowledge and experience about computer-based technology impede older adults information gathering and organizing effectiveness, such as spending more time to re-find information they need.
	Health care (Mobile health)	Literature review	Previous studies	N/A	Lack of knowledge about technology is caused by a lack of confidence in using information management technology.	Kuerbis et al. (2017)	
	E-learning	Traditional literature review	Previous studies	N/A	Lack of knowledge and experience about computer-based technology can affect individuals work training effectiveness and productivity.	Chien (2008)	
	Psychology	Traditional literature review	Previous studies	America	Aging slows down the cognitive process, decreasing memory capacity and decreasing attention control impacting on the learning of technology.	Charness and Boot (2009)	
	Psychology	Traditional literature review	Previous studies	America	Older adults generally have less technological experience than younger people, as they were not exposed to computers during their formal education and many of them have no experience in using technology.	Erber (2013)	
	Psychology	Focus groups	older adults age between 65 and 76	Scotland	Lack of clarity in, instructions and support impacting the usage of technology in older adults.	Vaportzis et al. (2017)	
	Information Management	Face-to-face semi-structured interview	Software engineers	New Zealand	Lack of knowledge about the nature of Web 2.0 technologies can be challenging for personal knowledge management.	Fathizargaran (2012)	

Lack of computer-based technology resources	Health care (general)	Focus groups	Adolescents (aged 11–19 years)	America and the United Kingdom	Lack of computer-based technology might limit accessing a diverse range of health information sources.	Gray et al. (2005)	Lack of technological resources obstructs older adults information and knowledge management productivity, efficiency, and flexibility.
	Health care (general)	Literature review	Older adults aged 50 years and older	America	People who have higher incomes and higher education are more likely to own a computer than those with lower income and education backgrounds.	Peterson et al. (2009)	
	Health care (disabilities)	A conceptual abstract review	Original resource created by the author and equivalent alternatives (video resource)	N/A	Lack of computer-based technology led to the risk of being excluded from possible education and benefits.	Laabidi et al. (2014)	
	Health care (general)	Mailed survey	Adults (aged 18 and older)	America	Lack of computer-based technology might impact on people's knowledge and health care decision-making.	Jacobs et al. (2017)	
	Health care (general)	Literature review	Previous studies	N/A	Lack of computer and the Internet facilities will hinder an individual's access to available health-relevant resources, which leads to the risk of receiving a less effective health care outcome or service.	Showell (2017)	
	Education	Primary (questionnaire) and secondary	Graduate students	United Kingdom	Lack of computer-based technology might limit students from learning effectively.	Kumah (2015)	

		sources (includes textbooks, journals, magazines and the Internet)					
	Education	Literature review	Previous studies	America	Lack of computer-based technology might impact on individuals learning productivity, efficiency, and flexibility.	Serdyukov (2017)	
Security risks in computer-based technology	Health care (general)	Literature review	Previous studies	N/A	There is a risk with online information due to no or little peer review and no quality filter on the Internet, and therefore anyone can claim to be a medical expert and mislead patients into believing their views.	Cline and Haynes (2001)	Security risks in computer-based technology impact on older adults confidence in using technology for managing information and knowledge
	Health care (general)	Literature review	Previous studies	N/A	A computer hack might expose personal health information to the public.	Lynch and Duval (2010)	
	Business	Literature review	Previous studies	N/A	Portable storage devices such as USB might be a risky method for information management as they are easy to lose.	Gorge (2005)	
	Education	Literature review	Previous studies	N/A	Sharing information or discussing with people via social media sites is risking personal information access by others	Tayouri (2015)	
	Information technology	Online surveys and	Undergraduate students	Maryland	Security risk issues in computer-based technology (such as	Lazar et al. (2006)	

		face-to-face interviews	and workplace users (mainly of college Graduates)		computers crash, system congestion causes delays, dramatic consequences for users) can cause personal dissatisfaction and loss of self-efficacy and slow learning.		
	Information technology	Literature review	Previous studies	N/A	Personal computers are easily hacked due to many attack tools on the Internet available for individuals.	Jacobson and Idziorek (2016)	
Lack of trust in the information	Health care (general)	Literature review	Previous studies	N/A	Poor communication can impact on patients' trust and confidence in health care professionals.	Berry (2006)	Older adults lack trust in health care information and knowledge provided by health care professionals that they found on the Internet. This might be due to the failure of information and knowledge transactions (such as health care information containing commercial advertising and their previous treatment experience).

Lack of technological competence by participants	Health care	Face-to-face interview	Older people (aged from 56 to 78)	Maryland	Lack of knowledge and experience of the Internet can make online information seeking more challenging.	Huang et al. (2012)	Older adults lack competence in filtering, ordering, keeping and organizing health care information and knowledge that is relevant to them.
	Health care (clinical)	Face-to-face interview	Clinical faculty members of Iran University (aged from 36 to 57)	Iran	Lack of competence in ordering resources might be due to people having little or no information about these information management tools and the ways they are used.	Sedghi et al. (2015)	
	Information management	Literature review	Previous studies	N/A	A lack of ability to put information into order in a manner you can retrieve it can become challenging.	Teevan et al. (2006)	
	Information technology	Literature review	Previous studies	N/A	Lack of PIM skills can impact on a person performing and completing tasks (work-related or not).	Jones (2007b)	
	Education	Face-to-face interview	Postgraduate students	New Zealand	Lack of PIM skills can lead to difficulty and be time-consuming when retrieving information.	Benitez and Pauleen (2009)	
	Education and business	Online survey and a task-based semi structured interview	Adults (aged from 18 to 59)	N/A	Individuals' confidence, and knowledge of the devices influence the use of information management devices.	Balekundargi (2016)	
Lack of time	Health care (clinical)	Online survey	Clinicians	Irish	Lack of time limits individuals gathering relevant information	Flynn and McGuinness (2011)	Lack of time in gathering and sorting through

	Business	Literature review	Previous studies	N/A	Lack of time might impact on individuals 'knowledge development.	Mårtensson (2000)	available health care information and knowledge will lead to the failure of individuals' personal knowledge development.
	Business	Literature review	Previous studies	America, Greece and the United Nations		BenMoussa (2009)	
	Business	Semi-structured interview and face-to-face survey	Shopping centre consumers	The United Kingdom	Lack of time negatively impacts on individuals' knowledge management.	Mouzughi (2009)	
	Business	Literature review	Previous studies	N/A	Lack of time to process information can lead to information overload.	Jackson and Farzaneh (2012)	
	Business	Literature review	Previous studies	N/A	A lack of time leads an individual to search far less information, which forces them to stop information seeking sooner and to prefer easily accessible knowledge sources.	Cleveland and Ellis (2015)	
	Education	Online survey and focus groups	Chemists	Canada	Lack of time might lead an individual to have limited information and not consider all possible solutions before making decisions.	Gordon et al. (2018)	

To sum up, barriers (information overload, commercial advertisement, managing conflicting information, lack of knowledge about computer-based technology, lack of computer-based technology resources, security risks in computer-based technology, lack of trust in the information resources, lack of technological competence by participants, and lack of time) among information management and decision-making have been discussed in various fields such as health care, business, and education. These studies, however, show a lack of empirical evidence and mostly focused on individuals of a younger age, higher education background, and with higher technological skills. Identified barriers were discussed in different health care fields (such as clinical, childhood care, breast cancer, and arthritis) and a range of countries (such as Canada, Australia, Hong Kong, America, and the United Kingdom). This study filled up the gaps by providing empirical evidence by an action learning study in New Zealand with older participants (between 46 and 75 years) with less (high school) education background, and limited computer/technological skills. The same issues yet with different effects were found by this study. For instance, a previous study by Sedgwick et al. (2016) found that the issues of information overload in health care studies can impact on individuals' critical thinking and decision-making abilities, as well as information seekers' intending to use online health care resources (Swar et al., 2017). This study, however, found health care information overload is time-consuming when locating information, difficulty in judging the accuracy of information, causing confusion.

To address the barriers to effective information interpretation and decision-making, a four-stage PKM strategy was identified through coding and interpretation of the action learning process. This is discussed in the following sections.

5.3.1.2 A Four-Stage PKM Strategy

In this study, participants were asked to practice PKM strategies that they learned from their group members (including the facilitator). Through the training experience, participants provided insight into the potential application of these approaches in developing personal knowledge management. Figure 5-4 illustrates a four stage PKM strategy for effective information and knowledge interpretation and decision-making. This is identified through coding and interpretation of the action learning process.

'PKM" represents the conceptual categories of 'gathering', 'management', 'evaluation', 'networking and sharing'. PKM refers to a four-stage information and management strategy which assists an individual in optimizing their health care decisions. Stage 1, gathering credible information and knowledge through the process of an information and knowledge gathering pathway, information and knowledge filtering, and identifying credible information when seeking information and knowledge. Stage 2, utilizing computer-based technology, non-computer-based technology, and categories of information and knowledge to assist with information and knowledge gathered. Stage 3, evaluating information and knowledge for alternative treatment options via personal criteria and decision-making tools. Stage 4, networking and sharing information and knowledge via social media or face-to-face communication.

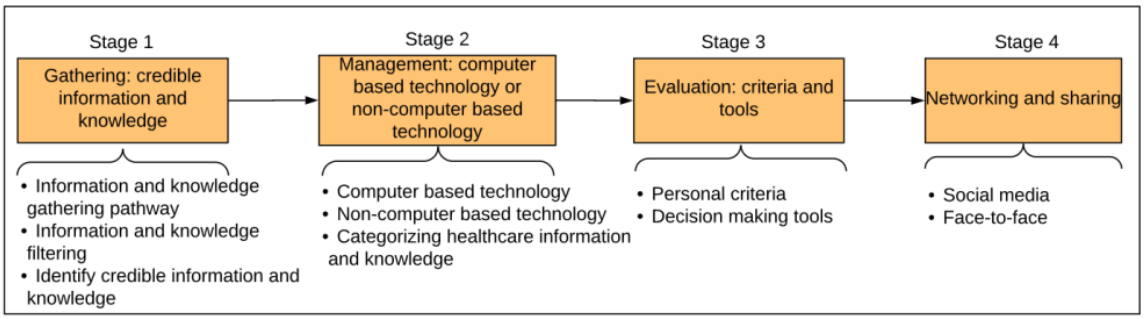


Figure 5-4: A Four-Stage PKM strategy

5.3.1.2.1 Stage 1 – Gathering: Credible Information and Knowledge

The key findings in this section include participants' insights of effective strategies for gathering credible health care information and knowledge. The conceptual category of 'gathering: credible information and knowledge' is a strategy which individuals use to resolve their need for seeking trustworthy and valuable information and knowledge that is relevant to them. The conceptual category of 'gathering: credible information and knowledge' are grounded in three code categories: *information and knowledge gathering pathway, information and knowledge filtering, and identify credible information and knowledge*. Figure 5-5 illustrates the participants' insights of PKM strategies for effective information and knowledge interpretation and decision-making. The findings of the study suggest that the strategies for information seeking play an important role in

guiding older adults to discover the information they need. Participants reported that this was the most critical stage as everything else follows. The strategy for information and knowledge searching includes *information and knowledge gathering pathway, information and knowledge filtering, and identifying credible information and knowledge*. According to participants, the strategy can help with reducing the issues of commercial advertising, information overload, and conflicting information when seeking health-related resources. As one participant notes:

> *"Session one homework (apply discussed strategies in health care information and knowledge searching it) was important to just flush through all the stuff and pinpoint the data (health care information related to their condition)" (Participant 5).*

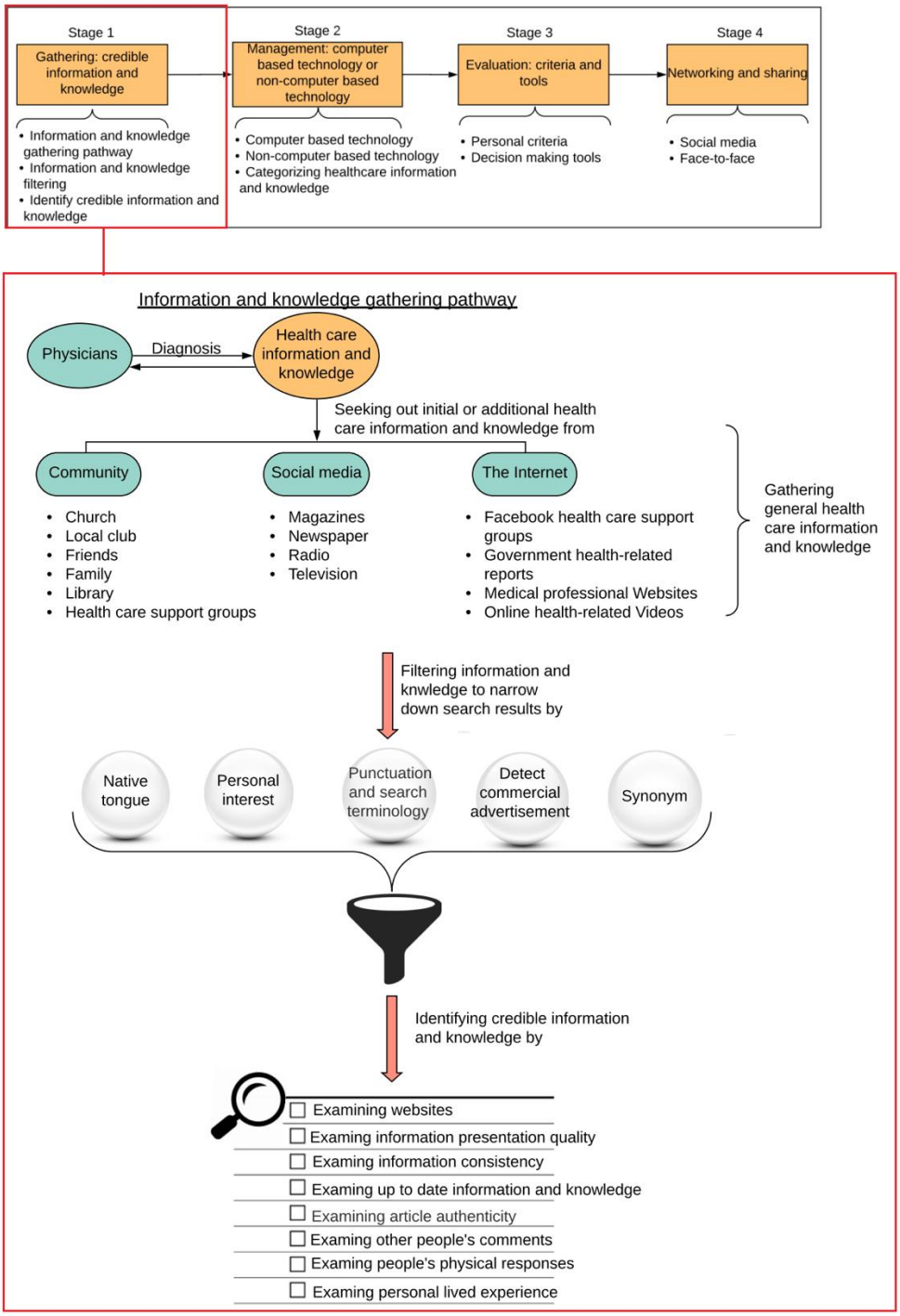


Figure 5-5: Strategies for Gathering Credible Health Care Information and Knowledge

Effective methods of an information and knowledge gathering pathway for older adults are discussed as follows:

Information and knowledge gathering pathway is a strategy where individuals gather general resources to assist with the understanding of their own health care conditions. Data shows that participants enter this information and knowledge gathering pathway in the beginning before consulting a doctor or after they received a health care diagnosis from their physicians. Participants point out the diagnosis provides basic information and knowledge about their health care conditions, which guides them with what medical terms to seek. Figure 5-6 illustrates participants' insights to effective information and knowledge gathering pathway.

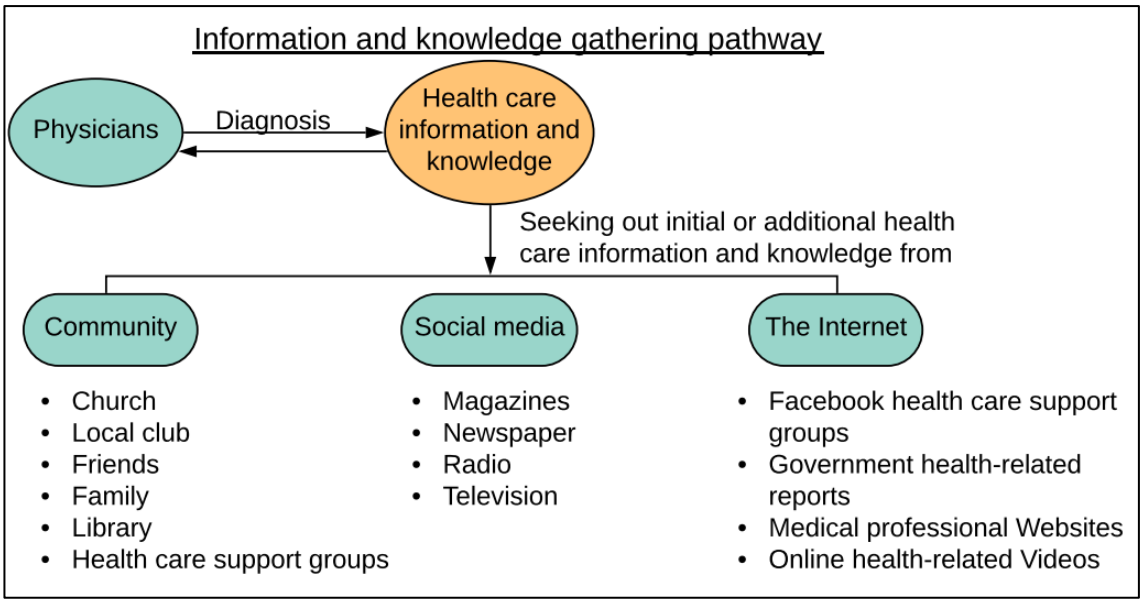


Figure 5-6: Information and Knowledge Gathering Pathway

According to participants, a medical professionals' diagnosis can provide them with basic information and notification for information seeking. Participants commented that with the diagnosis term in mind, they have an idea of what information to look for.

> *"First of all, because I am a person who doesn't really have medical background study or anything. I will go to the doctor, and say "okay, I've got a sore throat. My ear is sore, this is sore, my throat sore. What do you think it is? Then the doctor says "okay, you have an upper respiratory infection or whatever." I got a name now. I can research what that is. So now he (the doctor) will give me medical information, and*

so now I go on the Internet and say "okay, you've got an upper respiratory infection" (Participant 1).

Carlsson (2000) claims that it is essential for patients to get sufficient information from medical professionals to avoid the risk of them relying on non-medical sources to satisfy their need. Physicians play an important role in helping participants to close the knowledge gap of health care information research (Kandasamy, 2017). Yet, Li, Orrange, Kravitz, and Bell (2014) argue that patients possibly left their visits feeling poorly informed because their doctors did not elicit their concerns or did not involve them in decisions about the care they received. Participants' dissatisfaction with doctors' performance might lead them to believe that their physician is less patient-centred and turn to seek additional information from outside their medical centre.

This study found that most participants lack trust in medical professionals, and are very active in gathering information to understand their own health care conditions before seeing physicians. As per participant notes:

"I'd rather be knowledgeable before I go to the doctor. Do you know what I mean? So that I am like in charge sort of, rather than just believing anything the doctor says" (Participant 3).

"We call 'Doctor Google' before we go to see the doctor we check everything many times. We come to the doctors, we say what the problem is, but he doesn't know. So we find ourselves explaining to the doctor what the problem is, and what to do. He just needs to write the prescription for us. This has happened to us so many times. We've gotten so much false information from doctors. We find the correct information on the Internet. I think it's vital here in New Zealand. Basically, we call it "Doctor Google" That's the only doctor we trust here" (Participant 17).

Tan and Goonawardene (2017) assert that seeking information before visiting medical professionals can help patients prepare for their visit and understand what the physicians tell them. When seeking additional health care information and knowledge, participants reported several effective pathways. These included community groups (such as the local church, club,

family, friends, local library, and health care support groups), social networking (such as newspaper, radio, and television), and the Internet (such as health care Websites and government health-related reports). This study's participants commented that seeking additional information (when supported by information gathering strategies) can help them feel more confident and better understand their own health care conditions. Medical sources are particularly useful as they are clearly set apart from often sensationalist narratives of the media or commercially driven platforms (MacCabe, 2014). This suggests that health care gathering pathways have become an integrated part of contemporary healthcare, and has the potential to provide a baseline of information common to patients.

Community

Participants were aware there was abundant information they can obtain from their community (such as church, local club, family, friends, local library and health care support group). Participants indicated that community organisations such as churches are an important resource to access all sorts of common disease relevant information and engage in support groups. Participants also commented that community groups are easy to access and provide information and knowledge that is likely relevant to them. Participants commented:

> *"I went to the library to find out what is available in the community here. I found the library was the one that gave me a lot of information on what was available out there. I actually got heaps of free things. A diabetes magazine I was looking at that." (Participant 9).*

> *"I get my information from our (diabetes) magazines that come. They are really informative. Also, the guest speakers we have. She (the diabetes support group leader) is really good at getting a lot of good speakers. She asks our opinion about who we want as a guest speaker. So we get a lot of really good speakers coming, so we get a lot of information that way. They attend every study anything that is going, but that's put on by the diabetes education or even health western they put on, lots*

of education. We put on a lot of things together, so I try to go to as many things as I can" (Participant 9).

McDaid, Hewlett, and Park (2017) posit that older patients had more trouble understanding and receiving timely information, yet, club and health support groups can provide them with relevant information regularly, and enable them to exchange opinions and feelings. The findings of this study suggest that although involving communities (such as club and health support groups) require time and energy in travelling, the information gained from communities has an important contribution for them.

