Interest in the Learning of Mobile Touch Screen Technologies by Older Adults

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Abstract

One outcome of increased life expectancy is that older adults are leading active lives in their third age as they seize opportunities to learn new skills, and pursue new interests to challenge themselves. However, there are many misconceptions by the wider public about older adults' capabilities and aspirations, especially their attitudes towards technology. They are often misunderstood and seen as disinterested and unmotivated to engage with use of technology. Due to an absence of an *interest* framework for older adults to learn technologies, this research investigates the role that pre-existing interests play in their adoption of technology. The research aimed to explore older adults' relationship between pre-existing interests and their *interest* in technology with reference to Hidi and Renninger's *Four-Phase Model of Interest Development* (2006). This thesis seeks to address the following research question*: how can individual interests engender and maintain interest in technology use in older adults?*

A combination of qualitative and quantitative methods was employed in this research, which comprised of four studies. The Exploratory Study investigated how pre-existing interests can positively influence older adults' learning of technologies. The Field study introduced technology to an ageing well group and conducted interviews with teachers about strategies currently used. Subsequently, in a Comparative Study, there were comparisons of four different settings focusing on differing levels of interest and engaging older adults, both with and without technology in order to explore their uptake of mobile touch screen technologies based on the teaching method. The findings led to the expansion and extension of the current model and was subsequently named the *Interest-Bridge Model*. Successively, the Conceptual Phase looked at how this model can be applied in a classroom setting and develop a better understanding of relationships between the ways technology could best complement participants' pre-existing interests. It was accomplished through exploring older adults' attitudes and abilities to learn with technology based on the role of their pre-existing interests and focus group interviews. Finally, the In-Depth Study, investigated older adults' adoption of mobile touch screen technology based on the Interest-Bridge Model via a series of classes. This study investigated whether a curriculum guided only by pre-existing interests of older adults, rather than a structured curriculum would have a positive influence on their adoption of mobile touch screen technologies. The results show that when older adults are taught according to requests based on their pre-existing interests, it encourages long-term adoption of technology and builds up their confidence in usages of touch screen technology.

Acknowledgements

I may not have gone where I intended to go, but I think I have ended up where I intended to be.

Douglas Adams (1952-2001)

This thesis represents not only my investigation into a research question. It is also a milestone for me as I took the road less travelled. While harder, this road was ultimately the most rewarding. It would not have been possible to write this thesis without the help and support of the kind and generous people around me, only some of whom it is possible to give particular mention here. The responsibility for any errors or inadequacies that may remain in this work, of course, is entirely my own.

Therefore, in no particular order, I would like to offer my sincerest appreciation to my principal supervisor, Associate Professor Sonja Pedell for her good advice, support, encouragement and patience. Sonja has also been inspiring as she always believes in my ability to undertake research, which has been invaluable on both an academic and a personal level, for which I am extremely thankful. Thank you to Professor Bruno Mascitelli for his advice and stepping in at a crucial stage to support and help get me to the finishing line. I am also appreciative of Dr. Wendy Doubé for taking me under her wing when I first decided to embark on a path of research. Thank you Elizabeth (Liz) Ninnis for helping to proofread and polish the contents of the thesis.

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I would like to thank my Dad for his unequivocal support, always silently motivating me to strive towards my goals, for which my mere expression of thanks likewise does not suffice. I would also like to thank Jennifer (Jen) Lim, Dr. Carolyn Beasley, Dr. Julia Prendergast, Indriani (Indri) Wibowo, Charles Henshaw, Trish and Sam Tay, Anna Hickey, Doreen Berry, Stuart Favilla, Dr. Alison de Kruiff, Thi Thann Giang Tran, June Henderson and Juliette Barreau for their friendship, support, encouragement, advice and patience. Thank you for keeping me grounded at all times.

Even though I did mention earlier that this list is in no particular order, there is one person who is the most important person in my life – my tremendous mentor, Margaret O'Connor. Thank you for igniting my *interest* in undertaking research into ageing, I would like to express my special appreciation, gratitude and thanks for her kindness, friendship, support and patience at all times. I would like to thank her for allowing me to be a part of her life, for teaching me music and French, for always believing in my abilities, for encouraging me to pursue my passion and for always reminding me to *never give up and follow my dreams, for they give life a purpose*.

This thesis is a dedication to my friend, mentor, advisor, supporter, motivator, housemate and teacher – Margaret.

Merci très bien, Madame. A bientôt.

True nobility is not about being better than anyone else; it is about being better than you used to be.

Dr. Wayne Dyer (1940 - 2015)

Declaration

This PhD thesis:

1. Contains no material which has been accepted for the award to the candidate of any other degree or diploma, except where due reference is made in the text of the examinable outcome;

2. To the best of the candidate’s knowledge contains no materials previously published or written by another person expect where due reference is made in the test of the examinable outcome; and

3. Where the work is based on joint research or publications, discloses the relative contributions of the respective workers or authors.

[redacted]

Jeanie Beh

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List of Abbreviations

3G	Third Generation Mobile Wireless Cellular Network
4G	Fourth Generation Mobile Wireless Cellular Network
ABS	Australian Bureau of Statistics
ACMA	Australian Communications and Media Authority
AGHE	Association for Gerontology in Higher Education
AIFS	Australian Institute of Family Studies
AIHW	Australian Institute of Health and Welfare
ALA	Adult Learning Australia
App	Application
CEPAR	Centre of Excellence in Population Ageing Research (Australia)
COTA	Council of The Ageing (Australia)
DCCSDS	Department of Communities, Child Safety and Disability Services (Australia)
DELWP	Department of Environment, Land, Water and Planning (Australia)
DESA	Department of Economic and Social Affairs Population Division (United Nations)
DHA	Department of Human Services (Australia)
DHHS	Department of Health and Human Services (Victoria, Australia)
DIBP	Department of Immigration and Border Protection (Australia)
GDP	Gross Domestic Product
GPS	Global Positioning System
HCEC	Hawthorn Community Education Centre Inc.
HD	High Definition
HTML	Hypertext Markup Language
ICT	Information Communications Technology
IoT	Internet of Things
IT	Information Technology
Kbps	Kilobits Per Second
Mbps	Megabits per second
NBN	National Broadband Network (Australia)

NMA	National Museum Australia
NSPAC	National Seniors Productive Ageing Centre (Australia)
OECD	Organisation for Economic Co-operation and Development
PAV	Probus Association of Victoria Inc.
SDT	Self-Determination Theory
SMS	Short Message Service
SPSS	Statistical Package for the Social Sciences
SST	Socioemotional Selectivity Theory
U3A	University of the Third Age
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNFPA	United Nations Population Fund, formerly United Nations Fund for Population Activities
USCB	United States Census Bureau
W3C	World Wide Web Consortium
WEF	World Economic Forum
WHO	World Health Organisation
Wi-Fi	Wireless Fidelity
WWW	World Wide Web

Chapter 1.

Introduction

I enjoy talking with very old people. They have gone before us on a road by which we too may have to travel, and I think we do well to learn from them what it is like, easy or difficult, rough or smooth. And now that you have reached an age when your foot, as the poets say, is on the threshold, I should like to hear what report you can give and whether you find it a painful time of life.

Socrates, from The Republic by Plato (360BCE, Book I, 327a)

1.1. Touch Screens, Technology and Ageing

As technology of all varieties becomes more accessible to the totality of society across all generations and as an outcome of increased life expectancy, older adults are leading lives that are more active in their third age. Although the increased in life expectancy brings about societal and economical challenges (Sander et al., 2015), it also presents a new array of opportunities (Sanchez-Valle et al., 2017). Older adults do this in creating opportunities for themselves to learn new skills, and pursue new interests and hobbies to challenge themselves (O'Loughlin et al., 2017). At the same time, there are many misconceptions about older adults' capabilities and aspirations, especially their attitudes towards technology (Cherry et al., 2016). They are often misunderstood and seen to lack interest and motivation in the use of technology even though studies have shown otherwise (Pew Research Centre, 2017). What has become evident to government authorities is that there is a low-level uptake of technology amongst older adults (Chen et al., 2018). Not being able to use technology is isolating and makes it difficult for older adults to conduct their everyday lives (Quan-Haase et al., 2018), as seen for instance in access to online banking and government services. Hence, it is imperative for older adults to participate in technology use (van Deursen and Helsper, 2015).

Touch screen is an intuitive technology that facilitates the interaction between user and device. Back in 1965, E. A. Johnson invented the first finger-driven touch screen (Caprani et al., 2012; Pfauth and Prist, 1981; Johnson, 1967). Since then, there has been an evolution of touch screen technology. By the 1990s, we saw the launch of Apple's MessagePad 100 and Palm Pilot 1000. In 2006, Microsoft launched its Surface RT. Subsequently, Apple introduced its first generation iPad in 2010, which sold in large numbers. Since then, it has been followed by a series of different models. The latest is the iPad Pro, which to date has sold more than 350 million units worldwide (Statistia, 2018). The reason for the popularity of touch screen tablets could be related to a range of advantages that include ease of use, portability, speed, ergonomics and being lightweight (Baker et al., 2016). These days, touch screen technology is ubiquitous (Danial-Saad and Chiari, 2017). We use it from our homes, cars, offices, schools, restaurants, stores, museums, hotels, airports, aeroplanes, wherever private and public spaces exist. Touch screens have become ubiquitous on devices such as our smartphones and tablets that we use every single day (Akhtar et al., 2017).

In the three decades since Sir Timothy Berners-Lee invented the World Wide Web (WWW) (W3C, 2018), the Internet has changed our lives. There is an endless list of advantages that the Internet is capable of providing for us (Quan-Haase et al., 2018). People across the globe are undertaking distance education, updating their social media profiles on Facebook, uploading video clips on YouTube, catching up on television programmes that they have missed and keeping track of the performance of their shares and investment portfolio. Information Technology has permeated our daily lives. There is an enormous supply of knowledge and information available through use of search engines like Google. There are video tutorials of various topics available on YouTube. For many people, writing and sending of letters through traditional correspondence is a thing of the past. We are able to communicate with each other via emails, voice and face-to-face, regardless either of the distance between us or the different time zones. Gone are the days of thick stacks of Yellow Pages taking up space that we have to flip through to look for information. If you would like to access your bank account from the comfort of your home or while on the go, just log into your bank’s website or app using your allocated username and password. You can view your account balance, transfer funds and also pay bills electronically. What if you are too busy to visit the shops? There is online shopping such as eBay and Amazon available. These services are providing customers with easy access to compare prices between businesses. Besides that, online reviews are easily accessible to help with making better purchasing decisions. We have cloud computing and cloud storage, providing us with an endless supply of storage space and for backing up of our precious data, such as our holidays snaps. Then, there is the Internet of Things (IoT). Making home devices smarter, allowing them to be connected and enabling them to access the Internet saves time, money and energy. However, if individuals lack the basic technological skills then they will be excluded from accessing many of these digital services.

While the world was embracing the shift to using touch screen technology and the Internet in our everyday lives, people were at the same time living longer compared to their predecessors (DESA, 2015). As a matter of fact, an average of 30 years longer when compared to the early 20th century (ABS, 2017; Christensen et al., 2010). The developed countries were the first to undergo this major shift and currently, it has become a worldwide phenomenon (UN, 2018). Although this brings about societal and economical challenges (Sander et al., 2015) but it also presents a new array of opportunities (Sanchez-Valle et al., 2017). Thus, the author has examined how to achieve digital inclusion for older adults. This then became the theme of this thesis.

1.2. Terminologies

1.2.1. Older Adults

The media has used terms such as *oldsters, old-timers, baby boomers and silver tsunami* to refer to older adults and the ageing population in general. In this thesis, the term *older adults* will be the consistent term, even though, terms such as *seniors, elderly, senior citizens, older residents* and *older people* are used interchangeably in literature to refer to adults in the age range of 65 years onwards. The chosen term, *older adult* is supported by literature related to ageing, as this cohort may not perceive themselves as being *old* (Edgar, 2013; DCCSDS, 2012). OECD (2018) uses the term *older* to refer to people 65 years old and over, mainly to represent a benchmark of life stage, whereby it is considered a legal retirement age, with eligibility for a pension (OECD, 2018). In Australia, in order to be eligible to apply for a seniors card, the minimum age is 60 years and working hours per week are restricted (DHS, 2018). In this thesis, the Australian definition for older adults is adopted because it is pragmatic and additionally, the study took place in Australia.

1.2.2. Technology

According to Hayler (2015), the word "*technology*" is a "*remarkably loose term"* (p.60). Hughes (2004) expressed that "*technology is messy and complex. It is difficult to define and understand*" (p.1). The evolution of technology, considered in its simplest form was based on the development and use of basic tools. Technology is a combination of human knowledge that entails materials, systems, processes and tools. The fundamental application for technology was to improve our lives, either through accomplishing of tasks or solving of problems. Technology is applied across practically all aspects of our lives. Bain (1937) said "*technology includes all tools, machines, utensils, weapons, instruments, housing, clothing, communicating and transporting devices and the skills by which we produce and use them*" (p.860). In this thesis, use of the term *technology* encapsulates known modern technological devices and gadgets. The touch screen tablet in particular is the adopted device of choice for this thesis.

Touch screens are considered input and output devices. They are commonly used in point-of-sale (POS) systems, automatic teller machines (ATMs) and kiosks in airports and shopping malls. Several authors have referred to iPad tablets as mobile touch screen devices (e.g. Neumann and Neumann, 2017; Gybas et al., 2017; Goh et al., 2017; Stephenson and Limbrick; 2015. In this thesis, iPad and Android tablets will be referred to as mobile touch screen devices.

1.2.3. Pre-existing Interests and Interest in Technology

Throughout this thesis, in situations whereby the study is discussing older adults' individual interests in general, in order to avoid confusion for readers, it will be referred to as "pre-existing interests". Older adults' learning and uptake of technology will be indicated by "interest in technology".

1.3. Personal Motivation

As well as the aim to achieve digital inclusion for older adults, this study was also driven by my personal motivation, in response to the three following reasons:

Firstly, my *interest* in the technology experiences of older adults began when I shared a house with my friend and mentor, Margaret O'Connor[1]. Margaret was in her eighties. When her 20 year old television broke down, she purchased a new HD (high definition) model. I set it up, tuned it and then taught her how to use it. She practiced a few times under my supervision, then remembered the steps required and was able to program her favourite gardening and current affairs shows. Margaret had arrived on the doorstep of the Digital Revolution, embracing technology in her daily life. Through a local community centre, Margaret joined a computer class for mature-aged learners, where she was taught the use of Word Processing. During morning tea, she would socialise with her teacher and fellow participants. She came home and said to me that she needed to get a computer, so off we went to a computer store to browse and she decided on the model. At the age of 82 years old, she bought her very first personal computer – a laptop. She checked her emails on a daily basis and surfed the net for information. At a gathering one evening, she was asked by a small group of middle-aged men and women about

[1] Unfortunately, Margaret passed away in 2014.

her views on technology. She just casually said that she prefers Flash to HTML because the animations keep audiences engaged. People were speechless because they had assumed older people would not be comfortable with the new forms of technology. She complained to me that she was disappointed with their response. This, however, made me realise that these perceptions about the relationship between technology and age, younger and older generations exist and permeate throughout society.

Secondly, Margaret suggested I should volunteer and help older adults by encouraging them to learn about and use technology. It led me to volunteer as a computer class tutor for older adults with a local community organisation for seven years. I observed problems encountered by older adults during practical sessions when learning to browse the Internet, and heard questions raised in terms of functionality, technical jargon and symbols, to name a few. As I was trained and have worked as a multimedia developer and designer, I realised that there are major issues regarding older adults use of the web that are still not being addressed, therefore it is imperative to better understand how older adults use the Internet, their learning methods and surfing behaviours.

Thirdly, over one summer, I worked on a university research project in collaboration with a local council as part of their Ageing Well Strategy. We looked into opportunities to not only engage older adults in the use of suitable and fun mobile apps during group activities, but to develop technology in a way that it could be used to maintain a sense of group membership and shared interests amongst participants. Further consultations with my supervisors led to suggestions that the phenomenon that had been observed with older adults participating in the study about uptake of technology, could be related to *interest*. Following this, I explored literature on the topic of *interest*; which included interest development, conceptualisations, measurements and learning. The literature I found was mainly associated with early learning and adolescence within a school environment of academic subjects such as mathematics, sciences, languages and technology. The literature led me to pose the question - *how can theories of interest be extended from early learning to geragogy*? The next step was to develop a plan for a PhD research project to find out the role of *interest* in the learning of mobile touch screen technologies by older adults.

1.4. Overview of the Thesis

As a beginning, there is a need to establish the area of research in which this work belongs. It is inter-disciplinary, therefore, the study comprised of the combination of the following four different fields: (1) information communications technology, (2), psychology, (3) gerontology and (4) education (see Figure 1.1). This research is framed as being Human-Computer Interaction (HCI), because it is inter-disciplinary and therefore able to combine these four fields. While the history of HCI is interdisciplinary and it remains interdisciplinary, it is also an established field of its own. However, the emphasis here is on combining the different domains. The data collection method is primarily based on non-traditional Action Research (AR) methodology with an additional integration of the Living Lab approach. This combination of methodology is emerging, participative and reflective. Therefore, it does not fall into the cyclical nature of traditional AR methods.

This thesis opens with an introduction about touch screen, technology and ageing, followed by a section on terminologies. It consists of studies conducted by the researcher that support and justify this research. There is also an explanation regarding the selection of terms used throughout this thesis. The subsequent sections are comprised of the research gap, research framework and aim of the thesis, scope and significance of the thesis and closes with the chapter structure of the thesis.

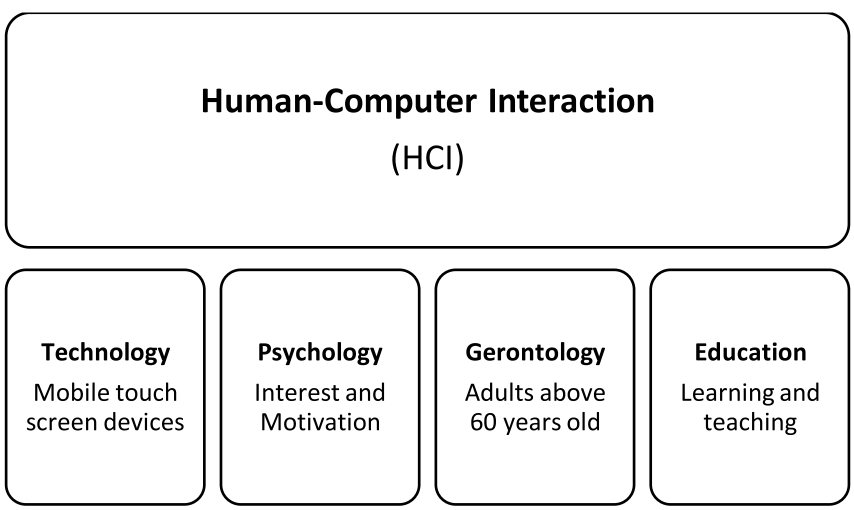


Figure 1.1. The combination of four relevant disciplines of this thesis.

1.4.1. Research Gap

In previous research, the majority of existing studies were focused on school children and younger adults in a classroom setting through Hidi and Renninger's *Four-Phase Model of Interest Development* (2006). To date, there has been very little research about how technology could support older adult's pre-existing interests. This identified gap is based on numerous online keywords searches of relevant studies conducted with older adults and Information Technology (IT). For this reason, the present research strives to address this gap, and is comprised of four studies developed by expanding and extending on Hidi and Renninger's model.

1.4.2. Research Framework

The topic of *interest* was first explored within the field of psychology in 1891 (Herbart). It then disappeared and resurfaced in the 1980s, falling into the subcategory of educational psychology (Silvia, 2006). The majority of existing studies mainly gravitate towards younger children and adults in a classroom setting and the *Four-Phase Model of Interest Development* by Hidi and Renninger (2006) was employed for these studies. For instance, trying to find out why boys prefer subjects such as mathematics and sciences, whereas girls favour languages and arts (refer to Chapter 2).

1.4.3. Aim of the Thesis

In this research, the overarching objective was to produce a curriculum for older adults to take up the use of technologies and to develop guidelines to support the techniques available for older adults to learn technology, thus aiding educators with curriculum development. The main factor for adoption of new technology is based on *interest*. The theoretical interest and motivation frameworks are comprised of *The Four-Phase Model of Interest Development* (Hidi and Renninger, 2006), *Self-Determination Theory* (Deci and Ryan, 1985) and *Socioemotional Selectivity Theory* (Carstensen, 1992), that will assist in the exploration of the factors that can stimulate *interest* in learning and uptake of mobile touch screen technologies by older adults and consequently improve the quality of their lives. It is not only imperative to provide technologies that are easy to learn, but also to consider the specific pre-existing interests of older adults in order to facilitate a successful learning environment. The goal of this research is to better understand how the *interest* framework can best complement and support older adults' learning capabilities and enable integration of their pre-existing interests and everyday activities in this process.

This thesis starts with the exploration of previous and current research conducted by scholars as it seeks to fill in the research gaps. The research is mainly focusing on older adults and their *interest* in the uptake of technology, in particular mobile touch screen technologies. The steps taken to fill this gap is through running of person-centred tailored classes whereby the curriculum structure is based on older adults' pre-existing interests. Following are the five major aims (Figure 1.2) that formed the basis of this research:

1. Explore the concept of human interest and its implications for the learning of technologies (Chapter 2)
2. Extend and expand on *The Four-Phase Model of Interest Development* (Hidi and Renninger, 2006) for older adults (Chapter 4)

Due to the basis of the study, aims three to five were not formulated right at the beginning but were subsequently developed based on findings of the earlier study.

3. Develop a *Model* for older adults (Chapter 5)
4. Trial the *Model* for older adults (Chapter 6)
5. Evaluate the *Model* for older adults (Chapter 7)

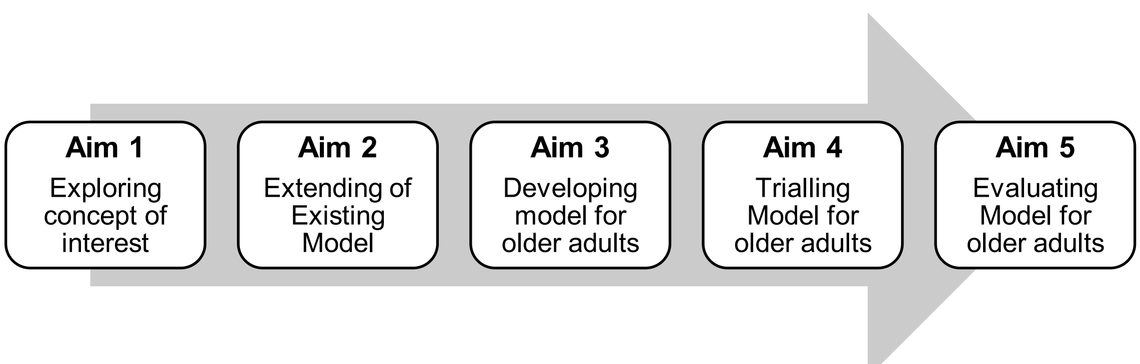


Figure 1.2. The five aims of this research.

This research project begins from the premise that *interest* is a fundamental aspect and perhaps holds relevance in older adults' uptake of mobile touch screen technologies. Early stages of the research are grounded in the literature. Expanding from this, the thesis revolves around older adults and the role of *interest* in their learning of technology. The research question is answered through:

1. Literature Review on the topics of ageing and technology uptake, encompassing the conceptual background and the research from the perspective of ageing and the process that led to the development of the *Interest-Bridge Model*
2. Exploratory Study
3. Comparative Study
4. Conceptual Phase
5. In-Depth Study

For sub research questions of individual study, please refer to Chapters 4, 5, 6 and 7. The overall research question to be answered is:

- **RQ** – *How can individual interests engender and maintain interest in technology use in older adults*?

This overall research question formed the basis of the research journey as the author explored and investigated learning approaches and teaching techniques from teachers, the technological barriers and difficulties faced by older adults, and methods to increase older adults' uptake in the learning of technology.

1.4.4. Scope and Significance of Thesis

This thesis explores the elements and factors contributing towards older adults' uptake of mobile touch screen technologies through their pre-existing interests. Due to an absence of a framework for older adults to learn mobile touch screen technologies, the aim of this thesis provides a model to facilitate older adults' *interest* in the learning of technologies. The aim of this thesis is centred on development of *interest* with a specific focus on older adults' uptake of mobile touch screen technologies. The significance of the thesis is evidenced in three ways:

1. Extends and enhances existing theory on interest by applying it to older adult learning

2. Extends the existing frameworks for interest and motivation in early learning, so they can be applied for older adults in learning to engage with mobile touch screen technologies

3. Develops learning and teaching guidelines for older adults in the uptake of technology.

The theoretical interest and motivation frameworks are comprised of *The Four-Phase Model of Interest Development* (Hidi and Renninger, 2006), *Self-Determination Theory* (Deci and Ryan, 1985) and *Socioemotional Selectivity Theory* (Carstensen, 1992).

RQ – *How can individual interests engender and maintain interest in technology use in older adults?*

Aims on page 9 of chapter one. The main elements of this thesis encompass the five key stages, driven by the core concept and *interest* framework. Finally, the chapter structure of this thesis will provide an overview of the individual chapters presented.

The core essence of the research is constructed based on co-creation between participants and the researcher. For the scope of the thesis, there are four studies in total, which took place in Melbourne, Australia – (1) The Exploratory Study consisted of 32 participants, 5 staff members and 8 teachers, (2) The Comparative Study consisted of 35 participants, (3) The Conceptual Phase is the reflective element and comprised of four participants in a pilot study and (4) The In-Depth Study comprised of 60 participants. This thesis aims to contribute in both theoretical and methodological aspects. Firstly, it extends and enhances existing literature that has considered *interest* in relation to early learning (pedagogy), by applying it to adult learning (andragogy) and older adult learning (geragogy). The proposed framework investigates the development of the theory of *interest,* when applied to older adults, above the age of 60, and their learning of technology, by engaging pre-existing interests. Subsequently, the research establishes a set of guidelines for learning and teaching, and curriculum development for older adults' uptake of technology.

1.4.5. Contributions

To date, there has been very little research about how technology could support older adults' pre-existing interests. This research project is seeking to create awareness of older adults' needs, to address issues such as ageing and adaptation of new technology. Results will inform future research in the use of mobile touch screen technologies by older adults, assisting organisations through curriculum development of life-long learning programs and investigation into future development of possible products and services.

1.4.6. Chapter Structure of Thesis

The chapter structure of this thesis is comprised of eight sections and is summarised as follows:

- Chapter One **Introduction**, introduces the research question its aims to answer and problems it seeks to solve, and provides the overview of this thesis.

- Chapter Two **Literature Review**, presents a review of current research and discusses current theories of literature based on ageing, technology, learning and *interest*.

- Chapter Three **Research Design and Methods**, describes the research design and methods employed during data gathering. It was based on non-traditional Action Research and is comprised of mixed methods. Qualitative methods include in-depth and focus group interviews, observations, card-sorting exercises and researcher reflexivity. The quantitative method consists of background questionnaires including short-term and long-term goals, followed by pre-study, mid-study and post-study questionnaires.

- Chapter Four **Exploratory Study**, the first of four studies, examines the research processes and results of the exploratory study. It comprises of a study with an activity group, exploring ways in which older adults use mobile touch screen technologies when provided with such devices and takes into consideration their pre-existing interests. It involved interviews with older adults, staff members and teachers. The Exploratory Study is the outcome of current practice at a local community centre and IT classes.

- Chapter Five **Comparative Study**, the second study, details the research processes and results of the Comparative Study. This study is the outcome of current practice at a local U3A and local community centre. It explores the relationship between pre-existing interests and use of technology through the observations of four short course activity classes, both with and without the use of mobile touch screen technologies.

- Chapter Six **Conceptual Phase**, the third study, describes the research processes and reflects on preliminary results of the Exploratory and Comparative Studies. It further investigates and trials the *Interest-Bridge Model*, teaching concepts and guidelines developed in a pilot. Thus, seeking to explore the role of older adults' pre-existing interests to support their learning and uptake of mobile touch screen technologies.

- Chapter Seven **In-Depth Study**, the fourth and last study details the research processes and results of the In-Depth Study. It explores techniques to help older adults with uptake of mobile touch screen technologies through attending classes where the *Interest-Bridge Model* was implemented. These participants and the author then evaluated the model, as they progressed through these classes.

- Chapter Eight **Discussion and Conclusion**, extends the research with a summary of findings and discussion of results, addressing aims of the research, contributions, recommendations and concluding comments.

Chapter 2.

Literature Review

In spite of illness, in spite even of the archenemy sorrow, one can remain alive long past the usual date of disintegration if one is unafraid of change, insatiable of intellectual curiosity, interested in big things, and happy in a small way.

– Edith Wharton (1862-1937)

2.1. Technology

2.1.1. Introduction

The development of the Internet was partially fuelled by the Cold War and its conclusion in the late 1980s. In 1957, when Russia launched *Sputnik*, their first man-made satellite into space, the United States feared that the Russians would dominate science and technology. Therefore, the US government shifted their focus onto the Department of Defense (DoD) to fund ARPANET. ARPA stood for *Advanced Research Projects Agency* and was later renamed *Defense Advanced Research Projects Agency* (DARPA) and NET is short for "*network*" (Marson, 1997). Concerned that in the event of a Soviet attack on the nation's telephone system, which could destroy the entire communication network, Licklider (Lukasik, 2011) proposed a "*galactic network*" of computers that could "*talk*" to one another (Waldrop, 2000). The US government injected large amounts of funds into scientific research and development. The team comprised of hardware and software scientists and researchers. The network was used by the team to communicate and share data with each other (Lukasik, 2011). At 56 Kbps, the network of copper wires used in ordinary telephone connections was causing sluggishness in the delivery of information. After these issues were addressed, the network was made available to the wider society. Since then information technology has become mainstream, and is integrated into every aspect of our daily lives. In particular with mobile technology as it becomes an extension of self (Belk, 2016), mainly through the three domains consisting of psychological, social and material as proposed by James (1890).