Furthermore, this study found that participants rely on human resources (such as family and friends) for information and treatment options. In this study, all of the participants consulted their family and friends about their health care conditions to help guide their behaviour or alternative treatment options (Briggs et al., 2007). One participant's family has been cited as a trustworthy resource especially in regards to treatment decisions. Smith (2011) states that family and friends are particularly helpful when physicians are unavailable for patients and they are being asked to manage their own health issues. Dutta-Bergman (2004) reports that 71.1% of people use family and friends as primary sources of health information for identifying symptoms, determining possible treatments, and making particular lifestyle changes. Fiksdal et al. (2014) claim that the older people in particular trust living sources of information, such as recalling their personal similar health situations in the past or asking people who might have had a similar health-related experience. This is might be due to older adults being less inclined to use self-directed forms of health management, and less interested in independently gathering health information to manage their own health (Chaudhuri, Le, White, Thompson, & Demiris, 2013)

In a study of library use and users, Dent and Yannotta (2005) report that the library community addresses the information needs of older adults, which provides a place to acquire skills and knowledge about health care. In this study, participants commented that local libraries include various resources and free services (such as books, DVD and program) and provide user

guidance and support to help them search for specific health care information. This suggests that the local library is a useful resource for older adults to seek health care information.

Social media

Participants suggest that social media (such as newspaper, radio, and television) allows them to acquire the latest health-related knowledge that can be important resources for decision-making. One participant commented:

> *"When my mum got sick, I was listening to the radio over in Ireland with mum's lungs they got a drug over there called coli deco. I thought that might help mum, so we asked the doctor over here to look into it. They looked into it, but they said it wasn't quite right for mum. But if it wasn't for the radio and the Internet, I wouldn't have known about it. So I have learned not only through Google but listening to the radio from overseas for information" (Participant 16).*

Napoli (2001) cliams that medical information can be gathered from mass media sources like television, radio, newspapers, and magazines. Yet, Rains (2007) argue that not all types of media are trustworthy. Rains suggest that typically contained information (such as newspapers and magazines) have more credible information and allow patients to engage in active, goal directed searches for medical information. Though, entertainment-oriented media such as television and radio provide less reliable information. This suggests that media coverage of medical innovations helps older adults take control of their health care needs. However, it is essential for older adults to identify trustworthy information from all types of media.

The internet

Participants commented that the Internet websites were the easiest way to access formal and informal information, such as medical professional websites and government health-related reports, as well as online health-related videos and Facebook health care support groups.

> *"Going through Google you will get the typical advert stuff, still a little bit of education stuff, and then just going through some of those sites you would pick out the Harvard University or institutions that are associated to health" (Participant 5).*

"I have been collecting information I need from the Internet. I go on the Internet, so I can look for different gyms or different fitness options. Because there is so much stuff on there from YouTube and that, you can get all sorts of information from there. I found it's easiest to go to because I don't really go to books, so I don't go to libraries. Mostly I go to the Internet because it is the easiest way I suppose" (Participant 14).

"You can find all the knowledge on the internet. You can find people who are suffering from the same thing as you, and see what they have been through, what they found is the best for them, and they share their knowledge" (Participant 17).

The Internet provides individuals a learning opportunity from others, such as watching or reading information that is related to someone else's personal experience with a medical or health-related issue on the Internet (Joseph, 2017). Indeed, online health care information can increase participants knowledge of, competency with, and engagement in health care decision-making (Tonsaker, Bartlett, & Trpkov, 2014). According to Kim, Shah, Namkoong, McTavish, and Gustafson (2013), patients feel relieved or comforted by the information they found online and have more confidence to make decisions about their health care. This suggests that through the support of information gathering strategies, the Internet is effective for older adults to seek and acquire health care information and knowledge.

This study found that the Internet and social network sites such as Facebook and health care support groups can provide older adults opportunities to share medical information and to provide and receive support with people who have similar health issues. Facebook is a social network platform received around the world. One participant commented:

"I didn't have the remedy that they said which was go to a doctor. They weren't available. So I couldn't do what I had on research. So I had to go through a different avenue which was on a blog and on social media which was Facebook. That's where I went" (Participant 1).

The easy accessibility and the popularity of Facebook has created opportunities for the evolution of support groups (Mustafa, Short, & Fan, 2015). Mustafa et al. (2015) examined health care

support groups on Facebook, and reported that most health care support group members are willing to share and offer their knowledge and experience so as to be helpful for others. Therefore, about 44% of patients are able to find potential treatment options from Facebook support groups (Lönnqvist & Erkkilä, 2017). This shows that social media such as Facebook increases health care information seeking opportunities for older adults.

Furthermore, this study found that participants use other Internet forums such as online videos (YouTube) for seeking health care information. Participants commented that online videos allow users time to pause, go back or forward to get a greater understanding in information and knowledge on health-related subjects. Online videos provided health-related education information that's presented in a simple format by illustrations, which helps laypeople to understand and concentrate much easier.

> *"They (online videos) explain that the average person can understand. That's why I like using YouTube a lot. I actually use YouTube more than Google because I found it a lot easier to understand. I like to learn from videos rather than reading things because I lose concentration after a while. But I like to watch videos, if I don't quite understand it, I can go back and go over it until I do understand it. That' why I like YouTube a lot" (Participant 16).*

Berry (2006) suggests that it is essential to allow time for older patients to process and understand the information and questions, which is in agreement with the results of this study. The Internet with online health-related videos has been found as a useful health care resource for patients. For instance, Pandey, Patni, Singh, Sood, and Singh (2010) investigated using YouTube as a source of information on the H1N1 influenza pandemic. Their report shows that 61.3% of YouTube videos have useful information about the disease. Similarly, Sood, Sarangi, Pandey, and Murugiah (2011) used YouTube as a source of information on kidney stone disease. Their result shows that 58.3% of YouTube videos have useful and relevant kidney stone disease information. Sood et al. (2011) further state that university channel online videos provide the best overall information coverage among the useful videos (100% prevention, 80% symptoms, 60%

treatments, and 80% other information). These studies indicate that the Internet online videos have a substantial amount of useful health care information. As can be seen, patient-generated channels like YouTube could have great potential in helping older adults' health care decision-making.

Information and knowledge filtering is a method to narrow down search results that an individual finds important from a larger amount of information and knowledge and reduce the issue of information overload (barriers to access, accuracy, and relevance). Figure 5-7 illustrates participants' insights on effective methods for filtering information and knowledge.

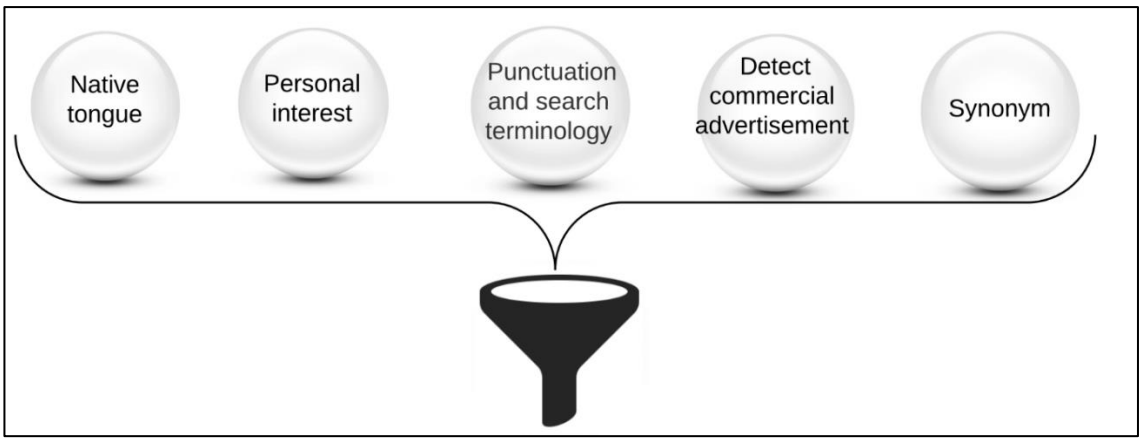


Figure 5-7: Methods for Filtering Information and Knowledge

This study found that the Internet provides a convenient time and local independency pathway for participants to access health care information of varying quality. All the participants, however, experienced the issue of information overload, and felt confused and struggled with a large amount of health care information and commercial advertisements. In a health care study, Klerings et al. (2015) suggest that individuals must process and filter information while being subject to information overload, so as to make correct medical decisions and engage in informed decision-making. This study found that methods of filtering information might help narrow down search results that an individual finds important, and reduce the issue of overload and irrelevant information. Effective methods of filtering information for older adults include the native tongue, personal interest, punctuation, detecting commercial advertisements and synonyms.

Native tongue

This study found that searching information with a natural language dialogue can be easier for older adults to recognize relevant resources. One participant stated:

> *"I use a lot of Israeli websites because Israel is very advanced in medicine, and also because that's my main language so it's much easier for me" (Participant 17).*

Most medical information presents technical information which requires a high reading skill level (Benigeri & Pluye, 2003). Understanding health care information can lead to patient satisfaction, a better understanding of treatment instructions, improvised treatment outcomes, and decreased time and costs (Marcus, 2014). Graf (2007) claims that native language can help people better memorise information and recall words, where as a second language might cause difficulty in understanding the meaning of a word. This suggests that older adults who use different languages might easily misunderstand and might not be able to express themselves as precisely as they could in their native language.

Personal interest

This study found that participants used different information seeking pathways to search for information based on what they were interested in. Participants commented:

> *"Because I have a computer, I can go on Google and if I want to know something, I will just put in what I want to know, and all these answers come up. Not necessarily health things. It's other stuff. You know anything else I want to know. How many kilometres to Wellington from Kerikeri, and all that sort of stuff. Also when you go to the doctor too. You can ask your doctor for information, and they will help you out" (Participant 2).*

> *"I found YouTube very good to find out about information because they use video clips and diagrams and that kind of thing, so I found it very good. I just type the subject I am interested in, for example, cerebral palsy they do a lot of videos and diagrams" (Participant 16).*

Benitez and Pauleen (2009) suggest that personal interest plays an important role in seeking information in giving individuals direction to decide what information to look for and what to keep. Savolainen (2014) posits that personal interest provides positive energy, fills the moment of activating information seeking with enjoyment and stimulates excitement, in which an individual is fully immersed in what he or she is doing. From this perspective, personal interest appears to play an important role in helping individual older adults' look for relevant information that is related to their own conditions.

Punctuation and search terminology

The study participants commented that keyword searches can result in wide and broad information returns. However, filtering information by using punctuation marks (such as apostrophes and hyphens) in keyword searches can significantly reduce large amounts of health care information on the Internet. This is reflected in the following comments:

> *"I never knew about apostrophes and all the rest of it and hyphens. So yes, it does narrow it down from 600 million to 2 million" (Participant 12).*

> *"The more I get on the computer I would probably do it without realizing it, finding information and things like that takes the choice down from two hundred websites to ten websites, so that's another good thing" (putting it in quotations so you can limit your findings* (*Participant 16).*

Many legal information retrieval systems provide complex search screens (Van Opijnen & Santos, 2017). Alternate punctuations can produce different results, since search engines have become sophisticated at guessing different punctuations (Smith, 2012). This shows that punctuation marks and search terminology can assist individuals with searching relevant online information more effectively.

Detecting commercial advertisements

The findings of this study suggest that detecting commercial advertisement can help older adults discover valuable information. Participants reported that this strategy helped them engage in relevant information and filter information more effectively. This is reflected in the following comments:

> *"When I am searching and it kind of makes sense, but it's too long winded and irrelevant. I immediately stop and say Trash" (Participant 5).*

> *"I was able to focus more on what I'm looking for. I picked the right information and moved aside the commercial information" (Participant 17).*

DeLorme, Huh, and Reid (2011) state that with a wide range of commercial advertisement in mass media, patients are likely exposed to a great deal of confusing and conflicting information about medical treatment. Chua and Banerjee (2013) assert that advertising in health care may cause unnecessary fear among patients, as people might not have sufficient knowledge to understand the information. Health care information contains commercial advertising that may be persuasive rather than informative (Santas, Santas, & Ugurluoglu, 2017). Conflicting or controversial health information effects individuals understanding of important health care issues and behaviour (Nagler, 2014). Individuals, in particular older adults, are easily confused by the medical information due to the highly technical language presented in the advertisement (DeLorme & Huh, 2009; Macias, Pashupati, & Lewis, 2007). Thus, detecting suspicious commercial messages in the information can help identify irrelevant material during their search.

Using synonyms

This study found that through capturing search terms, participants were able to recognize what information to look for and capture the ideas described in articles. An online information tool such as 'Thesaurus' can help participants to generate additional search terms. The result from Thesaurus' guides participants to seek wider and deeper and be more focused on the relevant information and knowledge they are looking for. One participant stated:

> *"The synonym words give you another word for ear, eardrum, and lobe, so you go search lobe or eardrum or whatever. The 'Thesaurus' is quite important particularly if*

you're starting on your topic and you are not quite sure what you are actually looking for. So you're looking for those keywords to help you then do that search. That has been a big impact, and a big help" (Participant 5).

Vocabulary skills required for information retrieval include the identification of potential search terms, key concepts, possible synonyms, wider and narrower terms, and related terms (Chelton & Cool, 2004). Individuals' language capabilities are critical in generating appropriate search terminology. Yet, people with lower education might be limited by their language capabilities. Using synonyms has been suggested as a useful method to seek relevant articles from irrelevant or inappropriate information. For instance, Niederdeppe, Frosch, and Hornik (2008) examined the relationship between cancer news coverage and information seeking, they state that the word "cancer," or a variety of synonyms for cancer helped patients identify relevant articles about the disease from the larger amount of information. Similarly, an information seeking training manual by Grace et al. (2011) notes that synonyms provide alternative keyword replacements in controlled vocabulary terms in which search terms can produce varying search results.

Furthermore, Lawrence, Guard, Meier, and Laflamme (2006) imply that information searchers can use the preferred terms or any of its listed synonyms by 'Thesaurus' and obtain the same search result. The function of 'Thesaurus' is a search tool that helps individuals conduct online searches with satisfactory completeness but with a minimum amount of irrelevant material (Lawrence et al., 2006). This suggests that older adults' information seeking skills might be limited by their language capabilities. However, search alternative terms by 'Thesaurus' can guide older adults to seek wider, and deeper and be more focused on the relevant information they are looking for, to help them target the keywords quicker.

Identifying Credible Information and Knowledge is a method which individuals used to determine trustworthy health care information and knowledge from the Internet or other third parties (such as an individual's family and friends). Figure 5-8 illustrates participants' insights on effective methods for identifying credible health care information and knowledge.

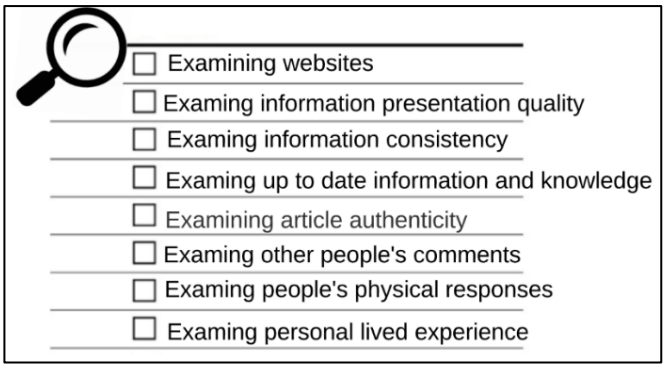


Figure 5-8: Methods for Identifying Credible Health Care Information and Knowledge

This study reveals that identifying credible information enables this older adult cohort to determine trustworthy health care information from the Internet or other third parties (such as an individual's family and friends), and reduce the barriers to accessing accurate and relevant health care information (barriers such as irrelevant commercial advertising and conflicting health care information). Based on interpretation of the data, eight strategies were found to be effective to assess information credibility and accuracy for older adults, which include: examining websites, examining information presentation quality, examining information consistency, examining up-to-date information, examining article authenticity, examining other people's comments, examining people's physical responses, and examining personal lived experience. Metzger (2007) cliams that the use of techniques are needed to identify credible information and reduce the issue of time-consumption in seeking trustworthy resources. Yet, an individual's willingness in undertaking an extensive effort to verify the credibility of information they find online can affect the outcomes (Metzger, 2007).

Effective strategies to assess information and knowledge credibility and accuracy for older adults are discussed as follows:

Examining websites

Participants consider that credible health care information should not contain irrelevant commercial advertisement. Participants commented that these types of commercial advertisement can be very distracting and cause confusion.

> *"Which one works, that part I don't trust because they sound like they are trying to sell me something? One says this works, one says that works" (Participant 14).*

In a health care study, Walther, Wang, and Loh (2004) examined the credibility of advertisements on health care websites. Their report stated that the.com domain has low credibility due to the commercial interests of the website sponsors. Commercial messages often contain the perception of a health care need that persuades patients to seek unnecessary services (Schenker, Arnold, & London, 2014). The domain and advertisements seem an important factor affecting the credibility of health care websites.

Participants also commented that government organisations are legitimate organisations and are less likely to contain irrelevant commercial advertising on the websites.

> *"I trust the information I found because I tried '.gov' so that told me it's a legitimate website. They seem to have some commercials but it wasn't much" (Participant 16).*

Government organisations contain more trustworthy information since the material for websites is produced by representatives of the state and other experts (Johannesson & Perjons, 2014). Health care information from.org and.edu sites without advertising can be seen to have higher credibility (Walther et al., 2004).

Examining information presentation quality

This study found that participants' perception of credible information is that it must contain quality grammar and spelling. One participant commented:

> *"In Nigeria where they are conning lots of people. There are lots of spelling mistakes and words in the wrong place and all of that sort of stuff, but people still get conned" (Participant 13).*

Freeman and Spyridakis (2004) defined 'credible' as a person's perception of credibility rather than a measure of actual quality. Appelman and Bolls (2011) examined the effect of grammar on individuals' cognitive processing and evaluation of information. Their study shows incorrect grammar leads people to spend more time reading articles than those that had no errors. Their study also found that individuals believe information with grammar errors to be less credible than the ones with no errors. Low quality of information can lead to wrong or incomplete health care information (Diviani, van den Putte, Giani, & van Weert, 2015). This study found that older adults' trust in the use of information from websites associated with the quality information presented.

Examining information consistency

The study's participants suggest that to judge credibility is to validate information by determining consistent information from different resources. One participant commented:

> *"I think the information is credible. I went to four or five web sites. The general consensus was they all said the same story" (Participant 1).*

Lay people often view several websites to determine if certain information is consistent even though the verification process is usually superficial (Metzger, Flanagin, & Medders, 2010). An inconsistency of health care sources may contain conflicting information or advice and can result in confusion (Lee, Hoti, Hughes, & Emmerton, 2014). Although examining multiple sources of information requires more effort than other strategies, considering the potential biases, it is still a relatively quick and frugal way to obtain a more robust approach to research source or final information updates (Metzger & Flanagin, 2013) for better informed health care decisions.

Examining up-to-date information

This study's participants reported that up-to-date information comprising the latest health care information and knowledge is more trustworthy, and allows them to feel more confident when making health care decisions. One participant commented:

> *"I was looking at something else that I wanted to find out about, if certain foods were affecting me, so I was looking this up. But I just kept looking to see where they came*

from, who wrote them, when they wrote them if they were up-to-date. I found some stuff is really up-to-date. I found a heap of things I didn't realise and didn't know about so I was really pleased about that. I now feel more confident to make decisions" (Participant 7).

Rahmatizadeh and Valizadeh-Haghi (2018) claim that the date of health care information publications is an essential strategy to determine whether information is credible. Often as new medical findings emerge they affect the perception of previously obtained results from older research and in turn validates the use of current information. As such, up-to-date medical information can be valid enough to help patients benefit from health care information websites. However, a website not up-to-date or an article published a few years ago may not include the latest treatment options (Rahmatizadeh & Valizadeh-Haghi, 2018). A good website should display the "last update" or clearly indicate the timelines of the information, and regularly maintain and update their site (The University of Edinburgh, 2018).

Examining article authenticity

This study found that by examining an article authenticity or identifying an online article writers' background can help individuals filter credible information and knowledge. One participant commented:

"One of the doctors that came up on YouTube. He kept coming up on all these YouTube videos all these people have improved in stem cells for themselves. They are all done by him, so I checked him out, and I put his name into Google. I found they have a thing called a quack report which is somebody who says they are a good doctor but they are not, or they have this cure but don't work things like that. They try to make money. The doctor was on the list. He is making out he is the big stem cell guru, but it turns out he has got a bad reputation" (Participant 15).

In a digital environment, anyone can be an author yet author identity or established reputation often lacks authority indicators (Kwan, 2006). Credible health care information includes works

from those such as doctors or health care professors who are revered and cannot be questioned (Mastroianni, Faden, & Federman, 1999). This study's findings suggest that by researching the author's background/history can help identify whether the article was actually written by the person, and confirmed if they were a real medical professional and can be trusted.

Examining other people's comments

Many participants suggested identifying credible information and knowledge by reviewing other people's comments. Participants commented that the Internet allows people to share their treatment experience, some comments are engaging in questions relevant to their health care decisions.

> *"I also listen to people who have cerebral palsy and they say this treatment works. If they believe it works, then you can't argue with that, can you, because that makes a difference in their lives" (Participant 16).*

> *"I looked up the doctor and reviews, people who have been treated by this doctor. I found very good reviews on her that give me more confidence to go to see the doctor" (Participant 17).*

In a health care study, Jones (2009) reported that almost two-thirds of people search for online information, consult blog comments, doctor reviews, hospital reviews, and one in five share their own reviews and comments about health care. This study found that online communities (such as health-related blogs, Facebook closed health care support groups and health care discussion forms) allowed older adults to share their treatment experience and participants were engaging in questions relevant to their health care decisions. Mazanderani, Locock, and Powell (2013). assert that people's experiences is an important source of knowledge as those who have a similar experience understand and offer the right type of support and information. As such, other people's comments can help individuals to determine treatment options, or where to go for treatment.

Examining people's physical responses

A human's physical response has been suggested as a method to examine trustworthy

information received from face-to-face communication. The findings of this study suggest that inspecting people's physical responses can help individuals to sense what others are really thinking, and determine whether their information can be trusted. One participant commented:

> *"I use face-to-face. I used this method because you can see a person's body language. You can see whether or not you can trust their opinion" (Participant 12).*

Lewis (2012) states that body language represents a very significant proportion of meaning that is conveyed and interpreted between people. Body language and facial expressions can provide essential information to help individuals better understand the meaning behind the communication (Vermeir, 2015). This suggests that facial expressions help perceive trustworthiness, and could help older adults to improve the accuracy of their information judgments.

Examining personal lived experience

The findings of this study suggest that personal lived experience, including participants' personal experience and other people's experience, provides participants a general understanding of the issue of information and being able to determine trustworthy information and treatment options.

> *"The first thing you do is ring Mum. Mum had seven kids. She knows what it's all about. Anytime of the night or anything that was my first port of call if I were in an emergency. You couldn't handle it. The first thing we do as young parents. It was a new experience for us" (Participant 5).*

> *"Why I picked this information is because some of these things are common everyday things that we can face in our lives and families, children, grandchildren whatever. A lot of these things that I applied there, I knew the symptom so it was easy to do it myself…..it's just from my experience, life experience, and knowledge" (Participant 4).*

Pérez Salgado, Wilson, and van der Klink (2014) state that life experience is the knowledge that individuals acquire by engagement with each other and learning from action. The knowledge

gained from previous experience that an individual can bring to a text (Griffiths, 2008). An individual's previous knowledge about information will provide meaningful links for new information, which helps to choose alternative treatment options (Sohlberg & Turkstra, 2011). For instance, if people perceive that the situation is familiar, they will process the information in a self-referential way, and the review becomes more credible, effective and trustworthy (Minazzi, 2015), since people with prior knowledge have wider criteria, selecting the information they are looking for and evaluating information credibility more easily (Karimi, 2013).

5.3.1.2.2 Stage 2 – Management: Computer-Based Technology or Non-Computer-Based Technology

Abdolahi, Tahamtan, Abdollahi, and Abdollahi (2012) suggest that the human memory is unreliable when retrieving information, so it is essential to use some techniques and tools to organize and keep information and knowledge in the right place for later retrieval. The key findings in this section include participants' perception of effective strategies for managing health care information and knowledge. The conceptual category of 'management' is a strategy which individuals use to organize and secure information and knowledge they gathered. Three code categories were found to assist with this activity: computer-based technology, non-computer-based technology and the strategy for categorizing information and knowledge. Figure 5-9 illustrates participants' insights of an effective strategy for health care information and knowledge management.

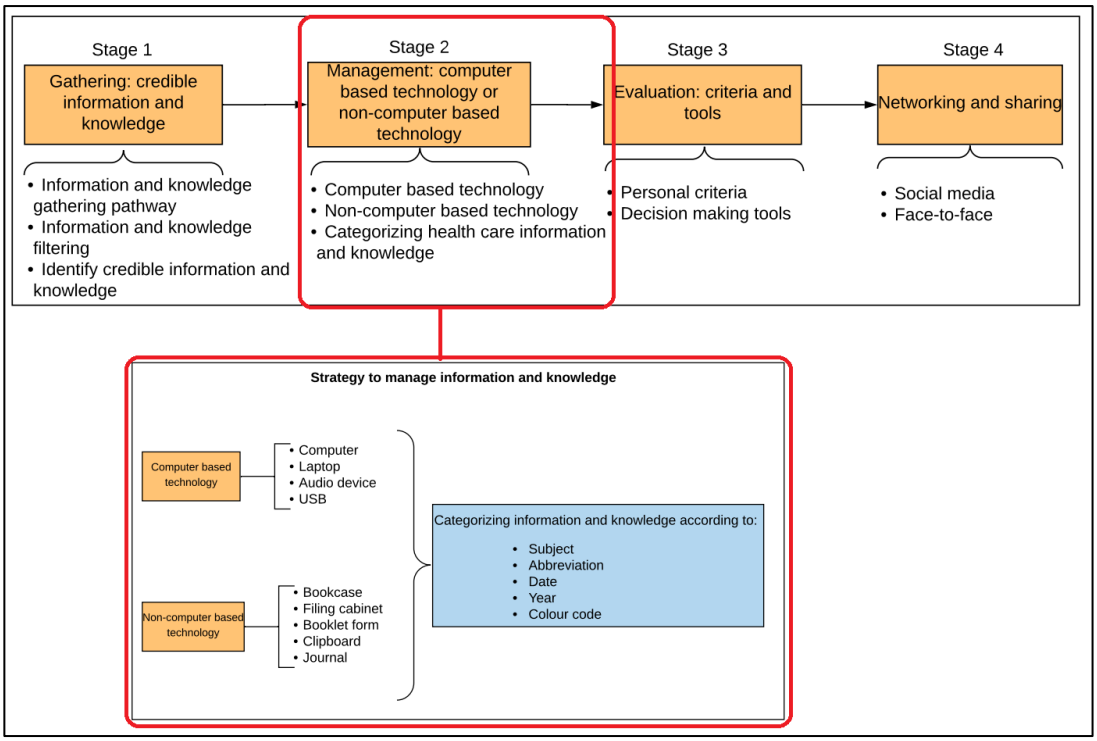


Figure 5-9: Effective Strategies for Information and Knowledge Management

The data shows that most participants do not trust the security of computer-based technology. Murdaugh (2007) suggests that a double protection system can improve the security of resources. In this study, participants with some computer skills tend to use both computer-based technology and non-computer-based technology to secure information and knowledge they have obtained. Participants commented that the best way to secure information and knowledge is to use multiple techniques and tools (such as computer and a paper filing cabinet), to backup files to ensure resources would not be lost.

5.3.1.2.2.1 Computer-Based Technology

Participants stated that computers assist with information technology such as bookmarks, cloud, Dropbox, web browser history, Google drive, computer desktop or taskbar or hard drive, and excel spreadsheets are a fast way to store and retrieve information. Below are three examples of participants interpretation of the benefit of using technology for managing information and knowledge.

"I think that bookmarks is probably the best way for me. The reason it's the best way for me is because I can go anywhere to anybody's place. If they have got a computer, I can go on the computer and login, and all my bookmarks and stuff is there so I can get it. The bookmarks, I mean I can get them from anybody's computer doesn't matter. Absolutely anywhere even on my phone if I want to" (Participant 14).

"Because I work a lot with computers, I use cloud (an information technology), Google drive, and I use Google, Dropbox. So whatever I do I make folders in there, and I put different things, it's like a filing system. So if I want to do research on say allergies. I put into that folder and if I need any information I bring it up" (Participant 1).

"Why don't you do this and have an excel spreadsheet, and then you can link with this to that. So you can link it if you have HTML link, you can bring out the documents. So you can know where it is" (Participant 1).

O'Kane, Hargie, and Tourish (2004) state that computer applications solve the growing information storage problem, and it can usually be retrieved much quicker than from a traditional filing system. Yet, older adults with less education would have lower levels of computer knowledge and higher computer anxiety (Czaja et al., 2006). Xie (2003) aruge that computer knowledge is related to one's experience. Xie asserts that experience with computers leads older adults to more positive attitudes toward computers. This study found that participants who have some knowledge about computer-based technology tend to use at least one device as their main tool to manage information and knowledge. Thus, the confidence of using computers for managing health care informaiton is related to one's computer knowledge.

Moreover, participants commented that memory sticks and audio devices are easily used for information and knowledge recording, transfer and storage for later use. This study found that small devices help older adults to carry information from place to place.

"If I need to transfer files to another computer, I found the USB is very good. If I had some stuff on my computer and I wanted to take it down to my son or my friends and

say "Look! Go and plug this in and have a look at this." It's good for that, so it works for me if I need to transfer files to another computer " (Participant 15).

"I used to use a tape recorder. I read my notes off the tape recorder like that. I listen to the notes when I am in the car. That's how I used to learn my subject. I don't like to write information. It takes me ages to write. So I use electronics all the time to store information, stuff like that" (Participant 16).

Audio recordings have been suggested for patients to store health care information on for informed decision-making. Wolderslund, Kofoed, Holst, Axboe, and Ammentorp (2017) investigated the effects of digital audio recording technology used by patients and their relatives in different health care settings. Their results show that the method of storing information by audio recording helped patients increase the chance of fulfilling their self-perceived information needs, as well as satisfaction and confidence in decision-making. As audio recording makes patients feel more informed, particularly about treatment alternatives, as well as improved recall and understanding after replaying the information (Wolderslund et al., 2017). Daymon and Holloway (2010) state that an audio device is an easy method to manage information, as it transfers information to a computer for storage and playback on any device. Jacelon and Imperio (2005) report that patients with peripheral neuropathies in their hands, if provided with an audiotape, may find it much easier for them to store information. This study's findings indicate that storing information by audio recording can be helpful for older people who dislike or have difficulty in handwriting.

Benitez and Pauleen (2009) note that technology can help in developing an indiviudal's information and knowledge management skills more effectively. The findings of this study suggest that memory sticks (also known as USB or flash drive) might be an easy way to help older people transfer and store health care information. A memory stick is a small device that connects with a computer through USB ports, which also functions as a kind of portable hard drive (Bushong, 2013; Tipton & Nozaki, 2009). Memory sticks are a common tool to help people store PDF formats and digital requirements and documents that can be opened with their software tools (Van

Domburg, van den Berg, Wijnhoven, & Kurtev, 2009). Brereton (2013) claims that a memory stick's design is flexible allowing a partially sighted person to easily put it into the port and make it work. This study's participants commented that the memory stick is an easy method for them to store information as it is a removable device and it makes information portable and easy to retrieve from any computer.

5.3.1.2.2.2 Non-Computer-Based Technology

Most participants commented on the effectiveness of using traditional hard copy filing systems (non-computer-based technology) to store, retrieve, secure or backup information. These techniques include the bookcase, filing cabinet, booklet form, and journal. One participant commented that traditional hard copy filing systems are easy to use, and do not require computer-based technology skills.

> *"I would probably just put them into a filing system because I am not so computer literate, and I don't know how to do all these boxes, and that Dropbox you (other participants) were talking about" (Participant 2).*

In this study, many participants lacked computer-based technological abilities. Jones (2010) suggests that a paper filing system does not need a computer or a power supply, and it can be very flexible, portable, and disposable, which is less complex than electronic systems. These non-computer-based techniques help them overcome their lack of technological knowledge and technological resources (barriers to using computer-technology).

Furthermore, one participant commented that he cannot afford a computer and a file folder and cabinet is the easiest way to store information. This study found that the method of non-computer-based technology might help older people to overcome the barrier to a lack of computer-based resource to manage information and knowledge. One participant commented:

> *"The file cabinet worked really well for me, but that's probably because I didn't have a computer at that time. Computers were really expensive back then, so I didn't worry about computers too much" (Participant 14).*

Despite participants showing an awareness of various ways in which digital technology can be used to support the management of informaiton and knowledge, many older adults perceive technology to be expensive and often prefer the "old-fashioned" way of non-computer-based technology to manage information and knoweldge (Andrews, Brown, Hawley, & Astell, 2019). Non-computer-based technology such as a filing cabinet is a piece of office furniture that is usually used to store paper documents in a folder in the drawer compartment, which can be used without the support of computer-based technology (Dubey, 2009). Thus, a file folder and cabinet can be the alternative solution and easiest way to store information and knowledge for older adults.

This study found that many participants do not trust computer-based technology (such as computers and memory sticks). Many participants used non-computer-based technology methods to manage information and knowledge to help prevent the issue of losing data, due to security risks in technology (barriers to computer-technology use), such as power outages or the computer crashing. The following comments reflect the sentiment:

> *"I live in a rural area, we don't have constant power, and therefore when I want something and it's on the computer I'm buggered. Technically I can't work on that, and therefore I still sometimes, on the important things need to have a file, readable piece paper of information on that, which is within my filing cabinet" (Participant 5).*

> *"The way I store information mainly is in a fileing cabinet or on the cloud. I don't use the computer much for storing information because the computer can crash or be hacked" (Participant 17).*

Computer-based information management tools (such as bookmark and cloud) over the Internet allow access to technology (Attaran, 2017). Yet, user's computers can be compromised and information can be stolen by hackers via the web (Hashizume, Rosado, Fernández-Medina, & Fernandez, 2013). Some researchers (Barnett, 2014; Phillips, 2010; Saumure, 2010) suggest that securing information by traditional hard copy filing systems (non-computer-based technology) and backing their data up after transferring it to their computer system. A backup file in a separate

management storage system can help the information still be retrieved relatively easily and the information itself has not been lost (Mushangwe, 2014).

5.3.1.2.2.3 Categories of Health Care Information and Knowledge

The study shows that many participants lack the ability to keep in order and organise resources, using information management tools (such as a file folder, filing cabinet, journal, computer desktop, Dropbox, cloud, and memory stick), as they store information without a strategy. This leads to information overload when information continues to accumulate, and it becomes time-consuming when retrieving resources. To address the issue (a lack technological competence in, keeping in order and organizing health care information), this study found that categorizing health care information (such as by subject, abbreviation, data order, yearly order and colour code) based on an individual's personal preference and needs, might make retrieval of resources faster and easier, and reduce the issues in the managing of information and retrieval time (humanistic barriers in competence and time). The following comments reflect the sentiment:

> *"I would have files, and I will print them or I will write them myself, and I would have that information which is usually for me concerning family sickness like diabetes. I have diabetes, so I would have a diabetic section. I would have a heart section. I do already have a heart section because I got all of those from the Heart Foundation for the things that happened with me, so I think for me the filing system is the way I do it is right for me" (Participant 2).*

> *"I help run a diabetes group, people ring me up and I gotta be able to just grab something, and I know where the folder is. I have it in date order, so I can just put my hand on it straight away, so I found it's really good" (Participant 10).*

> *"I prefer to have colour folders and things like that. I can see at a glance like this colour is predominantly for this course. I am on the society community at church, so it's blue and at a glance I can see things. I quite often go through everything and cull stuff that I don't need" (Participant 9).*

Jones, Wenning, and Bruce (2014) cliam that too much information in the folder may become time-consuming in retrieving information if the user cannot specify the dates or reference numbers that identify the particular documents. A well-configured file system can save time and help retrieve resources quickly and accurately (Forsyth, 2013). For instance, Darmoni et al. (2006) suggests to categorize medical information by decreasing order of medical file importance. Liao and Lee (2002) report that considering the nature of medical data, categorical variables are sometimes useful for decision-making and can extrapolate knowledge more easily. Vest and Abramson (2015) assert that categorizing health care information, into three dimensions (user role, usage initiation, and patient set) can help enhance health care information exchanged between health care organisations and patients' treatment outcomes. These studies indicate that, the categorizing of health care information can enhance the utilization of resources, and reduce the issue of overwhelming information.

5.3.1.2.3 Stage 3 – Evaluation: Criteria and Tools

The key findings in this section include the participants' perceptions of effective strategies in evaluating health care information and knowledge for decision-making. The conceptual category of 'evaluation: criteria and tools' is a systematic method which individuals use to judge information and knowledge they have collected to determine alternative health care treatment options. Two code categories were found to assist with this activity: 'personal criteria' and 'decision-making tools'. Personal criteria is one of the most important factors considered by individuals when choosing between alternative health care treatment options. Figure 5-10 illustrates participants' Insights into an effective strategy for evaluating information and knowledge for optimal alternative health care decisions.

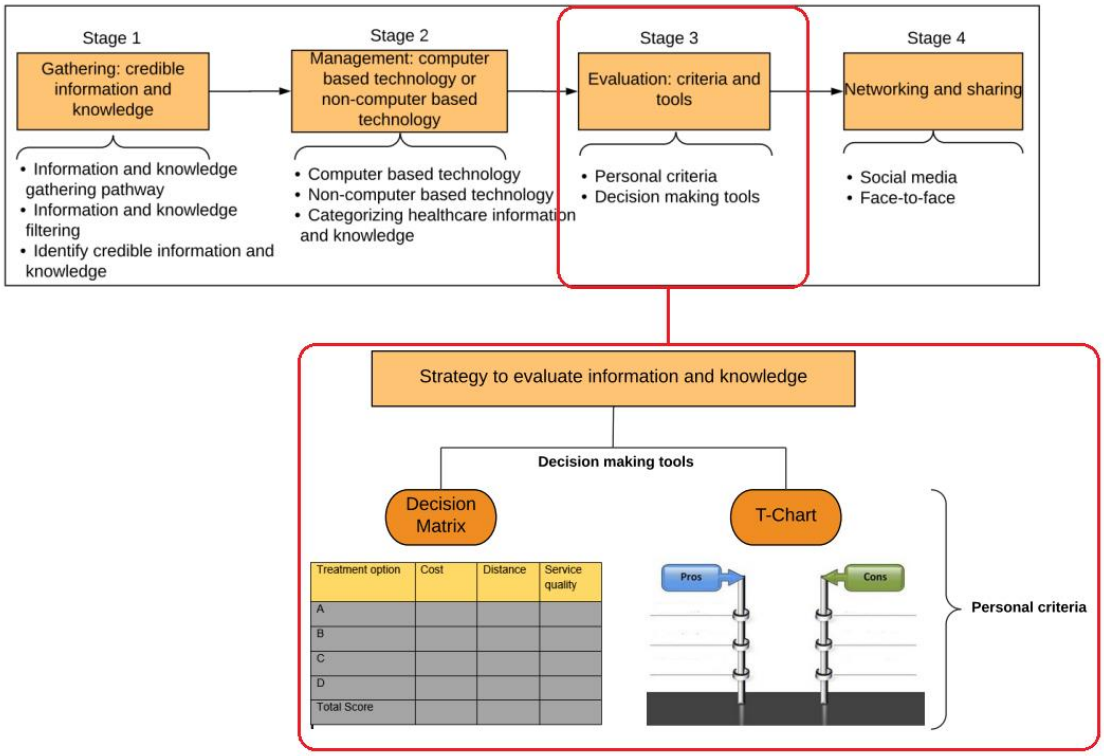


Figure 5-10: Effective Strategies for Evaluating Information and Knowledge

Uugwanga (2017) claims that an information evaluation method is needed to assess the relevance of information before it is used. Once individuals find information, they match what they find with what they need and already know. The method of evaluating requires individuals to critically think about the information and knowledge they've obtained (Uugwanga, 2017). The findings of this study suggest that decision-making tools and personal criteria can optimize an older adults' critical thinking and help them to evaluate information more effectively to make informed health care decisions, while also impacting their confidence in decision-making.

5.3.1.2.3.1 Personal Criteria

The findings of this study show that personal criteria can help participants to clarify confusion when facing multiple treatment options. The most common criteria of concern by participants when making health care decisions were cost, distance, the medical professional's experience, effectiveness, reliability, availability, and safety.

"If we had four doctors to choose from, and all of them can give us a good solution. I would have to choose the one who is closest to us probably. Other things I would consider would be doctor's experience and distance. If the doctor is in another area that won't help" (informant 9)

Personal criteria has been suggested as one of methods to support patient decision-making. For instance, in a study of diabetes' medical decision-making, Lee, Low, and Ng (2013) reported that patient decision is influenced by their personal criteria of life priorities (e.g., health, career, and finance), general philosophy (e.g., worldviews and ethical beliefs), and their background (e.g., family situations). Smartly, Berry et al. (2017) studied the values of patients with multiple chronic conditions to evaluate their decision-making. They reported that patients' personal criteria include principles (i.e., personal beliefs and standards to live by, such as honesty or independence), relationships (with family or friends), emotions (such as joy or serenity), activities (such as working, reading, gardening, or volunteering), abilities (i.e. physical or mental capacities or skills), and possessions (i.e. tangible objects or spaces). This information could be useful to a patient and provider when discussing treatment options. These studies indicate that patients' health care decision-making priorities are shaped by their personal criteria, which help them to determine alternative treatment decisions. According to Kwan (2006), personal criteria is a principle, standard, course of action, or quality which is considered worthwhile, central to people's lives influencing human behaviour. When health outcomes have no clear advantage and each treatment option has benefits and risks, the patients personal criteria becomes the determining factor in treatment decisions (Brown, Gardner, & Bonner, 2016).

5.3.1.2.3.2 Decision-Making Tools

This study found that personal criteria provides a practical guideline for older adults to evaluate the health care information. Personal criteria assisted by decision-making tools can help the process be more explicable and is easier to make optimized decisions. The study's participants commented that these decision-making tools (such as decision matrix and T-chat) bring their attention to the personal criteria, and determine what is most beneficial to them, in order to choose between alternative treatments options, and making optimized health care decisions. Figure 5-11

illustrates an example of determining alternative health care options via the techniques (decision-making tools and personal criteria).

> *"I used the decision matrix (a decision-making tool). I found that really helpful. I never thought numbering things from the weakest to strongest would be so beneficial. It truly was, it jumped out quite easily to the total score that it gave me. That worked out it was the cheapest one too. It is easily achievable, so it was actually a really good method to use. I really enjoyed it" (Participant 9).*

> *"The decision-making methods (tools) are great because it is like making an informed decision. It makes me more confident in my decisions because you've looked at all the other options you added them all up, and you come up with one, even though you might be surprised. You might think "Oh! Okay." But from the laws of mathematics and averages, what you have done and facts you put in, you work out the best option for you. That's what I like about it. I think it is brilliant. I will definitely use this for the rest of my life" (Participant 15).*

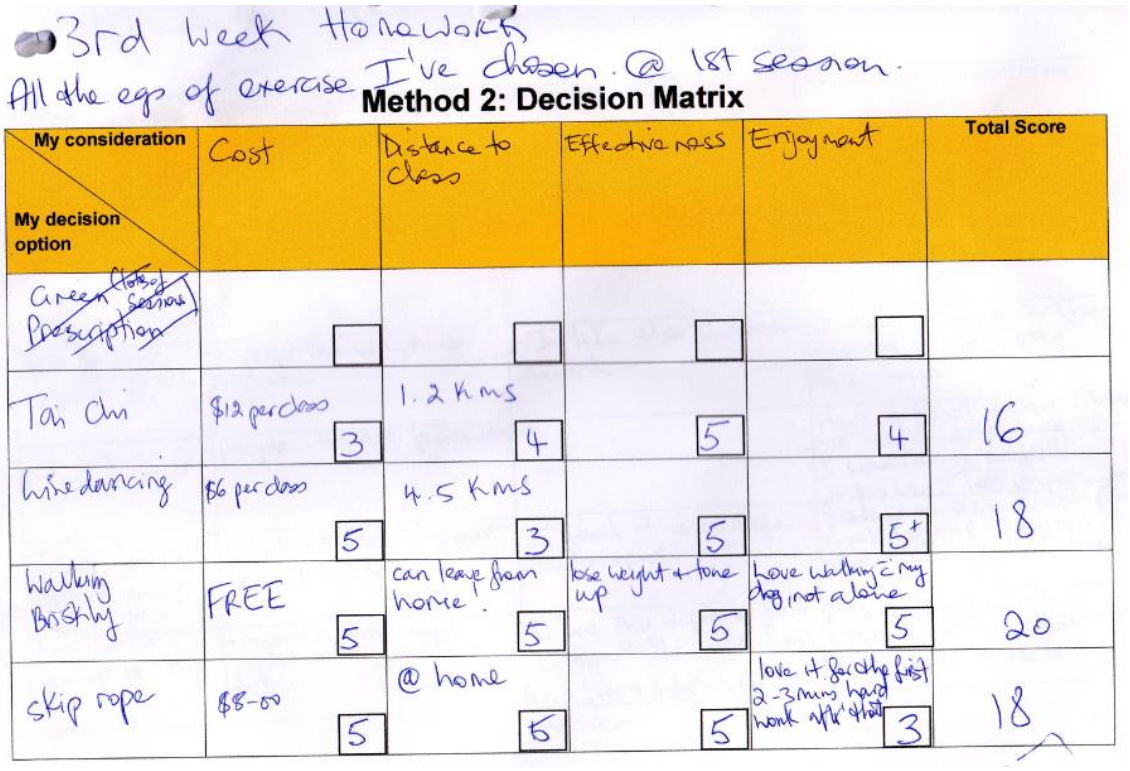


Figure 5-11: An Example of a Decision Matrix and Personal Criteria Techniques

According to Spath (2009), decision-making tools allow decision makers to evaluate, score, and compare different alternatives based on their criteria. These tools allow individuals to organize information, compare their experiences, synthesize information and promote critical thinking (Parrish & Johnson, 2010). The findings of this study suggest that decision-making tools (such as T-chart and decision matrix) provided an effective approach to a systematic consideration (personal criteria) in a practical format to guide and lead older adults to make a more confident health care decision.