By 2001, in most developed countries, high-speed mobile networks replaced these out-of-date copper wires. By 2016 download speeds reached 1,000 Mbps over fibre optic cables (Minges, 2016). Broadband Internet has brought about widespread changes in IT and also has had significant socio-economic impact on the world. It has led to globalisation, interconnectedness, easier communication, accessibility of information, on-demand services and manufacturing, increased productivity and performance of businesses and outsourcing (OECD, 2017). High-speed broadband and drastic reduction of costs for Information Communication Technologies (ICT) equipment has continued to facilitate the rapid pace of the evolving digital economy (UNCTAD, 2017). Along the way, innovations have had influence across other sectors, for instance health, transport and government (Minges, 2016). The digital economy is providing opportunities and helping smaller businesses in developing countries to connect and grow (OECD, 2017; Paunov and Rollo, 2015). In 2011, two billion people were connected to the Internet and almost US$8 trillion were exchanged through e-commerce (Manyika and Roxburgh, 2011). An estimated 6.5 per cent of global GDP comes from the production of ICT goods and services (UNCTAD, 2017). In the ICT sector alone, almost 100 million people are employed (UNCTAD, 2017). In some countries, there were setbacks experienced in the 2007-09 global economic crisis, but on the whole, the ICT sector has been relatively resilient. E-commerce sales reached US$25.3 trillion in 2015 (UNCTAD, 2017). By the end of 2017, there were 4.05 billion Internet users around the world (IWS, 2018). Between 2010 and 2015, while the number of Internet users grew by 60 per cent, nonetheless, more than half of the world's population remained offline (UNCTAD, 2017). In Australia, Internet subscriptions grew by 5.2 per cent from 32 million in June 2013 to 40.08 million in June 2017 (ACMA, 2017) – refer to Table 2.1 and Figure 2.1. This was largely attributed to the strong growth of fibre Internet connections – National Broadband Network (NBN) (COTA and Jones, 2012). The Internet is one of the tools that plays a very important role in everyday life. The Internet enables us to communicate with family and friends, provides access to online courses, keeps us up to date with news and current affairs and facilitates global transactions of goods and services. Therefore, Internet access is essential for older adults to take part in society. Internet penetration for Australia is currently 88 per cent (Statista, 2018), however, according to ABS (2017), between 2016 and 2017, only 55 per cent of Australians above the age of 65 years were Internet users. This is the lowest proportion of Internet users, compared to other groups such as teenagers and younger adults. Hence, there is a need to consider older adults and their access to the Internet.

Table 2.1. Number of Internet subscribers in millions from 2013 to 2017.

Telecommunication Services	June 2013	June 2014	June 2015	June 2016	Jun 2017	2016-17 change (%)
Total mobile subscribers	25.80	26.52	29.66	30.86	32.44	5.1
Mobile handset subscribers	19.65	20.57	23.65	24.82	26.33	6.1
Mobile wireless broadband subscribers	6.15	5.95	6.00	6.04	6.11	1.1
Total fixed Internet subscribers	**6.21**	**6.53**	**6.76**	**7.26**	**7.64**	**5.3**
Total Internet service subscribers	**32.00**	**33.05**	**36.41**	**38.12**	**40.08**	**5.2**

Source: ACMA, 2017.

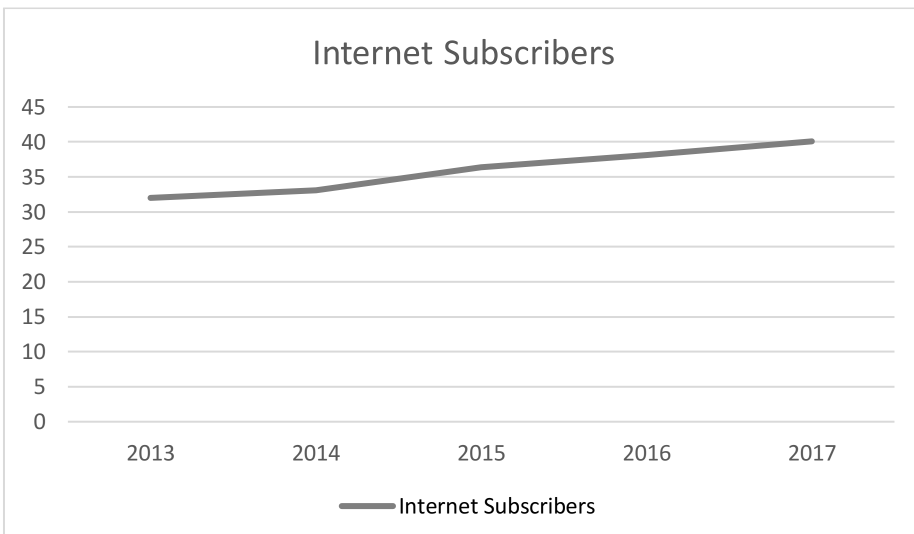


Figure 2.1. The number of Internet subscribers in millions in Australia.

Source: ACMA, 2017.

2.2. Older Adults and Technology

Older adults are often excluded from the digital world, possibly because of misconceptions that they are not interested and/or motivated to use new technologies (Durick et al., 2013). In fact, globally, older adults are consuming more goods and services, such as purchasing of mobile touch screen technologies (smartphones and tablets) and want to participate more actively in social life (OECD, 2015) than previous generations at this stage of life (Ianculescu et al., 2011). There are more opportunities available for future generations of older adults in the developed world, as they are expected to be more educated, healthier and more skilled, and therefore remain more active in the workforce compared to their predecessors (OECD, 2015; Durick et al., 2013; Ianculescu et al., 2011; Harvey and Thurnwald, 2009). Computing technology not only brings benefits to the younger, but also to the older generations (Phiriyapokan, 2011). It can increase the social inclusion of older adults, improving the quality of their lives and making a more sustainable society that could benefit from their greater autonomy (OECD, 2015; Kobayashi et al., 2011; Lim et al., 2011). In order to engage and include older adults in the digital world, it is therefore crucial to understand what motivates older adults to use technology (Doyle et al., 2010). Studies have shown that learning occurs most rapidly when an individual is generally the happiest, and to obtain optimum results, time spent on learning should be distributed across many shorter sessions (Amthor, 2012). Advantages associated with use of the Internet and computers could include increase in self-confidence, ability to learn and memory retention (OECD, 2015; Heo et al., 2012). Nevertheless, despite older adults' willingness to learn the use of computers, they are usually faced with difficulties, such as understanding technical terms, remembering steps to perform a task, and using technology, such as the mouse (Sayago and Blat, 2011). Some of the main barriers that prevent the uptake of technologies by older adults include physical and/or financial constraints, difficulty with transportation and/or mobility and health issues (OCED, 2015; NSPAC, 2011; DHA, 2011, 2010). There are also issues associated with digital literacy and educational levels (Sayago and Blat, 2011). Older adults may not have been taught good conceptual models related to the workings of technologies (Nielsen, 2002). A number of technological devices rely on a person's ability to keep information active over time in memory, which could be an unrealistic expectation for older adults unless they are proficient users (Caprani et al., 2011). Studies have shown that there are similarities with the use of technologies between younger and older adults, but at different usage rates (Olsen et al., 2011). It is also necessary to take into consideration that there are many cognitive differences between younger and older adults. For example, the slowing down of working memory (short-term memory) and thought processing (Lynch, 2011). Older adults may interact with computer devices differently when faced with trying to use new computer products (Phiriyapokan, 2011). Older adults do not necessarily gain the support required to help with their learning of technology, but if there is a learning model that is both engaging and attainable, it could keep older adults interested and motivated in learning technology (Carroll et al., 2011).

2.2.1. Mobile Touch Screen Devices

The use of mobile touch screen devices is one of the options that could enable older adults to access the Internet. Recently there has been much interest in Human-Computer Interaction (HCI) in researching the use of mobile touch screen devices for older adults (e.g. Pedell et al., 2013; Waycott el al., 2012; Lindsay et al., 2012). However, these studies focus more on tailoring solutions, than on the teaching of technology to older adults. This thesis argues that in order for older adults to avoid stigmatisation, they should learn the same technology as the rest of the population. This is supported by the large sale numbers of mobile touch screen devices. According to ACMA (2015), Australians have embraced the use of mobile touch screen devices since they were introduced in 2010 (Table 2.2), even more than in America and the United Kingdom. Sales of tablets reached 1.4 million units by 2012, and annual sales had almost doubled to 2.4 million units by 2015 (ACMA, 2015; Telsyte, 2014, 2013). In the first half of 2016, 1.59 million units were sold alone, an increase of four per cent (Gizmodo, 2016). By 2017, the annual figure is estimated at 7 million units, climbing from 22 per cent to 70 per cent. One of the reasons that the mobile touch screen was chosen for this study was because Australia has the highest number of mobile touch screen device users compared to the United States of America and the United Kingdom.

Table 2.2. Tablet ownership across Australia, USA and UK.

Country	2013	2014
Australia	42%	50%
The United States of America	31%	42%
United Kingdom	24%	44%

Source: ACMA, 2015.

Mobile touch screen devices can have advantages over traditional keyboard/ mouse/ screen interfaces for older adults, because of ease of use, thus enhancing communications and improving their quality of life (Upton et al., 2011). Mobile touch screen devices can be easier to use than some equivalent technologies, as they accommodate some of the age-related physical and cognitive limitations faced by older adults (Caprani et al., 2011). The close proximity of keyboard to information on the screen could increase spatial contiguity and reduce cognitive load (Doubé and Beh, 2012; Mayer, 2005). In addition, mobile touch screen devices enable items such as buttons and texts to be enlarged, making them (1) easier to see and (2) easier to select accurately (Caprani et al., 2011). One of the key aspects in successful ageing is to remain actively engaged in leisure activities (Nimrod, 2010). It has proven to be vital through fostering of social communications (Doyle et al., 2010). Technologies are also able to create new opportunities and stretch potential in the development of new activities for older adults (OECD, 2015; Edgar, 2013). In addition, older adults' quality of life has been enhanced through the use of technologies (Reeder et al., 2011) and simultaneously, this enables them to remain connected in an inexpensive and flexible way (Satariano et al., 2014; Renda, 2012).

2.3. Ageing

In a 2015 informal interview about ageing on the TV programme *60 Minutes Australia* (60 Minutes Australia, 2015), Dr. Claudia Kawas, a neurology professor at the School of Medicine at the University of Irvine, California (UIC) is a co-principal investigator of *The 90+ Study*. It is a longitudinal study initiated in 2003 to investigate the fastest growing group of the *oldest-old* (Kawas, 2008) in the United States of America. In the television interview, Dr. Kawas said: "*half of all children born in Australia, the United States and Western Europe today will live to a birthday past 100*."

In 1900, the world population was approximately 1.7 billion (UN, 1999). By 1950, the world's population was at 2.5 billion (CEPAR, 2016). As of February 2018, the United States Census Bureau (USCB) estimates the world's population at slightly over 7.4 billion and it continues to increase (USCB, 2018). It is expected to rise to 9.7 billion by 2050 (CEPAR, 2016). According to Hippolyte and Collard (2011), depending on the study, there are actually different measures of ageing. Being regarded as older adults could be set at these fixed ages of 50, 60 or 65 (Weijiters and Geuens, 2006). The ageing index is calculated as the number of persons 60 years or over per hundred persons under the age of fifteen (Gavrilov and Heuveline, 2003). Those aged above 60 years old account for 13 per cent of the world population and the figure is growing by three per cent per year (UN, 2018). As fertility rates continue to decline at a steady pace (UN, 2015), the proportion of persons aged 60 and over is expected to double between 2007 and 2050 and their actual number will more than triple (CEPAR, 2013) – 1.4 billion by 2030, 2.1 billion in 2050 and 3.1 billion in 2100 (UN, 2018). Back in 1950, there were approximately 14 million above the age of 80 and currently, there are 125 million (CEPAR, 2016). It is projected that the number of those over 80 years old is likely to quadruple to nearly 430 million by 2050 (CEPAR, 2016) – refer to Figure 2.2. Hence, there is a need to teach older adults the use of technology.

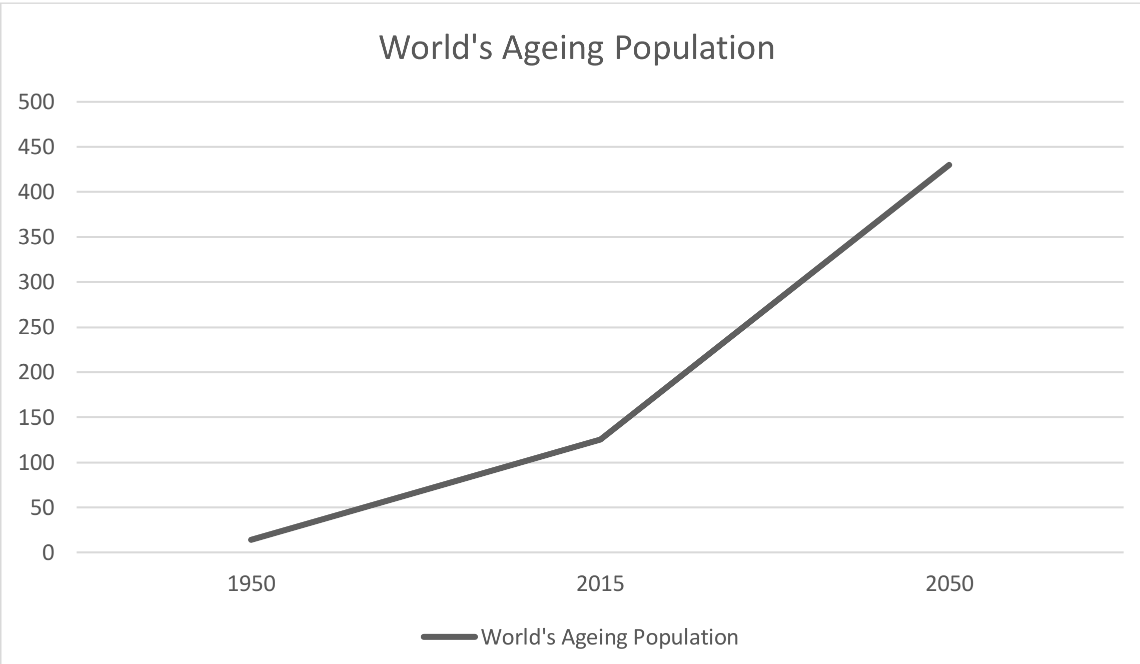


Figure 2.2. World's ageing population over 80 years old measured in millions from 1950 to 2050.

Source: CEPAR, 2016.

Australia has a similar pattern. In the 19th century, fuelled by the gold rush (NMA, 2018; DIBP, 2017), Australia's population increased significantly, and reached nearly 4 million by 1901 (ABS, 2006). At the beginning of the 20th century, natural increase was the main contributor towards population growth. For the first time, birth rates outnumbered death rates. Over the past century, life expectancy increased gradually (ABS, 2017; Perrier, 2015). Due to the improvement of living conditions, advances in food quality, better health education and public sanitation, mortality rates have decreased across all ages (UNFPA, 2018; ABS, 2017; Perrier, 2015). With the advancement of medical science in areas such as immunisations and antibiotics (ABS, 2017; AIHW, 2017), Australians are expected to live considerably longer than those from last century (Harvey and Thurnwalk, 2009). The current population of Australia is over 24.9 million and continues to increase through births and migration (ABS, 2018) – refer to Figure 2.3. In 1891, the life expectancy rate for men was 33.3 years and women at 33.7 years (ABS, 2017).

Compared to their counterparts born in 1980, the average life expectancy for women was 89 years old and 84 years old for men (CEPAR, 2013). According to the ABS (2017), a person born in 2015, would have the average life expectancy of 84.5 years for women and 80.4 years for men. This, therefore, ranks Australian life expectancy amongst the highest in the world (WEF, 2017) – refer to Table 2.3.

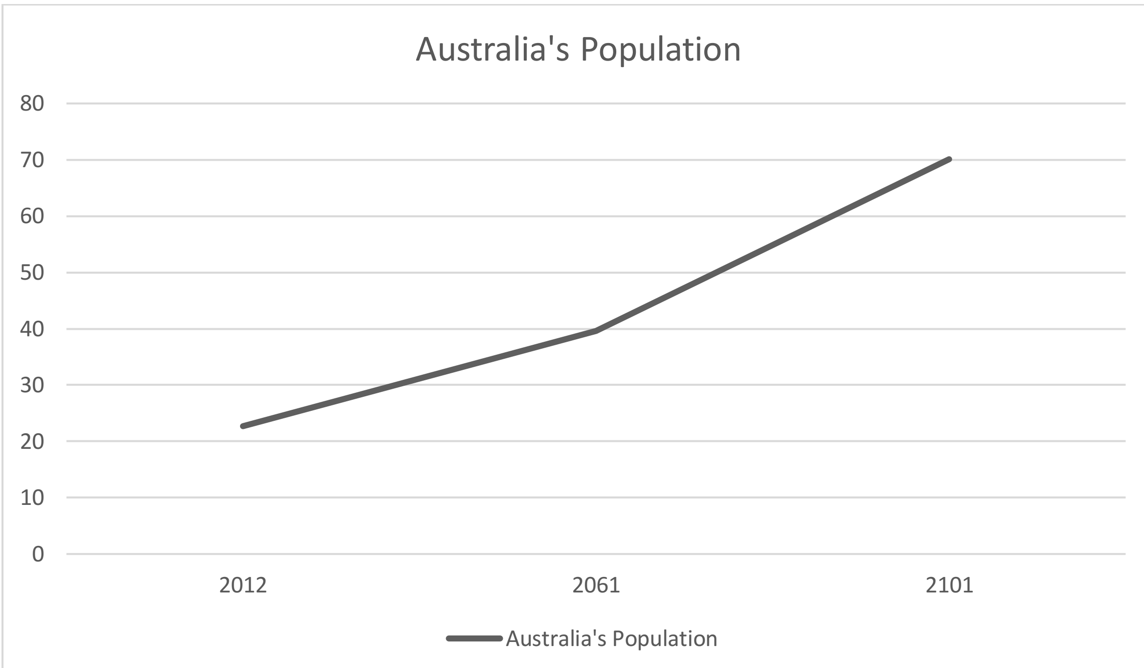


Figure 2.3. Australia's population in millions from 1901 to 2101.

Source: ABS, 2017.

Between the period of 1996 and 2016, the 65 years old and over group increased from 12 per cent to 15.3 per cent of the Australian population (ABS, 2016). By 2050, the projected number of Australians above the age of 65 is estimated to reach 7.2 million (CEPAR, 2014). According to the ABS (2016), over the past two decades, the number of persons aged 85 years and over increased by 141.2 per cent, compared with a total population growth of 32.4 per cent over the same period. The number of Australians above the age of 85 is expected to reach 1.1 million by 2050, a four-time increase from 2010 (CEPAR, 2014). These figures illustrate the increasing proportion of the population predicted to be occupied by older adults. At the time of writing, the state of Victoria's population reached 6.3 million (ABS, 2017). By 2051, Victoria's population is projected to reach 10.1 million (DELWP, 2016). In 2011, 14 per cent of the population was above 65 years old and by 2051, it will increase to 21.5 per cent. In retrospect, 800,000 and 2.2

million respectively (DELWP, 2016). The largest increase came from people aged 85 years and above, Victoria saw an increase of 2.6 per cent (ABS, 2017). In common with residents of other Australian states, Victorian residents become eligible for a range of state government benefits, such as public transport concessions and discounts on a range of goods and services, upon reaching 60 years of age and also on condition that they are working less than 35 hours per week in paid employment or fully retired (DHHS, 2018).

Table 2.3. Average life expectancy of 15 nations with highest levels of life expectancy.

Ranking	Country	Life Expectancy
1	Hong Kong	84.3
2	Japan	83.8
3	Italy	83.5
3	Spain	83.4
5	Switzerland	83.2
6	Iceland	82.9
7	France	82.7
8	Singapore	82.6
9	Sweden	82.6
10	**Australia**	**82.5**
11	Luxembourg	82.2
12	Korea, Rep.	82.2
13	Canada	82.1
14	Norway	82.1
15	Israel	82.1

Source: World Economic Forum (WEF), 2017.

According to the UN's website (2018), "*population ageing is one of the single most important phenomena of our time, bringing wide-ranging challenges and opportunities*". The Australian Government is seeking solutions for funding and managing its current healthcare and pension systems to support the growing ageing population (ABS, 2016). According to CEPAR (2014), in 2050, the projected public expenditure on health proportion to Gross Domestic Product (GDP) is 10.3 per cent, an increase of 6 per cent from 2010. Compulsory contribution to superannuation started in 1983. It was an initiative by the Australian Government for people to accumulate funds that will provide them with a source of income to sustain them through retirement. In 2013, when the first baby boomers reached 65 years, with retirement in the near horizon, a key policy focus of government was on people's ability to support themselves financially, funding their own retirement through superannuation, investments and other personal income sources (ABS, 2017). Edgar (2013) suggests that the Australian Government is mistaken in measuring older Australian's worth in the economy in terms of productivity that contributed directly towards the nation's GDP (DCCSDS, 2012). It was stated that the majority of Australians are predicted to be better educated, healthier and wealthier than previous generations. Older Australians are saving the Australian Government considerable expenditure through social and volunteer activities (Edgar, 2013). According to Betts (2014) in 2010, 45 per cent of those aged 65 years and older volunteered their services. In 2015, volunteering by older adults is estimated to have added 3.1 billion dollars to the Australian economy (Perrier, 2015). Therefore, there are opportunities for tech-savvy older Australians to benefit from the learning and uptake of technology.

2.3.1. Human Lifespan and Ageing

Ageing is defined as "*a persistent decline in the age-specific fitness components of an organism due to internal physiological deterioration*" (Rose, 1991, p.38). Comfort (1979) defines ageing as "*a progressive increase throughout life, or after a given stadium, in the likelihood that a given individual will die, during the next succeeding unit of time, from randomly distributed causes*" (p.17). Ageing usually begins at approximately 30 years of age (Chopra and Tanzi, 2012). The ageing process or cell deterioration is contributed by the shortening of telomeres, when each time a cell copies itself (Blackburn, 2017). Due to different genetic compositions, everyone ages differently (Chopra and Tanzi, 2012) and at different rates and stages of life (Jeong, 2011). Cell deterioration in general progresses at one per cent annually (Chopra and Tanzi, 2012). In old age, certain diseases would occur, but ageing is not a disease (Cahill et al., 2017). Age-related changes, the aspects of primary ageing that everyone experiences, are usually associated with slowing in motor responses, intellectual functioning, sensory processes and acuteness (Hoffnung et al., 2013). Ageing could lead to cognitive impairment (Hu et al., 2012), associated with slowing of processing speeds in both working (short-term) and long-term memory (Topiwala and Ebmeier, 2012). There is no uniform impairment of cognitive domains resulting from ageing (Kraft, 2012). According to the World Wide Web Consortium (W3C), the most commonly occurring age-related functional limitations that often take place during the ageing process are vision decline, hearing loss, diminishment of motor skills and cognition decline (Arch and Abou-Zhara, 2012). Neuroplasticity is an important aspect that is compromised during ageing (Borgesius, 2011), and some research investigates the determinants of cognitive function in order to better understand how to postpone and slow down its decline (Hu et al., 2012). This is of relevance to lifelong learning, as it affects older adults' learning and uptake of technologies. Although there is an abundance of theories describing different aspects of the ageing process, no single theory can fully explain why we age (Saxon et al., 2015). Consequently, what does it mean to be old? When does old begin and what exactly is ageing? According to Agronin (2011), to be old, is, "*a realm of great complexity and uncertainty*" (p.59). Age is measured in time and "*chronological age is defined as the difference between an individual's date of birth and the present date*" (Whitbourne, 2008, p.7). However, the definition of chronological age should not impede lifelong learning nor obstruct older adults from learning technology.

Originally, three divisions of age groups were proposed for older adults: (1) young-old from 65 to 74 years old, (2) old-old from 75 to 84 years old and (3) oldest-old for 85 years and older (Saxon et al., 2015; Whitbourne, 2008). However, as more people are living to advanced ages, two more divisions were added; (4) centenarian from 100 to 109 and (5) super-centenarian from 110 and above (Saxon et al., 2015; Whitbourne, 2008) – refer to Table 2.4. This system of keeping track of age, although convenient to calculate is in itself flawed (Saxon et al., 2015; Hoffnung et al., 2013; Whitbourne, 2008). This is because our biological functions are not keeping up with our supposed chronological time system (Beunen et al., 2006). It seems to have a mind of its own, operating to an internal clock instead. There are two aspects of ageing: (1) primary ageing and (2) secondary ageing. The former refers to normal age-related changes and the latter refers to pathological ageing that is usually associated with diseases and illnesses (Saxon et al., 2015; Hoffnung et al., 2013; Whitbourne, 2008, 2013).

Table 2.4. Divisions of ages.

No.	Divisions	Age Range
1	Young-old	65 to 74 years old
2	Old-old	75 to 84 years old
3	Oldest-old	85 to 99 years old
4	Centenarian	100 to 109 years old
5	Super-centenarian	110 years old and above

Source: Saxon et al., 2015 and Whitbourne, 2008.

Although, the human lifespan is usually determined by chronological age (Lindley et al., 2008) and usually associated with events such as graduation, marriage and retirement as a form of lifespan measurement, no two individuals will live exactly the same life. Therefore, Kendig and Browning (2011) argue that ageing should be described as a transition and that the older members of the population should not be segregated (Durick et al., 2013). This is because we are all going to age (Agronin, 2011) and no one can escape the ageing process unless they die young (Whitbourne, 2008). The stereotypical perspective of older adults as being in poor health, living in isolation, being unproductive, and with a mind not being as sharp, or capable of using and/ or learning technology, has started to change over time (Edgar, 2013; Östlund, 2005). Older adults are still being discriminated against for being old (Edgar, 2013), even though the image of being old is our future self some years down the road (Hollwich, 2016). People identified in the older adult age group rarely perceive themselves as being *old*, if they are still living independently, remain autonomous and are leading active lives (Durick et al, 2013; Lindley et al., 2008). The majority of older adults remain alert, aware, healthy, active and involved with their local communities (Betts, 2014; DCCSDS, 2012). According to Sperry and Prosen (1996), the stereotype of ageing should not be justified on general decline in cognitive and physical functions. Slowing down is not equivalent to being incompetent (Saxon et al., 2015). Older adults are as capable of contributing their knowledge and experiences to their communities as their younger counterparts (Harvey and Thurwald, 2009). Therefore, it is imperative for older adults to remain active and engaged in their lives, as staying active mirrors interest in the aspiration and motivation to continue with learning (Östlund, 2008), that includes technology (Durick et al., 2013; Waycott et al., 2012; Hernández-Encuentra, 2009). Silvia (2006) explains that, "*the development of interests is a special case of motivational development*" (p.113), and believes that "*interest appears to promote learning, through several mechanisms*" (p.73). According to a study conducted by Carroll and her colleagues (2011), older adults were "*motivated to learn techniques and had the motivation and domain knowledge and were able to find the time to learn the needed technology by themselves*" (p.9). Consequently, motivation is one of the key elements in this research that facilitates older adults' learning and uptake of technology.

At the moment, there are a number of different theories on ageing and some are considered fairly out-dated, for the reason that, these theories usually carry with them a negative perspective and reinforce these perceptions about ageing. Thus, this research aims to overcome these negative perspectives. In the *General Theory of the Third Age*, Laslett's model of life stages (Laslett, 1991), is comprised of four ages: (1) first age, (2) second age, (3) third age and (4) fourth age – refer to Figure 2.4. The first age consists of dependency, socialisation and education. It includes babyhood, childhood and education. The second age is comprised of maturity, independence, familial and social responsibility and is usually associated with work, family and production. The third age consists of personal achievement. Laslett (1991) suggested that it is related to "*a matter of choice*" (p.152). The fourth age is comprised of dependence and decrepitude, taking into consideration events such as decline in physical health, leading to being frail and requiring either care at home or at an aged facility, and later on, eventually leading to death.

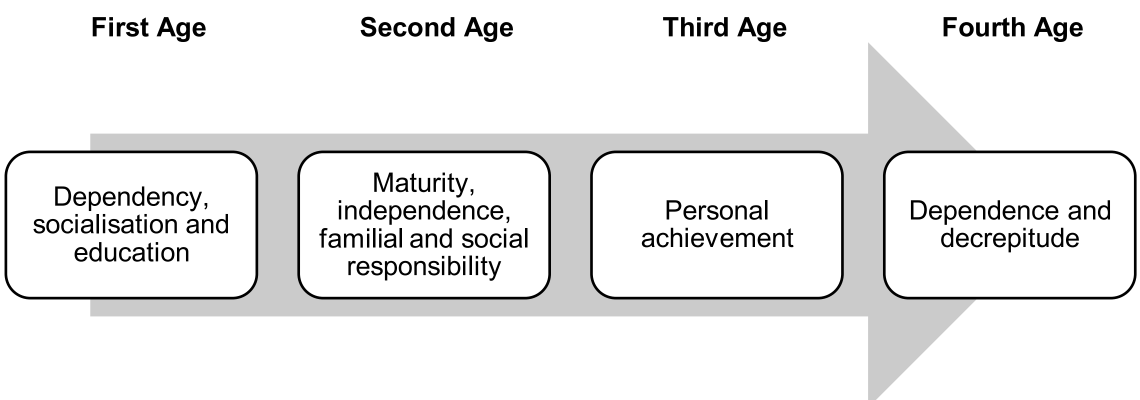


Figure 2.4. Theory of the Third Age.

Source: Laslett, 1991.

Erikson's Theory of Psychosocial Development describes the psychoanalytic theory of human development that identifies the eight stages of an individual from infancy to death. Erikson collaborated with his wife, Joan, on the development of these stages of psychosocial development in their book, *The Lifecycle Completed* (1987). During infancy (zero to two years), the parents will take care of their infant's basic needs, thus leading to trust. In early childhood (two to four years), the child explores its surroundings to foster autonomy with help from parents. By pre-school (four to five years), the child is learning basic skills and its sense of purpose. As the child continues onto school age (five to twelve years), he or she becomes aware of their level of competence in regards to learning of new skills. At the adolescence stage (13 to 19 years), the child is concerned about their identity, a transitional stage from child to adult. In the early adulthood stage (20 to 39 years), young adults are ready to make long-term commitments to relationships. In the adulthood stage (40 to 64 years), the period of contribution, one's life usually revolves around work, society, family and relationships. By the maturity stage (65 years to death), individuals are older and most probably retired. During this time, people generally look back on their lives, goals and accomplishments, assessing whether they have led a successful life (refer to Table 2.5).

Table 2.5. Theory of Psychosocial Development.

Stage	Descriptions	Approximate Age	Virtues	Psychosocial Crisis
1	Infancy	0 to 2 years old	Hope	Basic trust vs. mistrust
2	Early childhood	2 to 4 years old	Will	Autonomy vs. shame and doubt
3	Preschool	4 to 5 years old	Purpose	Initiative vs. guilt
4	School	5 to 12 years old	Competence	Industry vs. inferiority
5	Adolescence	13 to 19 years old	Fidelity	Identity vs. role confusion
6	Early adulthood	20 to 39 years old	Love	Intimacy vs. isolation
7	Adulthood	40 to 64 years old	Care	Generativity vs. stagnation
8	Maturity	65 years old to death	Wisdom	Ego integrity vs. despair

Source: Erikson and Erikson, 1987.