The decision-matrix is a standard format for evaluating options. Vaughn (2010) states that a decision matrix is a deductive tool for general decision-making with various options. A decision matrix provides a structure that compares options that may not be directly comparable because of their complexity. A decision matrix gives decision makers' a list of alternatives and criteria using a table of rows and columns to weigh each option. The weighing of each option is used to give decision makers' preferences by the importance of the criteria (Lu et al., 2007).

It has been suggested that the decision-matrix be used as an aid to support patients with treatment decision-making. In a health care book, Leamy (2009) suggests using a decision-matrix to choose between alternative health insurance plans to find the best investment. Similarly, Löckenhoff and Carstensen (2007) use a decision-matrix to help older adults to choose among physicians (top) and health plans. These studies suggest that decision-making tools can offer rational support to patients when making alternative treatment options. In this study, participants commented that a decision-matrix allows them to place importance on each option. This relieved their emotion and confusion about alternative treatment options and helped them make informed decisions.

The findings of this study suggest that the T-chart is another effective decision-making tool for older adults.

> *"The pros and cons one (T-chart), that was the simplest one, took me less than five minutes to write down pros and cons about each thing, so that one is easier for me " (Participant 1).*

"I tried the T-Chart. The pros were it was an easy way to take medication', and whether at home or traveling instead of having an injection, and there are no side effects with that. The cons for that was I still need to watch my diet, have regular meals, and have regular daily exercise. It's not really a con, but it's something extra you have to fit into your day. The T-Chart helped me with thinking about what I am doing, which way I am going. I am quite happy with what I am doing. The T-Chart keeps me thinking about things" (Participant 10).

Bergstrom and Randall (2016) claim that all options have positive and negative sides. A decision-making tool (such as T-chart) encourages decision makers to consider all positives and negatives of each option when making a decision (Shim, Thompson, Richards, & Vaa, 2018). Moreover, decision-making tools help individuals gain evidence from personal experiences to support or refute their claims, and develop core ideas and the understanding of concepts (Shim et al., 2018). For instance, Also, Capizzi (2008) used the checklist of T-charts to guide teachers to identify students' needs and write more specifically targeted annual goals and short-term objectives for education program development. As can be seen, a decision-making tool can help individuals' organize information based on their personal criteria and synthesize them to promote critical thinking. In this study, all participants commented that the technique is easier and less time-consuming when comparing alternative treatment options and helped them make health care decisions more rationally and confidently. The techniques (personal criteria assisted with decision-making tools) therefore might be a potential solution for older adults who have a lack of time when making alternative treatment decisions.

5.3.1.2.4 Stage 4 – Networking and Sharing (Social Medial or Face-To-Face).

The key findings in this section include participants' insights on effective strategies for sharing health care information and knowledge with others. The conceptual category of 'networking and sharing': social networking or face-to-face is a strategy which individuals use to exchange their ideas, experiences, and personal thoughts with each other. The conceptual category of 'networking and sharing' are grounded in two code categories: social networking and face-to-face. Figure 5-12 illustrates participants' insights to effective strategies for networking and sharing

health care information and knowledge. The findings show that networking and sharing information and knowledge with others might help individuals stimulate or assist with their health care decisions. This sentiment is reflected in the following comments:

> *"There were different ways of commenting, so I did it on social media which was Facebook, and different things because I belong to a group, people who have mothers, first time mothers, and stuff like that, that ask for advice and stuff, so you don't give a medical description. You just say what you have done before. So if they don't want take your advice, that's their choice. But you put it out there and that's their decision to take it or not and they can go further or they can ask somebody else, or they can go to a professional in that case" (Participant 1).*

> *"Sharing information stimulates discussion within a group (face-to-face). Yes, it could influence my decisions, but depending on whether the person is a specialist in their field or whatever, and the knowledge imparted pertains particularly to me then it will impact on my decision" (Participant 9).*

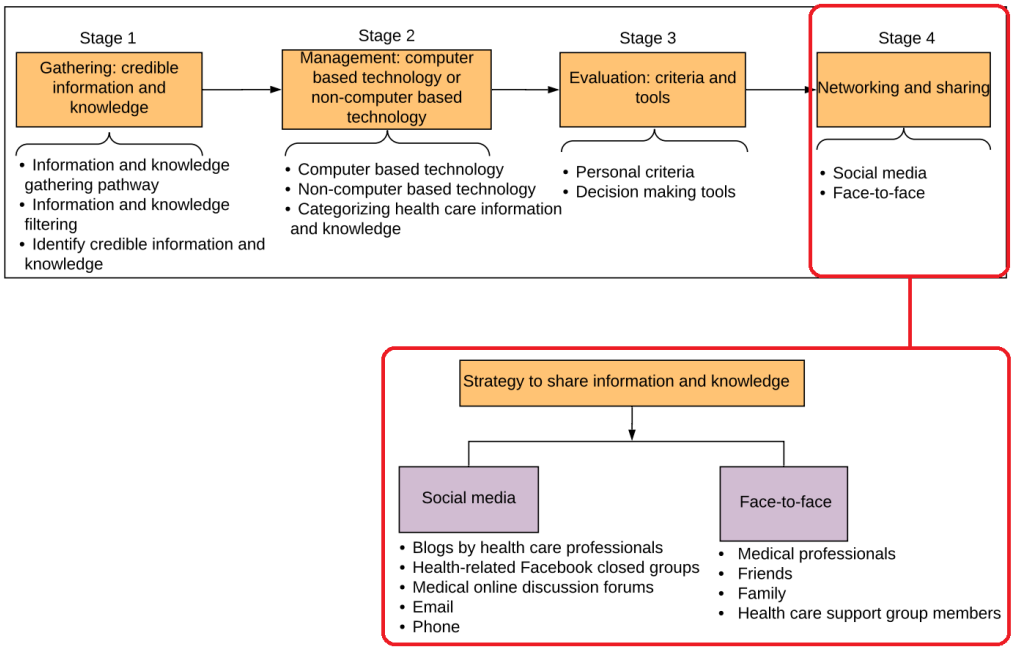


Figure 5-12: Effective Strategies for Sharing Health Care Information and Knowledge

Information and knowledge sharing is a communication process between individuals where people exchange their ideas, experiences, and personal thoughts with each other (Savolainen, 2017). Sharing information and knowledge can help individuals make quality health care decisions and to see other people's opinions (Council, Chow, Teare, & Basky, 2009; Milkman & Berger, 2014). Skirven, Osterman, Fedorczyk, and Amadio (2011) imply that sharing information and knowledge helps patients engage in decision-making. Through question asking, revealed preferences, weighing and evaluating treatment alternatives, and formulating treatment options. Efficient and effective sharing of information and knowledge can help reduce the time and the cost of seeking new resources (Levit, Balogh, Nass, & Ganz, 2013).

Saumure (2010) claims that sharing information and knowledge can help to create a discussion group, allowing the outside world, to access further information and make relatively inaccessible materials more accessible, or seek political gains. In this regard, the techniques of sharing information and knowledge might help older people to overcome the issues and difficulty in accessing health care information. This study found that social networking and face-to-face are two efficient and effective techniques for older adults to help with sharing and discussing health care information and knowledge with others.

5.3.1.2.4.1 Social Networking

The findings of this study suggest that social networking is the easiest and most convenient way for individuals to engage with other people who have relevant health care knowledge or experience. Social networking such as blogs by health care professionals, health-related Facebook closed groups, medical online discussion forums, personal emails, and phones are effective tools for older adults in sharing information and knowledge. According to participants, social media (such as Facebook closed groups) is easy to focus on relevant themes/diseases when sharing information and knowledge with others. One participant notes:

> *"To find the treatment, you won't go off the topic. We have joined a (Facebook) closed group called XYZ association. We were looking for treatment, we posted on the group*

and said 'hi guys, can anyone please give us some suggestions?' So people say try this and try that" (Participant 17).

Social networking offers patients a platform to communicate with other patients and physicians, which can be used to exchange credible, evidence-based health care information and reinforcing advice (Bhatt, Dey, & Ashour, 2017). Social networking has become mainstream, and more people use it to share health care-related experiences (Van de Belt et al., 2015). Denecke et al. (2015) state that online social media can help support health care processes, gather and share information and bring individuals together with communication regarding health-related topics. This study found that social networking, such as health-related Facebook closed groups, provide specific health care themes (such as diabetes or heart disease) which can help older adults focus more easily on relevant discussions. This suggests that social networking leads to a potentially new era in providing health care information to older people (Partridge, Gallagher, Freeman, & Gallagher, 2018).

One participant comments that another benefit of using social media to share information and knowledge is it is easier to engage with a large number of communities.

"I think media, social networking would be how I discuss it (health care information and knowledge) with others because you can reach a larger amount of people if you feel something worked for you" (Participant 15).

Arampatzi, Burger, and Novik (2018) assert that when communicating online, people seek to reduce the uncertainty about members from their real-life and virtual social groups. Statista (2019) reports that online social networking, such as Facebook had approximately 2.38 billion daily active users in the first quarter of 2019. Social networking Web sites help communicate between patients more efficiently (Wise, Alhabash, & Park, 2010). For instance, in a health care study, Greene, Choudhry, Kilabuk, and Shrank (2011) report that over 13% of people share diabetes management strategies and other relevant information on Facebook, and nearly 29% provide emotional support to others as members of a community. Thus, these type of platforms can help

older adults connect and engage with a wider range of communities relevant to their health situation from different countries more easily and effective.

Also, many participants commented that one of the benefits with using social media to share information and knowledge is it has no time restraint. This sentiment is reflected by the following comments:

> *"Because there are people there (social networking sites) 24 hours a day, because where they are it might be during the day, and where I am its night time, but they are awake. So it might be a different country different zone different time period" (Participant 1).*

> *"I didn't have the remedy that they said which was go to a doctor. They weren't available, so I couldn't do that. So I had to go through a different avenue which was an online blog (medical professional sites) and on social media which was Facebook (health-related closed groups) that's where I went" (Participant 3).*

> *"I belong to the XYZ Facebook site. So often we see at night a young mum on there with problems with their babies, and they are really worried, and the doctors are all shut. What should I do? My child is still in this this and this. Do you think I need to find a doctor? Can anyone help me with this issue? You know. Have you got suggestions or experience with what my child is suffering from at the moment? And there will be all of these people who say you should do this, try this, try that" (Participant 3).*

Mustafa (2017) reports that social networking has brought people closer and has led to an increase in the number of support groups for various purposes although there are geographical distances, different ethnicities, and time differences. Social networking (such as Facebook, online discussion forum and email) allows individuals to post and respond to messages from each other, as well as communicate with people at any time (Robinson, 2011). Therefore, a social networking platform can be helpful for participants who have time constraints to discuss possible health-related issues with others. In particular, when they are unable to reach medical professionals at

night time, social networking might help older adults to overcome the issue of a lack of time (humanistic barriers).

5.3.1.2.4.2 Face-to-Face

The findings of this study suggest that face-to-face communication (with medical professionals, health care support group members, friends, and family) is another effective method for older adults to share/exchange information and knowledge with others. This study participants commented that they are more comfortable and find it easier to communicate with a person face-to-face than using other strategies (such as an online social networking platform). One participant commented:

> *"I feel a lot more comfortable talking about things than doing it on paper or whatever. I found it a lot more comfortable to communicate with a person face-to-face……... "It's more informative and you get other people's opinions as well. That's what I like about face-to-face (to share information), you can get a lot more opinions" (Participant 16).*

In a health care study, Shearer, Fleury, and Belyea (2010) found that face-to-face communication creates a relaxing atmosphere, which provides a platform to build trust between people (such as medical professionals, health care support group members, family and friends). Similarly, in a study of patients' help seeking behaviour, Griffiths, Crisp, Barney, and Reid (2011) suggest that sharing information and knowledge with people such as family and friends, and those who are well placed to provide support which patients perceive to be positive (available to discuss matters honestly, comfortable talking to family or friends, and approachable), can assist them in obtaining formal health treatment. This study found that older adults are concerned about the risk of sharing/discussing personal health matters on the Internet due to the difficulty in identifying a stranger's identity (barrier to computer-based technology use). Accordingly, face-to-face communication might offer older adults a safer and more comfortable environment.

The findings of this study show that face-to-face communication stimulated older adults thinking and knowledge, and helped them gain information and knowledge related to health care from the flow of ideas that the others might suggest. The following comments reflect the sentiment:

> *"Even though we are sitting around and talking, just suddenly I'm thinking "oh, yeah. That's right this and that" so I think communication with each other, it's quite a big key" (Participant 14).*

Wang and Woo (2007) suggest that face-to-face communication has greater efficiency in higher perceived interactivity, important verbal and non-verbal communication cues, immediate feedback, and no technical issues. Face-to-face communication provides a questioning opportunity which allows discussions to further stimulate inquiry, critical thinking and reflection (Ruth, 2017). The technique of face-to-face communication might help older adults to overcome the issues of health care information limitation (barriers to access, accuracy, and relevance).

Based on the findings of this study, the conceptual model was revised and is shown in Figure 5-13.

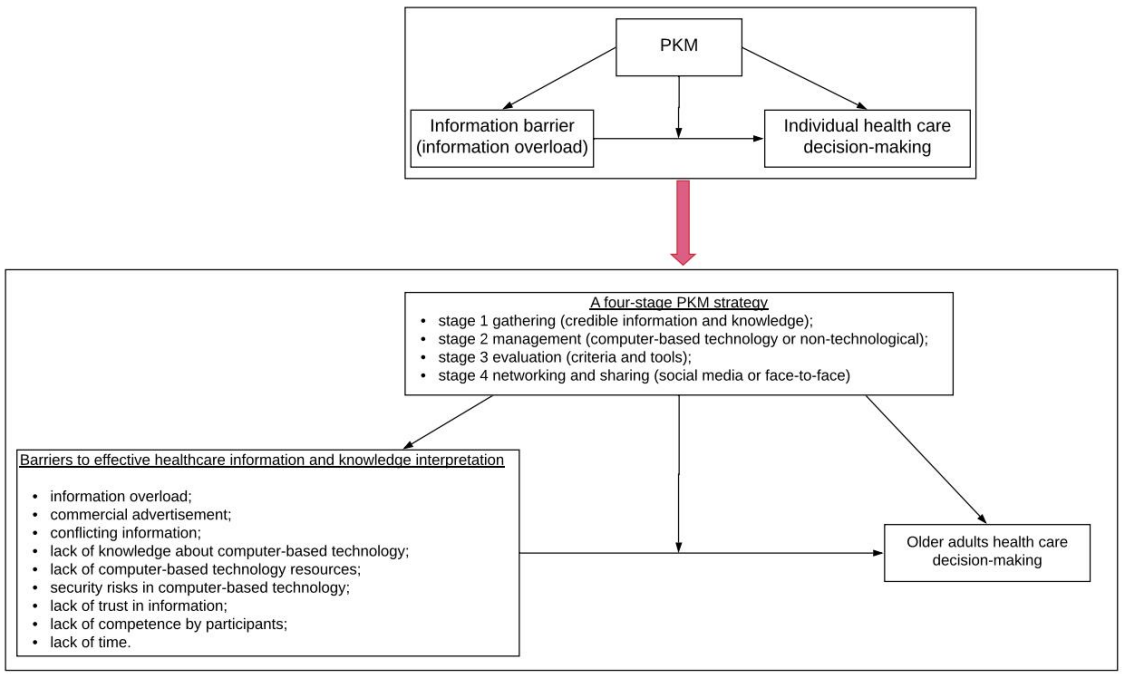


Figure 5-13: The Modified Conceptual Model Grounded In Data

The revised model (Figure 5-13) describes the issues among individual older adults' health care decision-making, and a potential solution (a four stage PKM strategy) to the barriers for effective information interpretation and decision-making. Barriers to effective information interpretation and decision-making refers to those obstacles including, information overload, commercial advertising, managing conflicting information, lack of knowledge and resources about computer-based technology, the security risk in computer-based technology, lack of trust in the information, lack of technological competence by participants, and lack of time. The findings of this study suggest that these barriers have impacted on the older adults' information and knowledge management, as well as their confidence in making health care decisions. Four-stages of personal knowledge refers to the gathering of credible information and knowledge, managing, evaluating, as well as networking and sharing, these stages can assist an individual optimize their health care decisions.

Based on the literature review, I am defined PKM as an ability by which an individual can grow their knowledge and the value of information through technology, personal skills, and processes in order to achieve, in relation to this study, optimized health care decisions. I developed a training program based on action learning principles to help individual older adults learn to access and manage an over-abundance of information and knowledge to assist them to make well-informed decisions for themselves. The findings suggest that a four-stage personal knowledge management strategy could help older adults (with limited computer/technological skills) to overcome the barriers to effective information interpretation and make informed health care decisions. Based on the literature and the results of the study I am now redefining PKM as "a strategy of gathering, managing, evaluating, as well as networking and sharing to develop individual personal knowledge for effective information interpretation and health care decision-making.

5.4 The Findings and Discussion Related to RQ3

This section presents the findings and discussion related to RQ3: how effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making? Based on the thematic coding, the second main theme

('participants' comment on issues related to this training program'), and nine sub-themes ('memory restriction', 'the amount of self- practice exercises', 'the complexity of academic phrases', 'uneasiness with talking to complete strangers', 'low levels of competency with technology', 'struggling to absorb knowledge', 'discomfort with self-practice exercise completion questions', 'potential copyright harm', and 'lack of specific practice topic by participants') related to RQ3 were identified. The Thematic Map and Identified Themes related to RQ3 shows as Figure 5-14.

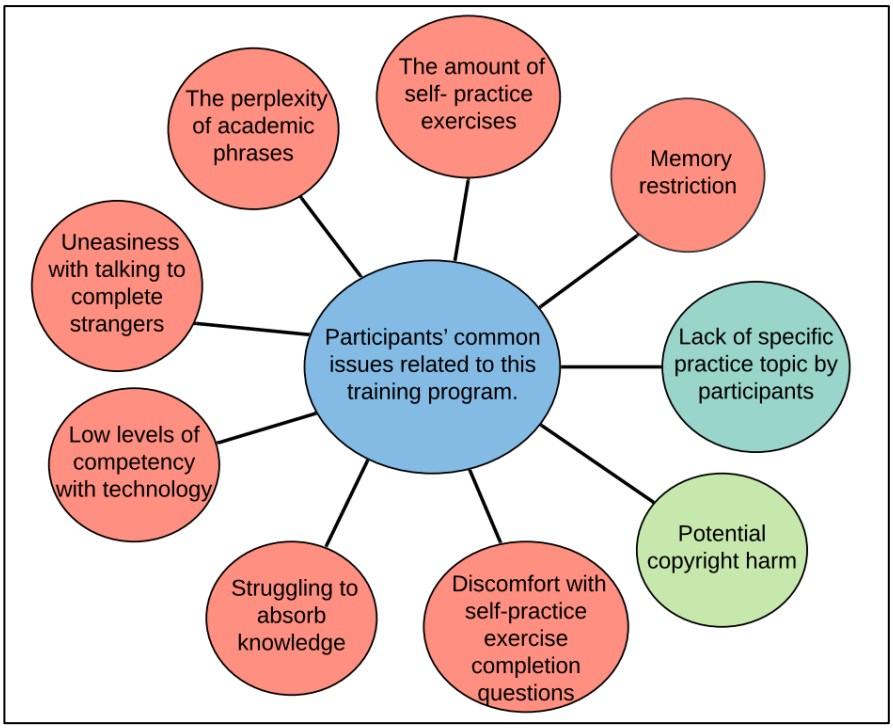


Figure 5-14: Thematic Map and Identified Themes Related to RQ3

The identified main theme and sub-themes report on the key issues I found regarding this training program, which provided a clear understanding of 1) what needed to be refined in terms of program structure, content and delivery; and 2) how to train and learn with older adults. In the next section, the identified main theme and sub-themes in each cycle are first discussed. This is

followed by my reflection on this training program as a researcher, facilitator, and co-learner.

5.4.1 Participants' Comment on Issues Related to This Training Program

Based on the thematic coding, the second main theme '*Participants' Comment on Issues Related to This Training Program'* emerged from analysis of the data, which encompassed all the issues that participants experienced when participating in this training program. The sub-themes that emerged during the pilot study include 'memory restriction', 'the amount of self-practice exercises', 'the complexity of academic phrases', 'uneasiness with talking to complete strangers', 'low levels of competency with technology', 'struggling to absorb knowledge', 'discomfort with self-practice exercise completion questions'. The sub-theme 'potential copyright harm' was identified during cycle I, and 'a lack of specific practice topic by participants' was found in cycle II. In the following section the identified nine sub-themes through the pilot study and the three formal learning cycles are discussed.

5.4.1.1 Memory Restriction

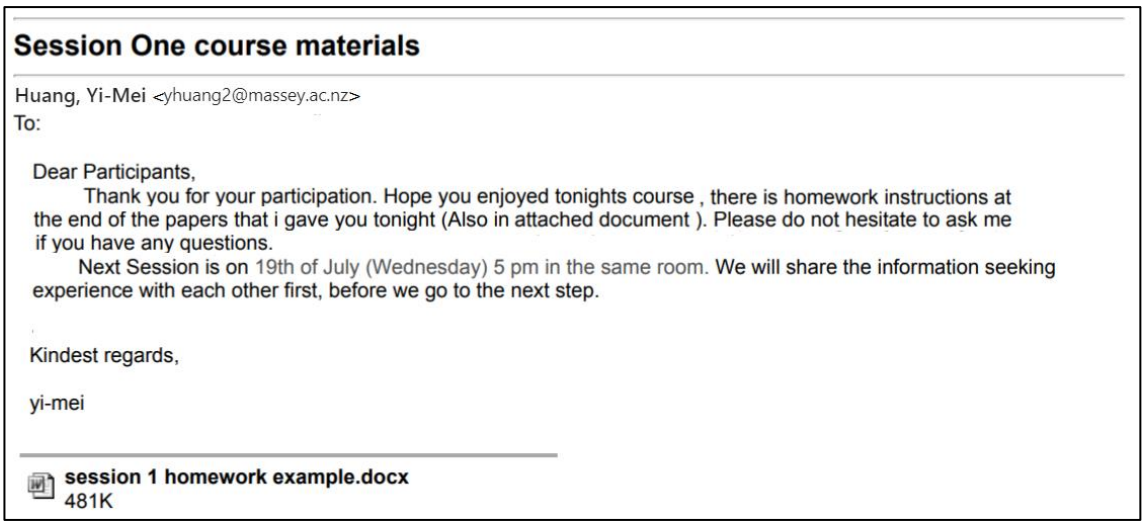
The study found that participants were unable to recall the program introduction that was given in the pre-training program meeting, which described the objective and the procedures of the training program in the Participant Invitation Letter (Appendix D) and Information Sheet (Appendix E). This information was also conveyed through speaking verbally to the participants. One of the comments from a participant as follows:

> *"We didn't have a good explanation about the whole program first before we started in the sessions. We needed like an introduction into it" (Participant 1).*

Regarding memory and brain function; Michelon (2012) found this slows down with age. Age can affect people's concentration and the registering of information in their long-term memory. Michelon suggests that older people can perform to the same level as they used to by taking more time and minimizing distractions. To address the memory issues that affected the training program learning effectiveness, a 15-minute introduction to the project by the facilitator was added to the first session, and a 10-minute '*revision and introduction to today's schedule'* were added to each

session. These changes helped the participants to recall the whole training program design and purpose as well as give participants a clearer idea of what is covered in the following five sessions.

Additionally, Kim (2008) suggests that email technology can enhance an individual's learning making them more effective, efficient, and engaging. Kim claims that the contribution of email to education includes supporting individual needs, learner-centred context, individualized instruction, and exchange of resources and information. Accordingly, a follow up email regarding each course was used to facilitate training activities - remind participants what they have learned and the date for the next training session. An example as Figure 5-15.


Session One course materials

Huang, Yi-Mei <yhuang2@massey.ac.nz>
To:

Dear Participants,
Thank you for your participation. Hope you enjoyed tonights course , there is homework instructions at the end of the papers that i gave you tonight (Also in attached document). Please do not hesitate to ask me if you have any questions.
Next Session is on 19th of July (Wednesday) 5 pm in the same room. We will share the information seeking experience with each other first, before we go to the next step.

Kindest regards,

yi-mei

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Figure 5-15: An Example of Follow up Email for Participants

5.4.1.2 The Amount of Self- Practice Exercises

I noted that in each session some participants did not complete their self-practice exercises. They explained that the tasks were too large and time-consuming to complete before the next session. This also affected discussion in the follow-on sessions and reduced data collection opportunities.

> *"My homework was not quite done, because just to do one search took a whole hour just to do that. So that was only one positive and one negative. So to do five was five hours to get through the information" (Participant 5).*

There is a positive relationship between the amount of self-practice exercises individuals do and their learning effectiveness. Trautwein and Lüdtke (2007) in an educational study assert that it is essential for people to learn the value of self-practice exercises. However, people tend to have lower learning performance when they spend too much time on self-practice exercises. Trautwein and Lüdtke suggest that by stemming the effects of self-practice exercises a reasonable amount of meaningful self-practice should be allocated to keep individuals engaged in the learning process. To address the self-practice exercises issue, it was necessary to condense self-practice exercises. For example, collecting ten articles for each treatment option was reduced to collecting a total of ten articles for all treatment options in session one. Figure 5-16 illustrates an example of the amendment to this issue.

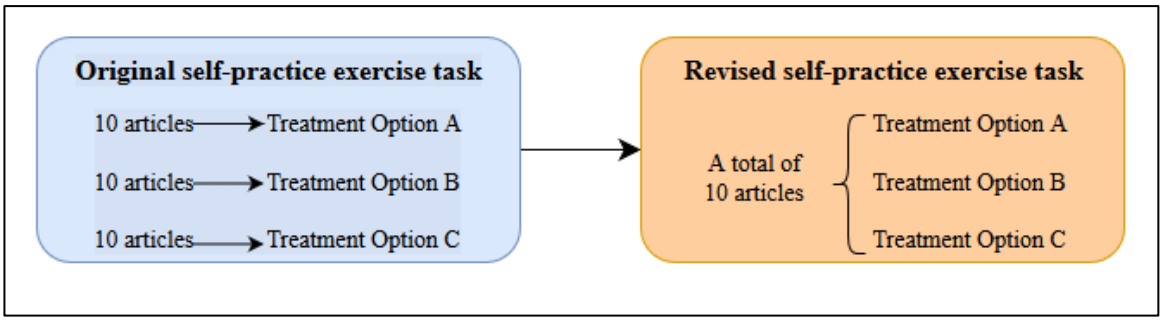

Figure 5-16: An Example of Self-Practice Exercise Revision

5.4.1.3 The Complexity of Academic Phrases

Participants commented that the self-practice exercise questions were written in an academic format, which resulted in difficulty in understanding them. This was also reflective of all the sessions, and participants' inability or unwillingness to do the follow up self-practice exercises.

> *"I feel that the academic component of the questions needs to come back to layman terms for us to understand it……. That's the only thing I felt difficult. Difficult to understand the questions" (Participant 5).*

One's comprehension level impacts understanding, interpretation of meaning, and organisation of thought. Lowenstein and Bradshaw (2004) report that 50 percent of adults were functionally illiterate and have difficulty reading or have a low-literacy level. Lowenstein and Bradshaw

suggest that individuals must be able to understand, interpret, and use the information in order to function on content they have read. Without comprehension, adherence is by chance rather than by choice (Lowenstein & Bradshaw, 2004). To address the overuse of academic language, all questions were rechecked and rephrased to ensure they are simplified and reader friendly. Notes for self-practice exercise sessions (an example shows as Appendix I) were developed and printed on A4 size paper to help participants more clearly understand the instructions.

5.4.1.4 Uneasiness with Talking to Complete Strangers

I found that it was difficult for older people to share and discuss health-related issues with different genders or people who they were not familiar with, when in a group. Participants pointed out that this made them feel uncomfortable. Their comments:

> *"It was a bit personal to start talking about things in front of basically strangers" (Participant 1).*

> *"The other thing about medical is that it's a personal thing, and then maybe it's a group who doesn't really know each other enough, to open up on a personal level. Just being the only male here, it is pretty difficult, five other females you know" (Participant 5).*

To function well, group members must be comfortable and familiar with each other. Pepping (2003) reports that when individuals have formed an attachment to each other and to the group leader, they are likely to be far more effective. To address the uncomfortableness when discussing specific topics with strangers and the different gender issues the method of an "ice breaker" was suggested to be used when the group begins, to help group members get to know each other and feel more comfortable (De Lichtenberg & London, 2008). An interactive game related to the training program, therefore, was applied to the introduction session in the following three formal learning cycles.

This study's participants indicated how important it is to employ a group of people who are familiar with each other as the platform for delivering the training program. Participants stated that as they

were in the same patient support group, this had given them an opportunity to discuss and encourage each other with health-related decisions.

> *"We talk with each other at the meetings and discuss things about our conditions and so forth and treatments and about what we're doing. So we are happy to say things in front of each other. Perhaps we wouldn't feel like this if we were all strangers. So the fact, we all know each other from the group. It makes it easier for us" (Participant 7).*

> *"I think having a smallish group has worked extremely well for us. I think if it had been a bigger group, you would have lost us in the first night. I would have hesitated to come back because we were all able to share our fear as well on the first night" (Participant 9).*

> *"Our support group (i.e. New Zealand diabetes health support group) we are all quite close and help each other. The first time you go to the group, you think what's happening. But everyone gets quite close, so if anyone's got a problem, they just come along to our monthly meeting. It doesn't matter if it's personal or medical. We can usually help each other out so that is a huge thing" (Participant 10).*

In 2006, Auckland District Health Board reported that nine out of every ten patients wanted their family or friends involved in their health decisions. Indeed, the benefits of education require a high level of engagement, a support group often helps people cope with their conditions better (Rankin, Stallings, & London, 2005).

5.4.1.5 Low Levels of Competency with Technology

I noticed that participants have difficulty or lack interest in using computer-based technology (such as the Internet) for information seeking. Their comments implied that this could be related to a lack of knowledge about computer-based technology (the Internet). This has limited relevant information to be gained. Participants commented:

"I am not so computer literate. I got all of those (information) from the Heart Foundation for the things that happened with me" (Participant 2).

"But honestly, for the computer I have always been scared of using computers. Somebody did ask me "why are you scared of using it?" I said "I don't know how it works? I don't know what makes it work?" They said "do you know how the car works? You drive that, don't you?" You know. Do you have to know what makes the thing actually work? I guess just my age probably, not from the computer age" (Participant 2).

"As a woman of 70, I regularly go to a chiropractor. She is an American. She has also been asked to help with health. So I don't use the Internet. I never think about it (using the Internet for information seeking)" (Participant 4).

Lack of knowledge or interest in using technology. Mitzner et al. (2010) investigated factors influencing older adults technology usage and attitudes. They report that older people were less likely to use computers, the Internet and other technology items such as cellular phones than younger people. Factors predicting general technology use were age, education, race, computer self-efficiency, and anxiety (Mitzner et al., 2010). Houser and Oman (2011) in a health care study claim that a step-by-step instruction for participants can enhance participants performance when accessing information. To address the issue of the complexity of self-practice exercises and learning ineffectiveness, an example of step-by-step information seeking by technology (Appendix J) was developed based on my own experience, and reviewed by this study's supervisors.

5.4.1.6 Struggling to Absorb Knowledge

I observed that participants had difficulty in absorbing more than one knowledge management skill per session.

"Participants look to be struggling to learn and understand two methods of managing and judging information and knowledge at the same time" (memo, 13 September 2016).

Agarwal and Batra (2015) assert that older brains work slower due to processing a lifetime of stored-up information. Goodwin (2013) in an older adult's education training study suggests to focus on one particular skill in each session and ensure that each participant is synchronized with the facilitator. To address the issue of slow learning, session two strategies for managing and judging information and knowledge were divided into two sessions.

5.4.1.7 Discomfort with Self-Practice Exercise Completion Questions

I observed that participants do not feel comfortable when being asked whether they had completed their self-practice exercises or not. This was recorded in the facilitator's notes during the program. Her notes:

> *"Participants physical reaction shows that they do not feel comfortable when being asked if they have done their homework or not" (memo, 13 September 2016).*

The study found that sustained engagement around self-practice was a problem. In response, Bernstein (2019) states that participants may remain motivated and interested during training sessions, but they will probably be exhausted and inattentive by the end of the training. This might be another reason why participants did not complete their tasks. Other reasons may include the fact that participants do not have the knowledge to complete the task, give up, or they are not getting any closer (Blakiston, 2014). Blakiston suggests not to imply that the participant was right or wrong. To address this issue of being uncomfortable when asked about self-practice exercises, the rest of the sessions that relate to this question are removed.

5.4.1.8 Potential Copyright Harm

During this training process I identified the potential risk of offering a full copy of the training manual to participants. Even though the copyright is clearly stated in the first page of the participant training manual as follows:

> *"Copyright is owned by the Author of the research. The training manual may not be reproduced elsewhere without the permission of the Author" (Participant Training Manual | page i)*

Yet, a participant mentioned she used one of the training manual tools in her work environment and shared it with others. She says:

> *"I did the decision-matrix which I've never heard of before. Then numbering it one to five, then adding it up, giving it self-headings and totals to work with them was really good. I must say I used that at work…… I got everyone to number it like this, and then we decided what we're going to be our top four headings. I kept it really tight four headings like you did here" (Participant 9).*

To address the potential copyright harm, I consulted my PhD supervisors and Massey University copyright advisor, and it was suggested to provide limited course material instead of a full copy of the training manual with the next training cycles.

The findings show that participants' learning outcomes were not hindered by the change of only providing limited course material. At the end of the training program, I received consistent feedback relating to the amended training program. Their comments:

> "*The program has definitely helped. I didn't realize you could classify it in that respect and check out whether it's genuine or someone after money or whatever it is. So from that perspective, it's helped my decision-making ability. Also, it helps me classify the information as being reliable or not, don't even need to open those sites. From that perspective, it helps me manage things. I have enjoyed the new things and appreciated being able to do this with you. Thank you very much for the opportunity" (Participant 13).*

> *"I think that a lot of skills that you have given us will help in decision-making of what is the best option even in an insurance environment on making a decision which is best for us, so in that perspective, I think it will be excellent" (Participant 12).*

"I think the training course is good. It's definitely expanded my thinking, learning, and judging of things. I think you have done a great job. If people are making decisions, I will recommend this program because it expands your thinking. I can kind of be a bit narrow minded in my own thinking sometimes, so I think the program has helped me to expand. I think it's good for everyone really" (Participant 14).

5.4.1.9 Lack of Specific Practice Topic by Participants

Participants commented on how important having a specific health-related practice topic in pre-training is, as it can affect their learning effectiveness. Their comments:

"It was very difficult to come up with the thing straight off the top of your head of what you had to think of, or things like what you're going to do as a subject. If you do this (the action learning training program) again, I really think that you need to tell people what's coming up, so they can think about that" (Participant 12).

"I think it's very important to have a subject to research to start with. It makes it easier to look for information I was getting on the subject, and make sure it's genuine and look at all of the different types of cures for the subject" (Participant 15).

"I think it's a good idea to do that because that way you are more focused and you know which direction you're going to go in. I didn't realise there was so much in that until I looked into it. It's still in the early stages but once you've focused on the topic, I think it's easy to find the information you know" (Participant 16).

The participants indicated the importance of having one specific topic for an individual's decision-making for the program practice. Indeed, recognition or problem recognition is an important stage of decision-making that guides an individual to seek information about possible solutions to their problems (Vroom & Yetton, 1973). To ensure participants have one focus topic for the training

program practice, potential participants are required to consider their health-related topic in the pre-training program. Participants indicated that a specific topic helped them to identify genuine information faster, easier and to be more direct.

Nine sub-themes related to this training programs issues has helped to refine the training program, in ways like improving the program presentation techniques and the training process. All participants agreed that the training program enhanced their confidence in decision-making and the skills required in managing information and knowledge. For example, participants stated that the program has helped them better understand what information they needed and to target more relevant information faster, which resulted in better decision-making, and feeling more confident. As one participant asserts:

> *"I have definitely changed the way I do it now after this course. Through this course, I'm looking at it much faster more targeted on pros and cons. I suppose I call your cons actually my trash bin. So when I am searching and it kind of makes sense, but it's too long winded and irrelevant. I immediately stop and say "Trash", and so, therefore, I go back to the pros of what I was looking for. So my information gathering is much more targeted and much quicker, and my brain, ends up with a much better decision, a quicker decision-making process rather than me sitting there. Prior to this course I could be there intentionally looking at something on a medical issue, only to still be there in an hour or two hours later, and none the wiser, whereas now what I have done in question three, we are straight into it, done and dusted in ten minutes" (Participant 5).*

The training program, through action learning practices, has changed participants' attitude toward technology and its use. This is in line with González, Ramírez, and Viadel (2015) study, which claims that using computer-based technology in training and learning programs can help older people recognized the benefits of technology, and lead to positive response in using computers with interest and confidence. My participants commented that the program had helped them

conquer their fear of using technology, such as using the Internet for seeking information and sharing information and knowledge with others via relevant social networks. Participants stated:

> *"I wasn't a computer person in the beginning. I wasn't a person that used the computer for this type of thing, and I think yes, definitely, that now I will search for something, through your course it shows me that there is information out there, that I didn't know was there. And definitely, I know now, I can go and search for information through the course. But I didn't really know all the information was in there" (Participant 2).*

> *"I am pleased I come to this course. I wasn't very pleased with my own performance, but anyway, I have conquered some fears about blogs (medical professional blogs). So I have learned quite a bit" (Participant 5).*

The nine issues mentioned above, provided an important guideline about what needed to be refined in terms of program structure, especially with respect to layout and the time needed to complete the self-practice exercises for each session. Based on participants' comments and my observation, all of the issues in the training program were addressed. The final modified training manual for the participants and the facilitator are presented in Appendix B and Appendix K. Participants indicated the amended training program version has met their needs appropriately and is satisfactory. Their comments:

> *"I don't really think it (the amended training program) needs improving as such. I think you've just about got it right" (Participant 7).*

> *"I think you did really well. I don't think there is anything I can recommend better. That you can do better, really! I think you have gone into the areas, you know you have really gone deep into the areas you taught us about, and that's made us really think. It has altered our outlook on making decisions. I certainly can't think of anything you can do to improve it. That's all. Marvellous! Wonderful!" (Participant 15).*

"I think you have covered everything in the program. I can't see any improvement because you covered everything. I'm trying to think of some, but I can't. If I can't think of anything, then you have done a good job" (Participant 16).

The effectiveness of the training program was evaluated in several ways and the findings are outlined. First, as a training instrument for older adults (with limited computer/technological skills), the training program enhanced participants' confidence in health care decision-making and the skills required in managing information and knowledge. For example, participants stated that the program has helped them target relevant and trustworthy information, as well as improve their personal knowledge of their own health care conditions. This resulted in better decision-making, and them feeling more confident. Moreover, through action learning practices participants' attitudes toward technology and its use changed. Participants' commented that the program has helped them conquer their fear of using technology such as the Internet for seeking information and sharing information and knowledge with others via relevant social networks.

In addition, as a data collection instrument, the action learning training program provided data for analysis based on the users' experience of the training program (Pauleen & Yoong, 2004). The collected data from the action learning training program enabled me to answer the research questions accurately, to repeat and validate the PKM strategy for older adults and develop comprehensive and detailed findings of this study based on supported evidence.

Finally, as a learning instrument for a novice action researcher, the action learning training program helped to develop my skills in teaching, coaching, and collaborating with older adults. Moreover, it enhanced my ability to design and deliver the training program with confidence when presenting courses to a group of native English speakers.

5.4.2 My Reflection as a Researcher, a Facilitator, and a Co-Learner

In this section, my reflection of the action learning training program is presented. This includes what I learned as a researcher, trainer/facilitator, and co-learner, as well as my suggestions to improve the next study.

In my role as an action learning researcher, I designed the training program (based on literature review and my supervisors' feedback), recruited participants, learned and discussed questions with them to generate dialogue and relevant data. I used memo notes which was suggested by Glaser (1978) to record my self-reflection to get ideas about codes and their relationships. My primary goal was to collect data through the action learning training program. However, as a novice researcher in action learning, I found it difficult to design a proper training program. In the first two to three months I tried to learn training program design through action learning related articles, books, and online courses. Yet, I found those materials (articles, books, and the online courses) did not provide concepts on how to begin a training program design, but did have some tips on development of action learning programs.

It was obvious to me that I was looking at the wrong resources. The articles, books, and the online courses I needed at this point needed to be related to training program design. After months of struggling, I found a book called "Training Program Workbook And Kit" by Nilson (1989) that provided a clear outline of program design for the training program. The main topic of the training sessions were then filled up by literature. The details of this training program design is discussed in section 4.2.

Yet, after I finished with a couple of learning groups, I found that the strategies provided by my training program were much too difficult for these type of groups of people (older age, lower education background, and limited computer/technological skills). The PKM methods and strategies are based on previous studies. Yet, previous information and knowledge management studies were focused on education and business, which were aimed at people of a younger age, higher education, and have basic or higher level computer/technological skills. Most of my participants were struggling to follow these strategies I found in the literature. Although most participants who left this program cited family issues, I believe that the true issue probably was caused by my program design. As participants commented:

> *"I went home after the first night and then that's when I read from the first session, and then it gave me a little bit more idea what I was in for. Then I decided to myself I*

wasn't really capable because it is all PhD all of the things. So I thought okay, this is for university students, that's not for me" (Participant 2).

"After session one last week I found it difficult to understand what we were trying to do. Because for some reason I just couldn't lock on to what you were saying. The first session didn't kind of make sense to me, too much" (Participant 5).

"As we've all shared the first night, we were all shocked. We all thought far out, are we going to be able to do this. We were here (hands down low) and we felt it was way up there (hands up high)" (participant 9).

There is no doubt that older adults (with lower education and limited computer/technological skills) might have more difficulties than younger people in using computer-based technology to assist with their PKM. According to Huang et al. (2012), this might be due to older adults limited knowledge and experience with computer-based technology (such as the Internet and online information seeking). Dickinson, Eisma, Gregor, Syme, and Milne (2005) suggest that to overcome the barriers that older people face learning to use computer-based technology, it is important to provide an appropriate training course exclusively for older adults.

It was obvious that my program design was too much for them to learn. Yet, due to time limitations, it was too late for me to go back and re-design the program. To help participants be able to follow this program and put lessons into practice, I offered my time to help participants who were willing to learn computer/technological skills after each course, such as turning the computer on, and using a memory stick to store information. I found a small achievement such as turning on the computer can bring their confidence back to learning and staying interested in this program. One participant commented:

"I feel to me it has become more interesting than not doing something like what I am trying to do now. I actually started to think "Yeah, okay, I can probably get into this. Whereas before I just thought "no, I don't know. I can't understand at all, but after discussing and talking about things. I find I am quite willing to learn new methods now, but I wasn't before because I didn't quite understand it. But now as we

go along, to session two, I am starting to understand that. It is a very good reason for me that I try and learn……..What you have shown me that we can do with the computer is very good, and I really need to get some practice or get somebody to actually come in to show me how to get the files and set them all up" (Participant 2).