In 1998, three years after the death of her husband, Erikson, Joan added a ninth stage to the existing theory in *The Life Cycle Completed: Extended Version*. She proposed that individuals face all eight stages in the psychosocial crises when in their ninth stage, but in reverse. It was based on Joan's personal experiences living through her eighties and nineties. It included the loss of one's physical health, independence, family members and friends. Individuals might experience isolation from society and youth, as one loses autonomy and has to be moved into retirement homes and/or assisted living facilities. Eventually, the inevitable reality of the end of lifespan arrives, as death creeps up on one. It is a very negative outlook, whereas this research is looking towards positive outcomes in ageing. Both the General Theory of the Third Age and the Theory of Psychosocial Development are positive, but still not a model to encourage skill acquisition at a later age. Taking into consideration that people are living past 100 years, the difference between 65 and 100 is 35 years. This is a very long time frame that is unaccounted for when applying older theories about ageing. This paragraph contains deficit centred views on ageing, such as the negativities brought about by ageing. However these interpretations will be countered in later sections within this chapter to a more positive view shared by the researcher.

2.4. Lifelong Learning

Pedagogy is part of education theory. Some of the well-known educational theorists include John Locke, Jean-Jacques Rousseau, John Dewey, Maria Montessori, Jean Piaget and Albert Bandura (Farquhar and White, 2014). In this thesis, Johann Friedrich Herbart's (1776-1841) work was chosen over the other educational theorists mentioned. This is because "*during his lifetime and after his death he was largely positive reviewed. He became a pedagogical theorist who, by his views, influenced educational theory and teaching practice across Europe and America*" (Hofmann and Kyrášek, 1977, p.5). Herbart had a profound influence on teaching practices, especially for adolescents (Somr and Hruskova, 2014; Hilgenheger, 1993). Ellerton and Clements (2005) stated that the four steps of instruction that Herbart came up with were: (1) clarity, (2) association, (3) system and (4) method. Yet, Dunkel (1970) argued that Herbart was inconsistent in his ways of defining the four steps of instruction or the terminology used in the descriptions. The information gathered from literature varied. According to Ellerton and Clements (2005), Ziller later on renamed Herbart's four steps as: (1) clearness, (2) association, (3) system and (4) method. Yet, Gangel and Benson (1948) stated that Ziller actually expanded Herbart's work into five steps. While Rein further developed the five steps into: (1) preparation, (2) presentation, (3) association, (4) generalisation and (5) application – refer to Table 2.6.

Table 2.6. Core pedagogy principles.

No.	Herbart's Four Formal Steps	Ziller's Four Formal Steps	Rein's Five Formal Steps
1	Clarity	Clearness	Preparation (analysis)
2	Association	Association	Presentation (synthesis)
3	System	System	Association
4	Method	Method	Generalisation
5	--	--	Application

Source: Ellerton and Clements, 2005.

In order for the progression of a knowledge society and in keeping up with this volatile environment, the ability to learn is considered one of the most basic skills required for success (Chan, 2010; Hoskins, 2008). According to Lachman (1997), learning refers to a relatively permanent change in behaviour as a result of practice or experience (p.477). The Theory of Evolution (Darwin, 1859) stated that evolution is adaptation to the environment across generations. Learning is seen as adaptation of an individual's lifetime to its environment (Skinner, 1938). It is viewed as a process of skill transference (Chan, 2010). Andragogy focuses on adults and is defined as *"the art and science of helping adults learn"* (Knowles, 1980, p.43). The term *andragogy* was first coined by Alexander Kapp (1833) in Plato's Educational Ideas. Kapp suggested that ongoing learning throughout the lifespan does not depend solely on the teacher or the instruction, but also takes place through adults' life experiences and self-reflection (Henschke, 2010). *Andragogy in Practice* (Knowles et al., 1998), is based upon six core adult learning principles: (1) learner's need to know, (2) self-concept of the learner, (3) prior experience of the learner, (4) readiness to learn, (5) orientation to learning and (6) motivation to learn – refer to Table 2.7. Knowles' six core adult learning principles looked at individual learners. These principles are of relevance to this study, as they formed the basis of developing tailored learning of technology for older adults.

Table 2.7. Six core adult learning principles.

No.	Learning Principles
1	Learner's need to know
2	Self-concept of the learner
3	Prior experience of the learner
4	Readiness to learn
5	Orientation to learning
6	Motivation to learn

Source: Knowles, 1998.

The term *geragogy* refers to theories for teaching older adults, especially the "*frail*" (John, 1988). Chan (2010) recommends that in order to engage students in active learning in acquiring practical skills, the teacher or instructor should tailor contents with activities, by applying anagogical principles similar to Knowles' in Table 2.7. Regardless of age, active learning can be more effective than passive learning (Chan, 2010). According to Hebb (1949), in order to be remembered, new learning should be transferred into everyday life. Stimulating and real-life experiences can be crucial for learning to occur, since the brain can be compared to a muscle - *use it or lose it* (Amthor, 2012). As humans age, there is a need to find dynamic flexibility in the brain. With the development of neuroplasticity theory, the long-held belief that the brain becomes rigid has been overturned (Doidge, 2016; Arrowsmith-Young, 2012; Doidge, 2008). Throughout adult life, synapses can be modified by further activities, thus demonstrating a connection between adult developments and learning processes (Wilson, 2011). In addition, older adults have different individual characteristics shaped by personal life experiences (De Hoiwe et al., 2013), different life patterns (Jeong, 2011), and memories and habits (Chropa and Tanzi, 2012). There is a need to consider older adults as individuals instead of a cohort. Therefore, different teaching approaches are needed to encourage lifelong learning and assist with decelerating of the ageing process.

Learning is not entirely an intellectual activity, but something that has been embedded in human ability to accomplish tasks and challenges that can be overcome (Amthor, 2012). Learning has a lifespan trajectory; it can be easy when young, difficult after adolescence and very challenging for most older adults (Amthor, 2012). Arrowsmith-Young (2012) argued that the obsolete conjecture that the brain was fixed, and education was based on pouring content into a fixed system, has major implications for education and learning. This learning theory is still embedded in many educational systems and will therefore continue to play a role in the teaching and learning process (Chan, 2010). In contrast, a new paradigm – neuroplasticity – has emerged. Neuroplasticity advocates that each human brain has the ability to create a map of its own workings – a map based on knowledge and training (Arrowsmith-Young, 2012). The concept of the neuroplastic brain with a map, in relation to education has yet to be fully understood and implemented in education systems (Arrowsmith-Young, 2012). In the course of a lifetime, the human brain can remap itself and grow new neural connections (Doidge, 2016; Arrowsmith-Young, 2012; Doidge, 2008). In other words, the brain has circuitry but no wires. The circuits consist of living tissues and constantly rewire themselves with new thoughts, memories, desires and experiences (Doidge, 2016; Doidge, 2008). The brain is plastic, capable of change, is constantly adapting to the environment in order to optimise behaviour (Boyd, 2015; Arrowsmith-Young, 2012; Amthor, 2012). In an interview by Doidge (2008), Merzenich pointed out that humans are able to change the structure of the brain itself and increase its capacity to learn, because unlike a computer, the brain is constantly adapting itself, suggesting that it is capable of being flexible and dynamic. In a publication by *National Geographic* (2012) it was stated that learning and memory work together because learning changes the brain, changing the synaptic weights allows learning to take place rapidly, compared to adding new neurons and connections (Amthor, 2012; Hebb, 1949). Merzenich emphasised in his interview with Doidge (2008), that when learning occurs in a way consistent with the laws that govern brain plasticity, the mental machinery of the brain can be improved, so that we learn and perceive with greater precision, speed and retention. His research shows that brain health can improve. In addition, intellectual abilities increase and the brain reserve gets larger due to more education (Wilson, 2011). According to Wilson (2011), brain-based learning is a new paradigm, but very little interest has been given to it in the field of andragogy. As the brain is not definitive but open to change, the main interest of brain-based learning is to continue to discover how the brain was designed to learn in its natural form (Wilson, 2011). It also improves individuals' future responses to situations that are similar to situations that triggered the learning (Amthor, 2012). Learnings from research suggests studies about learning have indicated that older brains function just as well as their younger counterparts (Doidge, 2008). According to DCCSDS (2012), *older adults are keen to continue to learn* (p.16) and *"many have an interest in learning about new things"* (p.17), so ability is not a challenge, but where to access educational learning in later life is. Additionally, to find out about older adults' motivations towards learning is difficult. Their needs and prior experiences should also be considered during the learning process (Boulton-Lewis and Tam, 2012).

Findsen (2007) discussed two concepts of learning: (1) lifelong learning and (2) lifewide learning. The former is a process whereby people learn throughout their lives. The latter proposes that learning is no longer confined to the formal education of traditional school settings, such as obtaining qualifications. According to AGHE (2018), *gerontology is the study of the ageing processes and individuals as they grow from middle age through later life*. It is an interdisciplinary study (Ferraro, 2007). The word *gerontology* was derived from Greek – "*geront*" equivalent of old man (Harris, 1988). The term was used by Ilya Metchnikov (Komp and Aartsen, 2013; Green, 1993). It is a multi-disciplinary study that compasses sociology, psychology and biology (AGHE, 2018). McClusky (1974), a pioneer in the field of educational gerontology (older adults' learning), provided five basic needs: (1) coping needs – leisure time and basic education, (2) expressive needs – cultivated through enrichment of living, (3) contributive needs – contributions to society, (4) influence needs – becoming social changers and (5) transcendence needs – the desire to live a meaningful and fulfilling life (Figure 2.5). Ageing is relevant not only to older adults but to everyone. Ageing should be viewed as a lifespan development issue (Findsen, 2007). In 1982, the United Nations Vienna International Plan of Action on Ageing identified other issues besides ageing in general. Recommendations made to the educational sphere included equal access for everyone, raising awareness and challenging misconceptions. However, it is still unclear what these recommendations would entail in practical terms when put into action, so this is where this research is located.

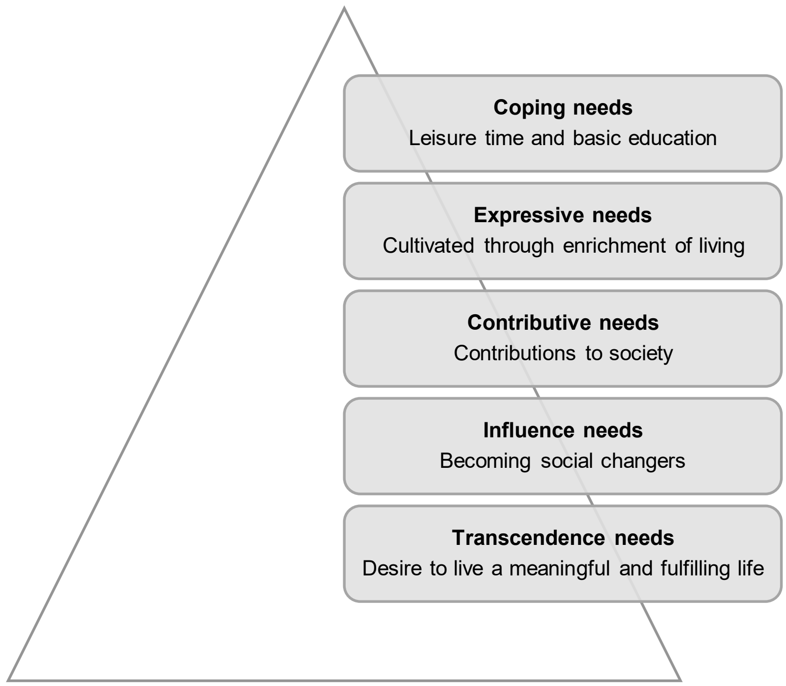


Figure 2.5. Five basic needs in the field of educational gerontology.

Source: McClusky, 1974.

University of The Third Age (U3A) provides opportunities for older adults to participate and enjoy a wide range of activities that include adult education and recreational courses for retired and semi-retired people above the age of 55. No entry qualifications are required, there are no examinations, and no certificates or diplomas are awarded (U3A Hawthorn, 2017; Swindell and Thompson, 1995). Courses vary widely, including academic, leisure and social pursuits. Humanities and visual arts are popular topics and are the core content. Course delivery is commonly a mixture of study groups, lectures and excursions (Swindell and Thompson, 1995). There are two different approaches: (1) the French model and (2) the British model. Both models have evolved and were widely adopted by different countries across the globe (Swindell and Thompson, 1995). The University of the Third Age started in France in 1972, known as the French Universite du Troisieme Age, adopting the model, whereby local U3As will be guided by a local university, as a form of goodwill offered by the university to members of the U3A. Then, in 1973, Toulouse University of Social Sciences ran a gerontology course that was eligible for local retirees and eventually led to the formation of the first U3A. By 1975, it had spread to universities across Europe, the United States and Canada (Swindell and Thompson, 1995). U3As were funded in a few ways, such as by fees and donations. U3A in the United Kingdom began in 1981 at the University of Cambridge. Its founder, Peter Laslett did not adopt the French model, as he firmly believed that U3A should be a self-help group. Members' roles would be both teachers as well as learners. There was no teacher, but a convenor to coordinate and guide its members. The British model was not dependent on public funds. Laslett also decided that U3As would be self-governed – democratically run by its members. These members contribute to a minimal annual membership. There are currently 106 U3As across the state of Victoria (U3A Victoria, 2018).

In 1984, Hawthorn, located in the southeast of Melbourne was the first U3A to be established in Australia (U3A Hawthorn, 2018). Australia adopted the British Model of U3A when it was introduced to Melbourne in 1984 (Swindell and Thompson, 1995). Mainly because U3As in Australia received "*little or no support from external sources*" (Swindell and Thompson, 1995, p.3). This U3A UK model was based on andragogy instead of pedagogy. It was established that the focus would be on sharing of knowledge between U3A members, instead of operating it as a teacher-student scenario similar to that of an academic context. According to U3A Victoria's website (2018), "*The U3A movement is a unique and exciting organisation which provides, through its U3As, life enhancing and life changing opportunities. Retired and semi-retired people come together and learn together, not for qualifications but for its own reward: the sheer joy of discovery! Members share their skills and life experiences: the learners teach and the teachers learn, and there is no distinction between them*". Members join courses based on their individual interests and hobbies, they get to socialise while at the same time learn from one another. There is more motivation than merely the acquisition of skills. The U3A model promotes lifelong learning, on the other hand, it did not focus on individual needs, such as technology learning.

2.5. Human Motivation and Interest

Older adults' quality of life could be enhanced by the capacity technology could provide (Iancu and Iancu, 2017). However, older adults need to have the basic technological skills to operate these devices in order to fully utilise and gain from its benefits, such as remaining independent and staying in touch with family and friends. Boulton-Lewis (2009) suggests that it is not only important to provide technologies that are easy to learn, but also consider the specific interests of older adults, in order to facilitate a successful learning environment and make use of learning capabilities of older adults. This indicates that it is crucial to empower any person for any kind of learning, no matter what age (Adult Learning Australia, 2011). In addition, studies by Waycott et al. (2012) and Robertson et al. (2012) show that older adults need to see a purpose in using a technology in order to engage with it. According to Silvia (2006), *"the motivational function of interest extends to activities that are not inherently interesting or appealing. Interest can bolster motivation to complete tasks that are boring and tedious"* (p.22). The adoption of technology by older adults is influenced by a variety of factors. These factors are not restricted only to socioeconomic background, education, health, attitudes towards technology and technological skills (Oppenauer, 2009). In order to assist with the increase of digital inclusion amongst older adults, it is crucial to take into consideration their motivational level, as it affects their learning and uptake of technology (Francis, 2017). Looking from the older adults' perspective, they have to take into considerations the amount of time, effort and money required to acquire technological skills (Melenhorst et al., 2006). Furthermore, the barriers they have encountered cause frustrations with use of new technology. Hence, older adults' motivation ought to be explored in order to help with encouraging and sustaining their learning of technology.

2.5.1. Human Motivation

Motivation is relevant to technology learning especially for older adults, so that they can have access to goods and services provided to everyone with digital access. An important result of Kumar and colleagues' study (2013) was that there were "*effects of physical and cognitive barriers that come with ageing, but here we discuss obstacles that have roots in attitudes, personal history, motivation and socioeconomic context*" (p.2) There needs to be a paradigm shift with identification of issues related to older adults' motivation towards the adoption of technologies. At this junction, motivation according to some is considered to be another relevant concept for understanding how people learn. According to former president, Eisenhower, *"motivation is the art of getting people to do what you want them to do because they want to"* (Singh and Deepak, 2013, p.37). The following section describes motivation terms relevant to academic achievement. Throughout the history of psychology, motivation has been a robust and fertile area of theory and research (Bernard et al., 2005), with numerous theories being formulated. The scientific study of motivation originated in the 1930s and encompasses broad theories through to mini-theories (Graham and Weiner, 1996). Several key researchers that have made significant contribution towards relevant motivational theories such as Attribution Theory (Weiner, 1973; Atkinson, 1968), Hull's Drive Theory (Hull, 1943), Lewin's Field of Theory (Lewin, 1939) and Theory of Achievement Motivation (Atkinson, 1957). Each and every one of these researchers advocated and subscribed to different theories of motivation, founded through their experiences, perspectives and scientific research conducted during their time.

What motivates a person to perform a particular task? For example, why would a person be interested to learn a new language or a musical instrument, but another person would find it very tedious? To address these questions, Bernard and colleagues (2006) state that *"motivation refers to the why that caused an organism to initiate and persist in certain behaviours as opposed to others"* (p.134). Graham and Weiner (1996) define motivation as *"the study of why people think and behave as they do"* (p.63). Over time, different disciplines have defined motivation from different perspectives. The word *motivation* originates from the Latin verb *movere* that means to move (Beck, 2004, p.3; Graham and Weiner, 1996, p.65). According to Ryan and Deci (2000) to be motivated means *"to be moved to do something"* (p.54). An example provided by Graham and Weiner (1996), when a person is oblivious to all else, through being engaged in a particular activity, that is considered interesting, captivating and involving to an individual, then motivation is considered high. Bernard and colleagues (2006) state that *"motivation is what animates us, what prompts our initiation, choice and persistence in particular behaviours in particular environments"* (p.137). On the one hand, motivation can be considered a unitary phenomenon, when a person either has very little motivation to act or a great deal of it. Alternatively, although by nature, human beings are curious and possess the desire to learn (Niemiec and Ryan, 2009; Ryan and Deci, 2000), they can be considered to have different amounts and different kinds of motivation. In other words, they vary not only in levels of motivation, but also in orientation of that motivation (Deci and Ryan, 2008; Ryan and Deci, 2000). Research in learning is commonly associated with the area of achievement motivation. Murphy and Alexander (2000) proposed a lexicon of terminology in the field of achievement motivation. Figure 2.6

presents a summary of that lexicon, focusing on motivation and interest only, while based on the relevance of studies conducted in this thesis.

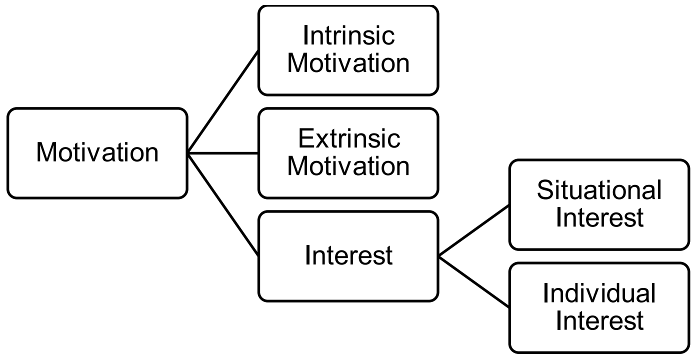


Figure 2.6. The resulting corpus of motivation terms relevant to achievement motivation.

Source: Murphy and Alexander (2000).

The following section of the literature review summarises the concepts behind the terminology. Intrinsic motivation is defined as individuals performing a particular task that is naturally of interest to them (Pink, 2009; Eccles and Wigfield, 2002; Ryan and Deci, 2000; Carver and Scheier, 1985) in the absence of external stimuli (Pink, 2009; Niemiec and Ryan, 2009; Ryan and Deci, 2000), that are usually associated with rewards and punishments (Beck, 2004; Ryan and Deci, 2000). The activity is a reward in itself, because individuals attempt it to satisfy essential psychological needs, such as enjoyment, *interest* and satisfaction (Ryan and Deci, 2000). According to Carver and Scheier (1985), actions within Self-Determination Theory (SDT) are carried out by individuals based on interest in a particular activity, and therefore they are more likely to be intrinsically motivated. According to Ryan and LaGuardia (2000), intrinsic motivation influences the way knowledge and skills are acquired across the human lifespan. Whereas, extrinsic motivation is recognised as an individual performing a task which leads to a *"separable outcome"* (Ryan and Deci, 2000, p.55), focussing on the *"instrumental value"* (Ryan and Deci, 2000, p.60) instead of enjoyment of the task itself (Carver and Scheier, 1985). Within the framework of Self-Determination Theory (SDT), extrinsic motivation is further sub-divided into (1) external regulation, (2) introjected regulation, (3) identification and (4) integrated regulation (Table 2.8).

Table 2.8. Sub-division within extrinsic motivation.

No.	Extrinsic Motivation	Associations
1	External regulation	Rewards
2	Introjected regulation	Individual ego and approval
3	Identification	Self-endorsement of goals
4	Integrated regulation	Individual's needs and values

Source: Deci and Ryan, 1985.

External regulation is known as the least autonomous form of extrinsic motivation, as it is usually associated with rewards. It is then followed by introjected regulation, which involves the individual's ego and usually focuses on approval from either self or others. Identification is considered *somewhat internal* because individuals tend to associate activity with a value and a self-endorsement of goals, and consequently experience more autonomy. Integrated regulation resembles individual's needs and values. It is the most autonomous form of extrinsic motivation, mainly because individuals are able to associate it with themselves rather than an external entity or force (Ryan and Deci, 2000).

Self-Determination Theory

Numerous studies related to SDT have been conducted for children, adolescents and younger adults. In high schools, studies included subjects, such as science (Dettweiler et al., 2015), music (Evans, 2015), physical education (Standage et al., 2005), and within the higher education sector (e.g. universities), subjects such as organic chemistry (Black and Deci, 2000), second languages (Noels et al., 2000), law (Sheldon and Krieger, 2007) and medicine (Williams and Deci, 1996). Studies have also been conducted in workplaces, for instance in the corporate sector (Deci et al., 2017; Olafsen, 2015; Gagne and Deci, 2005; Shirom et al., 1999; Deci et al., 1989) and charity organisations (Deckop and Cirka, 2000). According to Ryan and Deci (2000), "*although motivation is often treated as a singular construct, even superficial reflection suggests that people are moved to act by very different types of factors, with highly varied experiences and consequences. People can be motivated because they value an activity or because there is strong external coercion*" (p.69). Self-Determination Theory (SDT) distinguishes several types and levels of human motivation within a framework of goals (Niemiec and Ryan, 2009; Deci and Ryan, 2008). Deci and Ryan (1985) define the three important elements that make up SDT to be: (1) autonomy, (2) competence and (3) relatedness (Figure 2.7).

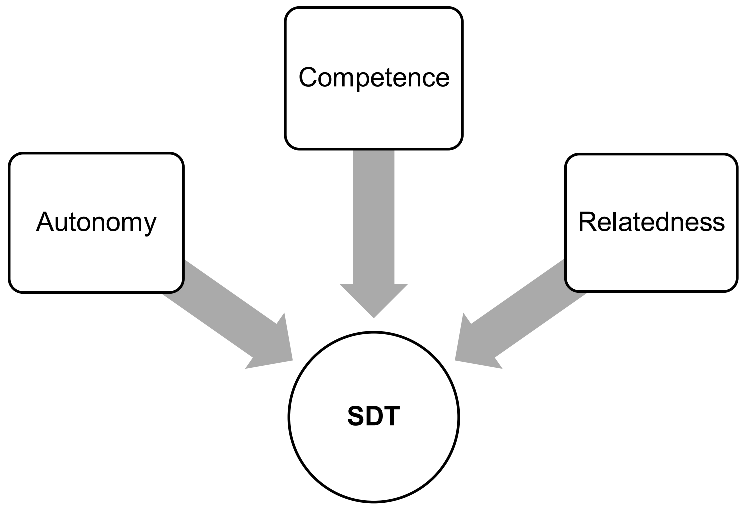


Figure 2.7. Self-Determination Theory (SDT).

Source: Deci and Ryan, 1985.

These three elements are the essential foundation in the development of personal well-being and social development (Ryan and Deci, 2000). Both autonomy and competence are classified as basic psychological needs and necessary for sustained motivation (Niemiec and Ryan, 2009). Sound learning outcomes are more likely if determined by individuals who feel that they have a certain amount of control over their learning (Hagay et al., 2013). Motivation can be classified along a continuum from intrinsic to extrinsic (Reeve, 2005; Beck 2004; Atkinson, 1968). Deci and Ryan (2008) reported that the latter theory was indeed a stable idea due to the abundance of research. Since the mid-1980s, Deci and Ryan (1985) have been leaders in motivational research in education. In this research it was intended that this theory would act as a framework in focusing on older adults' learning and uptake of technology.

Socioemotional Selectivity Theory

There has been little research conducted of relevance for older adults using the Self-Determination Theory (SDT). Whereas, in contrast, Socioemotional Selectivity Theory (SST) is of greater relevance to older adults. Mainly because SST is also known as *life-span theory of motivation*, this theory maintains that as people start to age, they realise that their time horizon shrinks (Carstensen, 1993). SST was developed by Carstensen, an American psychologist in 1992. In SST, time remaining is viewed as a constraint. Older adults become very aware that they are *running out of time*. Perception of time plays a vital role in decision making with regard to the selection and pursuit of individual goals (Carstensen et al., 1999). Therefore, older adults tend to be more selective about making the right choices, so as not to waste their precious time. Carstensen and her colleagues (1999) claim that SST plays an important role; it determines the motivational shift leading older adults to invest their time to select and pursue goals and activities that are emotionally meaningful (Charles and Carstensen, 2009; Hendricks and Culter, 2004; Carstensen and Charles, 1998). Charles and Carstensen (2009) state that ageing brings changes to social and emotional life. Besides motivational shifts, ageing also influences personal goals. Studies show that younger adults perceive their future as open-ended and therefore they prioritise their goals towards knowledge-related areas. They concentrate on acquisition of knowledge, in order to plan for endeavours that would pay off in the future, such as getting a job promotion. On the other hand, older adults shift their focus towards emotion-related goals, directing their attention towards goal-relevant information to deepen existing relationships and fulfil personal satisfaction (Carstensen, 2007) – refer to Figure 2.8. A number of studies (i.e. Wilson et al., 2007; Barnes et al., 2004; Fratiglioni et al., 2000) show that older adults with strong social connections are less likely to experience decline in their cognitive functioning. Social networks also contribute towards regaining higher cognitive functioning (Glymour et al., 2008; Gelder et al., 2007). Therefore, suggesting that older adults might be able to learn technology, in particular, touch screens, when they are attending classes with other like-minded individuals.

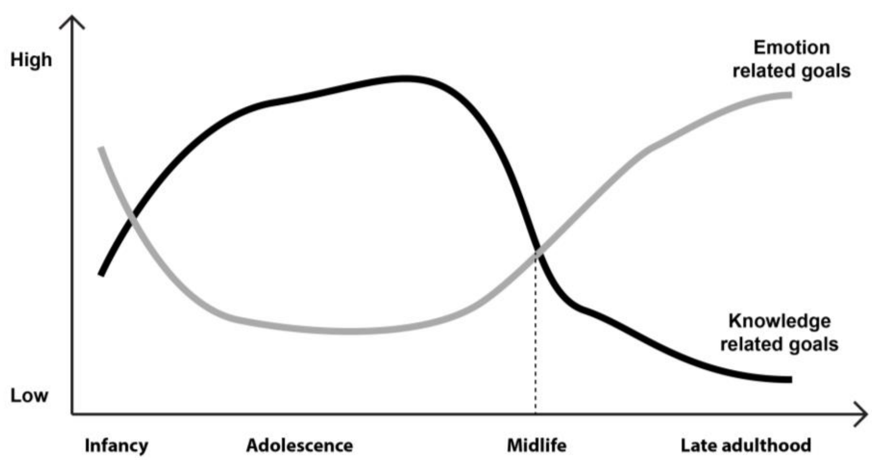


Figure 2.8. Socioemotional Selectivity Theory (SST).

Source: Carstensen, 1992.

2.5.2. Human Interest

In Boulton- Lewis and Tam's book on *Active Ageing, Active Learning* (2012), the numerous authors have contributed their views and supported the need to improve on learning amongst older adults, especially in the field of technology adoption, as it leads to successful ageing and lifelong learning. Even though "*there is limited empirical evidence, still mostly correlational, that education in early life or in ageing will halt the decline of cognitive powers*" (Boulton-Lewis, 2012, p.2). Studies on digital literacy for older adults, for instance Kobayashi et al. (2017), Delello and McWhorter (2015), Xavier et al., (2014), Rebok et al., (2014), Cai et al. (2014), Neves and Amaro (2012) and Williams and Kemper (2011) have shown that there is a reduction in cognitive decline amongst their participants. It is without doubt that the ability to maintain high cognitive function would be top priority towards successful ageing. According to Boulton-Lewis (2009),

> "*There is very little research that describes what older people themselves say they want and need to learn; however, there are statements about what others believe is necessary. There is no doubt that we need more data from older people themselves about their attitudes to learning and why, how and what they want to learn.*" (p.3).

Therefore, this statement has led me towards the path of focusing on the topic of *interest* in technology usage for older adults in this research. Based on Arnold's work – *Psychology of Interest* (1901) and *Interest and Attention: A Study in Psychology and Education* (1910), an overview was provided on three prominent figures, mainly Herbart, Arnold and Dewey's contribution to the topic of *interest* and their interpretation of *interest*. Johann Friedrich Herbart was a German philosopher and psychologist. *Lehrbuch der Psychologie* that he wrote in 1816, was translated into English by M. K. Smith in 1891, under the title of *Textbook in Psychology*. According to Arnold (1910), Herbart's educational writings were most accurate when read in German, and had been misinterpreted by authors *"according to their own views"* (p.3). Herbart's perspective of psychology was based entirely on apperception, without any reference to *interest*.

John Dewey was an American philosopher and psychologist. He was one of the prominent figures in educational reform, in particular, educational pedagogy, concentrating on *interest* and attention (1913). Dewey was more original with his theory on educational pedagogy. According to Arnold (1901), Dewey's *"entire theory is founded on his own principle of activity which forms the basis of most of his psychological and philosophical discussions"* (p.227). Dewey believed that students should be allowed to experience and interact with the school curriculum, thus taking part in their own learning. Dewey (1913) stated, *"in behalf of interest it is claimed that it is the sole guarantee of attention; if we can secure interest in a given set of facts or ideas, we may be perfectly sure that the pupil will direct his energies toward mastering them; if we can secure interest in a certain moral train or line of conduct, we are equally safe in assuming that the child's activities are responding in that direction"* (p.1). Dewey's theory of *interest* is interpreted as the correlation of the following elements: active, teleological and emotional. Felix Arnold wrote *Attention and Interest* and part two of his book was dedicated to the topic of *interest* (1910). Arnold wrote mainly on education. He mentioned that *"one feels interest in a situation in that the situation excites innervations and tendencies, which, when more fully realised, will bring about a condition of pleasure, ease, satisfaction, and the like"* (p.185). Hence, *interest* could be tapped into, in order to encourage older adults with learning of technology and increase their uptake of technology over time.