I found that it was time-consuming to help them practice these techniques (apply computer/technological assist with their PKM), as they had to practice these strategies after each session, so as to be able to share and discuss their opinion and experience in the next class. Yet, I found that through this training program participants' abilities to use computer-based technology with PKM has significantly improved. For instance, one participant commented:

"I suppose the impact for the gathering of information is really about how fast to get it. So I suppose that the participating in the training is highlighted for me to get to the sources quickly and as fast as you can. So you know semicolons above on your search engines, confining your search to actually what you're inputting. So we've tried that a few times, and it's had to resolve itself by putting the comma up in my search to confine the um, I wasn't getting the answers, I was just getting 22000 different website pages until you actually put commas in.. The Thesaurus is quite important because particularly if you're not to or starting on your topic and you are not quite sure what you are actually looking for. So you're looking for those keywords to help you then do that search. That has been a big impact, and was a big help" (Participant 5).

I found that by offering my time to help participants with their technological skills has helped me to understand my participants' abilities, and also help them be able to follow the lessons. I also found that when I spent more time helping them, they felt more comfortable and put more trust in me. One participant commented:

"It would have been good to have another group. She (the support group leader) is another one who could do with this. Also, we all feel comfortable talking in front of you" (Participant 9).

An issue with recruitment was being a student with no reputation to work from and little professional credibility. I faced a huge challenge when recruiting participants. I received no response from most health care support groups I contacted by email and phone. When time started ticking by I began to get anxious. Yet, the situation changed after I received approval from my supervisors to recruit participants from churches, and soon I found the first group through the support of a local church administrator.

When the first learning group of participants was found, I interviewed them one by one to check their criteria. I found older adults did not see or hear well. As most of them couldn't see properly or forgot to bring their glasses for the interview, I had to explain it to them very slowly and repeat several times what this study is about and their rights. There is no doubt to me that 'patience' is the key to engage (with) older adults.

The second learning group of participants I found were from a health care support group. After hunting numerous health care support groups, I finally received a response from a leader of a health care support group. Her suggestion about doing a program introduction presentation for her group was very helpful and successful. As with the first group recruitment experience, I learned that I had to speak slowly and repeat the key points as they might not understand. Eye contact and facial observance to ensure they all understood what I was saying was very important. These changes helped me successfully recruit six people for the second learning group.

The experience from the second group strengthened my confidence in recruiting participants. The strategy of doing a program introduction presentation was very helpful. In the pre-training program introduction presentation, I noticed that people were not afraid of asking questions in front of their support groups' members. One participant commented:

"We talk with each other at the (health care support group) meetings and discuss things about our conditions and so forth and treatments and about

what we're doing. So we are happy to say things in front of each other. Perhaps we wouldn't feel like this if we were all strangers. So the fact, we all know each other from the group. It makes it easier for us" (Participant 7).

In the beginning of recruitment, my supervisors suggested to avoid recruiting church members for the reason of any research bias and narrative as well as potential ethical issues. As most people know each other, and even some might know me as I am a part of the church community. Yet, a recent health care study by Martin-Hammond, Vemireddy, and Rao (2018) argued that the most effective way to recruit older adults is through a local community. The director of the centre advertised program information to their member base and collected the names of people who were interested in participating. They also assisted with arranging and coordinating with interested participants to schedule the days and times that would work within their schedule (Martin-Hammond et al., 2018). Indeed, I found that recruiting older participants through the local community can be more effective, since the local community were willing to lend support and the participants felt safer with the environment and were more comfortable with people they are familiar with. This also impacted on their willingness to participate in the training program. One participant commented:

"Because the whole group came, and it's in the same building. I didn't think there is any problem coming along and see what I can find out how to improve my problem" (Participant 8).

Mfutso-Bengo, Masiye, Molyneux, Ndebele, and Chilungo (2008) found that people are more likely to reject participating in health care studies when researchers are strangers in the community. When I had meetings with church administrators who I have never met, one of the administrators commented that "*I don't know you, you might be some kind of crazy person turning up to my church. I cannot put my people in danger*". I found that all of the evidence I provided (such as my student ID, my supervisors' contact number, and Massey University human ethics approval letter) were not enough to gain their trust. I think it might have been easier if I was introduced by someone who knew these communities.

Additionally, I learned that a presentation (with power point) can help to reach out to a larger group of people, and help potential participants to understand my project. However, the third learning group took me approximately five months to recruit sufficient participants to start the program. As only one or two people showed their interest in this program in each of my presentations, some people called off participation during waiting for me to recruit sufficient participants to start the program, even though they signed the consent forms. I learned that people easily lost patience and motivation after two weeks even though I kept them up to date with the recruiting situation.

After the third group, I tried to seek participants from other health care support groups and hospital patient support groups (such as diabetes and heart disease), yet without success. The biggest mistake I made was spending too much time and putting too much trust and hope in waiting for one health institution's response. After four weeks of waiting, they changed their mind about supporting this project, I then moved on to other health institutions. I did not realise that these health centres are under the same institution, which means that I am not allowed to recruit participants from any of their branches even though they are in different districts. I learned that it is essential to check whether the potential recruiting targets are linked to the same organisation before making contact.

As a novice researcher in action learning, I think the level of my ability may have affected the way I conducted the research and limited this study's results. I found that participants regard me as a professional in the field, and thought that I asked questions that I already had answers to. Many participants thought I expected them to give me a correct/fixed answer to the discussion questions. The mind-set led them to feel confused and they tried to give me the answer they thought I was looking for. One participant commented:

> *"You're trying to find answers for certain things, but that directs your course to derive the answers as an academic you already know, or want to find out. So you can steer the course to a defined answer which is what you want for which it's not what it actually is. So you have to be careful with that one, and*

with me getting lost like that. We found it difficult to actually answer or give you the answers" (Participant 5).

I learned that it is important to explain the limitation of my knowledge in this field to participants before the program. Give them an accurate attitude that I do not have an answer and we are learning and finding the answers together. In order to generate participants' own opinions and experiences with PKM, instead of trying to guess what answer I am expecting.

In my role as an action learning program trainer/facilitator, I presented information to the participants, shared knowledge of PKM (based on the literature) with participants to help them applied this in their real life issues (i.e., health-related decision-making), and tried to keep learning groups going. However, I found that I had to repeat the questions to each participant when their turn to answer the question came. The benefit of repeating questions was when I asked the question again, other participants heard it and had time to think about their answer. Yet, repeating the same questions was frustrating and time-consuming to me.

To help participants' concentration, Rajabi and Ketabi (2012) suggest that a power point presentation incorporating graphics, animation, colour, and imagery can be more interesting than traditional lectures. Indeed, I found that through the use of power point (an example as Figure 5-17) to present discussion questions helped older adults increase their attention, and was much easier to focus on the topic.

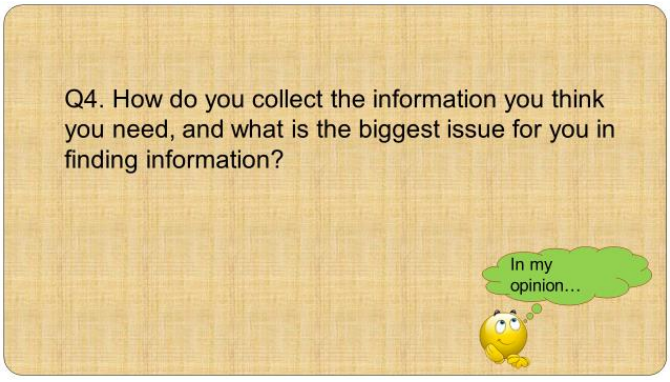

Figure 5-17: An Example of Communication with Older Adults by Power Point

I found that participants needed to think for about two or three minutes to most questions before answering, or they could easily go off topic and not know what they are saying. For instance, one question discussed was about how they share and discuss information and knowledge with others (Q12: How can you pass on or receive learning and information to and from others). Yet, one participant provided an irrelevant answer. She says:

> *"I found it was quite good going through the procedures. The main thing I got was I haven't got a car, so I do walk a lot. But I got to get people trained to my way of thinking that I want to walk most places where especially around Te Atatu everyone knows everybody. They want to stop and pick you up. They think you are a little bit odd turning them down. But I gradually got through to them, and just say ' if I wave out I want a ride, if I just make a little wave, just keep driving'. It seems to be working after about seven years. So it's good" (Participant 10).*

It was frustrating to me when participants misunderstood the question or were not sure what the question was or lost concentration. Yet, I learned it is important to let them finish what they want to say, but then come back to the question and explain it to them in a simpler and easier phrase.

I also found it is essential to be patient with older adults in this cohort although they might need more time and support to understand the lessons. I found a follow up email about what they have learned in each session is an effective way to refresh their memory (An example as Figure 5-15). One participant commented:

> *"I found it helpful your emails. When you click on what you've done and that will take you straight to the things we have done at the sessions. That was incredibly helpful. There was one on USB stick that I clicked on your link then that gave me what we looked at. I put it up and that was incredibility helpful. It gave you an aspect of what you were teaching that night. So I found that really helpful when you emailed us, the homework was actually on the email. So that was good. That was very good" (Participant 12).*

Furthermore, action learning study involves a group of people to learn together, yet, the challenge to me was to keep participants in the program. It was frustrating and I was anxious worrying someone might call or email me about leaving the group. I found that when people want to leave the learning group, they will not give you the true reason behind it. Though, with the support of health care support leaders and church administrators, I was able to discover the real reason behind them leaving. The reasons I discovered include loss of motivation, not feeling comfortable with strangers, too much for him/her to learn and cannot catch up the lessons. This may limit the potential data that can be collected. However, due to ethical considerations, I was not allowed to contact participants to get more details/understanding behind the reason for leaving. In future studies, I will pay more attention to each participant, this includes their learning condition and feeling about each session. Following them up after each session might help discover whether they understand the lessons and self-practice exercises. By doing so, they might have a chance to ask me any questions/concerns they have after each session. As some people might be afraid to ask questions in front of others, especially with a group of strangers.

The training program was held five times once a week, some participants had unexpected emergencies or events during scheduled learning sessions. As these sessions were connected, it was difficult for participants to follow the next sessions if they missed previous sessions, as they would not be able to understand what their learning group was discussing. However, due to time limitations, I was not able to reschedule extra lessons to help them catch up on the missed sessions. Additionally, rescheduling sessions also needed the other members' agreement. As a result, I lost some of the participants. In future studies, I think that a training assistant might be able to help with this issue, by offering extra lessons to help them catch up on missed sessions.

In my role as a researcher and co-learner, I discussed questions with the participants to try and generate relevant data, the primary goal is to collect data through the action learning training program. I listen and learn from the participants as they worked together on real issues, to explore their opinions and experiences of PKM regarding health-related decisions, and their perspective of an effective training program. Yet, the biggest mistake I made and learned from during the training sessions was, I missed recording my own feelings and thoughts about the

training/learning experience. As a researcher and co-learner I have an important contribution to this study. Therefore, I should have recorded my feelings and reflections about this training/learning experience from the start. A diary would have been helpful to record thoughts and feelings towards the actions and events (Alaszewski, 2006). Yet, my focus was on my participants and I ignored my own feelings as I thought it was not important. This mistake caused me extra hours of re-listening to the recordings, and to memo my feelings and thoughts about the training experiences. Fortunately, as I was a part of these groups, I was able to recall most of my feelings and thoughts when I re-listened to the recording. In future studies, I will memo my reflection and feelings through a journal or audio recording throughout training sessions.

I found that participants easily forgot whether the strategy was their original idea or whether they learned it from this program. For instance, before the program, one participant commented that doctors was the only way for patients to gather information. Yet, in the next session, the participant changed her comments and confused her own idea and strategy she learned from the previous session. Following is the comments from the same participant that caused by confusion:

> *"You cannot collect information because the only information you can collect is via your GP" (Participant 1).*

> *"If I want to do research on say allergies. I put it into the folder and if I need any information I bring it up, and I just do a Google search and say okay, this is the symptom, and I look for that word in that document, and then I read up around it to see where was the situation and what must I do, and if it's not enough information then I look for more" (Participant 1).*

This was difficult and time-consuming for me to distinguish their ideas from this program. I had to review the transcriptions more than twice to find accurate answers for the first research question: *How do older adults access and evaluate information and knowledge for health care decision-making*? Although reviewing transcriptions several times was time-consuming and frustrating, it refreshed my memory about the incidents, and helped me become more familiar with the collected data each time. To make it clearer, in future studies, I will memo participants' own ideas

throughout the session. Also, a question about whether they used to do it this way, or do they do it this way after learning from the training program might be helpful.

As I did not have any training/learning experience with older adults it was challenging for me to start the first learning session for the pilot study. I made a big mistake by using a group of people who were strangers to each other. I observed anxious and uncomfortable behaviour from everyone's faces and nervous voices. This made my first training session very difficult since no one was willing to start talking openly. While I was worrying about this session being difficult to manage, the church administrator/pastor came to welcome and thank them for participating. I then detected the participants' tension reduced when they saw a familiar face. My participants finally had a smile on their faces and were willing to open their hearts and talk to each other and me. I learned that it is important to have someone who the group members trust to come to talk to participants before the training. A five minute talk can significantly reduce participants' stress and make them feel more comfortable.

To sum up, I learned that previous training program studies provide basic knowledge of program design. Yet, engaging older adults in a computer-based technology design training program can be challenging. I found that to design an appropriate training program for certain groups of people such as older ages, participants' capability (such as reading and technological skills) should also be considered, as these skills impact on their learning outcomes and willingness to engage in the training program.

From the recruiting experience with health care support groups, churches, and medical centres, I learned that the best way to recruit a group of people is to get in touch with health care group leaders and organisations' or administers from my own community. Yet, it is essential to check whether the potential recruiting targets are under the same institution before making contact, as some health care institutions or medical clinics might have more than one branch in different districts.

A program introduction presentation can be a huge help to reach out to a number of potential participants. Eye contact and facial observance to ensure people understand the project, and be

patient with people's questions even though you might have repeated yourself several times already so be sure to speak slowly, as older adults might have poor hearing. Schedule program introduction presentation dates as closely as possible to ensure recruited participants don't become impatient and loose interest in participating while waiting. In future studies, I will consider these strategies in order to accomplish effective recruitment outcomes.

I found keeping participants at the same time and in the same place five times was challenging. I learned the key to keeping participants is to make the program interesting and attractive, learning material easy to understand, follow up with their learning condition, help them catch up on missed lessons, and make the learning environment as comfortable as possible, such as recruit a group of people who already know each other, and invite participants group leaders or administrator to welcome the learning members before the program begins. Finally, be generous with time to participants and build up a learning partner relationship to earn their trust.

Communication with older adults was another skill I learned from this study, repeating lessons and discussing questions for older adults is needed. Also, keep the discussion questions in front of them (such as by power point) and give them a few minutes to think about it before answering. Finally, I learned it is important to clearly state that my role in the program is to guide and learn with participants, so as to avoid participants waiting for my answer instead of thinking for themselves.

My action learning experience was difficult and unexpectedly challenging. All of the issues I found and the mistakes I made in this study were too late for me to go back to the beginning to redesign and re-run this program. This study journey, however, enhanced my knowledge in terms of researching and training/learning skills with older adults (who have lower education background and limited computer/technological skills). In future studies, I will consider all the issues I experienced from this study and avoid them.

Based on participants' reflections and my training/learning experience with older adults, an effective training/learning with older adults can be concluded as follows:

1) ***Confirm major individual health-related issues with each of the older adults in the pre-training program***. To ensure older adults' learning effectiveness, it is important to ask them to consider their own health-related issue in the pre-training program, in order to have one focused topic for the training program practice. Due to processing a lifetime of stored-up information, human memory slows down with age (Agarwal & Batra, 2015). Memory affects people's concentration and the registering of information and influence absorbing knowledge and slowed down learning capability. Michelon (2012) suggested that older adults need to take more time and minimize distractions to perform to the same levels they used to. Preparation of a specific practice topic for older learners to apply in the training program can make learning outcomes more effective.
2) ***Start with a warm welcome before the training program***. Discussing health care issues with different genders and strangers can be difficult to older adults. Yet, a welcome introduction by a person who they are familiar with and/or an ice breaker can be useful to help group members get to know each other and feel more comfortable (De Lichtenberg & London, 2008). Interactive games that are related to the training program might be of some use.
3) ***Quick overview of the previous session and provide a follow up email after each session.*** A 15-minute introduction to the PKM project in the first session, and a 10-minute 'revision and introduction to today's schedule' in each session by facilitators, as well as a follow up email regarding the learning session can help older adults to recall the whole training program design and purpose as well as give them a clearer idea of what is covered in the following sessions.
4) ***Break each topic into small parts***. Older learners may need more time to learn new things as they respond more slowly than young learners (Wlodkowski & Ginsberg, 2017). Breaking each topic into small parts (one skill/topic in a session) can help older adults recall and absorb learning materials much easier.

5) ***Small number of self-practice exercises for each session***. Older adults have lower learning performance than younger people, a small amount of self-practice exercises for each session can help older adults to complete it easier.
6) ***Avoiding the use of academic phrases*** - Older adults with less education have a lower literacy level. To help them understand learning material and enhance their learning effectiveness, simplified and reader friendly context can help them better understand learning materials and enhance their learning effectiveness.
7) ***Provide a step-by-step guideline for self-practice exercises***. It can be a challenge for older adults with limited computer/technological skills to follow computer-related self-practice exercise tasks. A self-practice exercise notes guideline (example as appendix I) can help them better understand learning material and enhance their learning outcomes.
8) ***Avoid asking potentially embarrassing questions about self-practice exercises completion questions***. Avoid asking self-practice exercises completion questions, as these can create stress and uncomfortableness for older adults.
9) ***Provide partial course material for each session***. Providing partial course material to older adults will not limit their learning outcomes. This method can help prevent the issue of program copyright and avoid older adults being overwhelmed by the course materials.
10) ***Display discussion questions by power points*** - Display discussion questions by power points can help older adults increase attention, and makes it much easier to focus on the topic.

5.5 Summary of the Chapter

This chapter outlines an overview of the training program evaluation, and the findings of the study, data and the categories that were explained by the participants' comments. Based on thematic and grounded theory coding techniques, the themes and core-category that have emerged and were discussed.

Methods participants used to access and evaluate information and knowledge before training were found. This includes accessing information and knowledge by the Internet, medical professionals, family and friends as well as personal life experience. To evaluate alternative treatment options, the most noted techniques were family, friends, medical professionals, and personal life experience.

Three barriers (being access and accuracy, computer-technology use, and humanistic) impacting on participants' health care decision-making were identified. A four-stage PKM strategy: stage 1 gathering (credible information and knowledge); stage 2 management (computer-based technology or non-computer-based technology); stage 3 evaluation (values and tools); and stage 4 networking and sharing (social networking or face-to-face) was found to be effective in assisting with an individual's information and knowledge management. It also discusses how PKM might potentially dissolve the barriers to effective information interpretation and decision-making.

Finally, the training program evaluation and refining were also presented. This was based on participants' experience and my experience as a researcher, a facilitator, and a co-learner.

So far, the nature of the research problem, the methodology design, and the findings and discussion have been presented. The next chapter concludes the study by addressing the implications and contributions of the findings, as well as identifying the limitations of the study and recommendations for future research.

Chapter 6 Implications, Contributions, Limitations, and Future Research

6.1 Chapter Overview

The main objective of this study was to investigate an effective PKM strategy for older adults (with limited computer/technological abilities) to manage complex health care issues through well-informed decisions in an information-intensive environment. PKM has been widely used in education to help individuals' manage large amounts of information and knowledge, and improve learning performance. Using an integration of action learning, thematic and grounded theory coding techniques, this study developed a four-stage PKM strategy for older adults (with less education and limited computer/technological skills) to make informed health care decisions.

In Chapter 4, merged categories were identified in the analysis and then reported. Chapter 5, discussed the findings of the study. This chapter, provides the conclusion for this study. It begins with a review of the research problem, objectives, and key findings. This is followed by a research contribution and implications. The limitations of the study and suggestions for future study are then discussed. Finally, the chapter summary and a concluding statement are provided at the end.

6.2 A Review of the Research

The purpose of reviewing the research problem, objectives and findings before the discussion of the contribution and implications of this study, is to provide a clear picture of this study's place in existing literature and in the context of policy and practice.

6.2.1 Research Problem and Objectives

Many older adults in New Zealand who live with illness, have been encouraged, expected to or wanted to seek, health care information. However, with the growth of the Internet and the development of social media, people are often confronted with considerable volumes of health care information. It is difficult to know what information is relevant and useful for making effective decisions, especially for older people.

Being able to make effective health care decisions is important. Personal knowledge management (PKM) may be one way to improve individuals decision-making, such as helping manage information overload (Frand & Lippincott, 2002), increasing knowledge management capabilities (Jain, 2011), and empowering critical thinking skills (Huang et al., 2016). Accordingly, the objective of this study was to investigate an effective PKM strategy for older adults to manage complex health care issues, through well-informed decisions, in an information-intensive environment.

To achieve the objective, a training program was develped based on methods of action learning. Thematic coding techniques (Braun & Clarke, 2006) were used to identify the participants' original methods of access,evaluate the information, knowledge and key issues regarding this training program, and refine the program. The grounded theory coding techniques (Glaser & Strauss, 1967) were adopted to explore people's opinions and experiences of PKM, regarding health care decision-making.

6.2.2 Key Findings from This Thesis

The key findings of this study include: the methods participants used to access and evaluate information before training, barriers they encountered when facing health care decision-making, and participants' insights of an effective PKM strategy (a four-stage PKM strategy), as well as both the participants and my own reflection on this training program. To answer these research questions: 1) how do older adults access and evaluate information and knowledge for health care decision-making before training; 2) how can PKM help older adults with limited computer/ technological abilities manage their information and knowledge for health care decision-making; and 3) how effective is an action learning training program in supporting older adults who have limited computer/technological abilities for health care decision-making. These findings are briefly summarized below.

Regarding RQ1: How do older adults access and evaluate information and knowledge for health care decision-making, this study found that the Internet (such as Google, Facebook closed groups and YouTube online videos), health care support groups, family and medical professionals, are

the most common information sources for older adults. Participants tend to use the easiest and less time-consuming techniques to seek health advice and trust the information and advice they find. This study also found that the participant's environment influenced the ways they collect information. Participants from health care support groups mainly collected information from their doctors, while non-members primarily sourced information from the Internet, family and friends. This study also found, that due to a lack of abilities to evaluate information and knowledge, participants mainly relied on the opinions of family, friends, medical professionals' opinions, and personal life experience to make alternative decisions.

Regarding RQ2: How can PKM help older adults with limited computer/technological abilities manage their information and knowledge for health care decision-making? From the literature review, information overload was the main issue that impacted on older adults' effective decision-making. Yet, this study found eight additional important issues that negatively impact on participants' health care decision-making. These barriers include commercial advertisement, managing conflicting information, lack of knowledge about computer-based technology, lack of computer-based technology resources, security risks in computer-based technology, lack of trust in the information, lack of technological competence by participants, and lack of time.

The findings of this study indicate that a four-stage PKM strategy might help participants overcome the barriers to effective information interpretation when making informed health care decisions. The four stages of PKM includes stage 1 gathering (credible information and knowledge); stage 2 management (computer-based technology or non-computer-based technology); stage 3 evaluation (criteria and tools); and stage 4 networking and sharing (social networking or face-to-face).

The findings of this study suggest that information and knowledge gathering pathways, information and knowledge filtering, and identifying credible information and knowledge, can help older adults with reducing the issues of commercial advertising, information overload, and managing conflicting information, when seeking health-related resources.

Traditionally filing systems are more user friendly for older adults to manage health care information and knowledge. In addition, clear guidance with written and explicit directions about the treatment options is a key method that would benefit patients (Sims, 2014). Decision-making tools such as a T-chart or decision-matrix, can help older adults to systematically consider a practical format to guide and lead to more convincing alternative health care decisions.

Findings also suggest that sharing and discussing with others can help older adults add narrative and build a new understanding of their own health-related issues. Yet, older adults do not feel comfortable about sharing health-related information with different genders and strangers in person. Technological social networking, such as Facebook health-related close groups, online health-related discussion forums and emails might be the solution, when coming to share health-related information with others. It allows individuals to post and respond to messages from each other, and to communicate with people at any time without facing others. Also medical professionals, family, friends, and health care support groups (such as from local communities) are another solution when it comes to older adults sharing health-related information.

Regarding RQ3: How effective is an action learning training program in supporting older adults with limited computer/technological abilities for health care decision-making? Nine issues were identified relating to the developed training program. These include ‘memory restriction’, ‘the amount of self- practice exercises’, ‘the complexity of academic phrases’, ‘uneasiness with talking to complete strangers’, ‘low levels of competency with technology’, ‘struggling to absorb knowledge’, ‘discomfort with self-practice exercise completion questions’, ‘potential copyright harm’, and ‘lack of specific practice topic by participants’. The identified issues were then used to refine the training program.

Based on participants’ reflections and my training/learning experience with older adults in this training program, ten effective training/learning techniques for older adults were developed. I found the refined sessions became much easier for the next learning groups to follow. A brief training/learning model with older adults is presented as follows (details within section 5.4):

1) Confirm major individual issues with each older adult in the pre-training program, to seek a specific practice topic that relates to them;

2) Start with a warm welcome before the training program, to avoid the issue of uneasiness with talking to complete strangers;

3) Quick overview of the previous session and provide a follow up email after each session, to address the issue of memory restriction;

4) Break each topic into small parts, to avoid the issue of struggling to absorb knowledge;

5) Use a small number of self-practice exercises in each session to increase the completion rate of self-practice exercises;

6) Avoiding the use of academic phrases will assist older adults with their understanding of the training material;

7) Provide a step-by-step guideline for self-practice exercises, to reduce the issues of the complexity of self-practice exercises and learning ineffectiveness that is caused by 'low levels of competency with technology';

8) Avoid asking potentially embarrassing questions about self-practice exercises completion questions;

9) Provide partial course material for each session, to avoid potential copyright harm;

10) Display discussion questions by power point, to help older adults increase their attention span, and keep focus on the topic.

The findings of the training/learning techniques for older adults are expected to be applied in future PKM and training education studies, in order to produce an effective and quality program for older adults (with lower education and limited technology skills).

There are also some other important lessons I have learned from this study:

1) It is important to pre-diagnose the participants' abilities in learning and computer-based technology before designing the training program. This will help with developing an appropriate training program for a specific group of people;

2) People feel more comfortable and are more willing to discuss health-related issues with people they are familiar with (such as family and friends); in particular older adults;

3) It is important to check whether the potential recruiting targets (such as health care institutions or medical clinics) are linked to the same organisation before making contact;

4) An introduction presentation of the program for the members, can be helpful to reach a number of potential participants;

5) Help participants be open minded and advise them there is no right or wrong answer;

6) Be patient with older adults, repeating work they have covered in previous sessions is inevitable;

7) Try to make older adults feel as comfortable and stress free as possible, so they might be willing to remain and participate in the training program. For instance, be generous with time to help participants catch up on sessions they do not understand and build a learning partner relationship;

8) Keep a memo of my own feelings and thoughts during the training sessions.

In the following section, the contribution and implications of this study are discussed.

6.3 Contribution of the Research

As previously noted in Chapter 1, with the growth of the Internet and the development of social media, individuals are often confronted with considerable volumes of health care information. Individuals may have difficulty absorbing the health care information, or lack the skills to incorporate the information into their base of knowledge, and this may generate confusion and hinder decision-making; especially in older adults. PKM has been suggested to help improve an individual's learning and decision-making. However, very limited research or significant

conceptual development has been done with PKM in individual decision-making, particularly in the context of health care. This study filled the gaps by providing an in-depth understanding of the utilizing of action learning with PKM on older adults' health care decision-making, such as diabetes and obesity. A PKM-based decision-making training program was developed to help older adults' manage information and knowledge and to be confident in effective health care decision-making.

This study provided a detailed review of PKM concepts, and how these concepts might be useful to decision-making. These concepts were then applied to four action learning cycles. Within these cycles, an individual's interaction with the health care decision-making process was explored, with the concept of PKM introduced to better make sense of this. An action learning training program and a four-stage PKM strategy were developed to answer the research question. On top of that, this study was published on several platforms, such as the International Journal of Knowledge Management (IJKM) in 2018, printed in local newspapers, Rodney Times, Stuff- online New Zealand media news in 2017, and Australasian Conference on Information Systems (ACIS) in 2016. Moreover, other publications mainly from this paper are presented in 'Notice and List of Publications' of this thesis. The following sub-sections present and discuss, the contribution to the literature and implications for practice.

6.3.1 Theoretical Contributions to the Literature

The findings of this study contribute to our understanding of PKM and what PKM entails in practice with decision-making in the health care context. As one of the early empirical studies in PKM, this study broadens and deepens our views of the practicability and the applicability of PKM in information overload and health care decision-making studies. These findings have been empirically confirmed and have expanded the theoretical literature on the subject.

6.3.1.1 Information Overload Literature

Health care decision-making can be a complex and stressful decision-making process. Information barriers have been suggested to have a negative impact on individuals decision-making; particularly in information overload. There were, however, very few studies discussing a

solution to dealing with health care information barriers. This study filled the gaps in the information overload literature by proposing an alternative strategy to interpreting health care information and knowledge; particularly for people with limited computer/technological abilities to manage information and knowledge. This study provides a unique insight into the particular problems and gaps identified from previous health care studies in New Zealand.

6.3.1.2 Health Care Decision-Making Literature

The contribution of the findings of this study to health care decision-making literature are significant. Previous health care studies provide an essential understanding of the consumer decision-making process, and has focused on the factors that influence individual health care decision-making, such as service quality, cost and information quality. However, these studies do not address the perspective of individuals; particularly in older adults. Also, these studies failed to consider factors of individual knowledge management abilities that might hinder their health care decision-making. This study extends the current decision-making literature, by providing barriers to effective information interpretation that should be considered within health care decision-making.

Moreover, this study makes a theoretical contribution to the decision-making literature by qualitative empirical testing the EKB model. Some aspects of model were confirmed and one was refuted. This study suggests that older adults do follow the steps of the Engel et al. (1973)'s consumer decision model (need or problem recognition, information searching, evaluation of alternatives, and decision-making) except step three (evaluation of alternatives). According to Virjoghe (2014), evaluation of information is the process of critically analysing information to determine its quality or value and credibility. Critical analysis of information helps to avoid cognitive biases and errors in the judgment of information thereby preventing contradiction of and consensus on inconsistent evidence (Fischer, Greitemeyer, & Frey, 2008). In this study, participants mainly rely on personal experience and other people's opinions in making health-related decisions; in particular medical professionals, for a diagnoses. According to Stiegler and Tung (2014), personal experience (excessive and unconsciously experienced) leads to unconscious or cognitive biases and individual preferences and automatic influences on individual

judgment and decision-making without people realising this. Unconscious bias is often due to the use of rule-of -thumb and heuristics by individuals to short-cut the process of decision-making, which often leads to poor decision-making (Friedman, 2017). This study found that the older adult participants omitted the process of evaluation of information which is likely due to their lack of ability to evaluate health care information.

6.3.1.3 PKM Literature

This PhD thesis makes an original contribution to the literature in the following ways. Firstly, this study addresses issues of decision-making by health care consumers whilst previous PKM studies have focused on education to help improve students' learning abilities. For instance, Liu (2011) investigated the use of PKM with Web 2.0 technologies in Chinese higher education. Liu's study shows that Web 2.0 technologies for PKM can help students facilitate creativity, collaboration, sharing, and exchanging knowledge. Ma and He (2013) examined the PKM requirement of college students for future employability and competitiveness. They reported that knowledge collection, assessment, innovation and application, tools selection, and the establishment of personal knowledge systems, can help college students improve their ability to gain knowledge. From the available literature in this area there is very limited empirical research or significant conceptual development on the topic of PKM and decision-making (see Chapter 2); particularly in the field of health care. The literature indicates a lack of empirical research on PKM, and as a result the effectiveness of PKM is not fully understood. This study makes a contribution to knowledge on PKM as a theoretical construct by confirming and expanding on studies in the decision-making and PKM literature, through the finding that a four-stage PKM strategy can help older adults (with limited computer/technological skills) to make more informed decisions, by improving information processes and evaluation, as well as knowledge management capabilities to create personal knowledge.

Secondly, previous studies in PKM application have focused on online information. This study makes a contribution to knowledge on PKM in relation to older adults' health care decision-making in both digital and general resources (such as printed information and people's opinions) by expanding the PKM literature. This study suggests that non-computer based technology (such as

traditional hard copy filing systems), and evaluation criteria and tools (such as personal criteria and decision-making tools) in PKM can help older adults to manage (with limited computer/technological skills) information and knowledge as well as make judgements more effectively.

Based on the above contributions, this study has shed light on the theoretical gap between PKM and health care decision-making, by providing qualitative empirical evidence for the conceptual framework. The modified conceptual framework represents a key step toward recognizing PKM in a more systematic way from older adults (with limited computer/technological skills). The activities associated with PKM via an action learning approach to support older adults' health care decision-making. The four-stage PKM strategy developed with older adults in this study has provided a foundation for further research in this field of study.

6.3.2 Implications for Practice

Considering the findings are based on the perspective of older adults, this study is very important for practitioners in the training field. The findings of this study suggest a persuasive practical guideline for training/learning for older adults, which has significant benefits to education, health care industries, and individual older adults. Implications for practice is further discussed in the following sections.

6.3.2.1 Education

In recent years, the number of older adults returning to school for formal and non-formal education has increased significantly (Lee, 2015). Several universities and institutions are offering older adults various courses, such as lectures, assignments, quizzes, forums, and various other learning materials (Liyanagunawardena & Williams, 2016). Yet, many barriers have been found that hinder older adults learning activities. In an older adults education study conducted by Friebe and Schmidt-Hertha (2013) state, that the barriers existing in older adults education includes a lack of suitable educational institutions and programmes for the older adults, and a lack of learning motivation. Another older adults education study by Richardson, Zorn, and Weaver (2002), report that barriers of fear and frustration of learning among older people include financial, learning and

training barriers; in particular short memory, lack of motivation, physical and cognitive problems in learning, lack of social support. A similar study by Wang et al. (2016) reported that older Chinese adults' learning activities are influenced by dispositional barriers (including low self-esteem, low self-confidence, and poor previous learning experiences), situational barriers (such as lack of time for learning, lack of funding), physical barriers (such as memory decline and lack of energy), informational barrier (such as hard to distinguish and navigate information), and institutional barriers (such as need better facilities). The available literature, however, lacks empirical evidence regarding the effects of strategies for overcoming barriers. This study filled up the gaps by providing empirical evidence via an action learning study in New Zealand with older participants (between 46 and 75 years) who have less (high school) education background, and limited computer/technological skills. The findings of this study make an important contribution for educational planners and lecturers in the development of educational programmes with and for older adults. This implication is to a great degree associated with the quality of older adults learning, and what education and skills are needed to be provided to ensure effectiveness. The findings of this study, therefore, have significant implications for the educational practice of older adults.

6.3.2.2 Health Care Industries

To improve health care service and treatment outcomes, patients are encouraged to take responsibility for their own health care decisions (Coulter et al., 2008; Vahdat et al., 2014). The findings of this study might have implications for health care industries by providing an understanding of older consumers' decision-making process and factors that influence the process.

The results show that a medical professionals' diagnosis can help patients target information they might need to look for. Yet, people prefer to have medical knowledge before seeking physicians, due to a lack of trust in the information provided by doctors. The Internet, was found to be the most effective pathway for older adults to seek health care information and knowledge. However, there are some current health care information issues on the Internet, which include information overload, commercial advertisement, and conflicting information. Commercial advertisement

makes it difficult to identify valuable and relevant information. Too much information results in difficulty judging the accuracy of information and locating the information they need. Conflicting information leads to the individual's confusion, and failure of appreciating and understanding the content of health care information (Carpenter et al., 2016). These issues have a significant impact on older adults' confidence when making health care decisions.

The findings of the study show that older adults have lower levels of knowledge or interest in using technology, such as computers and the Internet. This has impacted on the ways which they seek health care information and knowledge. Also, individuals' personal skills, time availability, and computer-based technology availability, impacted on the way they manage the information they obtain. This might be a consequence of age, education, computer self-efficacy or anxiety (Mitzner et al., 2010).

6.3.2.3 Improving Older Adults' Health Care Decision-Making

In the age of the Internet, it is common for people to self-diagnose their treatments by using invalidated online resources without medical training (Avery, Ghandi, & Keating, 2012a). Available health care information may result in improved patient self-awareness, understanding, and a sense of self responsibility for self-care (Vasconcellos-Silva & Castiel, 2009). However, the Internet-based health information being suggested is often inaccurate and problematic for physicians (Ahmad, Hudak, Bercovitz, Hollenberg, & Levinson, 2006). When patients use such information inappropriately, it can negatively influence their health care (Avery, Ghandi, & Keating, 2012b). This thesis examines PKM strategies in the field of health care embraced by older adults. This thesis has implications for individual health care consumers and provides new insight for PKM utilization with older adults' health care decision-making. A four-stage PKM strategy (information and knowledge gathering, managing, evaluating, and sharing) was identified to help older adults (with less education and limited computer/technological skills) to manage information and knowledge when confronting health care decisions in an information-intensive environment.

Medical professionals, community, social media, and the Internet were suggested as effective methods to gather health care information and knowledge. Using synonyms, native tongue, personal interest, punctuation, search terminology and detecting commercial advertising, were suggested as effective strategies to identify valuable and relevant information, while simultaneously reducing large amounts of information. Finally, examining websites, information presentation quality and consistency, examining up-to-date information, article authenticity, other people's comments, people's physical responses, and personally lived experience were suggested to be used to identify credible and accurate health care information and knowledge.

To organize information effectively, digital filing systems and traditional hard copy filing systems were suggested to help older adults manage immense amounts of health care information and knowledge easier and faster. Backing up information using multiple filing systems, can help overcome the issues of losing information due to unpredictable issues with computer-based technology. Technology filing systems and traditional hard copy filing systems associated with category strategies, such as organizing information in order by abbreviation, date, year and subject, help reduce time when re-locating and identifying the particular documents. In addition, a traditional filing system can be less complex than a digital filing system (Hamel, 2018), which makes it easier for older adults who lack knowledge about technology, or lack technological resources, to manage health care information and knowledge.

Personal perceived value and criterion with the aim of a decision-making support system (such as T-chart and decision-matrix) were suggested as effective strategies to help older adults determine alternatives and choose what is most beneficial for them.

Finally, to share and discuss information and knowledge with others to add up an individual's narrative and new health-related relevant understanding, technology social networking and face-to-face techniques were suggested to be the most effective pathways for older adults. The ability to use technology like social networking allows older adults to engage a large number of communities at any time. This might help reduce the lack of time issue for individuals. In addition,

face-to-face technique of sharing and discussing information and knowledge, might help older adults, who lack knowledge and resource about technology, easily engage with others.

The findings of this study might help older adults apply their knowledge and new found skills in areas other than their health care situation, by applying similar processes and structures when managing information and knowledge.

6.3.2.4 Methodological Practices

This thesis recognizes the importance of health care decision-making and the limited availability of methods that can be used to support older adults. Action learning with thematic and grounded theory coding techniques was conducted to investigate an effective PKM strategy, to help older adults manage information and knowledge to make informed health-related decisions. A five week training program, based on methods of action learning, was developed for older adults' health care decision-making. The training program structure was developed based on the book "Training Program Workbook and Kit" by Nilson (1989), information and knowledge management literature, and Engel et al. (1973)'s consumer decision-making model. Details of the training program development were discussed in Chapter 4, which might help novice action learning researchers better understand the process of designing an action learning training program. The findings of this study presented in Chapter 5 also add to the literature on facilitating action learning in different contexts.

As the study researcher and program facilitator, I observed the program whilst the participants evaluated it at the end of each cycle. This allowed for changes to be made, ready for the next cycle. My training experience with participants provided insight into the potential application of these approaches in developing an action learning program. The result of this study suggests several implications for action learning training program practice. It highlights the issues for changes in training practice, and provides suggestions on changes that may be made when working with older learners.

This study used a purposive sampling technique to identify and engage participants who are health care consumers. Purposive sampling techniques focus on particular characteristics of a

population (Raza et al., 2012) and have been commonly applied in health care studies. For example, the pilot study started with a church group made up of older adults who have general health-related issues and are feeling confused, and struggling with a large amount of treatment information they obtained. In a pre-training program interview, I also examined people's criteria (Appendix E) to ensure the characteristics of a population.

Previous action learning studies have focused on health care professional training to improve their work performance (Bieber et al., 2008), and online training to enhance students' learning outcomes (Roberts-DeGennaro, Brown, Min, & Siegel, 2005). This study filled the gaps by addressing the limited studies on training in older adults' decision-making, and demonstrates how action learning can be linked with a training program. Based on data collection and analysis, all learning groups contributed to the research and to the development of the PKM-based decision-making training program and its related elements. This is because action learning allows me to explore an effective PKM strategy for older adults' health-related decision-making without imposing pedagogical teaching.

The training program aims to develop PKM strategies for older adults' health care decision-making. A training program is a complex process, and has been applied to develop health care professionals' abilities in the area of learning or work performance. Yet, training program design or models for older adults (with less education and limited computer/technological skills) have been neglected in health care and information and knowledge management studies. This study filled the gap by contributing to a more comprehensive training, essential for this type of group of people in relation to the following: 1) the importance of older adults attitudes and attributes towards training; 2) factors that influence an older adults' learning effectiveness; 3) strategies for conducting an effective training program design for older adults.

6.4 Limitations of the Research

There are limitations to this study across three categories: methodology, findings and researcher capabilities.

6.4.1 Limitations Associated with Research Methodology

There are limitations associated with the overall research methodology. These include the nature of the research sample, action learning bias, and individual coding.

The nature of the research sample: This study applied a purposive sampling technique to identify and engage participants who were closely associated with health-related issues. All the study's participants were located in Auckland, New Zealand, the result might work differently for other countries, due to different education systems and learning cultures.

Action learning bias: As I was the facilitator and developer of the training program throughout this study, this created the potential for me to manipulate and organize the program. It could have created a reluctance for participants to be fully open, since they assume I am a professional in PKM.

Individual coding: As the relationships between codes and categories were complicated, some of the codes and categories were overlapping and redundant. Therefore, while following Glaser (1978) suggestion coding in a parsimonious way, I also consulted with the project supervisors. As a PhD student, I could not get other people to do the coding, which means that someone else may have a different view with different sorts of codes, categories, and explanations with the same data set.

6.4.2 Limitations of the Research Findings

There are limitations associated with the overall research findings, which include generalisability, not an accurate description, and participants as older adults. These are discussed below.

Generalisability: Data was collected from a pilot project and three formal training programs conducted in one area (health care) by the same trainer (me). Additionally, this study was a relative and highly specific small number with a total of 18 participants in a total of 20 learning sessions. As such a small sample, the people involved in this study cannot be considered a full representation of all New Zealanders or older adults.

Not an accurate description: The objective of this study was to examine an effective PKM strategy for older adults' health care decision-making through action learning and grounded theory approaches. The revised model (Figure 5-13), however, has not yet been tested. This thesis does not claim the developed PKM strategy to be an accurate way to interpret health care information and knowledge for older adults' decision-making, but an alternative strategy.

Participants are older adults: The action learning set is a group of people who learn from each other and tackle their problems by questioning and testing possible answers to problems through action and reflection from experiences (Bourner & Brook, 2019). This study has been conducted with an older age group of people between 46 and 75 years. These groups of people mostly have a lower education (nearly 89% of participants completed high school) background and did not grow up with these computer-based technology resources. Participants with more education might have more skills or experiences to help others to learn. The data were collected from participants' discussion of issues or experiences that they encountered while practicing the PKM skills they have learned. This study found that people who had tertiary qualifications did not change or have any particular impact on the findings. This might be due to the two participants (average age 65 years), who despite being educated were computer illiterate and lacked experience in locating and managing information when making health-related decisions. The group of older adults' perspectives towards PKM, may be different from a younger generation of people who have a higher education background, or have better knowledge about computer-based technology.

6.4.3 Limitations of the Researcher's Capabilities

Although my best efforts are fair and follow the principles of action learning and grounding and the guidance of my supervisor, my ability as a novice researcher may have influenced and limited the study results.