What is *interest*? Is it an emotion, a feeling or an affect? Is it considered positive or negative? Fredrickson (1998) argued that *interest* is a positive emotion (Silvia, 2006; Frijda, 1986; Izard, 1977; Tomkins, 1962). Other theorists such as Renninger and Hidi (2006), Ekman (1992) and Lazarus (1991) do not consider *interest* as an emotion, but rather as a feeling or an affect. The word *interest* originated from Middle English, *interess*, from Latin *interesse*, meaning "*to be between*" (Jonas, 2011, p.115). The topic of *interest* in learning appeared more than one hundred years ago (Herbart, 1891; Arnold: 1901, 1910; Dewey: 1910, 1913). After this initial appearance, it was encountered infrequently until the 1980s, when it entered the field of educational psychology (Silvia, 2006). At present, research in *interest* is mainly associated with early learning and adolescence within a school environment of academic subjects such as sciences (Tapola et al., 2013; Linnenbrink-Garcia et al., 2012), including physics (Lavonen et al., 2005), biology (Hagay et al., 2013; Uitto et al., 2006), organic chemistry (Black and Deci, 2000), mathematics (Wang, 2013; Berger et al., 2012; Frenzel et al., 2010) and languages (Tin, 2013; Daskalovska et al., 2013). Silvia (2008) stated that *interest's* function is "*to motivate learning and exploration*" (p.57). The development of interest based on individuals is complex, because people differ in levels and stabilities of their interests (Hagay et al., 2013; Harackiewicz et al., 2008). This is usually determined by individuals' experiences and prior knowledge. Furthermore, their levels of *interest* could either be considered deep or limited, depending on individual's initial *interest* and whether it develops over a certain period of time (Harackiewicz et al., 2008). Besides *interest* levels and timeframe, there are also other factors that contribute to the effects of individuals' development of *interest*, such as environment, culture and languages (Hagay et al., 2013). Many of the terms and concepts explained above are closely connected to *interest*. However, these studies have not explored older adults' learning of technology.

Interest is further separated into situational interest and individual interest (Hidi and Renninger, 2006). Situational interest is fleeting, once triggered, it could either be maintained or disappear altogether (Hidi and Renninger, 2006). Ainley et al. (2002) decide that situational interest is usually associated with individuals who do not have any pre-existing individual interests. Situational interest is associated with support from the environment and the people around an individual (Renninger, 2009), is usually momentary and may or may not last over time (Hidi and Renninger, 2006; Renninger and Hidi, 2002). According to Tin (2013), situational interest acts as a bridge in order for more stable individual interests to develop. According to Hidi and Renninger (2006), there is a misconception that situational interest cannot be developed if it is non-existence. But, this non-existence situational interest could actually be nurtured over a period of time. Individual interest could be referred to as personal *interest* (Hidi and Renninger, 2006), that resides in individuals and is considered relatively stable, and indicates that individuals are able to re-engage with contents after a certain time (Hidi and Renninger, 2006). While individuals are engaged with the experience and seek opportunities to be involved in a particular activity, he or she will expand their knowledge of that activity (Ainley et al., 2002). Individual interest is associated with intrinsic motivation, because it is considered a stable predisposition, content-specific (Hidi and Renninger, 2006) as it develops over time (Tin, 2013), through the interaction between an individual and his or her object of *interest* (Tin, 2013).

2.5.3. The Four-Phase Model of Interest Development

The *Four-Phase Model of Interest Development* developed by Hidi and Renninger (2006) was illustrated to clarify the different phases for this study – refer to Figure 2.9, which extends and expands on their earlier three-phase model published in 2002 (Krapp). The *Four-Phase Model of Interest Development* consists of the following – (1) phase one – *Triggered Situational Interest*, (2) phase two – *Maintained Situational Interest*, (3) phase three – "*Emerging Individual Interest*" and (4) phase four – *Well-developed Individual Interest*.

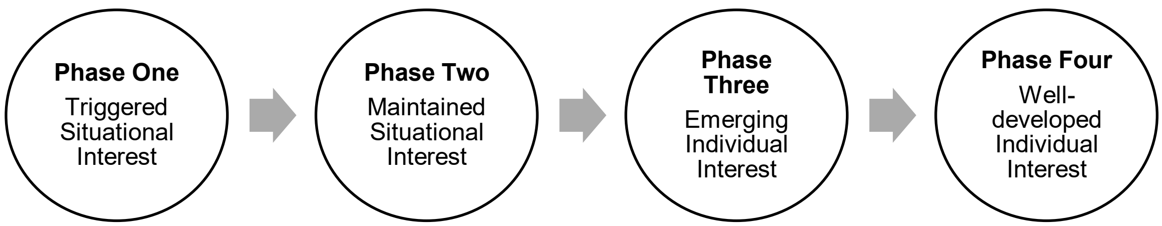


Figure 2.9. The Four-Phase Model of Interest Development.

Source: Hidi and Renninger, 2006.

Hidi and Renninger (2011) have suggested that "*Triggered Situational Interest*" could be sparked by either environmental or textural features, as a psychological state resulting from short-term changes in both affective and cognitive processing. "*Maintained Situational Interest*" is described as subsequent to a triggered state. It typically occurs over an extended period of time, reoccurs persistently and involves focused attention (Hidi and Renninger, 2011). In "*Maintained Situational Interest*", learners are drawn to understand more about particular content, and are inclined to ask questions about it, thus marking a shift in phases of interest (Renninger and Su, 2011). "*Emerging individual interest*" refers to the beginning phases of an endearing predisposition, indicated by seeking repeated engagement with particular content over time. *Well-developed individual interest* is defined as showing a relatively enduring predisposition toward engaging with the particular content over time (Hidi and Renninger, 2006). Renninger and Su (2011) reported that *"learners at all ages with varying experiences can develop new interest at any time but age also affected how and whether interest is likely to develop"* (p.171). Related to the current research, the thesis proposes that it is important to know about existing interests of older adults in order to leverage them into technology learning, As a first step it is important to better understand the relationship between individual *interest* and technology uptake by older adults. This is partly because the model of the *Four-Phase Model of Interest Development* suggested by Hidi and Renninger (2006) neither focuses on older adults nor on technology learning. The interest model is both suitable and promising, as it is related to motivation and would facilitate individual teaching approach for older adults in learning technology.

2.6. Addressing the Literature Gap

Generally, technologies were not built with older adults in mind. The main drivers in the advancement of technology usually occur as a result of economic or military influences. The shift in technology changes as society progresses. The impacts of technological change has led to the creation of new processes and products, increased efficiency and lower costs, and facilitates in the evolution of economies (Wheale and Amin, 2010), for instance the stock market and e-commerce. The dot com bubble occurred between 1995 and 2000 (Morris and Alam, 2012). During this timeframe, there was an exponential growth in the adaptation and usage of the Internet by businesses and consumers. Between 2000 and 2002, the bubble burst and subsequently led to the crash of the stock market, causing many companies to fail (Porter, 2001). Since then, we have learned our lessons from it. Technology has always changed the world, often for the better. The advancement in technology has also enabled people to harness its potential to create social impact (Berzin et al., 2015). As people are living longer and thus focusing on their quality of life, they also want to be able to continue to learn new skills and be engaged through their third age. The widespread availability of mobile touch screen devices has reduced the economic barriers for most people living in developed countries. As technology continues to become more affordable, it has presented a shift in the way older adults are able to communicate with friends and families, thus reducing their level of social isolation. Even though the uptake of technology might be able to dissipate the digital divide amongst older adults, their limitation of knowledge and exposure to technology, means that older adults are often being left behind. Although, there are technology courses and classes accessible via local community centres and houses that are offered to older adults at affordable rates, nonetheless, there are limited education and resources available to facilitate older adults' uptake of mobile touch screen devices through tackling learning from the perspective of their pre-existing interests.

The literature has helped with identifying the gaps for this research. *Interest* constitutes the main theoretical concept of this research and will be discussed in greater detail in this thesis. Within motivational concepts, *interest* has been distinguished as an important motivational variable (Tin, 2013). This is because *interest* plays an important role in enhancing individuals' learning experiences (Hagay et al., 2013). *Interest* is recognised by some as a drive to motivate individuals to put in effort to overcome obstacles that come with pursuing of tasks that are associated with deep learning (Tin, 2013) and expanding of one's existing knowledge (Ainley, 1998). Yet, the concept of *interest* has been rarely used for older adults in terms of their uptake and learning of technologies. Ageing, technologies and learning are currently located in silos within their own disciplines, but in this research, through the adoption of *interest* as the main driver, it seeks to connect these disciplines together. The next chapter will focus on the research design and methods employed in conducting the four studies planned.

Chapter 3.

Research Design and Methods

We have put more effort into helping folks reach old age than into helping them enjoy it.

Frank A. Clark (1860-1936)

3.1. Overview

In this chapter, an overview of the research design is provided and of the essential activities conducted and their contributions to answering the overall research question of the thesis – *how can individual interest engender and maintain interest in technology use in older adults*? The methodology chosen to address this question is based on a mixed methods approach (Patton, 2015; Ary et al., 2014; Guest et al., 2013; Bryman, 2012; Cohen et al., 2011). Mixed methods is described by Guest et al.: *"the basic premise behind using a mixed methods research design is that the combination of both approaches provides a better understanding of a research problem than either approach could alone"* (p.16). Hence, a combination of both qualitative and quantitative methods is used.

The analysis methods implemented in this research comprise of content analysis (Patton, 2015; Ary et al., 2014; Howitt and Cramer, 2014; Bryman, 2012) and affinity diagramming (Courage and Baxter, 2005). This chapter details the methodological approaches and methods utilised in the fieldwork that explored the extension of the theoretical framework on *interest* to older adults' technology learning by Hidi and Renninger (2006) described in the literature review. It outlines the qualitative methodology as well as providing detailed discussion on the practice of in-depth and focus group interviews employed in this study. The chapter also includes discussion of recruitment strategies, informed consent procedures and interview techniques. Following this is a discourse on the methods used to circumvent methodological problems, to increase data quality and an overview of data analysis. In the following an overview of each study and justification for its use in this thesis is given.

3.2. Overall Research Question

The main aim of this research was to investigate and explore whether an existing early learning interest framework (Hidi and Renninger, 2006) is applicable for older adults in the learning of mobile touch screen technologies. To pursue this aim, the following overall research question (RQ) was formulated:

- **RQ** – *How can individual interests engender and maintain interest in technology use in older adults*?

The investigation comprised of four studies (Figure 3.1) based on the literature review. Furthermore, there were sub research questions formulated for each study. These questions are presented in their individual chapters (4, 5, 6 and 7).

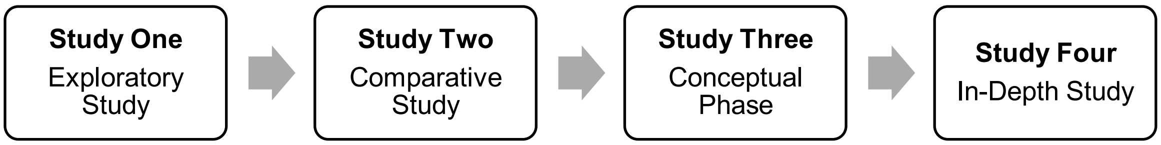


Figure 3.1. The four studies exploring the relationship between interests and interest in technology.

Study One (Chapter 4) explored older adults' domain interests and their attitudes to technology. Study Two (Chapter 5) compared changes in attitudes to technology under different classroom teaching formats. The findings of these studies, in combination with the literature review (Chapter 2), resulted in a concept to teach older adults to learn technology. The teaching concept was piloted in Study Three (Chapter 6) and evaluated and refined in Study Four (Chapter 7).

3.3. Methodological Approaches

3.3.1. Action Research

Action Research was selected for this study because the learning environment for my research was situated in real world settings, but not confined to an organisation and/or department. This is in alignment with works by (Sagor and Williams, 2017; Patton, 2015; Ary et al., 2014; Bryman, 2012). Greenwood and Levin (2007) suggested that *"action research is neither a method nor a technique; it is an approach to living in a world that includes the creation of areas for collaborative learning and the design, enactment and evaluation of liberating actions … it combines action and research, reflection and action in an ongoing cycle of cogenerative knowledge"* (p.131). In this instance, I was working with older adults, teachers and staff members. There was a constant exchange of knowledge and feedback from these participants. Sagor (2000) defined Action Research as a *"disciplined process of inquiry conducted by and for those taking the action. The primary reason for engaging in action research is to assist the 'actor' in improving and/or refining his or her actions"* (p.3). This is relevant to this research because of the implementation of the Action Research Framework (Figure 3.2) into these studies

(Denscombe, 2010). Based on the findings from the Conceptual Phase (Study 3), refinements were made for the In-Depth Study (Study 4) of the research. Hammersley and Atkinson (1983) pointed out that *"reflexivity is central to action research, because researchers are also the participants and practitioners in the action research – they are part of the social world that they are studying"* (p.14). According to Adelman (1993), Kurt Lewin "*is often referred to as the originator of action research"* (p.7). Lewin (1946) mentioned that *"research that produces nothing but books will not suffice"* (p.32). The overarching objective of my research was to produce a curriculum for older adults to take up the use of technologies, so Action Research was a complementary method, included in this mixed methods research. Levin and Martin (2007) described action research as *"not a single method. Action research is a strategic approach to knowledge production, integrating a broad array of methods and methodological approaches in specific ways to create new understanding for participants and researchers through solving practical and pertinent problems and supporting problem-owners' democratic control over their own situation. As an approach to knowledge, action research expands outside the existing borders of discipline-based conventional social science"* (p.220). Action Research was compared to other methods and selected because it could overcome the limitations of some traditional methodologies (Table 3.1), such as lab research that is conducted in a controlled environment with limited number of users. Whilst from the perspective of educational research, it has to accommodate a larger number of participants across different settings. The Action Research framework (Denscombe, 2010, p.129 – Figure 3.2) aims to fulfil the following goals:

1. Stage 1: Professional Practice – real-life problem or issue
2. Stage 2: Critical Reflection – identify problem or evaluate changes
3. Stage 3: Research – systematic and rigorous enquiry
4. Stage 4: Strategic Planning – translate findings into action plan
5. Stage 5: Action – instigate change

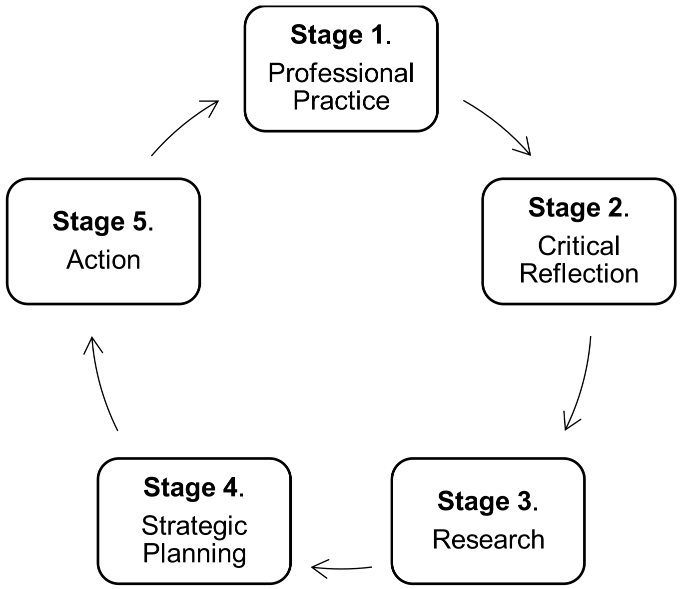


Figure 3.2. Action research as a cyclical process.

Source: Denscombe, 2010.

Referring to the Action Research framework (Figure 3.2) above, the researcher has adopted all of the stages. In Stage One's professional practice, she identified the real-life problem through literature (Chapter 2) and the Exploratory Study (Chapter 4). Whilst the Comparative Study (Chapter 5) spans across two stages of the framework above. They comprised of Stage Two's critical reflection and Stage Three's research. The researcher managed to identify the problem, evaluated changes and engaged in a systematic and rigorous enquiry simultaneously. In Stage Four's strategic planning, she translated her findings into an action plan by conducting a Conceptual Phase (Chapter 6). Lastly, in Stage Five's action, she instigated change by running a series of classes as part of the In-Depth Study (Chapter 7).

Action Research was selected because the Conceptual Phase and the In-Depth Study investigated whether a curriculum guided by the domain of individual interests of older adults, rather than a structured curriculum, would have a positive influence on older adults' adoption of mobile touch screen technologies. Even though Hendricks (2009) defined Action Research as a powerful tool for studying and improving one's practice, referring to characteristics of Action Research (Table 3.1) by Higgins and Klein (2011), the last study does not fall into the category of being confined to either a particular organisation or a department. I was collaborating with participants from local community centres and local residents within the municipalities of Boroondara, Whitehorse, Yarra, Stonnington and Manningham City Councils. Therefore, it was chosen to combine Action Research with Living Lab methodology with a strong focus on upscaling. This was done primarily because fundamental to the design of this study was the inclusion of older adults as co-researchers (co-creators), rather than as participants in Action Research. It is a research strategy that enabled their voices to be heard, with the focus being on their perspectives, based on their own experiences of relationships between domain interest and technology use.

Table 3.1. Comparison of research approaches.

Lab Research (User Labs)	Action Research	Living Lab
Controlled environment	Real world setting, yet typically confined to a particular organisation or department	Real world setting, involving multiple stakeholders from multiple organisations and their interaction
Limited, clearly assigned role of users	Not specific about user role	Active roles of users as co-innovators: exposing technology to the creative and destructive energies of the users; facilitating dynamics of collective action
Designed for replicability	Active (social and political) role of researcher in the research setting	Multi-disciplinary research team actively involved in the research settings, confronted with the technical, social and political dynamics of innovation, at times even driving the agenda
Designed for observation of outcome	The researchers observe and take part in the creation of an outcome	Joint collaboration to create a desired outcome

Source: Higgins and Klein, 2011.

3.3.2. Living Lab Approach

Living Lab is a concept developed in the early 2000s by Mitchell at the MIT (Angelini et al., 2016; Graczyk et al., 2015; van Geenhuizen, 2013). According to the Living Lab Methodology Handbook (Stahlbröst and Hoist, 2012), a Living Lab *“has been defined as a methodology, an organisation, a system, an arena, an environment, and a systematic innovative approach”* (p.5), however these authors disagree with this definition. They believe that Living Lab is *“both an environment and an approach”* (p.5). Living Lab is described as a concept based a on user-driven co-creation approach (Angelini et al., 2016; European Commission, 2009), whereby it consists of components such as partners and users, management, research, approach and information communication technologies and infrastructure (Stahlbröst and Hoist, 2012). There are five key principles involved in Living Lab activities that determined the value and what counts as the Living Lab approach (Stahlbröst and Hoist, 2012). These formed the foundation of Living Lab operations. Higgins and Klein (2011) explained that *"Living Labs are a new methodological approach – building on and adding distinctive features to the tradition of action research"* (p.2).

The Living Lab approach tends to involve extra workload for researchers, because it is based on a concept whereby human actors are engaged in complex live settings (Higgins and Klein, 2011). Therefore, this approach presents researchers with certain challenges during data gathering. However, these challenges could be overcome through improvement of the workflow. The purpose of the implementation of an educational Living Lab is generally prompted by a specific problem, with an aim to improve educational practice (Denscombe, 2010). It would benefit the participants as it was geared towards improving teaching practice and to resolving problems (Denscombe, 2010) such as high drop off rates with use of technology. This project aimed to improve educational practice for older adults and was prompted by problems older adults experience in acquiring technical skills. In keeping with the Living Lab approach, this research was based on co-creation with participants. There was a continuous cycle of development and change via on-site research using focus groups as part of the teaching sessions.

3.3.3. Mixed Methods

The combination of qualitative and quantitative methods was chosen as the strengths of one method can balance the weaknesses of another method (Patton, 2015; Ary et al., 2014; Gay et al., 2014; Guest et al., 2013; Bryman, 2012). Due to the complexity of the interest as a subject for research, the researcher made the assumption that investigation of the research questions of this study was best served with a range of approaches supported by mixed methods methodology. To date, there has been very little research about how technology could support older adults' pre-existing interests (Boulton-Lewis, 2009) and it is a very complex topic, with many variables influencing the learning and adoption of technologies. The majority of studies have focused on children and their interests in a range of academic subjects (Section 2.5.1) and have been conducted using quantitative methods, typically surveys and questionnaires with pre-determined categories (Gay et al., 2014; Cohen et al., 2011; Denscombe, 2010).

In this thesis, unlike children in a classroom setting, older adults can differ greatly in general background, level of technical experience and knowledge, and issues with availability (Boulton-Lewis and Tam, 2012). All four studies were situated in naturally occurring classroom settings; therefore, there was no attempt to systematically manipulate behaviour of the participants (Ary et al., 2014). Consequently, random allocation to groups, with a control group, was not seen to be a suitable approach. However, with over 131 older adults, 5 staff members and 8 teachers participating in the studies, a representative sample was achieved. In addition, limited quantitative data was extracted from questionnaires, including Likert (1932) scale surveys.

Data obtained using qualitative methods such as observations and interviews (in-depth and focus group) supplemented the quantitative data, providing deeper insights into eight teachers' experiences and teaching (Ary et al., 2014; Guest et al., 2013). Older adults were not always able to articulate their attitudes and problems with technology and consequently, observations and interviews with experienced teachers were often a more effective means of data gathering (Guest et al., 2013). Interviews provided opportunities to better explore the effect of the technology and teaching together, as the questionnaire could be misunderstood. Finally, Action Research was chosen to trial the concepts developed during the first two studies (Sagor and Williams, 2017; Patton, 2015; Ary et al., 2014; Bryman, 2012). However, unlike traditional Action Research, the trials were not strictly based in classrooms, schools or any particular organisation, and consequently aspects of Living Lab approaches (Angelini et al., 2016; Graczyk et al., 2015; van Geenhuizen, 2013) were integrated into the Action Research. Thus, the use of more than one method enhanced the findings, while providing the researcher with a clearer picture of these explorations as they progressed.

One of the objectives of this research was to develop guidelines to support the techniques available for older adults to learn technology, thus aiding educators with curriculum development. A mixed methods approach could assist this objective by being more suitable than single methodologies for reaching a larger audience (Dörnyei, 2007). Gorard (2004) contends that when data comes from a variety of methods, the results may be more persuasive and convincing for policy-makers. The data gathered supported a reliable direction for planning of the curriculum. A mixed methods approach also provided a heightened sensitivity to the nature of data triangulation (Ary et al., 2014; Gay et al., 2014; Cohen et al., 2011). It supports complementarity of data analysis (Ary et al., 2014) whereby quantitative data entered into SPSS statistical package (Cohen et al., 2011) was combined with qualitative date extracted from focus group and in-depth interview (Denscombe, 2010) transcripts important for analysis (Ary et al., 2014; Gay et al., 2014; Cohen et al., 2011).

However, one of the disadvantages with a mixed methods approach is that it can increase the time and costs associated with data gathering and analysis (Gay et al., 2014; Ary et al., 2014). It was to a certain extent difficult for only one researcher (myself) to conduct the four studies with the workload imposed by mixed methods research. In some of the studies, the researcher did data and methodological triangulations as she discussed and analysed the findings with her supervisors. In some studies, one of the supervisors was present to provide support and assistance with data gathering. The other obstacle encountered was the ability to have *equal skills in both methods* (Ary et al., 2014, p.602) and to make decisions about the composition of the mixture to be implemented into the studies. Reflexivity assisted largely with finding the balance and get most out of the data.

3.3.4. Researcher Reflexivity

A mixed methods approach enabled the researcher to investigate the research process from different perspectives (her roles as a researcher, a teacher, and a moderator) and converge these results (Creswell, 2009). She saw her role as a researcher as the primary instrument for data gathering (Ary et al., 2014). Lincoln and Guba (1985) highlighted the distinctive role that the researcher had to take on in their inquiries. In this study, there was a large involvement from participants. Besides finding out participants' background demographics and attitudes towards technology, the investigation also benefitted from data gathered from teachers' experiences about their strategies and techniques for teaching. According to Kleinsasser (2000) "*researcher reflexivity represents a methodical process of learning about self as researcher, which, in turn, illuminates deeper, richer meanings about personal, theoretical, ethical, and epistemological aspects of the research question. Qualitative researchers engage in* *reflexivity because they have reason to believe that good data will result"* (p.155). Yet, amongst some researchers, there are assumptions that researcher reflexivity could lead to bias or skewedness (Lynch, 2000), thus leading to undesirable outcomes that affect the results of studies. Ary and his colleagues (2014) identified reflection as a strategy to minimise problems of discrepancy. A sense of self-awareness (Walter et al., 2013) is required of the researcher, as their values, attitudes, perceptions, opinions, actions and feelings (Pillow, 2010; Alvesson and Sköldberg, 2000) etc are feeding into their studies (e.g. Hendricks, 2009; Malterud, 2001). Therefore, to reduce discrepancies, Lincoln and Guba (1985) suggested that during the research process, researchers should also develop a routine or habit of making regular entries into their reflective journals.

3.4. Methods

This section provides an overview of methods within the context of the overall methodology. A detailed description of the specific methods used in the four studies will be described in the forthcoming four chapters (4, 5, 6 and 7).

3.4.1. Recruitment and Sampling

The participants belonged to natural groups and all participation was voluntary. 32 older adults and 5 staff members from a regular council activity program, and 8 teachers from local organisations, participated in the Exploratory Study (Chapter 4). They were recruited for this study, when the author was a research assistant. Within the terms of the ethics application for the Exploratory Study, I was able to re-visit its data for the study documented in this thesis. In the next stage, 35 older adults across four short course activity classes were recruited from two local community groups for the Comparative Study (Chapter 5). From my volunteer work, I was familiar with the programs offered at the community groups, and emailed co-ordinators of relevant courses for permission to observe their classes and to interview their students, who subsequently were supplied with information statements and consent forms. For the Conceptual Phase (Chapter 6) I sent out an email to 12 older adult students who knew me from my volunteer work at the local community centre. In response, 5 participants agreed to assist in trialling the six-week pilot I had developed. With established rapport, I could expect honest feedback from these participants for the purpose of refining the workshop. For the In-Depth Study (Chapter 7) 60 participants were allocated across ten four-week workshops refined from the previous study that was conceptualised and piloted in the Conceptual Phase. Participants were recruited via an email to the secretary of the University of the Third Age (U3A) Hawthorn, who then placed a recruitment notice in their monthly online newsletter. I also recruited participants through local libraries by placing flyers at information counters.

Snowball Sampling

As older adults visiting IT classes are usually considered part of a minority group, snowball sampling was able to assist me with identifying individuals to participate in my studies. These participants were able to help by referring other participants from their social groups and personal networks (Ary et al., 2014; Cohen et al., 2011). According to Noy (2008), "*snowball sampling is particularly valuable in qualitative research; it is a means in itself, rather than a default, fall-back position"* (p.330). "*Snowball sampling is essentially social"* (Noy, 2008, p.332), "*as it often relies on strong interpersonal relations, known contacts and friends; it requires social knowledge and an equalisation of power relations"* (Noy, 2008, p.329). All these factors assisted in the smooth running of my workshops for older adults and the resulting conceptual frameworks I developed.

Opportunistic Sampling

When I was volunteering as a computer class tutor, I had access to a list of contacts with organisations such as local community centres, neighbourhood houses and the University of the Third Age (U3As). Therefore, I was able to *"take advantage of new leads and unexpected opportunities"* (Ary et al, 2014; p.458) as part of recruitment and sampling for my studies, with large response rates.

3.4.2. Ethical Considerations in Qualitative Research

Ethics is part of traditional research. It is a mandatory requirement put in place by the Australian Code for the Responsible Conduct of Research (2007) developed by the National Health and Medical Research Council and Universities Australia. The code informs the expected national standards for conducting research responsibly. Before the commencement of the research, an ethics application (Howitt and Cramer, 2014; Cohen et al., 2011; Bryman, 2012) was submitted to and approved by Swinburne University's

Human Research Ethics Committee (SUHREC). The documents consisted of informed consent, information statement and a list of semi-structured interview questions for both older adult participants and their teachers (Appendix A2). This research did not include people in vulnerable situations, nor was it of a nature that could cause harm and/or injury. The researcher did not expect any risks arising for participants due to the project being based primarily on retrieving information on technology usage. The activity group staff members and teachers were available at all times during data collection sessions. No risk was anticipated, as this research did not involve any sensitive issues. It was carried out in the group setting of the participants by the researcher, under the guidance of the researcher's principal coordinator and supervisory team. As anticipated no problems arose. For a copy of the ethics approval, refer to Appendix A1. A number is allocated to each individual participant, so that he or she cannot be identified. A spreadsheet of names and numbers were retained during all four studies. Anonymity is maintained throughout thesis, with additional permission for use of photographs. The system of allocating a number to individual participants enabled the researcher to reference information gathered. In the process of interviews being transcribed, any information that might lead to identification of the participant was removed. Over time during the research, there developed a relationship of trust, which allowed the participants to open up and express their views. Teachers were kind and allowed the researcher to gather data from their activity groups while they conducted their classes. Therefore, the researcher volunteered to offer her technological skills to help older adults, while lessening the responsibilities of teachers at the same time. According to Ary et al. (2010) such a procedure is relevant and helpful, as it builds a rapport with teachers at the same time.

3.4.3. Data Collection

As there were four studies in this research and the data collection methods were quite similar across all of them, an overview is provided. Individual study chapters (4, 5, 6 and 7) will provide readers with more details.

Procedure

The general procedure for each study was the following. In the first session, participants were given a standard informed consent form, including an information statement, with a description of the specific aspect of the research project and the activities involved. This paperwork was completed by participants prior to any commencement of data collection. In addition, a background questionnaire was included, to find out participants' demographic information, such as gender, age range, educational level, technology literacy (years of computing and technology experience), main purpose of using technology and pre-existing interests. A post-study questionnaire consisted of an open question about whether mobile touch screen technologies could support them in maintaining their individual interests and hobbies and four questions to record self-assessment, in the form of a Likert scale (Likert, 1932) of overall experience about mobile touch screen technology in general. During each weekly session with participants, they were interviewed in a group setting, with the time commitment per interview within a range of 10 to 30 minutes. Information provided by older adults through weekly focus group interviews was recorded and transcribed (Bryman, 2012) – refer Analysis section. At the end of each study, the interview transcripts (from participants and teachers), observations (notes, video and audio recordings) were compared and analysed for key themes and patterns, within the context of the key research questions of the particular phase of the research project. Microsoft Excel software was employed in recording of data for analysis. More detail is given in the individual study chapters – Exploratory Study (Chapter 4), Comparative Study (Chapter 5), Conceptual Phase (Chapter 6) and In-Depth Study (Chapter 7).

Photography and Filming

Photographs and video clips were taken to further understand activities, and the roles that technology could play, in more detail. Other forms of data gathered from the Exploratory Study (Chapter 4) comprised of video recordings of iPad interactions, mind mapping (Munium and Mahmud, 2012; González, 2002) of participants' interests and occupations. Results were drawn with Adobe Illustrator software. Across all four studies, photographs, still images and moving images were taken as part of the data collection; they were able to convey meanings that text alone could not achieve. These also captured participants' interactions with each other, staff members and the technology (Cohen et al., 2011).

Observations

Activities, interpersonal interactions, behaviours, conversations, actions and any other forms of observable human experience that can be documented, are classified as observations (Patton, 2015). These are considered *rich, detailed descriptions* (Patton, 2015, p.14) that researchers pursue (Howitt and Cramer, 2014). According to Bryman (2012, p.273), there are six major types of observation research: (1) structured observation, (2) systematic observation, (3) participant observation, (4) non-participant observation, (5) unstructured observation and (6) simple observation and contrived observation. In this research, participant observation across all four studies, was chosen, because it is considered as *one of the best-known methods of research in the social sciences* (Bryman, 2012, p.273). The researcher was able to observe participants' behaviours in a social setting and record activities within that setting (Howitt and Cramer, 2014; Walter et al., 2013).

Interviews

Digital audio recorder and smartphone were implemented in data gathering of in-depth and focus group interviews. These devices were easy to use and not intrusive (Guest et al., 2013). There were two types of interviews employed in this study. Qualitative data consisted of transcribed audio recordings of focus group interviews with participants and staff members, and transcribed audio recording of in-depth interviews with teachers.

Focus Group Interviews

Focus group interviews were conducted across all four studies. It enabled the researcher to find out and understand how people feel (Bryman, 2012). One of the most important advantages of focus group interviews is time saving. Rich data can be gathered in a familiar environment. Focus group interviews can be *conducted quickly* (Guest et al., 2013, p.174). Thus, allowing the researcher to study *individuals collectively* (Bryman, 2012, p.504). On the other hand, focus group interviews could be difficult to control, organise and manage (Howitt and Cramer, 2014). The recommended size of focus group that proves to be optimal would be between six to twelve participants (Howitt and Cramer, 2014; Guest et al., 2013). For the reason that older adults are the designated target group and they were in a familiar environment. One main advantage of focus group interviews is that the researcher created synergies and participants bounced ideas off each other (Bryman, 2012). The discussions are stimulated and motivated by other members in the group (Howitt and Cramer, 2014).

The style of interview employed across all four studies was semi-structured. In the Exploratory Study (Chapter 4), the researcher has a list of questions, to draw on in a flexible way when interviewing participants. This is usually referred to as an *interview guide* (Bryman, 2012, p.471). The list of questions consisted of specific topics to be covered, in this case, finding out about her participants' interests and technological skills. Similar interview guidelines were adopted for focus group interviews with staff members. However, here the list of questions primarily focused on older adults' attitudes towards mobile touch screen technologies, before and after being introduced into their activity classes. For the Comparative Study (Chapter 5), the researcher has a list of questions as prompts, because she wanted to find out participants' interests, attitudes and experiences in learning of technology. In the Conceptual Phase (Chapter 6) and the In-Depth Study (Chapter 7), focus group interviews were conducted with older adults. They comprised of audio recordings to ascertain participants' interests, attitudes and experiences in learning of technology.

In-Depth Interviews

Patton (2015) says "*we interview people to find out from them those things we cannot directly observe and to understand what we have observed. […] The fact of the matter is that we cannot observe everything. We cannot observe feelings, thoughts, and intentions*" (p.426). In-depth interviews were conducted for the Exploratory Study (Chapter 4). The Interview was semi-structured in format (Appendix A2 and A4). In the Exploratory Study, it was employed to find out information from eight teachers about their teaching experiences with older adults and technology. The data gathered was based on subjective experiences of teachers who had been involved in similar situations themselves (Merton and Kendall, 1946). Teachers were interviewed to establish their participants' interests, their learning and/or teaching styles, their views on life-long learning, and on barriers preventing older adults from the use of technology. Teachers also provided their impressions of the implementation of technology usage in their classes, when compared with other activities, in this case, for example, the comparison of modern media such as painting on iPads with the traditional media of water-colour painting.

Questionnaires

Except for the Exploratory Study (Chapter 4), the rest of the studies comprised of distribution of a background questionnaire, followed by pre, mid and post-study questionnaires to the participants and teachers. The background questionnaire (Appendix A6) comprised of a range of formats such as dichotomous, multiple choice and rating scales. As for pre, mid and post study questionnaires, they consisted of rating scales (Likert, 1932) and open-ended questions (Cohen et al., 2011). The scales provided the researcher with channels of measuring participants' attitudes towards technology (Shattuck et al., 2011). The open-ended questions offered participants the flexibility to provide an unlimited number of possible answers, while encouraging them to share deeper insights into their thinking process with the researcher. There were four seven-point Likert-scale questions about participants' attitudes towards technology and three open-ended questions prompting further comments about mobile touch screen technologies.

Card-sorting Exercise

Card-sorting exercises were conducted in Conceptual Phase (Chapter 6) and In-Depth Study (Chapter 7). These exercises were employed in the running of the classes. Card-sorting exercises offered participants with further opportunities to explore their pre-existing interests that they might have missed out while filling in their list of pre-existing interests in the privacy of their own homes. The exercise helped participants to brainstorm with their peers and explore pre-existing interests that they could have missed out on.

3.4.4. Data Management and Content Analysis

Data management is simply an organisational process (Guest et al., 2013, p.275). Huberman and Miles (1994) explained that data management is often overlooked, because it is tightly bound between data collection and analysis. Data management in this research comprised of identifying sources and labelling data. Coding is considered a key aspect of qualitative data analysis (Cohen et al., 2011). The initial coding process consists of taking the data apart and breaking it into small pieces (Ary et al., 2014, p.518). These individual codes are further categorised into manageable chunks.

Categories and themes are applied to transcripts (Ary et al., 2014). Data analysis methods comprised of content analysis and affinity diagramming.

According to Hsieh and Shannon (2005), *content analysis is a widely used qualitative research technique* (p.1277). It is a flexible approach for analysing information across a variety of different media, for instance, visual images, documents, texts, cartoons, news programmes on radio and television, speeches, obituaries, song lyrics and signs (Bryman, 2012; Hsieh and Shannon, 2005). Krippendorp (2004) defines content analysis as *a research technique for making replicable and valid inferences from texts to the contexts of their use* (p.18). Words, texts, phrases and sentences are categorised and logged according to word frequency (Ezzy, 2002). The types of visuals gathered are comprised of photographs and still images, as well as video and moving images of participants. The main advantage of content analysis is, it is easily understood and considered an inexpensive research method. Webb et al (1966) devised a term referring to content analysis as an unobtrusive method, primarily because it does not require contact with interviewees. In this research, content analysis was applied across all four studies. The data analysed included responses from focus group interviews with participants, staff members and teachers. The general procedure comprised of four stages (Figure 3.3) following an approach from Bengtsson (2016). In stage one, interview transcripts were printed, then decontextualisation of data took place. Sentences and/or paragraphs with meanings were identified and labelled. Then, recontextualisation took place in stage two of the analysis. In this case, the identified themes were highlighted. The researcher read through the transcripts and made a list of the types of information identified along the way. In the next stage, it was categorised. The recurrences of words and themes from participants' responses were identified and categorised. The study ascertained that certain categories could be merged or sub-categorised. Lastly, in stage four, is the compilation of the data with a summary of themes, categories and sub-categories presented in a table format. The identified themes were counted, but not ranked.

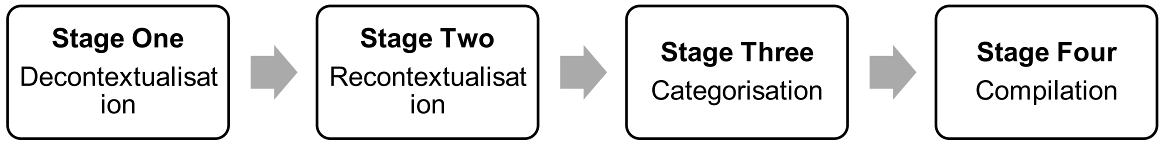


Figure 3.3. Context analysis of data gathered in four stages across four studies.

Source: Bengtsson, 2016.

Affinity Diagramming

Affinity diagramming was applied across all four studies of this research. It is a visualisation approach, a creative process and a technique used for grouping and analysing large quantities of qualitative data gathered from interviews into smaller clusters. Affinity diagramming is a bottom-up approach used to organise ideas into groups based on common and/or related themes (Courage and Baxter, 2005). For instance, the top-level label helps to identify the area of concern. The second-level label is comprised of a summary of the set of groups and is categorised into homogeneous groupings, and the third-level label takes the summary of the set of groups another step further. Lastly, the single point provides the interpretation of the data. In this study, responses provided from participants were written onto post-it notes and these were organised into various levels of groups and sub-groups. There is an affinity when two notes comprised of a similar idea. Then, they were grouped together and labelled with an appropriate group name.

3.4.5. Data Validity and Reliability

In order to ensure that both quantitative and qualitative data are considered effective research, validity is an important requirement to be in place (Cohen et al., 2011). Reliability has to be applied to both quantitative and qualitative data gathered. According to Lincoln and Guba (1985), other terms such as "*credibility*", "*confirmability*" and "*dependability*" are used interchangeably. Data validity and reliability differ between quantitative and qualitative data, therefore cannot be applied across both (LeCompte et al., 1993). In this study, the researcher has employed a mixed methods approach. Therefore, she considered triangulation as the most appropriate measure to increase the credibility and validity of her study. This is in accordance with suggestions in the literature (Patton, 2015; Howitt and Cramer, 2014; Bryman, 2012). The objective was to achieve greater confidence in the findings attained from across the four studies that were conducted. There are four basic types of triangulation identified by Denzin and his colleagues (2006). The researcher has selected methodological triangulation. It comprised of more than one method of data gathering. It consisted of both qualitative and quantitative methods. In this case, interviews were combined with observational methods and questionnaires, to provide the researcher with deeper insights into what she had already observed (Blomberg et al., 2003).

3.5. Conclusion

In this chapter, the research design and methods employed were the common denominator that guided the researcher on her journey towards the completion of her interdisciplinary study. It has provided an overview of the four studies planned for exploring the *interest* conceptual framework and its suitability for older adults teaching, comparing technologies within four different activity classes, extending and expanding on the *interest* model and evaluating its effectiveness in real-life settings with older adults. This chapter has also presented the selection and justifications of methods implemented in answering the overall research question posed at the beginning of this thesis, and sub research questions put forward in individual studies. This research was based on mixed methods that comprised of qualitative and quantitative approaches, researcher reflexivity, with the combination of Action Research and Living Lab approaches. The details of the adoption of principles and methods, the data collection, the data analysis and the results adopted are further described within these individual studies that can be found in the Exploratory Study (Chapter 4), the Comparative Study (Chapter 5), the Conceptual Phase (Chapter 6) and the In-Depth Study (Chapter 7).

Chapter 4.

Exploratory Study: Interest and Engagement with Technology

The real problem is that there's a tendency to associate ageing with loss and decline and things that aren't desirable. But experiencing all that there is to experience in life – whether that's at the age of ten or thirty or fifty or eighty – is what life is all about.

– S. Jay Olshansky (1954 – current)

4.1. Overview

The Exploratory Study is the only study in this thesis that focused primarily on a qualitative approach. There were two stages in this study. In stage one, it focuses on what interests the older adults, and their preliminary attitudes towards technology. In stage two, this study investigates teachers' perspectives and approach towards the teaching of older adults. The methodology approaches in this study comprise of focus group interviews with participants and staff members from Central Park Community Centre and in-depth interviews with teachers from Hawthorn Community Education Centre Inc. and University of the Third Age, Hawthorn. Central Park Community Centre offers programs and activities for its local residents, ranging from cultural, education, recreation and leisure and clubs & associations. Older adults were recruited from the Senior Citizens Club. It encourages residents over 55 years old to get together for social activities that include outings, bus trips, cards and Bingo.

University of the Third Age, Hawthorn was the first U3A established in Australia in 1984. U3A Hawthorn is recognised as a community self-help organisation, providing a range of courses, recreational activities and excursions for semi-retired and retired people. The curriculum offered spans across a wide range. The activities comprised of art appreciation, art and craft, photography, languages, technology, current affairs, excursion programs, indoor and outdoor exercises, games, humanities, literature, music and philosophy.

4.1.1. Selection of Participants

Stage One: Activity Group – Technology Use and Internet

Older Adults

There were 32 participants – 24 women and 8 men. Participants were all above 65 years old with most in their 70s and 80s. Participants' countries of origin comprised of Australia, the United Kingdom and Italy. The majority of participants had some type of physical and/or mental disability. Physical disabilities included mobile restrictions, hearing impairment and vision impairment. Mental disabilities included various forms of memory loss. None of the participants had grown up with technology. During their work life, most of them were involved in manual occupations, such as vegetable grower, sheep shearer, and mechanic and truck driver. Therefore, they had restricted opportunities to be in touch with technology. Other challenges included illiteracy and problems in speaking English (Italian participants). Only one participant owned an iPad, which was given to her by her daughter as a gift. The rest had heard of iPads, but had no experience in using them.

Staff Members

In this particular activity group, there were five staff members, including full and part-time, available to support the older adults. They were all female and within the age range of 30s to 50s. All staff members had at least five years experience in working with older adults and lived within the vicinity of CPCC.

Stage Two: Teachers' Interviews – Teaching Technology to Older Adults

Teachers

In this specific study, eight teachers were interviewed, who were running activity classes for older adults. All teachers were experienced and consequently a reliable source of information about older adults and teaching approaches. One teacher was working for U3A Hawthorn and the rest were from HCEC. The selection of participants was based on network sampling and opportunistic sampling (see Chapter 3 for more detail). These forms of sampling were suitable due to the researcher's previous involvement as a volunteer with these groups. In this section, a summary on the background of the eight teachers interviewed is provided (Table 4.1). All teachers' names are pseudonyms to ensure their anonymity. Their teaching experience is based on educating older adults. There were four women and four men. Their age range was from 40s to 60s. There is a wide array of experience from education, corporate, engineering, technology and sports. Their teaching experiences ranged from 5 to 20 years.

Table 4.1. Overview of teachers' backgrounds.

No.	Names[2]	Teaching Experience	Gender	Age	Organisation	Class	Previous Background
1	Jessie	15 years	Female	50s	HCEC	PC	Education
2	Lucy	20 years	Female	50s	HCEC	PC	Corporate
3	Iain	6 years	Male	40s	HCEC	PC	Corporate
4	Tony	5 years	Male	50s	HCEC	iPad	Engineering
5	Richard	10 years	Male	60s	HCEC	PC	Technology
6	Johan	8 years	Male	60s	U3A	iPad	Sports
7	Joanne	9 years	Female	50s	HCEC	PC	Education
8	Julie	20 years	Female	50s	HCEC	PC	Education

Source: author (2015).

4.1.2. Data Collection

Stage One: Interviews with Participants and Staff Members

The study of this activity group was carried out over a period of 12 weeks. The duration of each weekly visit was two hours. It led to video and audio recordings of group interactions (including focus group interviews with participants, observations and journaling). Two interviews were conducted with staff members. Participants' behaviours and levels of engagement were observed and noted, while on screen actions were captured and stored on file. The researcher also observed participants' social interactions with each other and staff members. Thus, the researcher was able to learn about teaching the use of iPads and ascertain any problems that older adults may encounter when using tablet devices. Centre staff members were interviewed in relation to their impressions of participant engagement, compared with other existing activities such as snooker and knitting. The researcher encouraged participants to engage with the apps. In situations whereby participants would withdraw, sit back or leave the group, the researcher would stop and change activities or speed, in order to try to maintain their level of engagement. *Interest* was not only evaluated based on facial expressions, but also according to initiation of conversations about the apps, positive evaluations of these apps and active length of use by participants, which were also recorded (Figure 4.1).

[2] All names of interviewees are pseudonyms to ensure their anonymity.

Figure 4.1. Data gathering through observations and focus group interviews.

Interviews with Teachers

In-depth one-to-one interviews were conducted with teachers at the end of week twelve. Each interview lasted between 30 to 60 minutes. These interviews were recorded and transcribed. Each teacher was interviewed once. The interview questions revolved around teachers' views on lifelong learning, their approaches towards teaching and learning methods for older adults, their students' motivation for attending of classes and finding out about students' pre-existing interests and keeping them engaged during classes.

4.1.3. Data Analysis

Mind Mapping for Activity Group

Participants were asked the following questions – "*what do you like to do?*" or "*what are your interests and hobbies?*" From these questions and the responses received, the frequency of words related to participants' pre-existing interests were manually extracted from focus group interviews and grouped to create a mind map (Munim and Mahmad, 2011; González, 2002). A hand-drawn diagram indicated the overview of participants' pre-existing interests. Based on the focus group interviews with participants, when the pre-existing interests were mentioned by at least half of the group, it is indicated in bigger circles on the mind map (Figure 4.2). The colours, orange, yellow, green and blue, were used to represent the four main categories of participants' pre-existing interests. Orange indicated *sports*, yellow stood for *socialising*, green *represented arts and crafts* and blue was used for *board games and puzzles*.

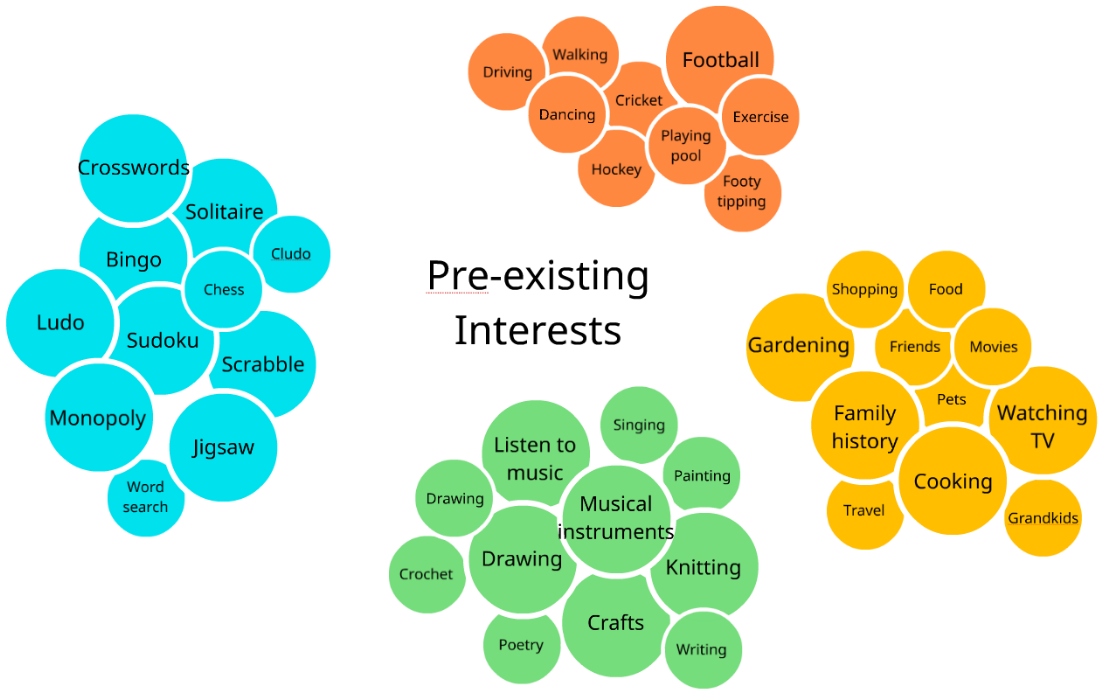


Figure 4.2. Mind map of participants' pre-existing interests.

Content Analysis

Stage One: Focus Group Interviews with Participants

From the mind map (Figure 4.2), within each of the categories of sports, socialising, arts and crafts and board games and puzzles, those pre-existing interests that were presented in bigger circles were then compiled into a list (Table 4.2) of most common pre-existing interests.

Table 4.2. Most common pre-existing interests of participants.

Pre-existing Interests	
Crossword puzzles	Ludo
Drawing	Playing musical instruments
Scrabble	Monopoly
Sudoku	Jigsaw puzzles
Listening to music	Family history
Bingo	Cooking
Solitaire	Gardening
Football (Aussie Rules)	Knitting
Crafts	Watching television

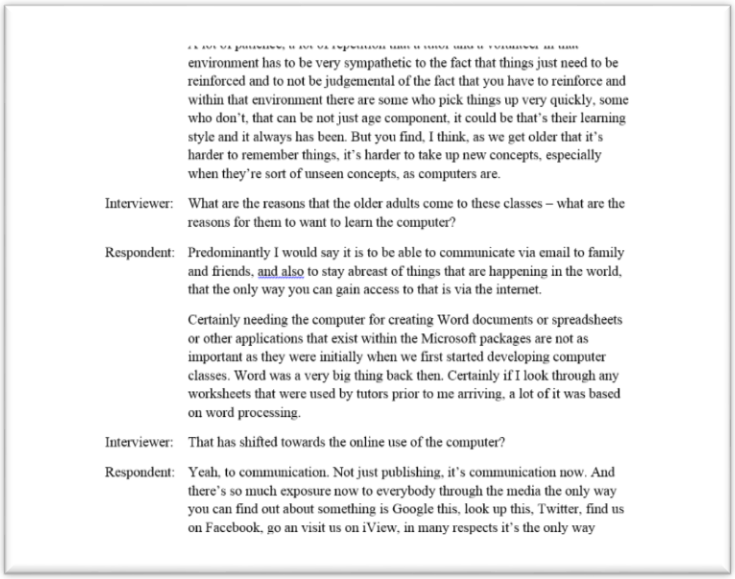
The data gathered was analysed through pairing of pre-existing interests of the group with suggested equivalent apps on the iPads. Trends were identified from observations and interviews. Afterwards, the researcher selected a list of applications (apps) based on participants' pre-existing interests (Table 4.3). For example, participants enjoyed playing board games and puzzles, so the researcher selected Ludo, Monopoly, Bingo, Solitaire and jigsaw puzzles as equivalent apps to match participants' pre-existing interests. The researcher also introduced other games to the group of participants. Games included Fruit Ninja, Tic Tac Toe and Air Hockey.

Table 4.3. Most common pre-existing interests and pairing with equivalent apps.

Pre-existing Interests	Apps
Drawing	Sketchbook Pro
Reading newspapers	The Age, Herald Sun
Watching television	YouTube, ABC iView
Listening to music	ABC Radio
Playing musical instruments	Tiny Piano, Drum Kit, Ukulele
Gardening	ABC Gardening Australia, Flower Garden
Word puzzles	4 Pics 1 Word
Football (Aussie Rules)	AFL Footy Live
Playing games	Fruit Ninja, Tic Tac Toe, Ludo. Air Hockey, Monopoly, Bingo, Solitaire, jigsaw puzzles
Family history	Google Earth

Stage Two: Interviews with Teachers

The interviews with teachers were transcribed (Figure 4.3). The researcher employed content analysis and the process is further discussed in the following sections. Text segmentation is used as a tool to analyse teachers' interview transcripts. It enabled the researcher to identify meaningful themes that answered the research question posed for this study. One of the approaches employed to facilitate the analysis was looking for patterns within data gathered. It allowed the study to pinpoint the main themes and elements associated with these main themes.



environment has to be very sympathetic to the fact that things just need to be reinforced and to not be judgemental of the fact that you have to reinforce and within that environment there are some who pick things up very quickly, some who don't, that can be not just age component, it could be that's their learning style and it always has been. But you find, I think, as we get older that it's harder to remember things, it's harder to take up new concepts, especially when they're sort of unseen concepts, as computers are.

Interviewer: What are the reasons that the older adults come to these classes – what are the reasons for them to want to learn the computer?

Respondent: Predominantly I would say it is to be able to communicate via email to family and friends, and also to stay abreast of things that are happening in the world, that the only way you can gain access to that is via the internet.

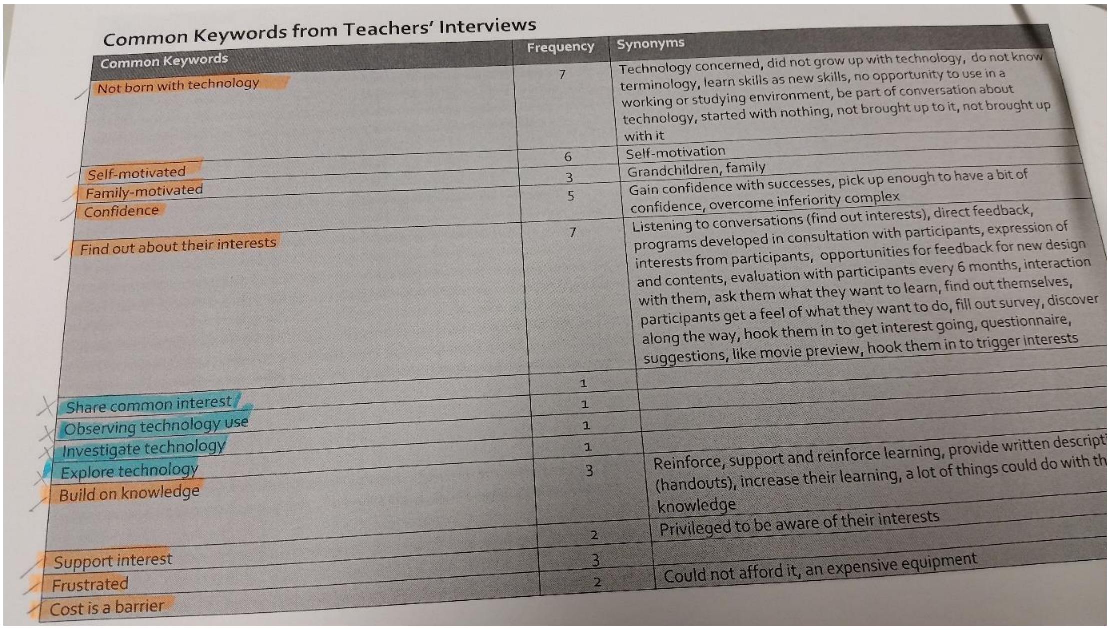
Certainly needing the computer for creating Word documents or spreadsheets or other applications that exist within the Microsoft packages are not as important as they were initially when we first started developing computer classes. Word was a very big thing back then. Certainly if I look through any worksheets that were used by tutors prior to me arriving, a lot of it was based on word processing.

Interviewer: That has shifted towards the online use of the computer?

Respondent: Yeah, to communication. Not just publishing, it's communication now. And there's so much exposure now to everybody through the media the only way you can find out about something is Google this, look up this, Twitter, find us on Facebook, go an visit us on iView, in many respects it's the only way

Figure 4.3. A sample of the transcript of semi-structured interview with one of the teachers.

In general, words, meanings, themes and ideas were analysed. The researcher highlighted each theme with a different colour. For example, green, blue and pink to differentiate the themes. Notes were written on the left-hand side of the interview transcript to indicate a summary of the interview snippets. For instance, the highlighted green section represents "*older adults' likeliness to want to learn technology*" and signifies "*flexibility and autonomy*" which contributes to the theme. The significance of words mentioned by teachers in these interview transcripts were calculated based on their frequency levels. The researcher entered the common keywords into a Microsoft Excel spreadsheet (Figure 4.4). The document was split into three columns: (1) common keywords, (2) frequency and (3) synonyms. For example, the keywords "*not born with technology*" were mentioned up to seven times by teachers, and some of the synonyms used comprised of "*technology concerned, do not know technology*". The common keywords were highlighted in orange, while the less common keywords were represented in blue.



Common Keywords from Teachers' Interviews

Common Keywords	Frequency	Synonyms
Not born with technology	7	Technology concerned, did not grow up with technology, do not know terminology, learn skills as new skills, no opportunity to use in a working or studying environment, be part of conversation about technology, started with nothing, not brought up to it, not brought up with it
Self-motivated	6	Self-motivation
Family-motivated	3	Grandchildren, family
Confidence	5	Gain confidence with successes, pick up enough to have a bit of confidence, overcome inferiority complex
Find out about their interests	7	Listening to conversations (find out interests), direct feedback, programs developed in consultation with participants, expression of interests from participants, opportunities for feedback for new design and contents, evaluation with participants every 6 months, interaction with them, ask them what they want to learn, find out themselves, participants get a feel of what they want to do, fill out survey, discover along the way, hook them in to get interest going, questionnaire, suggestions, like movie preview, hook them in to trigger interests
Share common interest	1	
Observing technology use	1	
Investigate technology	1	
Explore technology	1	
Build on knowledge	3	Reinforce, support and reinforce learning, provide written descript (handouts), increase their learning, a lot of things could do with th knowledge
Support interest	2	Privileged to be aware of their interests
Frustrated	3	
Cost is a barrier	2	Could not afford it, an expensive equipment

Figure 4.4. Keyword frequency based on interviews with teachers.

Affinity Diagramming

Stage One: Interviews with Participants and Staff Members

Affinity diagramming is a business tool usually employed to organise data, ideas, problems and solutions after a brainstorming session. It was devised in the 1960s by Jiro Kawakita and it is at times referred to as the KJ Method (Valsiner and Rosa, 2007; Ulrich, 2003; Scupin, 1997). This process assisted the researcher with categorising and organising data, gathered into logical cohesive groups. The goal of this method is to create a limited number of groups, thus seeing results that could be better understood. Similar ideas and themes for this study were grouped with use of affinity diagramming (Courage and Baxter, 2005).

Stage Two: Interviews with Teachers

Affinity diagramming was also employed by the researcher to analyse interviews with teachers (refer to above section).

4.2. Findings from the Activity Group

Before the commencement of this research project, the activities that older adults in this group were involved with, comprised of playing indoor lawn bowling and billiards, reading of newspapers and listening to music. The local council's aim was to introduce information technology and in this instance, use of iPads by older adults. However, an approach was to be formulated in regards to the introduction of iPads to activity groups. Therefore, this study was based on finding out of older adult's pre-existing interests in general. The most frequently encountered pre-existing interests included games such as crossword puzzles, Scrabble, Sudoku, Bingo, Solitaire, Ludo, Monopoly and jigsaw puzzles. Other interests also consisted of drawing, music (listening and playing instruments), cooking, gardening, football, knitting and crafts (Table 4.2). Participants were also comparing the differences between reading a physical copy of newspapers and a softcopy on the iPad (Figure 4.5 and Figure 4.6). With the latter option, it enabled participants to enjoy multimedia content, such as video clips, and also the iPad provided them with flexibility to enlarge font sizes to suit individual reading preferences. Based on observations of duration of involvement, degree of social interaction, facial expressions, questions, and tone of voice, the most engaging apps appeared to be Google Earth (Figure 4.7) to initiate conversations about home countries and general knowledge (Figure 4.8), musical instruments, for instance Tiny Piano (Figure 4.9) and competitive games such as Fruit Ninja and Air Hockey (Figure 4.10).