Facilitation: The way I have facilitated the trainings and interacted with the participants may influence the process of data collection and the study outcome. Training program facilitators should be skilled enough to create a comfortable environment and present meaningful questions

and actions instead of reflections (Johnson & Spicer, 2006). Despite following due process, as a novice training program facilitator, the level of my skills in training may have affected the way participants reacted and ultimately influenced the results of this study. I found it was challenging to maintain active participation in the learning sets. Also, as a novice qualitative researcher, the level of my ability in presenting questions may have affected participant's responses. I found it was challenging to explore innovative data from the groups of older adults (with a lower education and limited computer/technological abilities), which have no significant difference from previous studies. I feel my skill level in training and presenting questions to participants may have limited potential data that can be collected. This may also be a contributing factor for why there was difficulty in developing theory for this study.

Furthermore, if participants who dropped out of this study had stayed, they might have added advice or past experiences to participant interactions in the learning sets. Dropping out might mean possibly less diversity in terms of experience and opinion. Additionally, participants dropping out of this study reduced the extent/volume of data collected. However, this study used grounded theory approaches until theoretical saturation was reached, and no more new data appeared (Bakhtiari et al., 2014). Therefore the findings has not been adversely impacted on by participant dropout rates.

Theoretical sensitivity: Conducting grounded theory coding techniques requires the researcher to be theoretically sensitive. Theoretical sensitivity means that the researcher should be capable enough to notice subtle nuances in the data, and understand meanings and assign concept names to concepts and categories (Corbin & Strauss, 2008). The researcher needs to pick the important categories, describe and explain their interrelationships. However, as a novice researcher in grounded theory coding, the level of my ability in theoretically sensitive data may affect the way I conducted the research and limited this study's results.

6.5 Directions for Future Research

This study explored a neglected area of PKM and particularly in the health care context. This study answered important questions concerning how PKM can help older adults manage their

information and knowledge for health care decision-making. The area of PKM in decision-making, particularly in a health care context is still in its infancy stages and should be continuously explored in the future. Based on the limitations of this study, the recommended directions for future research are as follows:

6.5.1 Directions for Future Research Based on Limitations of the Research Methodology

The participants for this study reside in Auckland, New Zealand so there is limited generalisability based on a single geographical location. To increase the possibility of generalisability, future studies might use the concepts already developed in this study to do further research, such as examine the same theoretical concept in a country where they have different education systems and learning cultures to New Zealand. The results might contribute greatly to our understanding of older adults education.

Facilitating an action learning group is a challenge and requires experience. The findings of this study might contribute greatly to our understanding of conducting action learning. Future research might need to look into more strategies of running a learning group to ensure the quality of training program.

In this study, I developed an action learning-based face-to-face training program that includes internet-based information sources. Future study may include making the training program available online to help information seekers find and use information more effectively and to make informed health care decisions.

6.5.2 Directions for Future Research Based on Limitations of the Research Findings

The findings and the resulting PKM strategy can only be generalised to a very limited degree until this strategy has been tested in other situations. This approach has provided a closer insight into older adults' perspectives and experiences of PKM in health care decision-making. Future research may shed light on different fields of study, such as organisations and the nature of other

real life issues, so the theoretical results can be more generalizable across different settings.

This research provides empirical evidence from a qualitative study by adopting PKM in health care decision-making. The findings of the effective PKM and training/learning techniques for older adults were based on 18 participants. The developed PKM model is expected to be implemented in a larger sample size, and/or use other study design, to test the effectiveness of the strategy. Additionally, future work is expected to comprise of training/learning techniques in the next older adults education and training.

This study has only been conducted with older adults with lower education (nearly 89% of participants completed high school) backgrounds, and lower computer/technological skills. This study found that the participants' demographic information had an influence on the way they managed information and knowledge. For instance, due to a lack of knowledge about technology, they prefer to store information and knowledge using a traditional filing cabinet, which does not require computer skills, and is easier for them. The developed four-stage PKM strategy (see section 5.3.1.2) grounded in data was developed specifically for the target population's needs. Perhaps future studies should consider a younger generation or people who have a higher education background or have better knowledge about computer-based technology.

6.5.3 Directions for Future Research Based on Limitations of the Researcher's Capabilities

An important issue was the fact that I am a student who had no reputation to work from and little professional credibility. This results in a huge challenge when recruiting and retaining research participants. It took me at least one year to organize the training programs and collect the data. This study found that participants prefer discussing health-related issues with people they were familiar with. Future researchers might consider using participants who know each other such as family, friends, or work colleagues.

6.6 Summary of the Chapter

This chapter provides a conclusion for this study. The chapter reviewed the research problem, objectives, and findings. The implications of the study for research and practice were explained,

which includes contributions to the literature and implications for practice. The study's limitations associated with research methodology, findings, and researcher's capabilities were discussed. The limitations of this study include 'the nature of the research sample', 'action learning bias', 'individual coding', 'generalisability', 'not an accurate description', 'participants as older adults', 'facilitating', and 'theoretical sensitivity'. Directions for future studies are suggested at the end of the Chapter.

6.7 Concluding Statement

This research aimed to empirically explore and examine the concept of PKM in older adults' health care decision-making practices, using methods of action learning, thematic and grounded theory coding techniques. New Zealand patient health care support group members and church members were employed.

The findings demonstrate that an effective PKM strategy for older adults' health care decision-making, engages the four stages of the information and knowledge management process: stage 1 gathering (credible information and knowledge); stage 2 management (computer-based technology or non-computer-based technology); stage 3 evaluation (values and tools); and stage 4 networking and sharing (social networking or face-to-face) were found to be effective in assisting with an individual's information and knowledge management. According to the findings, the four stages of PKM might potentially dissolve the barriers that impact on older adults' effective information interpretation and health care decision-making. This study has extended PKM and decision-making research in a number of important ways, particularly in the field of health care.

First, previous health care research has focused on the medical profession service that influences individual decision-making, such as perceived service quality, expected service quality, and information quality. The findings of this study suggest a wide range of barriers in regards to effective information and knowledge management that impacts older adults' health care decision-making, including barriers to access, accuracy and relevance, barriers to computer-based technology use, and humanistic barriers.

Second, this study is one of the first empirical studies done on PKM in health care decision-making. Until now, little empirical research or significant conceptual development of PKM has been done in health care decision-making. Older adults were chosen as participants in the PKM training program. The result from the four cycles of training programs suggest nine issues, which include memory, self- practice exercises, academic phrases, discussing with different genders, technology, absorbing knowledge, self-practice exercise completion questions, potential training manual copyright harm, and a lack of specific health-related practice topics. These issues and suggestions have been addressed to improve the training program and participants needs. Many of these issues have been previously studied in isolation, but this study (along with several others that have been published in the last year) demonstrates the potential issues of learning and training, and the need for a thoughtful considerate approach to their implementation and use.

Third, as mentioned at the beginning of this chapter, the refined PKM training program grounded in data, provides ways for older adults to make informed decisions. The training program might serve as a starting point for educating older adults in developing their personal knowledge as a lifelong learning skill.

It is expected that the findings and contributions of this study broaden our scholarly understanding of the concept of PKM and older adult education studies, and in relation to health care decision-making. Additionally, it is expected that that the developed PKM training program grounded in the field data and theoretically supported by the literature, contributes to the improvement of older adults' decision-making skills in today's information-intensive environment.

This research has been life changing for me but a rewarding experience. The process of going through several thesis idea changes, difficulty in gaining full ethical approval, struggling to recruit participants, and retaining people within the training program, striving to solve data and development themes, and finally presenting and discussing the findings were all time-consuming and trying. Yet, the process has certainly enhanced my ability and knowledge as a novice researcher as well as developed my confidence and enthusiasm for research and learning, while making me a far better teacher for my future academic career.

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Appendices

Appendix A: Participant Demographics Information

Demographic Information

Self-assigned nickname: _____

Your information will be strictly kept confidential. Please tick one box for each question.

Q1. What is your gender?

○ Male ○ Female

Q2. What is your age?

○ 45 or under ○ 46 - 55 ○ 56 - 65

○ 66 - 75 ○ 76 or over

Q3. What is the highest level of education you have completed?

○ Less than high school ○ High school ○ Diploma

○ Bachelor ○ Post graduate ○ Others_____

Q4. What is your occupation?

○ Student ○ Government employee ○ Private sector employee

○ Self employed ○ Unemployed ○ Other_____

Q5. Do you have experience with computer?

○ No experience ○ Some experience (e.g. e-mail, basic word processing, and office computer) ○ Experienced (e.g. competent with a number of computer applications)

Q6. Do you have experience with the Internet?

○ No experience ○ Some experience (e.g. e-mail, online purchasing, or some searching for information) ○ Experienced (e.g. dedicated surfer)

Thank you for your time

Appendix B: An Example of Participant Training Manual

1

2

Appendix C: Massey University Human Ethics Approval

MASSEY
UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Date: 15 August 2016

Dear Yi-Mei Huang

Re: Ethics Notification - **NOR 16/32 - The influence of personal knowledge management (PKM) on individual decision making in healthcare medical treatment**

Thank you for the above application that was considered by the Massey University Human Ethics Committee: **Human Ethics Northern Committee** at their meeting held on **Monday, 15 August, 2016**.
On behalf of the Committee I am pleased to advise you that the ethics of your application are approved.

Approval is for three years. If this project has not been completed within three years from the date of this letter, reapproval must be requested.

If the nature, content, location, procedures or personnel of your approved application change, please advise the Secretary of the Committee.

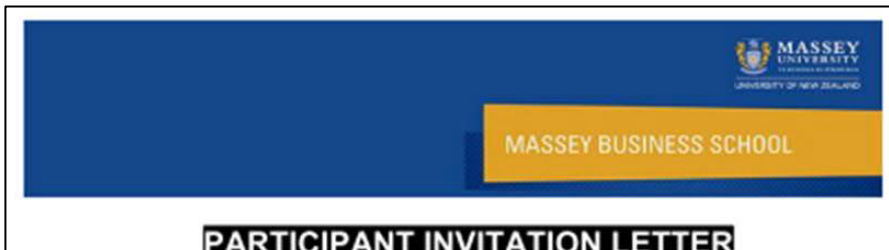
Yours sincerely

Dr Brian Finch
Chair, Human Ethics Chairs' Committee and Director (Research Ethics)

[3]

[3] During the research this study's title has been modified to 'the influence of personal knowledge management on individual health care decision-making: an action learning approach'.

Appendix D: Invitation Letter



PARTICIPANT INVITATION LETTER

Project Title: The influence of personal knowledge management on individual decision making in healthcare medical treatment

Dear …,

I am a PhD student at Massey University in Auckland. I am conducting PhD research about 'Information and Knowledge Management and Individual Healthcare Decision Making' with a team of supervisors, A/Prof David Pauleen, Dr. Shane Scahill, and Dr. Nazim Taskin. If you are facing a medical treatment decision, such as sleep disorders, diabetes, cigarette addiction, obesity or other issues of this nature (exclusive of severe health issues, such as cancer), and are feeling confused and struggling with a large amount of treatment information you obtained, you might be interested in this study. I would like to extend an invitation to you to participate in this research.

The information you provide will be recorded for academic purposes only and processes are in place to maintain confidentiality.

An **Information Sheet** which contains the participation procedures, participants' rights, project contacts, and **Participant Consent Form** are attached. If you are unable to participate, then your recommendations for others who might be interested in this project would be greatly appreciated.

Kindest Regards

Yi-Mei Huang PhD student
School of Management
Massey University
Albany, New Zealand
Contact number: [redacted]
Y.Huang2@massey.ac.nz

This project has been reviewed and approved by the Massey University Human Ethics Committee on Monday, 15 August, 2016, MUHEC Reference number NOR 16/32. The researcher(s) named above are responsible for the ethical conduct of this research. If you[4]

[4] During the research this study's title was modified to 'the influence of personal knowledge management on individual health care decision-making: an action learning approach'. The title of supervisors has changed to Prof David Pauleen and A/Pro Shane Scahill.

Appendix E: Information Sheet

PARTICIPANT INFORMATION SHEET

Project Title: The influence of personal knowledge management on individual decision making in healthcare medical treatment

The purpose of the research is to investigate how individuals make decisions when confronting health-related decisions in an information-rich environment. This study expects to help individuals better understand information and knowledge to improve each individual's confidence and effectiveness when making their own healthcare medical treatment decisions. Thus, participants must be comfortable discussing their individual health scenarios with a group of people, such as what healthcare decisions they are making, and what is hindering their decision making. However if anyone should feel uncomfortable or upset during the training session, they are able to leave the session. A tea break will be arranged before the discussion continues. You are also able to approach a free counselling support service (Lifeline 0800 543 354 or Samaritans 0800 726 666) if needed and you do not need the study researchers approval to do this.

The criteria described as follows:

Inclusion criteria:
1) Age 50 and over;
2) Live in the Auckland area;
3) English speaking;
4) Have health-related issues of a nature such as diabetes or obesity;
5) Lack of experience in managing information when making medical treatment related decisions.

Exclusion criteria:
1) People who are severely unwell, including:
- terminal patients such as those with cancer
- People with major psychological (schizophrenia, psychosis), or cognitive disorders (e.g. stroke, dementia) whose ability to make medical treatment decisions might be compromised;
- People who have a life threatening disease who are currently very unwell
- Persons who are likely to be hospitalised over the 5 weeks of a scheduled training program

2) People suffering alcoholism, or involved with illicit drug use or feeling tired and sick (with vomiting and diarrhoea etc.).
3) People whose capacity to give informed consent is compromised.
4) People who are not able to commit to five weeks of two hour sessions

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[5] During the research this study's title has been modified to 'the influence of personal knowledge management on individual health care decision-making: an action learning approach'.

Appendix F: Participant Consent Form

PARTICIPANT CONSENT FORM

Project Title: The influence of personal knowledge management on individual decision making in healthcare medical treatment

- I have read the **Participant Information Sheet** for this study and have had the details of the study explained to me. My questions about the study have been answered to my satisfaction, and I understand that I may ask further questions at any time.
- I also understand that I am free to withdraw from the study at any time up to two weeks after the completion of the training program, but my data will remain a part of this study.
- I agree to participate in the training program with audio recording.
- I consent to the collection and use of my personal information, opinions and experiences in Yi-Mei Huang's PhD thesis.
- I agree to have my personal views and opinions collected but understand they will be kept anonymous in any public documents, or journal articles.
- I understand that this program is not "intended to provide medical advice but is a training program on information and knowledge management.
- I understand and consent that if I have any questions about my healthcare, I will need to consult directly with my healthcare professional.

Signed: _____ Date: _____

Full Name: _____

Email: _____

Researcher

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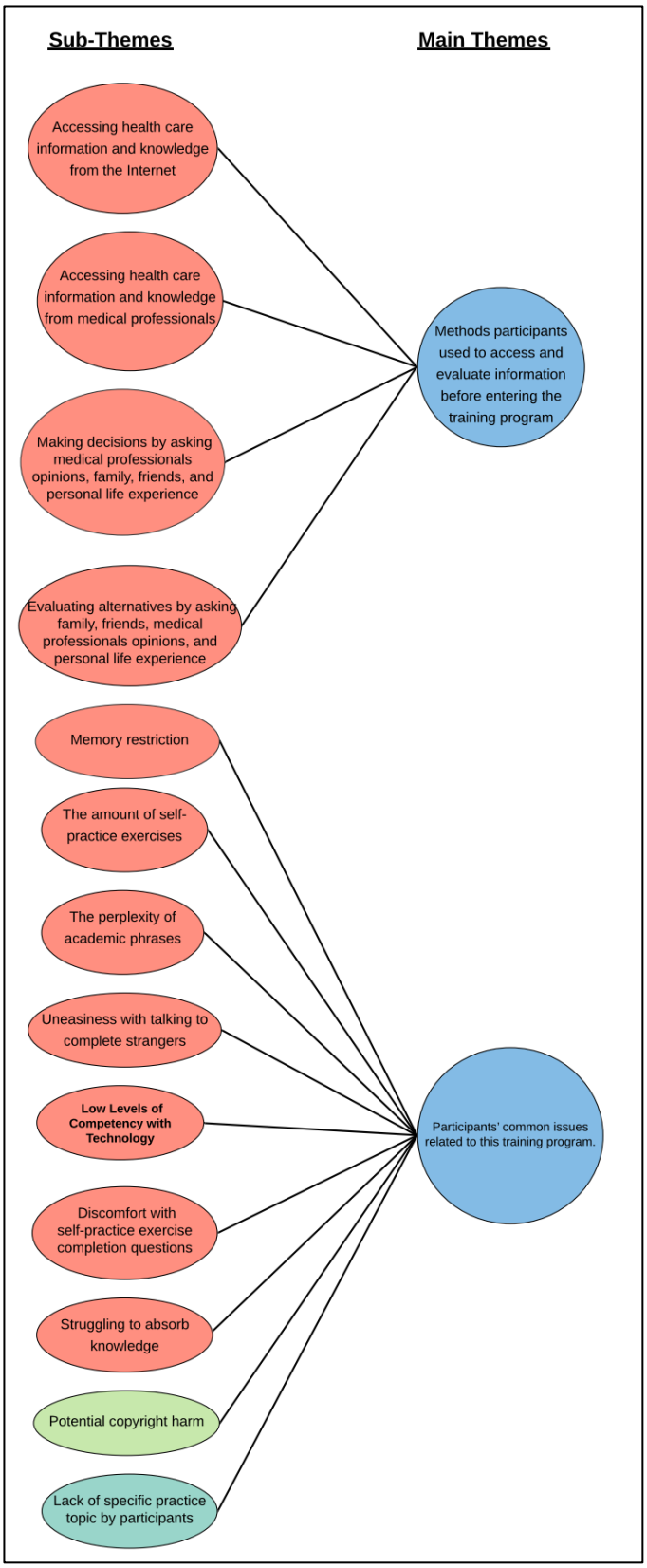
[6]

[6] During the research this study's title has been modified to 'the influence of personal knowledge management on individual health care decision-making: an action learning approach'.

Appendix G: Themes and Thematic Map



Appendix H: Conceptual Codes and Categories

Open Coding	Selective Coding	Theoretical Coding
Conceptual Codes	*Conceptual Categories*	*Sub-core Categories*
Information overload	**Barriers to access, accuracy and relevance**	**Barriers to effective information interpretation and decision-making**
Commercial advertising		
Managing conflicting information		
Lack of knowledge about computer-based technology	**Barriers to computer-based technology use**	
Lack of computer-based technology resources		
Security risks in computer-based technology		
Lack of trust in the information	**Humanistic barriers**	
Lack of technological competence by participants		
Lack of time		
Information gathering pathway	**Gathering: credible information and knowledge**	**A four- step PKM strategy**
Information filtering		
Identify credible information		
Computer-based technology	**Management: computer-based technology or non-computer-based technology**	
Non-computer-based technology		
Categories of healthcare information and knowledge		
Personal criteria	**Evaluation: criteria and tools**	
Decision making tools		
Social media	**Networking and sharing**	
Face-to-face		

Appendix I: Example of Notes for Self-Practice Exercises

4. **Homework for Session One** – 1) By yourself, please consider these tasks and questions (do not discuss in the group format), list all all possible and desirable solutions that relate to your medical situation; 2) For group discussion (will discuss in the next training session), please collect information on ten relevant articles about these solutions you have choosen, and identify the positive and negative articles. Please fill in Table 2 and give it back to the facilitator in the next training session.

Table 1: Notes for Session One homework

Solutions for my situation			
My condition	option A	option B	option C
Example: looking for an excise program to help my medical condition	Swimming class	Yoga	Running

Methods of information gathering:		
Methods I have used to collect information	The reason it works for me	The reason it doesn't work for me
Example: Visit the library	I like reading	X

Judging information resources:			
Article	Resource from	The reason it is a positive article for me	The reason it is a negative article for me
Example: A	Library	It helps me……..	X

Next training session: Date _____; Time _____

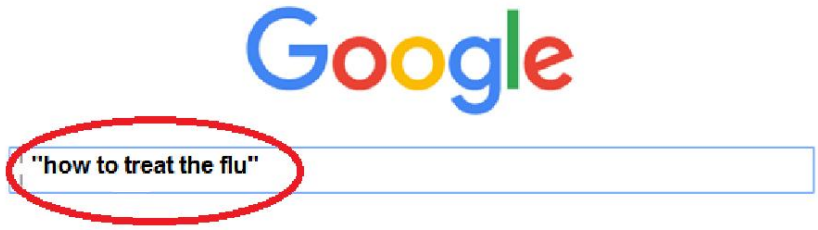
Appendix J: An Example of Step-By-Step Information seeking

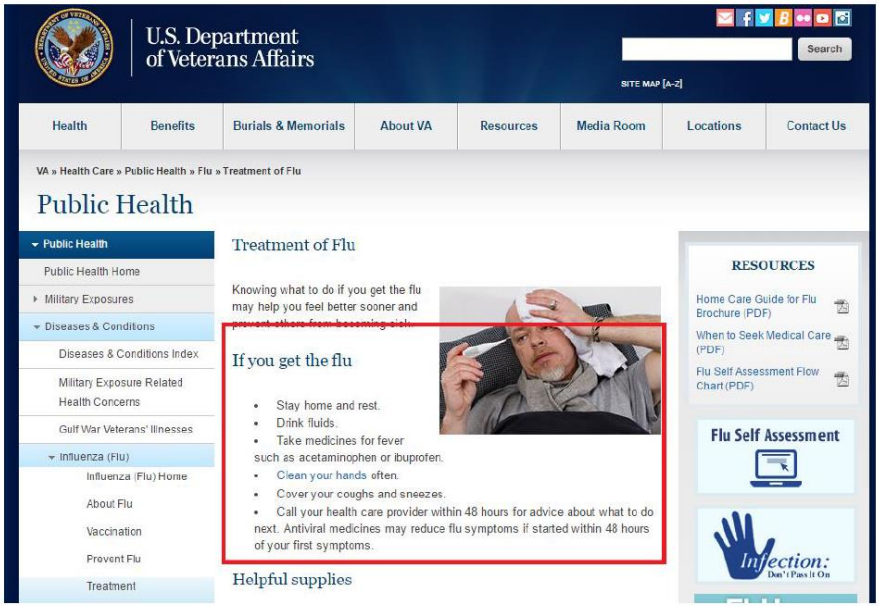
- **First search treatment options**
- **Second search for treatment options' articles**

Instruction:

Step 1: seek information about your question

Example: how to treat the flu





Appendix K: An Example of Facilitator Training Manual