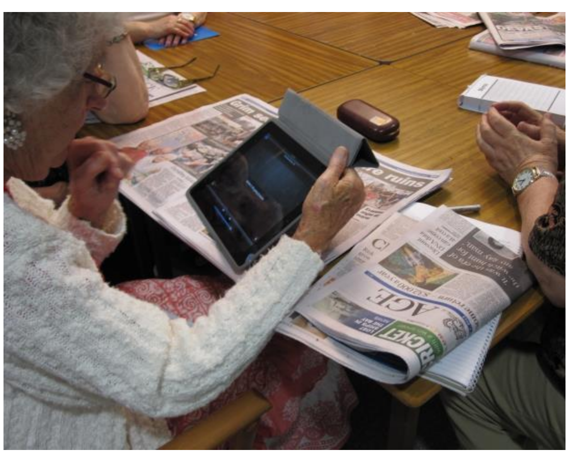


Figure 4.5. Participants reading newspapers – hardcopy and softcopy (with iPad).

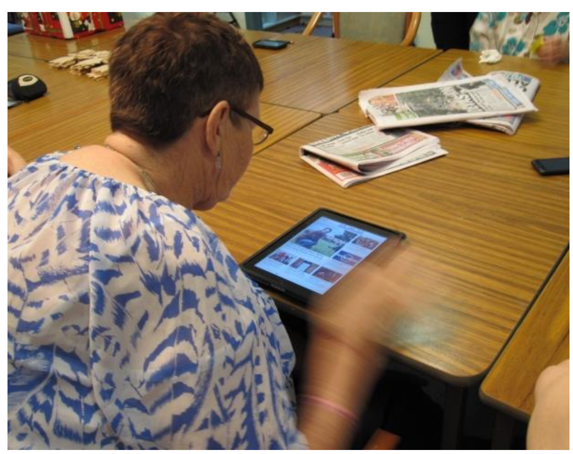


Figure 4.6. Participant reading newspapers with iPad and using multimedia.

Figure 4.7. Participant using Google Earth (with stylus).

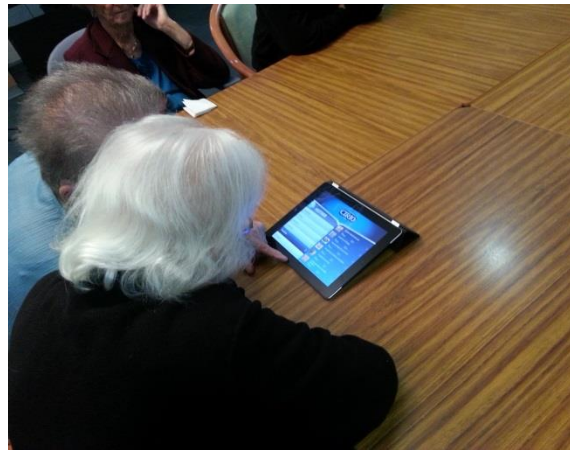


Figure 4.8. Participants interacting with general knowledge game – Cirio.

Figure 4.9. Participants playing musical instruments – Tiny Piano.

Figure 4.10. Participants playing competitive game – Air Hockey.

4.2.1. Attitude towards Technology

Participants mentioned technology, such as laptops and desktop computers that their children and grandchildren are using in their everyday lives. At first, participants appeared hesitant and even resistant, but after demonstrations and with encouragement to use the apps matching their pre-existing interests (Table 4.3), they appeared to be engaged and enjoyed using the iPads increasingly. This indicated that possibly the selection of apps based on their pre-existing interests could have enhanced their enjoyment of the activities. Overcoming initial resistance and fear was crucial in order to further investigate mobile touch screen technology use in activities for group settings. A council manager reflected on this progress and said: *Before when we were discussing you coming, and we were discussing iPads, there was quite a lot of resistance, "Well, what is this? We don't want this*."

Feedback from the management of the activity group and staff members confirmed that the focus on individual interests and hobbies helped participants to overcome the obstacles of adopting new technology and to make use of them according to their clients' interests and hobbies –

> *Just from that, from the iPad, from this alien thing. I mean it's alien to us sometimes, but to our clients even more, and just from a few clicks on Google Earth! The stuff that we can get from that, reminiscence and activity stuff and talking and remembering stuff. It's just invaluable to use here […] some of the responses to when you were going back to where they used to live, or their countries […] and everybody really, really loved it.* – Wyndham Council Management, 2013

4.2.2. Teaching iPad Use

In situations whereby participants might encounter problems with learning iPad use, staff members (Figure 4.11) and the researcher (Figure 4.12) would help, or participants would teach each other in the use of certain apps. Participants were thus able to overcome their initial fear and resistance towards using mobile touch screen technology.

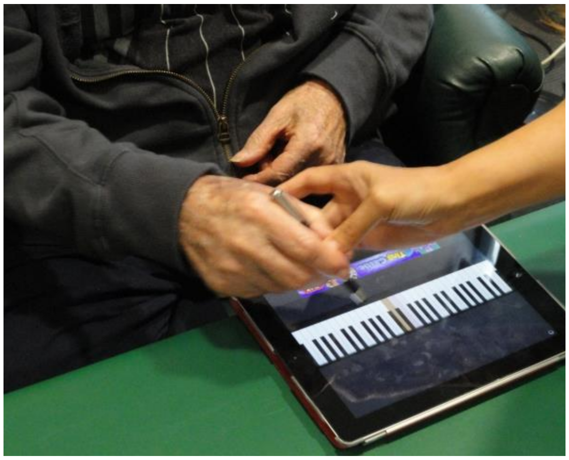


Figure 4.11. Participant using Tiny Piano (with stylus) being assisted by staff member.

Figure 4.12. Participants playing competitive game – Air Hockey (being assisted by the researcher).

4.3. Findings from Interviews with Teachers

The following is the summary of themes derived from interviews with teachers. This section is structured according to Table 4.4 with the following main headings: (1) impediments to learning technology, (2) benefits of technology, (3) student attributes, (4) teacher qualities, (5) strategies for learning and teaching and (6) philosophical approach. In this section, the following will be addressed. Firstly, there are barriers that teachers need to overcome in order to assist older adults with learning of technology. Secondly, finding out older adults' aims with regard to learning of technology and thirdly, the relevant concepts of self-motivation and confidence. Finally, the field of strategies that lead to the endorsing of *interest* to support and maintain technology learning amongst older adults. Within each heading, there will be in-depth detail of individual elements supported by interview quotes from teachers.

Table 4.4. Summary of themes derived from interviews with teachers.

Impediments to Leaning Technology	Benefits of Technology	Student Attributes	Teacher Attributes	Strategies for Learning and Teaching	Philosophical Approach
Not born with technology	Portable device	Self-motivated	Patience	Repetitions and reinforcement	Lifelong learning
Frustration	Communication	Confidence	Respect	Written instructions	Practical learning style
Lack of confidence	Social aspects	--	Experienced	Build on knowledge	Autonomy in use of technology
				Flexibility	Peer-supported environment
				Demonstrations	Purposes
				Analogues and metaphors	Cater for individual needs
				--	Finding out about interests

4.3.1. Impediments to Learning Technology

Impediments towards older adults learning of technology include the problem of not being born with technology, frustration with using technology and lack of confidence with using technology. The following section further details the individual impediments towards learning to use technology with older adults.

Not Born with Technology in their Day

The impediment of not being born with technology was most certainly considered an obstacle towards learning of technology for older adults. This impediment was supported by the majority of the teachers. Richard explained that:

> *It's not something they were born with therefore they feel uncomfortable with it*. – Richard, 2014

Even though all of the participants are at least 65 years old, the teacher believes that younger people such as above 50 years old may already struggle with technology. Jessie explained her view by providing the following example:

> *Where technology's concerned, then I think everybody who was probably born about the same time as me and that's in the late 50s, because we didn't grow up*

with technology. […] so, probably, anybody from perhaps the age of 50 up who was exposed to any form of computer after their compulsory schooling time, because it's something they have had to learn as adults. […] I think if you are not born with something you are constantly questioning it and constantly wanting an explanation of how it works. – Jessie, 2014

Johan said that:

They are not brought up with it, and they have got timidity about using anything to do with new technology. – Johan, 2014

Iain similarly said:

[…] first of all, they haven't grown up with it. And secondly, they don't know the terminology. – Iain, 2014

With the majority of older adults, there is a sense of uneasiness when they attempt to learn new technologies. This cohort tends to encounter more barriers in their way compared to their younger counterparts. This is mainly due to the fact that in their day, older adults were presented with far less opportunities during their educational journey, or had retired before technology was introduced. There is also a group of older adults, who engaged in occupations that did not offer exposure to technology, for instance, in accordance with the results of stage one, teachers referred to occupations such as farming or truck driving.

Frustration

Frustration is one of the negative emotions felt by many older adults when they are using technology. All teachers mentioned that their participants often encountered technical difficulties and were not able to solve them on their own. As Johan stated:

They started with nothing. The world has moved so rapidly, they feel insufficient. They feel incapable of learning this type of stuff. […] when they learn with grandchildren it's like shush, and then that's it. And so it's just that usually the word is frustrated, because they find that children and grandchildren don't have the patience to teach them. So they feel like they want to learn, but no one is there to teach them. – Johan, 2014

Their participants were accustomed to the concept of a machine for single use, for instance, electrical appliances, such as the refrigerator, microwave, television and radio. Therefore, their level of frustration increases due to not being able to understand the concept of a device that has multiple functions. For instance, an iPad can be utilised for a number of purposes that include surfing the net, watching television, listening to music and sending and receiving emails.

Lack of Confidence

According to Feist and McDougall (2013), "*the majority of older adults are less likely to have experienced new technologies in the work place and have left the educational system before new technologies were introduced*" (p.2). Lucy confirmed this and stated that:

> *I think they do because they have had to learn the skills as new skills and they don't have the opportunity to use them in a working or studying environment. Their confidence to use it, unless they use it all the time and they don't have the need to use it all the time, their confidence levels go up and down a bit*. – Lucy, 2014

Subsequently, older adults tend to encounter more barriers in the uptake of new technologies. Jessie explained that:

> *The majority of the students that we have, have their own technology at home and so then have the opportunity to follow it up at home. Some lack confidence in exploring too much unsupervised despite lessons for many years, some still lack that confidence and it could be because of language barrier, because English is not their first language, or just simply confidence*. – Jessie, 2014

Therefore, maintaining the use of technologies between lessons is really important. Lucy described a scenario whereby she tried to introduce the iPad into a non-technology class:

> *[…] I tried to introduce the use of iPad in a discussion group for the participants and they were very excited but very concerned. […] so, it became a little bit daunting. They were fascinated to watch how the iPad worked, to watch me do it, but then they got a bit nervous when they had to do it. And these are people in*

their late eighties and early nineties, but, (they) certainly understood the concept of the iPad. – Lucy, 2014

How the teachers dealt with the issue of building confidence is well explained by Richard in his computer class:

The barrier is the lack of confidence in being able to pick up everything. So my message to them is you don't have to learn everything, you won't learn everything. I'll never learn everything. But you'll easily pick up enough to know to have a bit of confidence about what you're talking about. – Richard, 2014

All teachers said that the lack of confidence could be compensated, through teacher's teaching and learning strategies, and approaches for addressing impediments.

4.3.2. Benefits of Technology for Older Adults

The focus of this section is on the benefits of technology. For portable touch screen devices, the three key elements that contribute to perceived benefits of technology for older adults, are ease of use, communications with family members and social aspects.

Portable Touch Screen Devices - Ease of Use

According to ACMA (2014), one of the factors that has driven up the uptake of mobile touch screen technologies was "portability". According to Tsai and her colleagues (2017), mobile touch screen tablets are portable and also easy to use. This whole concept of not having to think of which book to take is very convenient. There are millions of books available either at no cost or at a minimal cost. Jessie said that:

People with iPads would be using them on a very regular basis because they're a portable device. – Jessie, 2014

Some of the activities could include, but are not restricted to reading newspapers, playing games, or checking emails. Joanne stated that:

It helps to save time. You no longer have to carry all the books. – Joanne, 2014

Some of the real-life scenarios include using a touch screen tablet on the bus, tram and train or even while waiting at the doctor's surgery.

Portable Touch Screen Devices - Communications with Family Members

Data gathered by ACMA (2014) has included communications as one of the most popular activities. According to ACMA (2016), data shows that of the internet activities performed by those in the 65+ age group, 72 percent are communications. The following comments support the desire of older adults to use the technology to communicate and stay connected with their family and friends.

> *That is an incredible communication tool, to be able to take a photo, to send it, to share it. That is really big connection tool between people. Grandparents are relying on really closely to their hearts, because many of them with family spread far and wide, this is the only way they get to see their grandchildren and to see videos of their grandchildren*. – Jessie, 2014

As older adults get more skilled with the use of their touch screen tablets, Richard believed that:

> *It's a really good way to communicate with family and friends, and so the better they know how to use that technology, the better they can achieve that goal*. – Richard, 2014

In Julie's classes, students felt that knowledge of technology would help them to relate to and understand their families and the wider community. She described:

> *I supposed the overall thing is to stay connected with their community. To stay connected with family. To feel like they're not letting something pass them by and to keep their brain active, that's one of the comments you get – "we want to know what people are talking about even if we don't use it ourselves." […] I have introduced them to Twitter, to Facebook, we've had sessions on Facebook, we've had sessions on how to load your own video onto YouTube. They're all things that people, most of our participants, there's no way in the world our participants will do that, but it's so they know what it's about. So that when they see it in the media, see it on the television, they know what it's about […] to be able to make a choice if they want to.* – Julie, 2014

Julie felt that older adults mainly wanted to learn technology because it enabled them to maintain connectedness through communication.

> *Predominately I would say it is to be able to communicate via email to family and friends and to stay abreast of things that are happening in the world, that the only way you can gain access to that is via the internet.* – Julie, 2014

Older adults in her classes have family and friends living interstate and overseas, so being able to communicate via email is crucial. With most services shifting towards an online presence, the internet is able to provide older adults with the latest news and information. Motivation is related to *interest* and goals. Experiments run by Sansone and Smith (2000), have established that the accomplishment of goals is facilitated by the presence of *interest*. Therefore, participants would be able to learn better and set goals that are achievable.

Portable Touch Screen Devices - Social Aspects

In Wright's (2016) study, she mentioned that "*in line with geragogy theory, the evolving format of meetings sought a balance between imparting new knowledge and fostering social cohesion by enabling the exchange of ideas and experiences*" (p.84). Findsen (2005) suggests that one of the factors to improve on learning is via social networks, such as volunteering and clubs. Extending from family to other networks, social interactions were also a very important component. In this case, there are two categories within social interactions: (1) social opportunities during classes and (2) new opportunities based on acquiring new technological skills. These two elements are inter-related for older adults. All teachers mentioned that older adults come to classes to share stories related to their private lives, such as previous and current work experiences, life experiences, travel experiences and stories of family and friends. Lucy mentioned that:

> *[…] everything that they want to learn must include a social component. So, it's an opportunity for them to be involved in the community within a group setting, to belong to something. To have a use for whatever they may be learning is very, very important and the reason why they come. But the opportunity to create or develop friendship networks is by far, probably an even greater benefit and one that they are looking for, because as they are getting older, it's more and more difficult to remain connected to the local community*. – Lucy, 2014

Julie was asked if there were any restrictions on the geographical locations of students registering to attend her classes. Some students were prepared to travel further for the social interactions, as well as the opportunity for learning. According to Naufal (2008), the leading causes of social isolation amongst older adults was transport and mobility restrictions. HCEC Inc. is located within the City of Boroondara, close to public transport such as trams and trains. The social aspect element is further supported by Boulton-Lewis (2009). She wrote, "*Participation within the community is important. Firstly, for enjoyment and recreation and, secondly, for allowing older people to adapt to changes within their environment in areas such as technology, lifestyle, finances and health*" (p.22).

4.3.3. Student Attributes

According to the teachers interviewed, the main attributes that contribute to students' learning of technology comprised of self-motivation and confidence. At the beginning of the study, confidence was an important theme that was frequently mentioned when content analysis was employed for data analysis. Indirectly, confidence is an element that would contribute to older adults' learning of technologies. The section below provides quotes from interviews with the teachers.

Self-motivation

Jessie pointed out that older adults in her classes had very definite mind-sets when it comes to signing up and attending technology classes. She said:

> *[…] the most important thing to remember when working with older adults is that they are self-motivated, so they are there to learn something specific*. – Jessie, 2014

Julie for example explained, her students usually were self-motivated:

> *You get the occasional one who a friend would recommend it and they come along to that. You get the occasional one who will come, but is overwhelmed by it all and doesn't come back. But by far and away, yes, they're self-motivated. And they're not necessarily pushed by family or friends they're self-motivated*. – Julie, 2014

Therefore, self-motivation and interests are two elements that are closely connected. Richard concurred:

> *I think they are self-motivated. Not many of them are required to attend, so I think the only thing that brings them here is self-motivation*. – Richard, 2014

Although the majority of older adults realised that they do not possess much knowledge about technology, they recognised that there are opportunities for exploration and are determined to learn about the use of technology. Iain enforces this and said:

> *I think that some of it is to do with family […] because of conversations they've had with their family, and they've sort of realised that there's a lot of things they could be doing if they had this knowledge*. – Iain, 2014

This determination pushes them to attend classes and allows them to hold conversations with their friends and family, especially with grandchildren. However, generally, there is a curiosity amongst older adults. They are seeking to gain more experience, to find out what they could do with technologies, as it is able to provide them with more opportunities to explore their pre-existing interests.

Confidence

The other important aspect for student attributes is confidence. Older adults do not have much experience with information technology usage, as many of them would have been retired when new information technology was introduced. So "confidence" in this scenario is quite different from simply "*lack of confidence*" from not having the opportunities to learn technology. On the contrary, it focuses on building up older adults' overall level of confidence and empowering them via their ability to use technology in general, through learning. Joanne said:

> *[…] it's important for their own confidence to know what's going on*. – Joanne, 2014

Richard explained:

> *[…] that helps with the big one about confidence. Because when you're feeling you can add value to a course, or add value to the community, that's another incentive to learn stuff, if I learn this, I'm going to be useful. And once people*

> *retire, a lot of people have difficulty because they're no longer of any value. Or they feel like they're no longer of any value*. – Richard, 2014

It is imperative for them to have basic technological knowledge as it empowers them and increases their level of confidence to use technology to suit their individual purposes. These purposes could be maintaining social interactions with their family and friends and/or even sharing of similar pre-existing interests with groups of people, for instance, if an older adult is interested in woodwork, then he could consider joining the men's shed[3]. Members offer support and friendship to each other, while at the same time provide opportunities to give back to their local communities, through participating in grass-root projects, events and programs.

4.3.4. Teacher Attributes

The three essential teacher attributes that enhance teaching older adults to use technology consisted of being patient, being respectful and being experienced. The following section describes the individual attributes of teachers.

Patience

Patience was mentioned as one of the key aspects for teaching older adults, as indicated in the following statement provided by Jessie:

> *To rely on discussion, peer sharing, sharing of their experiences between each other, listening as much as telling, or talking, patience, repetition being able to repeat something if someone does not understand. Basically, to make those older adults feel comfortable asking more than once for clarification of something.* – Jessie, 2014

Teachers unanimously agreed that older adults find learning to use technology from family members a challenge, as they usually do not have the patience to explain in detail. Lucy described her experiences:

[3] Men's Shed is a movement and tool to help men in addressing issues related to their health and wellbeing

One of the most common stories we hear from our participants is they ask their children or grandchildren to show them what to do, and they run through it very quickly and say ‘oh. It’s easy and that’s it’ and that’s not how they learn. – Lucy, 2014

In order to make older adults feel comfortable so that they are able to clarify whenever in doubt, teachers have to be able to present and explain current and new technological concepts and terms according to older adults’ learning pace. While at the same time, teachers need to make it simple and easy for older adults to understand. They are better able to make the links when classroom activities are related to their pre-existing interests.

Respect

Another quality was being respectful. Teachers mentioned that their participants like to be valued as active members of their local community. It provides them with a sense of belonging. Jessie strongly believed that:

[You need to have] respect for people’s experiences and knowledge – even if they are not based on technology. – Jessie, 2014

Julie provided another piece of advice, and stated:

I think I said it before, just being respectful of the abilities and the achievements of the people that you’re working with. Being respectful of the fact that people have different ways and different times in which they learn. – Julie, 2014

Continuing from her above statement, Julie mentioned a few elements that contribute towards success with teaching of technology, including, older adults being treated with respect while interacting, trying not to single out anyone and not talking down to them as if they are children. Being respectful of individuals’ abilities and achievements, regardless of their backgrounds, is important. Positive emotions increase older adults’ ability to learn and absorb information.

Experienced

There are different teaching and learning styles between younger and older adults. Julie mentioned that she has a certain teaching and learning style that she implemented in her classes. She revealed:

> *It's more experience. I suppose when I learned to be a teacher, and I've got a Bachelor of Education. I'd have to say that different teaching models and styles wasn't big on the curriculum back then. So, I'm not an expert in different methods of learning and different methods of teaching. I do a lot of it by gut feeling and knowing what's worked. So, no, no method, no particular styles*. – Julie, 2014

Julie's teaching methods was mainly based on her own personal experiences of over 20 years – through trial and error and observation of her students.

4.3.5. Strategies for Teaching and Learning

The six strategies for teachers are using repetition and reinforcement, providing handouts and written instructions, building on knowledge, flexibility of curriculum, providing demonstrations and referring to analogues and metaphors. The following individual elements with regard to strategies for learning were found in the teachers' interviews. They included:

Repetition and Reinforcement

Repetition of activities was required, as older adults need to practice often or they tend to forget what they have learned. Although research shows that ageing could lead to slowing and decreasing of processing speeds in both working and long-term memory (Kraft, 2012), it can also be reduced through declining mental activity. Richard said:

> *Something that has to be taught to some people over and over again because they don't actively use it enough. They don't use it away from here, so they only use it once a week, so when they come back here they've forgotten what they learned last week because they haven't been actively using it.* – Richard, 2014

Iain stated:

> *Every week I have to repeat everything […] so it's constant repetition.* – Iain, 2014

Lucy supports this with the following statement:

> *And that's probably the biggest issue, their ability to learn. I don't believe is greater, provided that appropriate support and learning styles are used, then I think that their ability, or opportunity to learn and to retain those skills are very strong. But, the practicality of using those skills regularly is not as great for them and that's where their retention of that knowledge and the confidence of using that knowledge is not as great as a younger person.* – Lucy, 2014

Julie mentioned a few elements that contribute to success in teaching technology:

> *A lot of patience, a lot of repetition that a tutor and volunteer in that environment has to be very sympathetic to the fact that things just need to be reinforced and to not be judgemental of the fact that you have to reinforce and within that environment there are some who pick things up very quickly, some who don't, that can be not just age component, it could be that that's their learning style and it always has been.* – Julie, 2014

Older adults did not grow up with technology. Therefore, it is a new learning curve for them. At times, the same person will ask similar questions in a repetitive fashion. It would mean taking the repetition into consideration, while developing the course plan. Students in Julie's classes usually have difficulties in remembering procedures related to completing of technology tasks, therefore repetition in class and practice at home is crucial. Julie mentioned that she usually provides notes for her students. Teachers should be prepared to repeat explanations, when older adults raise similar questions. To avoid confusion, try to focus on a single aspect at a time. In order to increase older adults' level of confidence with use of technology, repeat activities that are related to older adults' interests, as it increases their ability to remember.

Handouts and Written Instructions

Merriam et al. (2007) stated that written instructions should be made available to older adults for future reference. According to one teacher, older adults also learn better when provided with step-by-step instructions to reinforce their technology skills. The following comments suggest that older adults learn better in any area in this way. Joanne stated that:

> *[I might differ from other tutors that] I believe providing as much information as you can in a written form. Certainly in the computer classroom, I would always demonstrate different applications using technology, but I would always follow that up with some sort of written description, because many people as an adult, as any learner, but particularly older adult learner, based on the way they have learnt, based on their ability to absorb information at first glance, having that reinforcement being able to take home a piece of paper to reinforce it, to be able to read through and practice on your own and reinforce those skills is really valuable.* – Joanne, 2014

"*Despite age-related decrements in aspects of information processing, we need to focus on what older adults can learn and how they might benefit*" (Boulton-Lewis, 2012, p.3). Tony pointed out that:

> *Part of the programme also is that I've introduced a handout. […] for additional information is reinforcing the information covered.* – Tony, 2014

Julie mentioned that she has to understand that everyone has a different learning style. She explained:

> *I had a particular chap who just really, really struggled with following instructions on a worksheet. […] He worked out so many concepts himself on the computer without any instructions. […] As it turned out, he wasn't a good person to follow notes and I could tell, he was floundering and he used to get really frustrated and really upset about himself*. – Julie, 2014

In this situation pointed out by Julie, she would console her student and say:

> *Don't worry about the notes, you know how to do this*. – Julie, 2014

The student would come back the next week and tell Julie that he had achieved the weekly activities but did them in a different way. Julie would encourage him by telling him all that matters is that he is learning and getting something out of it. So, handouts did not work for one student. However, in general, Julie found that students in her class learn better, when they have a point of reference in the form of notes. It can be difficult to link words to the computer screen, so images of the screen at each step should be included to improve older adults' learning needs (Merriam et al., 2007). The majority of older adults live on their own, and there may be no one around to help, so it is important to provide written notes in large font and provide handouts with screenshots that they could refer to when practising at home. Teachers should provide older adults with written materials with at least 14-point font and include relevant diagrams to match instructions. The use of technological jargon should be avoided, yet do not oversimplify the use of language, and make sure contents are arranged in a logical and organised sequence. Furthermore, make available the use of examples that are related to their pre-existing interests.

Build on Knowledge

Older adults tend to possess different mental models of their own, based on their prior knowledge and experiences (Merriam et al., 2007). Getting insights from participants will help with the design of programme curriculum for technology courses. Lucy firmly believed that:

> *Proven adult education, senior adult education methods are to tap into their experiences. Tap into their knowledge.* – Lucy, 2014

Richard stated:

> *[…] probably more important than that, is that their incredible expertise and life experience needs to be taken into consideration. They come with all of that, so they already bring a lot of knowledge to the table and that knowledge needs to be acknowledged and shared. They have skills to share as well as new skills to take on.* – Richard, 2014

Jessie expressed that:

> *I think technology is a wonderful way for people to build on their knowledge, search far and wide for information, and support what it is that their interests are by linking them with groups, organisations and other people who share a common interest.* – Jessie, 2014

Teachers should be aware that learning is facilitated and made relevant when associated with pre-existing interests. Older adults' past experiences should also be taken into consideration. In order to encourage older adults to practice technology usage on a regular basis and incorporate into their lives, activities should be designed in a way that relates to older adults' everyday activities and pre-existing interests.

Flexibility

The courses offered by other organisations ranged between four-weeks, six-weeks, eight-weeks and twelve-weeks, but HCEC in general was able to offer their programmes over a 39-week timeframe. Julie explained:

> *But tutors have a reasonable idea and flexibility, I think, if you're not fixed into a firm curriculum of course you've got that flexibility cause we're delivering our programme over 39 weeks, our courses are all 12 months in duration, and that's fairly rare that courses are ongoing courses, but that's the way seniors like to learn, they like to keep learning and they keep coming back*. – Julie, 2014

This course structure has provided their students with continuity and therefore, they were able to learn better. It is associated with the section on repetition and reinforcement. Julie said that structure of the curriculum affects the outcome – short-term courses versus long-term courses. She indicated that:

> *I can understand it as a teacher, if you've got an eight-week course, you have a certain amount of curriculum to cover, but we always digress either to the whole group, or we will digress just to the individual depending on the need. If some said "look, I really can't remember how you did that" or "I'd really like you to go over that", my statement, as a teacher, would always be "does anybody else want me to reinforce that again?" And even those who say, "I got it, but I'm happy to hear it again*". – Julie, 2014

Long-term courses provided Julie with more time. She could design and develop weekly curriculum according to her students' needs and requests. As part of the strategies for teaching and learning themes, it is of relevance for repetition and reinforcement to take place, because time is set aside for it.

Demonstrations

Julie found that students in her class were able to absorb knowledge and learn better, when she implemented the use of demonstrations in her curriculum. She set up a screen projector, attached it to her laptop, and worked through the weekly activities. She explained the systematic instructions required to complete tasks. She said:

> *The demonstration, the actual demonstration, I was told, was probably one of the most important concepts for them learning. It's that they could see the steps that they were going to have to do, once they got their handout.* – Julie, 2014

Julie received feedback from her students that demonstrations in their weekly classes were essential. They were able to follow the step-by-step instructions, while Julie explained. At the same time, they took down personal notes.

Analogues and Metaphors

Julie said that teaching style would be different from the perspective of technology. She explained:

> *You need to be able to often explain things in old school terminology. I find that as a teacher I have to make a lot of analogies to technology, that they may become familiar with in the past that was new technology to them years ago.* – Julie, 2014

In this instance, Julie elaborated her method by referring the learning of new technology to real-life analogues or metaphors for her students.

> *For example, I often refer to the microwave and how they were scared of the microwave when it first came in, but they learned how to operate the functions that they needed to know on the microwave and they're all at ease with that and therefore I liken that to a computer, in that there's lots of things a computer can do, but you familiarise yourself with things that you need and you just make the best of that.* – Julie, 2014

She revealed that her students learn better, when they could relate learning of new technology with real-life analogues or metaphors. It is something that is tangible, and therefore enables them to visualise the process.

4.3.6. Approaches for Addressing Impediments

The seven approaches for addressing learning impediments faced by older adults with uptake of technology are: views on lifelong learning; finding out purposes; having a practical learning style; providing a peer-supported environment; ensuring autonomy in use of technology; catering to individual needs and finding out about pre-existing interests. The following section further explains the individual approaches for addressing impediments.

Views on Lifelong Learning

Hiller (2012) defines lifelong learning as "*learning that takes place throughout a person's life. It is meant to be continuous and, therefore, does not stop at the end of compulsory schooling*" (p.34). Julie shared her views on lifelong learning:

> *To keep doing it. To keep living long enough to keep learning. The important thing about lifelong learning. Well. Every day is a new learning experience, I think, it's not shut your mind off to things that are out there. […] There's probably all sorts of philosophical explanations for lifelong learning. Just keep being part of the human race and you're learning along the way and share your knowledge, because you sharing your knowledge is assisting someone else's lifelong learning.* – Julie, 2014

Edgar (2014) suggests that the "*brain needs to be active and stimulated with rich and new experiences*" (p.51). Some teachers emphasised the importance of lifelong learning as a way of encouraging their participants to keep their brains active at the same time. Jessie defended her views about lifelong learning:

> *It's to never give up. To keep using your brain, to keep learning. Where I think there's proven, seems to be proven evidence, proven recommendation to keep your mind active to ward off dementia. We all continue to, no matter whether it's*

technology or not, you still have the ability to continue to learn, I just think that technology allows you to expand your learning. – Jessie, 2014

Richard believed that lifelong learning consists of being interested in life:

There are a number of things. First of all, it makes you interested in life in the world. It keeps your mind active and makes it a more interesting life. – Richard, 2014

Lucy explained her perspective on lifelong learning:

The most important thing about lifelong learning is that people bring a huge range of skills and experience to the table that will complement the learning that they're wanting to do, and we need to acknowledge that and we need to enable them to learn at their pace and to make sure that the environment, or the learning style is practical for them to apply at home. Lucy, 2014

Older adults are individuals and have ideas to contribute, and therefore should be appreciated. In order to make learning of technology interesting, teachers should share with older adults the advantages of learning technology. They should also be provided with suggestions on how technology could improve their lives by referring to their pre-existing interests.

Finding out Purposes

There were a range of experiences for HCEC's technology classes. This class was predominantly a beginner's class. Julie noticed a shift in the demographics of older adults taking technology classes, as younger and more active adults were now more likely to enrol. She mentioned that:

The demographic was younger, more active, still involved with community volunteering, a number still employed part-time. Whereas, the cohort I inherited were predominantly people who were doing it as a leisure, come to learn activity. – Julie, 2014

Julie further provided some examples on the cause of the shift from word processing towards online and web-based learning topics. This shift was driven by everyday activities, for instance:

There's an extra charge to do banking at the post office as opposed to online banking or online payment of bills or whatever. So it's been thrust upon people and I've been very fortunate working in a computer classroom of older people that they're the ones that embrace this change. – Julie, 2014

A study by Waycott et al (2012) showed that older adults need to see the purpose in using a technology in order to engage with it. It further supports the relevance of older adults' pre-existing interests. The following comments enforce the crucial factor of older adults requiring a purpose for technology usage, in order to understand the benefits. Lucy justified older adults needing to have and recognise a purpose:

If they can't find a reason or a benefit from using this thing regularly to support them or to help them live a better life, if you like, then they don't see the point of it, which is a very practical outlook. If they can understand how to apply it and the benefits of that, even if they couldn't afford it, they would save up for it. – Lucy, 2014

Richard explained to his participants:

The technology can be baffling, different forms of technology can be baffling, but once you know how to use it to get the best results for yourself, it becomes second nature. […] not to be too concerned about the fact that they don't understand how it works […] all you need to do is know how to get the most out of it for your own purposes. – Richard, 2014

Julie explained that:

Students come away with very little work at the end of the day in terms of things in their hands. So, I would always try and make a point of them producing something towards the end of the year that was useful, and it was a way of demonstrating to family and friends that this was what I've done. – Julie, 2014

Older adults have very abstract goals. They are usually not clear about what they can do with technology. Hence pre-existing interests might be a mechanism to assist with this. Julie elaborated:

[…] to say what it is they're wanting to achieve or what it is they're wanting to learn. But it ranges from the odd ones saying they want to learn how to do Excel better. Very rarely, the odd one saying they want to make a flyer, but most of them want to be able to become proficient in emailing and accessing the internet and getting the most out of it. – Julie, 2014

Julie recalled that when the Centre first started developing curriculum for computer classes, Microsoft Word was in very popular demand. She explained:

Certainly needing the computer for creating Word documents or spreadsheets or other applications that exist within the Microsoft packages are not as important as they were initially when we started developing computer classes. […] Certainly if I look through any worksheets that were used by tutors prior to me arriving, a lot of it was based on word processing. – Julie, 2014

She elaborated that the curriculum has since shifted towards online use of computers:

Yeah. To communication. Not just publishing, it's communication now. And there's so much exposure now to everybody through the media the only way you can find out about something is Google this, look up this, Twitter, find us on Facebook, go and visit us on iView, in many aspects it's the only way people can do things. – Julie, 2014

Julie provided further explanations regarding popularity of IT classes within the Centre:

We gave iPad classes and that probably is our best IT class, in terms of we've got a waiting list for our iPad classes. We're about to do some mobile phone classes offsite at a different premise for older people. So, certainly different, and what's happening is that, I imagine the iPad type of class might overtake computer classes. The iPad classes and the mobile phone classes come out of the fact that people are now getting given them for Christmas presents. […] I believe that the iPad, people that come along, and some of them have just been given one and they've got no idea how to use it, certainly embrace it. – Julie, 2014

Teachers should try to help older adults fulfil their short-term and long-term technological goals, as it helps to build their confidence. Being able to develop achievable goals along the way encourages older adults to persevere with learning of technology. Their learning could be further enhanced with reference to their pre-existing interests.

Having a Practical Learning Style

According to Merriam and her colleagues (2007), older adults tend to be problem-oriented and respond better to concrete examples rather than theoretical generalisations. However, older adults' insufficiency in technological experience was due to an absence of a learning framework that would benefit them. The following examples were used by the teachers. One taught older adults to compare the concept of file management on computers to a physical filing cabinet. Tony explained about creating new folders with meaningful names and grouping of documents:

> *And what I try to do is break it down to something that they can recognise in the real world. I will equate it to something else. Like folders, when you're talking about file management and folders. I'll equate that to the real world situation. I'll walk over to the filing cabinet and I'll say this is the filing cabinet which is equivalent to my documents, and then I'll go through the actual folders within the filing cabinet and the different drawers and I'll go through the actual physical folders and equate that to the folders on the PC*. – Tony, 2014

In his class, Richard associated his style with an example of shopping for a wardrobe in IKEA:

> *I have done a little exercise where I asked them to imagine that they've gone to IKEA and we've bought a prefabricated wardrobe. And I put it in the middle of the thing, and I've put markers around everywhere. And say here's the work area, here's the basic materials, here's the list of instructions, and there's the room you've got to put in it when you've finished. And then they assemble this drawer and put it over there. So I keep going back to the little everyday things that they can do as example and comparisons*. – Richard, 2014

Another example provided by Iain was:

> *I have found that explaining things in simple terms and trying to break it down to the lowest denominator is the best way to learn something. […] relate things to*

ordinary everyday things then it is easier to capture that in your memory. – Iain, 2014

Lucy concurred and firmly believed that:

[…] if what they're being taught is not applicable to their lifestyle then they will have no need to retain it. So, it needs to be very practical learning. – Lucy, 2014

Teachers should provide explanations to older adults that are associated with real-life situations that they could relate to, especially when it ties in with their pre-existing interests.

Peer-supported Environment

Teachers mentioned that their participants tend to feel stupid when they are unable to resolve technical issues that they have encountered while learning technology. Therefore, their participants usually learn better in an environment that allows them to share their experiences and technical problems, as both of these affect their level of confidence. According to various studies conducted on peer-supported programmes (Weeks et al., 2015; Seymour et al., 2011; Rose, 1992; Lynde, 1992), it has led to positive results in learning amongst older adults. These included an increase in their level of knowledge and also leading to their sharing of experiences and information with their peers. A peer-supported environment makes them feel assured that they are not alone, as there are others who might have encountered the same technical issues as themselves. Older adults assisted each other with explanations, teaching and learning together. This further indicates that a peer-supported environment is well regarded by older adults. The following statements reinforced the importance for older adults learning technology in a peer-supported environment. Lucy said that:

When they have failures, the importance of classroom really increases, because they are sharing how they are coping with other participants who have similar experiences. So that peer-supported learning starts to kick in as well. – Lucy, 2014

Joanne said:

> *The other greatest thing, of course, is the opportunity to learn it properly. So, if they don't feel that there's an appropriate supportive learning environment for them, then that's just as bigger a barrier as the cost.* – Joanne, 2014

As mentioned, peer-support is an important aspect. Another major reason that older adults kept returning to attend Julie's classes was the social aspect. She explained that:

> *As I said, some people just came almost for the social interaction. […] There's always that social aspect, that social support aspect.* – Julie, 2014

Society perceives older adults as frail people, often treated as "*old fuddy-duddies*", who have "*got nothing to offer*".

Although traditional peer-supported learning refers to students in the "*same age group*", in this case, it is inter-generational. Julie mentioned that having volunteers (in this case, university students) to help in her classes was imperative. In this interview, I asked her to elaborate, and she explained:

> *Because we've relied heavily on volunteers to assist people on a one to one basis where possible, and volunteers within our classes play a vital role intellectually, but also socially with our students.* – Julie, 2014

These social interactions with younger volunteers could reaffirm older adults' sense of their own competence, while assisting them to keep abreast of new developments. The social interaction between different generations and the exchange of knowledge and experiences benefitted everyone. Even family members often do not appreciate their parents' accomplishments in life. Julie said that older adults in general may not feel that they were recognised or celebrated for their achievements, careers and travels, that they did when they were younger. In general, older adults tend to learn more effectively in an environment with participants of a similar age group, skills and knowledge, however, the addition of inter-generational learning has demonstrated even better learning outcomes. Teachers should encourage older adults to participate in discussions, and persuade them to share their personal experiences, pre-existing interests, goals, and purposes, as well as their views on learning and using of technology.

Autonomy in Use of Technology

Autonomy is another important aspect influencing older adults' uptake of technology. No two people learn the same way, and individuals have different learning strategies. In their classes, teachers explain to their participants the number of methods available to accomplish their goals and allow them to choose an approach that they would consider most suitable. Teachers emphasised that their participants were eager to have control over their own devices, such as personalising home screens with their favourite photographs. Nobody likes to have someone looking over their shoulder all the time, telling them what to do and what not to do. There should be flexibility available to older adults attending these technology classes.

> *Some people would say, "I've heard the lesson, I've learnt something. I've got the notes. I can take it away and practice myself, but I don't want to stay or I can't stay.*" – Julie, 2014

In most classes, curriculum was planned for older adults based on pre-existing content and assumptions and older adults were not consulted (Boulton-Lewis, 2012). Therefore, they did not have control over what they want and need to learn. In this study, it has been shown that, firstly, older adults need to be self-motivated in order for them to attend classes. After that, from the knowledge gained, their level of confidence is built up. Once this is achieved, then older adults gain higher levels of autonomy in their attitude towards technology use in their everyday lives. This leads to the bridge provided by the *interest* model, taking into consideration the presence of self-confidence and autonomy.

Older adults also need an environment that is flexible and is able to accommodate their current commitments, such as volunteering and/or looking after grandchildren. Julie clarified:

> *We recommend that people progress, but often people are perhaps not necessarily placed in the best class that they could be in, but it's because it suits their other engagements in their life. It doesn't suit them to be there on a Tuesday afternoon so they'll come into a Tuesday morning, if perhaps they're not quite matched at the same level of competency, but all of our tutors endeavour to meet their needs irrespective of whether they're a little ahead or a little behind. That, we believe, is the success of our program.* – Julie, 2014

As there are several alternative approaches to addressing tasks, once the teacher understands that concept, then they were able to decide for themselves the particular learning method that was suitable, in order to fully utilise their usage of mobile touch screen devices. Furthermore, autonomy encourages older adults to use technology outside of classes, for example, checking public transport timetables to plan for their outing, or the weather forecast before booking a round of golf. Tony revealed that:

> *Autonomy is important, because they want to be able to learn, understand and work it out on their own, not to be treated like kids.* – Tony, 2014

Teachers should also promote independent learning by providing older adults with a number of strategies to accomplish their goals. As individuals learn differently, allowing older adults to decide on a suitable learning strategy preference is good. Let them have full control of their own technological devices and plan activities that cater towards their individual interests.

Catering to Individual Needs

Julie mentioned that a few of her students have hearing loss. She shared some of the techniques she applied when working with them:

> *The techniques are trying to make sure that that person, or those people know that they're in the conversation. Know that you're directing something. Saying their name first, so "so and so, are you going to do this?" and make sure you don't say anymore until the person answers. So that's how I would do it. "Julie, we're going to be doing this now", or the number of times I would repeat something because I could tell that that person hadn't actually heard it, but without saying, "Oh, Julie, we're turning to here". I would go "now, did everybody understand we're going to page five?" But particularly gaining the person's attention first or repeating something that I could tell that they hadn't heard without making it look like, "Oh. You hadn't heard!"* – Julie, 2014

Julie mentioned that paraphrasing is a technique that assists in accommodating hearing loss. At times, she would be required to paraphrase questions asked by students in her class, so that others could catch up. She provided an example:

> *Paraphrasing what other people have said, that was probably one of the biggest problems and it remains one of the biggest problems in any setting, no matter where you are. That is, someone is asking a question, the person who's controlling a group doesn't paraphrase, doesn't say "now that person said", "for those of you who didn't hear, the question was" that is just such a fatal mistake of so many presenters, so, always be aware of doing that*. – Julie, 2014

She gave an example of one of her students, who has a different learning style:

> *That, I think, was integral to assist their learning. As I said there was a chap who had difficulty following that, so it's important to be aware of how people learn. […] Sometimes I would just do a general demonstration, other times I would get the handout and go from start to finish if there were multiple steps to do in the activity.* – Julie, 2014

Hearing loss and poor eyesight are an integral part of physical ageing (Maharani et al., 2017; Gopinath et al., 2016). Julie found that hearing loss and poor eyesight contributed to the main difficulties experienced by teachers. She described:

> *Difficulties – physical difficulties for some, particularly hearing loss, that's very difficult for the students themselves, it poses difficulties for the tutor. For me, because I'm used to working with adults with different disabilities and have learned to deliver accordingly to that, I don't have an issue with it*. *[…] I can't think what else… making others aware that you'll have to speak up so everybody in the room can hear you.* – Julie, 2014

Yet, instead of these being barriers towards learning, Julie had found techniques to improve her students' capacity to continue with learning. Julie explained about difficulties with remembering things and taking up new concepts amongst older adults, especially technology. I asked Julie, if she could provide me with some main difficulties that her students have encountered. Julie explained:

> *[…] Forgetting. A number of them, actual physical disabilities. […] I think, as we get older that, it's harder to remember things; it's harder to take up new concepts, especially when they're sort of unseen concepts, as computers are*. – Julie, 2014

Julie felt that students could become discouraged when they could not remember what they had been taught. In order to keep them motivated, Julie supported memory loss with the teaching approaches discussed above, and felt that teacher and volunteer training was key to providing a conducive environment.

Finding out about Pre-existing Interests

While being interviewed, Julie described the computer as a tool that helped her with demonstrating techniques to older adults in accessing information that was relevant to their pre-existing interests. In this way, she could engage them by personalising the course with content that was useful in their daily activities. She said:

> *I suppose over the period of time I've got to know quite a few of my students quite intimately in knowing what their interests are, so I've been able to pick up on things that I've seen that's out there […] is to provide information and learning for people across a whole lot of different subject areas and the computer is a tool. Anything that we can look up on the net is related to things that they might be interested in. […] certainly don't have people come away and say, "God. This has proven it, I hate this computer. I'm never going near it again." That's not the way it goes.* – Julie, 2014

All of the teachers emphasised the importance of focusing on pre-existing interests for technology learning. Therefore, it is important to learn about older adults' pre-existing interests in order to facilitate their learning of technology. These teachers used different approaches to achieve this. These approaches evolved from the data gathered. Teachers mentioned finding out about their students' pre-existing interests through verbal feedback. Lucy provided an example:

> *A lot of the programmes that we run are developed in consultation with the participants. So, they will come to us and express an area of interest. For existing participants, once programmes have been developed, we do evaluation every six months, with opportunities for feedback and for new design or content.* – Lucy, 2014

There are different levels of *interest*. Most teachers interviewed in this study approach this via the following methods: (1) feedback from participants after classes, (2) asking the entire class for feedback or (3) through observation of participants during classes. For example, Joanne shared her method of finding out her students' pre-existing interests:

> *[Based] on what they tell us. On direct feedback, on inquiries. We also look at what other courses are being offered in the community to gauge areas of interest, but the strongest factor that we rely on is the direct feedback from existing participants even before they become participants.* – Joanne, 2014

There were a few other approaches. One of the alternatives to finding out about their students' pre-existing interests was through distribution and collection of a questionnaire. Johan explained:

> *I asked them. I did start off by giving them a questionnaire and that included whether they were interested in certain subjects to paint. And I gave that away, as I found it better to suggest subjects to them, and then let them go from there in the directions that they were inclined to find interesting and able to handle.* – Johan, 2014

Jessie stated that she mainly based her findings of pre-existing interests through interactions with her students:

> *It's not a question we ask on student's application forms or enrolment forms. Those interests, as far as my experience is concerned, you learn about people's interests simply by interacting with them, listening to conversations the students have between each other, and then you discover what their interests are, by what you see them searching on the net.* – Jessie, 2014

However, it was only Julie that adopted the approach of asking every individual older adult in her classes. Besides running the computer class, Julie was also running a current affairs discussion group for older adults. She would share information from this programme with her computer class students. She elaborated:

> *[…] I've come up against some speakers who are from vision loss or hearing loss organisations and so I've actually invited the computer class to attend some of those sessions if they wanted to attend. So I've quite good responses to that.* – [Julie, 2014]

Besides the example Julie provided above, she was able to offer me another example:

> *I've had Council of the Ageing come and talk to them about residential care options and we've done that instead of computer class at my suggestion and at their request. […] if I come across something that I think might be of interest to the students, then I offered it to them as an alternative or as an addition to what I've been teaching in the computer curriculum.* – Julie, 2014

Julie continued and provided a third example. She indicated:

> *[…] and I've tried to always integrate within my computer program other things that are happening in life that seniors' might be interested in. An example is that I always brought in materials that I've seen coming up, for example, always brought in the seniors' newspaper whenever it's delivered. I bring that in because it has a wide range of activities and things for seniors in the community.* – Julie, 2014

Some want to use technology in their everyday lives, whereas others are interested in technology itself. Julie then described attitudes she has observed in older adults when learning about technology:

> *There are so many thousands who are not interested, don't want to go there and put the shutters down in terms of any form of technology to do with computers and half the battle's over by the time they come to our class. So, you've got people who are prepared and willing and want to learn about these things to a multitude of different degrees, as to how much they want to know and what their applications are going to be. Some just come along because they want to know what this thing's about, "I'm never going to use it, but I'm interested to know what it's about."* – [Julie, 2014]

In other words, Julie believed that older adults varied in their attitudes to online services. She felt that the everyday lives of those who are interested and willing to embrace technology will progress much more smoothly, whereas others will be left behind, thus widening the digital divide. They appeared to be increasingly aware of this desire and were more likely to want to learn about technology at a younger age. Julie mentioned that in order to keep her students engaged in her classes, she tried to cater to their pre-existing interests. She shared the techniques she employed to find out about her students' pre-existing interests. She elaborated:

> *Through conversation. Through listening to examples that they bring in. Part of the format in which I personally teach, is a round table session away from computers for a third to half of the course time. So each class commences with a round table discussion, demonstration of the concepts – how to actually do the tasks that are at hand in terms of actually working your way around on the computer. Questions come up, conversations come up, personal anecdotes come out, and so everybody gets to know everybody else. They're sitting around looking at each other, as well as looking at screen.* – Julie, 2014

She continued with her explanation:

> *We celebrate birthdays; celebrate milestones – grandchildren being born and holidays. It's taking an interest in the people that you're with and sharing mine and the volunteers' interests as well. Sharing our lives with them and not just the other and I think, my observations of some teachers is that their life is private and they're not sharing it with their students, whereas, without boring them to tears, it's important, I think, for them to see that you are either family oriented or you're just like them and I think that helps break down that barrier between student and teacher and I think that leads to a healthy amount of respect both ways.* – Julie, 2014

Julie was bringing in many matters that were of *interest* in the community. Her class is similar to a small network within this community. These interviews confirmed that the research focus on *interest* was justified and supported by literature (Boulton-Lewis, 2012). The most important factor in the teacher's approach was to find out and support students' pre-existing interests throughout her delivery of computer classes. Comments from Julie provided insights into elements, such as providing older adults with the autonomy to make their own decisions. They were encouraged to make suggestions on curriculum that they are interested to learn.

> *Generally, my curriculum at the start of the year was based on the feedback form of the previous year and you've got to realise that the students that we have in our courses tend to come back year in and year out. They're not six weeks, see*

> *you later we don't ever see them again. So, quite often, the people that you're facing are the ones that have written feedback forms the year before, so you've got an idea of what they were happy with, not happy with, things that were yet to be covered, that they wanted cover. So, that's usually the basis for us to develop our initial program and then we're guided by their requests.* – Julie, 2014

Julie went on to share one of the most important factors for the success of her classes:

> *I suppose, listening to your students, giving them what they want, rather than telling them what you think they want. Asking students. […] We ask our participants and our students, "what do you want to know" and we will go about trying to find how to teach it to you or how to give you that information.* – Julie, 2014

Julie explained that there were times when she has to find consensus on her students' pre-existing interests:

> *If there's something that only one individual is interested in then we will make efforts to actually give that individual time. For example, my student wasn't particularly interested in using the computer, but he wanted to come to get out of the house, he wanted to learn how to use the internet; he wanted to learn how to email. He wasn't very proficient, but he was keen so we would sit one on one with him every week. We would have one volunteer, and the young volunteers would take it in turns to sit with him every week to show him what to do*. – Julie, 2014

She shared a technique of hers and elaborated:

> *If there's a particular topic someone wants to know, for example Publisher or PowerPoint that no one else is doing. I would endeavour to give them copies of notes, so they could take it home and do it themselves. Certainly help them with any questions they had, but it no one else was interested, they understood that they couldn't have a class tuition on that, but that they had notes that they could follow themselves.* – Julie, 2014

Julie has techniques to resolve issues whereby one student could suggest a topic of *interest* and another might not find it interesting. She explained:

> *They would say, "Look. I'm not particularly interested in that, but I'm very happy to sit and watch and I'm prepared to give that exercise a go."* – Julie, 2014

Julie mentioned a scenario from her classes:

> *They might say, "That was really interesting. I enjoyed that. Do you mind, instead of me doing the exercise that I check my emails" or "do a flyer for my group that I belong to".* – Julie, 2014

Julie said that she has always maintained the belief that time in computer classes is considered her students' time. Therefore, once they get working on these computers then they are welcome to do whatever is of *interest* to them. In other words, they were given the freedom to pursue their own interests. Julie believed that her class is unlike school. Her students are adults and they can make up their own mind on the activities they would like to do. As many older adults were not brought up with technology and therefore might approach learning of technology with a certain level of reluctance and caution, the teachers felt that it is imperative to approach learning of technology through supporting their students' pre-existing interests. For instance, one of the common pre-existing interests amongst older adults in this study was reading newspapers, so one of the teachers demonstrated some of the advantages of technology, such as the enlarging of texts and photographs and the availability of multimedia media – video and audio clips. Tony said that:

> *[…] they are adults and they are coming to increase their learning.* – Tony, 2014

Iain believed that:

> *A lot of people have an interest in travel and could use the internet to find out about places before they go. And we've had some actively who have done that. Quite a common goal, and quite useful thing that we can teach them, and that they can do at home. They don't have to be here to do it or anything. But once they've learned the technique and have a go about it, they can basically just increase it as much as they want.* – Iain, 2014

Jessie also agreed that:

> *[…] I think you'll probably find if you looked at the internet usage of a lot of older adults here, a lot of it would be travel and accommodation related, which is an interest*. – Jessie, 2014

Teachers should try to find out about students' pre-existing interests through conversations and observations. Additionally, through providing their students with real-life examples as references, they should explain that technology could enhance their pre-existing interests.

4.4. Conclusion

This section addresses the formulated research questions in regards to finding effective approaches to encourage older adults to adopt and maintain technology use. The main finding based on *interest*, confirmed the foundation built upon the literature on older adults learning of technology. Results from this study suggested that the phenomenon observed by being with older adults participating in the study about technology, could be related to the wider concept of *interest* and not just pre-existing interests in general. When older adults learn technology skills that are based on their pre-existing interests, then they are able to replicate these skills at home. Subsequently, older adults will be able to utilise technology skills to assist with their daily lives. Looking at data analysed through interviews with teachers from the current study, there was a presence of different degrees of interest.

According to Silvia (2006), "*researchers in many areas of the psychology of interest contend that interest has a constructive functional role in motivation*" (p.202). Furthermore, Fredrickson (1998) followed this approach and Izard (1977) stated that, "*interest enhances the motivation to learn and explore*" (p.202). In general, older adults appear to be attending technology classes because of self-motivation that is triggered by interest (Chapter 2). According to Crawford (2004), "*motivation is generally not a problem for mature adult learner because they are ready to learn. They are often motivated to learn due to or in anticipation of a career change and desire to be successful in obtaining that goal*" (p.5).

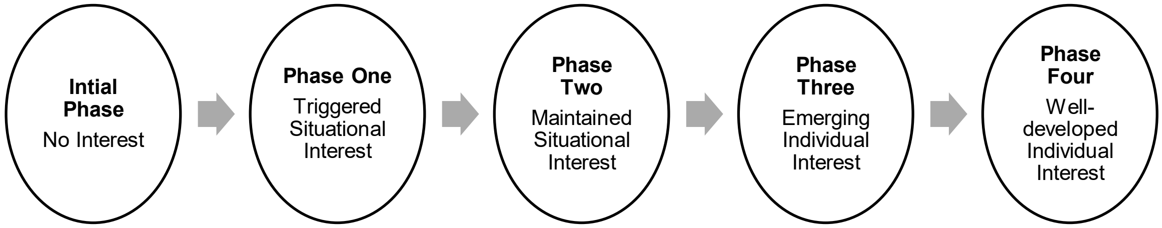


Figure 4.13. Four-Phase Model of Interest Development with "*No Interest*" Phase added on.

Source: Hidi and Renninger (2006), adopted by author (2014).

Based on findings from the present study, the majority of older adults; approximately 97 per cent in this activity group, had not been exposed to technology in general. Therefore, their interest in technology was not triggered until mobile touch screen technology was introduced by the researcher. Consequently, the researcher had put forward an *Initial Phase of No Interest* to be extended onto Hidi and Renninger's *Four-Phase Model of Interest Development* (Figure 4.13) to cater for older adults in similar situations. This extended model will be employed by the researcher in the next study. Further findings will be discussed in Chapter 8. Chapter 5 will focus on how older adults' interests in technology can be built around their pre-existing interests.

Chapter 5.

Comparative Study: Interest in Technology in Four Settings

Anyone who stops learning is old, whether at twenty or eighty. Anyone who keeps learning stays young. The greatest thing in life is to keep your mind young.

Henry Ford (1863-1947)

5.1. Overview

The Exploratory Study (Chapter 4) has shown that pre-existing interest shown by older adults may be crucial in order to instigate *interest* and formulate it as a focus for IT teaching. Older adults' uptake of the learning of technology is influenced by their pre-existing interest. This is supported by data that learning as opposed to *interest* is another promising field in need of exploration. In addition, it has been confirmed that mobile touch screen tablets appear to be a technology that is relatively easy to understand and use for older adults. Subsequently, the literature review (Chapter 2) produced the *Four-Phase Model of Interest Development* (refer to Figure 4.13 in the previous chapter). However, the model is usually applied to children and younger adults and it will be explored as to whether it also applies to older adults. From the previous study (Chapter 4), it was observed that some of the older adults at Wyndham had very little if any *interest* in the learning of mobile touch screen technology. Data was based on focus group interviews with participants, staff members and researcher's observations of activity group over 12 weeks. Consequently, at the end of the previous study, a phase was extended to the existing model. It included a *No Interest phase* (Figure 4.13). The study in this chapter, took place over a twelve-week period. Four different approaches were compared, in terms of teaching focusing on differing levels of *interest* and engaging 35 older adults, both with and without technology, in order to explore their uptake of mobile touch screen technologies. The comparative study consisted of questionnaires, observations and focus group interviews with participants from their respective classes. This study was conducted by systematically investigating the influence of *interest* on learning. There was an investigation into the specific pre-existing interests of older adults and the relationship between their pre-existing interests and interest in technology. Specifically, the study delved into the different interest levels. Explicitly, the research was directed at situational interest, because situational interest covers both "*Triggered Situational Interest*" and "*Maintained Situational Interest*", which are influenced by the environment and peers.

5.1.1. Aim

This study aimed to explore the relationship in older adults between pre-existing interests and their *interest* in technology, with reference to the *Four-Phase Model of Interest Development* (refer to Figure 4.13 in the previous chapter).

5.1.2. Sub Research Questions for the Comparative Study

This study aimed to answer the following sub-research question:

- **SRQ2.1** – How can the *Four-Phase Model of Interest Development* be applied to explore the relationship between pre-existing interests and learning of technology by older adults?

5.2. Methodology

Data for the Comparative study (current study) was gathered from participants across four activity classes belonging to two organisations – (1) Hawthorn Community Education Inc. and (2) University of the Third Age Hawthorn. The study employed mixed methods, primarily based on qualitative and quantitative approaches. The qualitative approach was comprised of focus group interviews and observations of participants. The quantitative approach, consisted of background demographics and a pre-study questionnaire.

5.2.1. Selection of Participants

Background Demographics of Older Adults

The background information included participants' gender, age range, ethnical background (country of birth), educational level, occupation, place of residence and technology literacy. 35 independently living older adults participated in this study, with 31 women and four men between the age ranges of 60 to 85 years old. Approximately 40 per cent of the participants were in their 60s, slightly more than half in their 70s, and less than ten per cent in their 80s. Participants were born in Australia, New Zealand, China, Malaysia, England and France. Out of these, 60 per cent were Australians, slightly more than 10 per cent from New Zealand, 11 per cent from England and subsequently 6 per cent each from China, Malaysia and France.

Education, Occupations and Place of Residency

The compilation of data from the background questionnaires provided an overview of participants' educational level and occupations. 11 per cent of older adults had completed secondary education, eight per cent had taken on an apprenticeship, and almost a quarter had a certificate or diploma, slightly more than half had bachelor's degrees and seven per cent had a master's degree. 85 per cent of participants were retired and the rest were semi-retired. Participants were recruited from the two local organisations. Their members are residents living in Melbourne, the majority in the Eastern and South Eastern municipalities and their suburbs.

5.3. Context and Approach

5.3.1. Activity Classes

These four activity classes (Figure 5.1) were chosen based on the four conditions relevant for comparison, in regards to: (1) iPad Classes – *interest in technology*, (2) computer classes – *interest in technology*, (3) water-colour painting with iPad classes – *interest in technology and pre-existing interest* and (4) water-colour painting – *pre-existing interest*. In this instance, both technology classes (iPad and computer) had the same condition of *interest in technology* because the researcher was exploring and comparing the uptake of two different technologies and older adults' pre-existing interests. The iPad is recognised as a more suitable facilitator of pre-existing interests compared to the computer. The following sections provide an overview of each activity class.

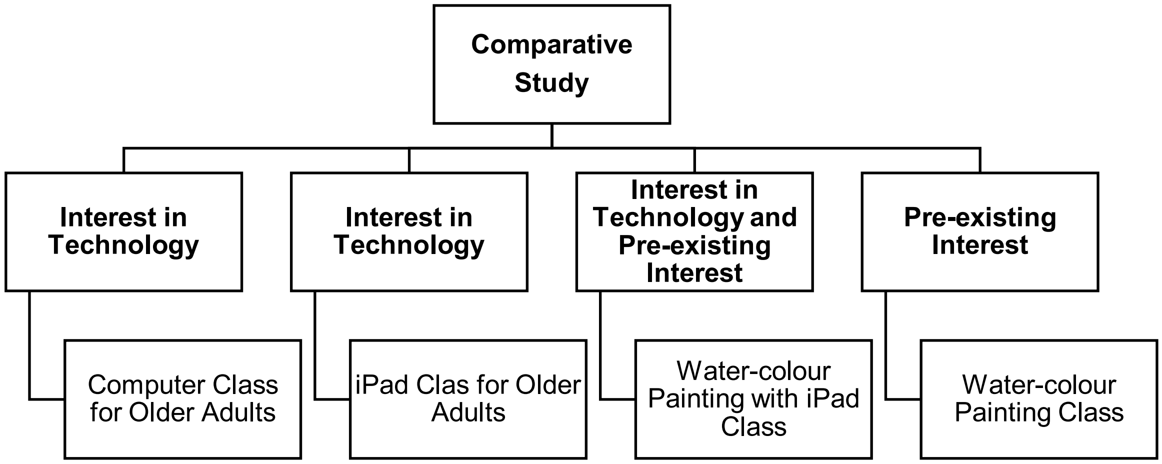


Figure 5.1. Investigation into relation of older adults' interest in technology and pre-existing interests (four conditions).

Computer Classes for Older Adults – Interest in Technology

Classes are held on a weekly basis in a computer lab with a class size in range of 8 to 10. These classes are aimed at older adults above the age of 60. Classroom curriculum originated from current teachers and their predecessors. Demonstrations were followed by practical exercises. Weekly exercises such as emails (checking and composing), Microsoft Word, Publisher, YouTube, ABC iView, copying and pasting texts, and internet search were provided by teachers to participants. In this class, there were 14 participants – 11 women and 3 men.

iPad Classes for Older Adults – Interest in Technology

This class was held on a weekly basis with a class size ranging from 6 to 8 older adults interested in learning to use the iPad. Participants were required to bring along their own iPads. The Centre employed the teacher; who wrote the class curriculum. It was a new course designed and developed for its popularity in the local community. In this class there were six women participants and two men. Demonstrations were interspersed with practice activities. Weekly exercises such as emails (checking and composing), app downloads, and screen capture, copying and pasting texts, internet search and Google Maps were provided by teachers to participants.

Water-colour Painting with iPad Classes – Interest in Technology and Pre-existing Interest

Classes are held on a weekly basis with a class size of 6 to 12 older adults. All participants are required to bring along their own iPads. As internet access to Wi-Fi was unreliable; participants were either required to have 4G enabled iPads or download materials before coming to classes.

Water-colour Painting Classes – Pre-existing Interest

Classes are held on a weekly basis with a class size ranging of 6 to 12. It is held in the Hawthorn Artists Society (HAS) studio in the suburb of Hawthorn. Space is provided by the Society, which relies on its membership and local community support. These classes are aimed at older adults above the ages of 60. There were 8 participants and all women.

5.4. Data Collection

This section is linked to Research Design and Methods (Chapter 3) of the thesis – a comparative study that involved four activity classes: (1) iPad Classes for Older Adults, (2) Computer Classes for Older Adults, (3) Water-colour Painting with iPad Classes and (4) Water-colouring Painting Classes (Figure 5.1). This study was carried out over a period of twelve weeks with weekly visits of about eight hours across four activity classes. The study involved two hours weekly for each activity class. These visits led to recordings of group interactions that comprised of focus group interviews with participants, observations and journaling. The interviews conducted were semi-structured and conversational, with no pre-determined response categories to ensure openness to the full range of possible themes and meanings. Two focus group interviews were conducted from each activity class. One was conducted in week one and one in week twelve. By the end of the study, eight focus group interviews were conducted. These interviews usually lasted between 20 to 30 minutes. All interviews were recorded and transcribed for the study. With the intention to support this research and correspondingly help to improve technology teaching long-term, older adults in this study contributed their opinions and ideas in a motivated and cooperative manner. There were also lively discussions during these interviews, expanding on each other’s ideas. A single method is insufficient in this study as evidence to shed light on the phenomenon that the researcher she had observed in her studies. Therefore, in order to assist with a deeper understanding of the phenomenon observed, the researcher employed multiple methods of triangulation. Data from different sources was triangulated, through combining data sourced from the older adults' background demographics, pre-study questionnaire, focus group interviews, observations, feedback on short course materials and reflexivity journaling by the researcher.

5.4.1. Background Demographics

The study has selected a target audience and a representative sample of a population, in this instance, older adults above the age of 60. A questionnaire was distributed at the commencement of the data collection. This method of data gathering sought to collect data, for example, on gender, age, educational level, post code, current and previous occupations, country of birth and languages spoken at home. Participants were also asked to provide at least three of their main interests and hobbies, as well as three activities they were least interested in. Participants were also asked to rate their dexterity, eyesight and memory levels. Participants were asked questions for instance, on their motivation and/or interest to continue with use of technology in future. Additionally, they were asked about the main difficulties they had encountered with use of technology in their lives. Questions included level of technology experience, usage of type of technology, for example computer or laptop, whether participants have email accounts, ownership of touch screen devices and duration of ownership. Participants were also asked to list at least three of their most common usages of their touch screen devices.

Computer Classes for Older Adults

There were 14 participants in this activity. 12 participants either owned a computer or laptop or both technologies, while two did not own any. Only one participant did not have an email account of their own. The rest used their email account on a regular basis. Only two participants owned a tablet. One had the iPad given as a gift and the other bought it for themselves. Both participants had owned their tablets for less than six months. They mostly worked on emails, internet search, news and photographs.

iPad Classes for Older Adults

There were eight participants in this activity class. Five participants owned a computer and the rest owned a laptop. Everyone owned an iPad and had an email account of their own that they used on a frequent basis. All participants had owned their iPads for less than six months. Their common usages of the iPads was for news, weather, emails, internet and photos.

Water-colour Painting with iPad

There were five participants in this activity class and all participants either owned a computer or laptop or both technologies. Everyone had their own email account and access on a frequent basis. All participants also owned an iPad. Four of these participants bought iPads for themselves. Three participants had owned their iPads between one and two years and the rest for less than six months. These participants' common usages of their iPads comprised of water-colour painting, emails, internet search, photographs and news.

Water-colour Painting

There were eight participants in this activity class and all participants either owned a computer or laptop or both technologies. Everyone had their own email accounts and access on a regular basis. Seven out of the eight participants owned a mobile touch screen tablet. Four of them owned their tablets between one to two years, while the rest owned it for less than six months. Two of them had their iPads given as a gift, while five bought it for themselves. Participants' common usages for their tablets was for emails, internet search, books and news. There were similarities in the common usages of mobile touch screen tablets with participants from all four activity classes. Referring to Table 5.1, the common usages comprised of email, Internet and news. Photos were listed by participants from both technology classes. The researcher could further explore whether there would be a change in participants' common usages of mobile touch screen tablets at a later stage, when curriculum is developed based on older adults' pre-existing interests.

Table 5.1. Common usages of mobile touch screen tablets.

	Computer Classes for Older Adults	iPad Classes for Older Adults	Water-colour Painting with iPad Classes	Water-colour Painting Classes
Common usages of mobile touch screen tablets	Email	Email	Email	Email
	Internet	Internet	Internet	Internet
	News	News	News	News
	Photos	Photos	-	-
	-	-	Painting	-
	-	-	-	Books

5.4.2. Pre-study Questionnaire

Self-Assessment of Attitudes towards Technology of Individual Activity Classes

In order to investigate the relationship between pre-existing interests, *interest* in technology and older adults' attitudes towards technology, participants across all four activity classes were asked to fill in a seven-point Likert scale pre-study questionnaire. The questions selected for this questionnaire was taken from Shattuck and his colleagues' (2011) study on measuring teachers' attitudes toward instructional technology (Table 5.2).

Table 5.2. Item descriptions.

1. I think that working with computers would be enjoyable and stimulating.
2. The challenge of learning a lot about computers is exciting.
3. I like learning on a computer.
4. I enjoy lessons on the computer.

Source: Shattuck et al., 2011.

Even though the study by Shattuck et al., (2011) was looking at teachers in general, the questions chosen for the current study were taken only from the section about interest in technology, and modified to cater towards older adults and more generally towards technology use (Table 5.3). There were four seven-point Likert scale questions.

Table 5.3. Item description modified.

1. I think that working with technology would be enjoyable and stimulating.
2. The challenge of learning a lot about technology is exciting.
3. I like learning about technology.
4. I enjoy lessons about technology.

5.4.3. Comparisons between Traditional Media and Modern Media

One teacher was dealing with both water-colour painting with iPad and water-colour painting classes and he provided some background about the two classes. Based on his previous classes, the teacher was able to formulate the advantages and disadvantages of technology use in teaching water-colour painting. He explained by providing some examples: (1) based on his personal experiences and (2) observations of participants in his activity classes. Based on this interview, the researcher was able to generate a table (Table 5.4) to represent the differences between painting on traditional media (paper) and modern media (iPad). The researcher was exploring the potential role that technology could contribute. This information was further utilised to justify the research design. In the table below (Table 5.4), the researcher provided her reasons as to why these two classes were promising for her to investigate further. This was predominantly with regards to the sub research questions she had put forward for the current study. The findings were split into individual classes to be discussed further in the section below – traditional media (paper) and modern media (iPad). The sections highlighted in blue are of particular relevance.

Table 5.4. Comparison between traditional media and modern media.

Traditional media – Water-colour Painting on Paper	Modern media – Water-colour Painting on iPad
Image from Wikimedia (2018) 	Image from Pixarbay (2018) 
Immediate and impressive result	Difficult to produce large scale results due to limitations of screen sizes
Concentrating on one medium means that discipline can be mastered because of limitations of options	Simulate or give the effect on a whole range of media
Need basic knowledge about materials, tools and colours in order to purchase equipment	Simplicity of materials, tools and colours that are available
Presence of sensory and tactile feel	No presence of sensory and tactile feel
Very cumbersome to carry all the equipment around	Resources are very convenient, it is portable
Difficult to produce multiple copies	Very easy to produce multiple copies
Unable to send through emails and social media	Easy to send by email and through social media or other means
Able to paint in very strong light	Difficulty painting in very strong light with reflection
Affected by environmental conditions	Not affected by environmental conditions
Aim is not to change	Undo mechanism and layers
No saving of work	Saving work at various stages
Resale value	No resale value

Traditional Media – Water-colour Painting on Paper

Traditional media, referred to as water-colour painting on paper was able to provide older adults with an immediate and impressive result. A rule of thumb is, to paint and not aim to change when there are mistakes being made, therefore, no "*saving of work*" button. Usually, the painter is able to concentrate on mastering one form of media, in this case water-colour painting. As it is difficult to produce multiple copies, hence there is a much higher resale value compared to modern media. One of the drawbacks is that the painter is unable to send through emails and social media, unless it is taken as a photograph. The painter is required to have basic knowledge about materials, tools and colours in order to purchase a set of equipment. This equipment is very cumbersome to carry around. Usually, participants put all their equipment into a shopping trolley bag and pull it with them to attend classes. Water-colour painting provides the painter with a sensory and tactile experience that is not possible to replicate on an iPad. These include the feel of the brush on paper, the dipping into the paint on the palette, the mixing of colour, the absorbency of the paper, the slight variations in texture and general lack of uniformity. One of the advantages is that the painter is able to paint outdoors in very strong light, however could be affected by environmental conditions such as rain.

Modern Media – iPad

In this activity class, Sketchbook Pro was the app chosen by the teacher. This app is able to stimulate and provide the user with a wide range of media, such as brushes, crayons, pens, pencils and markers. There is an array of resources provided to end users. The simplicity of materials, tools and colours are easily made available to end users. Interactions with an iPad screen are manifestly different with click, select and erase last action. There are tools such as the undo mechanism and layers available. End users are allowed to make mistakes and have access to making changes with the "*undo*" button, while saving work at various stage of the process with a "*save*" button. End users are able to produce multiple copies of their works and share through email and social media, such as Twitter and Facebook, at the touch of a button. Yet, the screen of an iPad limits the end user, as he or she encounters difficulties with producing images on a large-scale. Thus, leading to no or low resale value. For example, the common large canvas sizes range from 18 by 24 inches to 36 by 48 inches, whereas iPads have display from 7.9 to 9.7 inches. These are equivalent to the smaller sizes of the medium-sized canvas range. Users might encounter difficulties with painting in very strong light due to reflection on the screen. However, there is no need to worry about paintings being affected by environmental conditions, as long as the iPad stays protected from being damaged.

5.5. Research Design

Diagram (Figure 5.2) illustrates the different interpretations of *interest* in technology uptake for older adults across the four activity classes. The researcher's hypotheses were derived from the previous study. They were built on, firstly, by the in-depth interviews with teachers. One teacher mentioned distributing questionnaires to find out about his students' pre-existing interests. The majority of teachers moved from the phase of finding out about general pre-existing interests to grouping pre-existing interests afterwards. Secondly, focus group interviews were conducted with participants. Thirdly, observations were made by the researcher based on older adults' participation in the activity classes. The common element was the differing of interest levels amongst these older adults, between the phases of "*No Interest*" and "*Triggered Situational Interest*". In the current study, the move is from the "*Triggered Situational Interest*" phase to the "*Maintained Situational Interest*" phase of the *interest* development model (Figure 4.13).

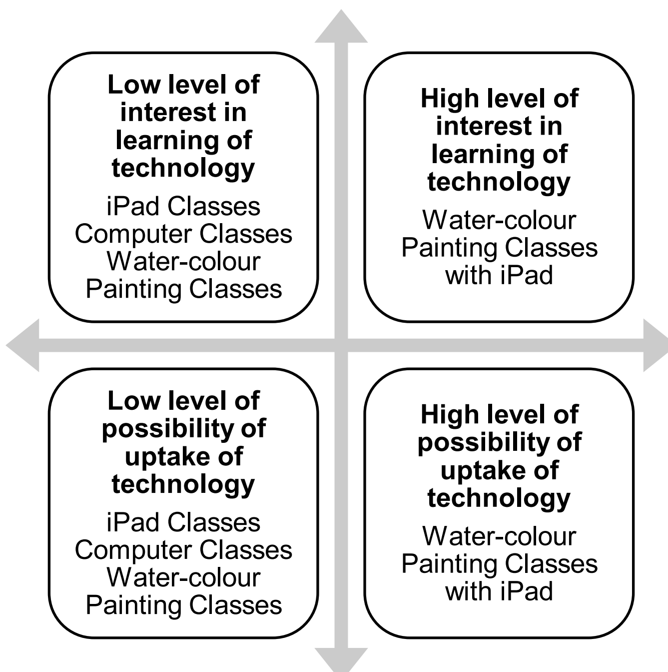


Figure 5.2. Research design of the four activity classes.

The hypotheses were based on the differences between older adults' level of interest in learning of technology and the possibility for uptake of technology (Figure 5.2). The assumptions made by the researcher was that there would be a low level of interest in learning of technology from participants in both iPad and Computer classes, because the curriculum did not include reference to older adults' pre-existing interests. However, participants in both technology classes had a certain level of interest in uptake of technology, for the reason that they had enrolled in technology classes. Furthermore, participants have more interest in technology as they own their own devices. There would be a high level of interest in learning of technology with the Water-colour Painting with iPad classes, because the curriculum and integration of the iPad use is based on their pre-existing interest, in this instance, water-colour painting. Participants in this class would have a high level of possibility for uptake of technology, because they already had interest in water-colour painting and therefore have enrolled in the course to further pursue this activity. The advantages (Table 5.4) of iPad for use in water-colour painting could be another contributing factor towards a high level of possibility for uptake of technology, in addition to the occurrence of a pre-existing interest. As for the Water-colour Painting classes, there would be both a low level of interest in technology learning and a low level of possibility for uptake of technology, because there was no use of technology. Simultaneously, the researcher is seeking to explore participants' level of *interest* in learning technology across the four activity classes with different conditions. Therefore, this study is looking to explore whether the assumptions can be confirmed.

5.6. Data Analysis

Data collected from pre and post questionnaires and focus group interviews were categorised into the four individual activity classes. This approach allowed the researcher to compare information, for instance participants' technology literacy, ownership, pre-existing interests and common usages for different technologies. Participants were asked to self-gauge their attitudes about mobile touch screen technologies. This was to enable a comparison of data of participants from across the four activity classes. The data collected from the pre-study questionnaires were entered into a Microsoft Excel spreadsheet. Each participant was assigned an identifying number, so that the researcher could keep track of their data throughout the 12-week study. The data gathered enabled a comparison of the different variables between classes, with and without technology, and also curriculum structure with or without reference to participants' pre-existing interests. Content analysis was employed, which is further explained in detail in the next section.

5.6.1. Content Analysis

The information provided by participants was analysed separately for each group, according to the four activity classes. The observations were categorised across the four activity classes into themes. Some of the themes consisted of: interest in technology, pre-existing interests and motivation for learning mobile touch screen technology. This data is further explained in the following section. The interview statements were grouped into themes, such as interest in technology, pre-existing interests, motivation for learning mobile touch screen technology, teaching approaches, contents, learning approaches, goals, social aspects and views on lifelong learning.

5.7. Findings

Pre-existing Interests

Participants from four activity classes provided insight into their pre-existing interests. This data has been listed according to individual activity classes (Table 5.6). From the data gathered, technology is not mentioned often, but there is a consistency across both the iPad and Computer activity classes. One participant from each technology class mentioned “learning computer” as one of their pre-existing interests. Participants from both Water-colour Painting with iPad and Water-colour Painting classes mentioned “water-colour painting” and “drawing” as one of their pre-existing interests. In the Water-colour Painting on iPad class, 2 out of 5 participants had an interest in drawing whilst all of them had interest in water-colour painting. There were 8 participants in the Water-colour Painting class. Half of them had interest in drawing and three-quarters were interested in water-colour painting. The number of participants with particular pre-existing interests in drawing and water-colour painting is provided in Table 5.5.

Table 5.5. Pre-existing interests from Water-colour Painting with iPad and Water-colour Painting classes.

	Water-colour Painting on iPad	Number	Water-colour Painting	Number
Pre-existing Interests	Drawing	2	Drawing	4
	Water-colour painting	5	Water-colour painting	6

Table 5.6. Pre-existing interests of participants from four activity classes.

iPad Classes for Older Adults	Computer Classes for Older Adults	Water-colour Painting on iPad Classes	Water-colour Painting Classes
Architecture	Antiques	Cooking	Art
Art gallery	Ballet	Crosswords	Book group
Cinema	Card games	**Drawing**	**Drawing**
Concerts	Cooking	Films	Gardening
Exercise	Family	Gardening	Golf
Family	Family history	Knitting	Grandchildren
Films	Films	Music	Learning French
Gardening	Footy	Reading	Learning Italian
Interior design	Gardening	Sewing	Movies
Learning computer	Keep learning	Travelling	Music
Parks and gardens	Knitting	Volunteering	Playing piano
Plays	**Learning computer**	Walking	Plays
Probus groups	Listen to music	**Water-colour painting**	Reading
Reading	Meeting people		Singing in choir
Singing in choir	Reading		Travelling
Socialising	Sewing		Walking
Volunteering	Theatre		**Water-colour painting**
Window shopping	Trading shares		
	Travelling		
	Volunteering		
	Walking		
	Wine		
	Writing		

Table 5.7. Common pre-existing interests of participants from across four activity classes.

iPad Classes for Older Adults	Computer Classes for Older Adults	Water-colour Painting with iPad Classes	Water-colour Painting Classes
Family	Family	-	Family
Gardening	Gardening	Gardening	Gardening
-	Music	Music	Music
Reading	Reading	Reading	Reading
Travelling	Travelling	Travelling	Travelling
Volunteering	Volunteering	Volunteering	-
-	Walking	Walking	Walking

Referring to Table 5.7, there were similarities in participants' pre-existing interests. For instance, gardening, reading and travelling (highlighted in yellow) were shared across all four activity classes. This would provide the study with a point of comparison with older adults' change of attitudes towards technology and the possibility of technology uptake at a later stage.

Overview of Pre-existing Interests across Four Activity Classes

The data from four activity classes were combined in order to get an overview of participants' pre-existing interests. There were 36 different pre-existing interests. These were further categorised. For example, cooking and wine will be grouped under the "food and wine" category, whereas, attending concerts and visiting art galleries were grouped under the category of "art appreciation". There were 12 categories and they are as followed: (1) arts and crafts, (2) arts appreciation, (3) clubs, (4) entertainment, (5) exercise, (6) finance, (7) food and wine, (8) gardening, (9) languages, (10) music, (11) social and (12) technology.

Based on data analysed from the current comparative study, the study found that some of the assumptions made in the research design section were not confirmed. For instance, it was expected there would be a low level of interest in learning of technology and a low level of possibility of uptake of technology for participants in the Water-colour Painting classes, however findings showed otherwise (Table 5.8).

Table 5.8. Findings from four activity classes.

	Computer Classes for Older Adults	iPad Classes for Older Adults	Water-colour Painting with iPad Classes	Water-colour Painting Classes
Reference to Pre-existing Interests with Technology	No reference	No reference	Reference	Reference without technology
Level of Interest in Learning Technology	Low level of interest	Low level of interest	High level of interest	High level of interest
Level of Interest for Learning based on Pre-existing Interest	Low level of interest	Low level of interest	High level of interest	High level of interest
Possibility of Uptake of Technology	Low possibility	Low possibility	High possibility	High possibility
Interest Phases	Initial Phase and Phase One	Initial Phase and Phase One	Phase One and Phase Two	Phase One and Phase Two

There was no reference to participants' pre-existing interests in both technology classes. Therefore, this has contributed to a low level of interest in learning of technology amongst participants. This has further led to a low level of interest for learning, because the curriculum had no reference to participants' pre-existing interests. Subsequently, the possibility of uptake of technology is low. In addition, older adults from both technology classes did not belong to just one phase of the interest model for technology uptake. They could be in a mixture of either "*No Interest*" (initial phase) or "*Triggered Situational Interest*" (phase one) of the *interest* model (Figure 4.13). Some of the participants did not have experience with computer use and were enrolled in the iPad classes. Referring to data gathered from participants, nearly all older adults in the iPad classes did not buy their own devices. Therefore, they did not possess any prior technological experience. Another common factor is, there was little or no usage of technology outside of these two technology activity classes. They would be categorised under the "*No Interest*" phase of the interest model. However, there was a minority of participants who had technological skills with computers and had the desire to learn more about the use of iPads. These older adults would be considered as part of the "*Triggered Situational Interest*" phase of the interest model (Figure 5.3).

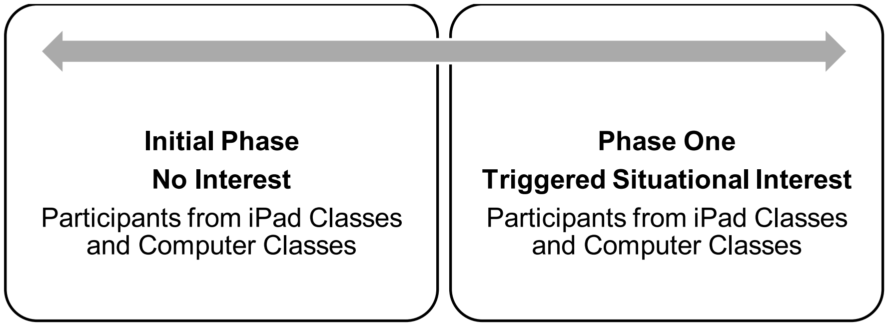


Figure 5.3. Interest phases of participants from iPad Classes and Computer Classes.

There was a reference to participants' pre-existing interest in the Water-colour Painting with iPad classes. This led to a high level of interest in learning of technology by participants. Consequently, because of the association of pre-existing interest in the curriculum, there was a high level of interest in learning. It has contributed to a higher level of possibility of uptake of technology amongst participants. This was based on the researcher's observational data obtained from activity classes with curriculum that focused on older adults' pre-existing interests.

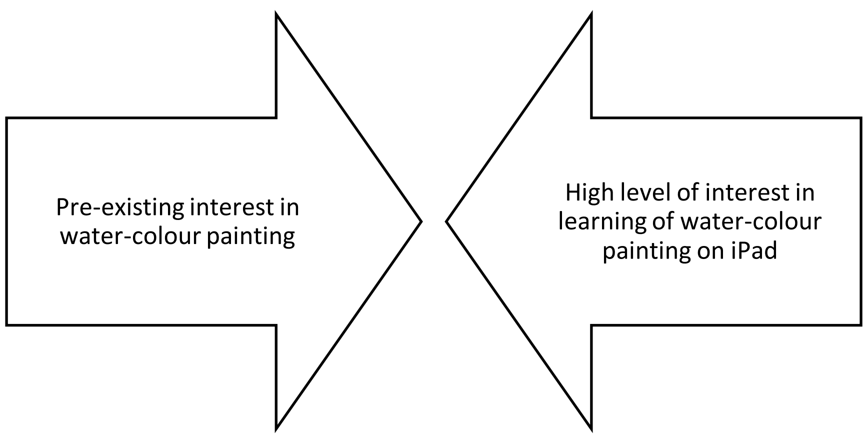


Figure 5.4. Correlation between pre-existing interest in water-colour painting and high level of interest in learning of water-colour painting.

Even though there may be a correlation between pre-existing interest in water-colour painting and a high level of interest in learning of water-colour painting on iPad. However, this is a casual, because one led to the other, especially given the small number of participants in my study. The researcher needed to use qualitative data from participants’ focus group interviews to support her claim of causality. The data from questionnaires also showed a correlation and suggested causality. Furthermore, participants in the Water-colour Painting with iPad classes used their iPads to continue to practice their use of the painting app, Sketchbook Pro, and asked for advice and feedback from their tutor, when they returned to class the following week. As a result, it also encouraged them to continue to learn about technology to widen their skillset. Therefore, participants’ interest phases with technology were hovering between “*Triggered Situational Interest*” and “*Maintained Situational Interest*” phases of the interest model (Figure 5.5).

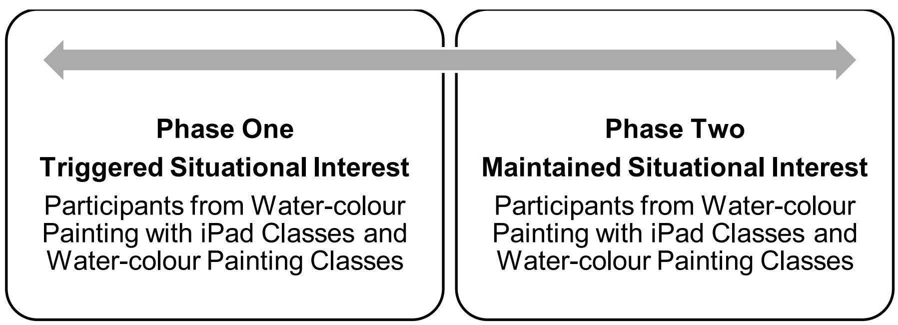


Figure 5.5. Interest phases of participants from Water-colour Painting with iPad Classes.

Even though the older adults in Water-colour Painting classes do not use technology in their classes, there is a high level of interest in learning technology, for the reason that they use their iPads to take photographs of scenery and use these materials as reference for painting when they get back to their weekly activity classes. In this class, participants used their iPads to facilitate the production process for water-colour painting. This harnessing of technology displays a high level of interest in learning because the curriculum was based on their pre-existing interest. Meshing of technology use and pre-existing interests by older adults are demonstrated in Study 3 (Chapter 6) and Study 4 (Chapter 7). This has contributed to a high level of possibility of uptake of technology, because when activities and tasks are related to older adults’ life and purpose, this will increase their level of confidence in using technology. This increased level of confidence enables them to use technology to communicate with family and friends. As a result, it also encourages the participants to continue to learn about technology. Therefore, participants’ interest phases with technology were hovering between "*Triggered Situational Interest*" and "*Maintained Situational Interest*" phases of the interest model (Figure 5.5).

Participants in all activity classes mentioned that it was difficult to learn about use of technologies from their children and/or grandchildren, as they usually do not have the patience to explain in detail and/or provide systematic instructions. Most participants said that only when they understand how technology works, that it improves their learning, but usually it is fear that prevents them from moving forward with use of technology. Participants were motivated to learn new technology, in order to keep up with their grandchildren and be able to hold conversations with them, as well as communicate digitally. Conversations could include television programmes and apps available on iPads. Therefore, from this study, there is a high level of interest with technology uptake, when it is referenced to older adults' pre-existing interests.

Self-Assessment of Attitudes towards Technology

There were 35 participants in total that took part in this study. In the Computer Classes, there were 14 participants, 8 in iPad Classes, 5 in Water-colour Painting with iPad Classes and 8 participants in Water-colour Painting Classes. Table 5.9 illustrates to readers the results compiled from participants' self-assessment of attitudes towards technology across the four activity classes. The questionnaire was based on a Likert scale of 1 to 7. This data was obtained at the beginning of each activity class.

Table 5.9. Participants' self-assessment of attitudes towards technology from four activity classes.

Attitude towards Technology	Computer Classes	iPad Classes	Water-colour Painting with iPad Classes	Water-colour Painting Classes
	N=14	N=8	N=5	N=8
	Average	Average	Average	Average
Q1	4.07	3.75	5.6	4.63
Q2	3.21	3.5	4.8	4.25
Q3	3.5	2.75	5.0	4.13
Q4	3.57	2.75	5.2	4.25
Overall	**3.59**	**3.19**	**5.15**	**4.31**

Based on these results, the average score from participants in the Computer class was 3.59. The iPad class was 3.19, and the Water-colour Painting on iPad class was 5.15, followed by the Water-colour Painting class at 4.31 (Figure 5.6). From the results obtained across the four classes, the average attitude towards technology is higher (value = 5.15) when curriculum is based on pre-existing interest, compared to curriculum that is based on technology only (value = 3.59 and 3.19).Therefore, the results revealed that older adults do have a higher uptake with learning of technology, when curriculum was designed and developed in accordance with their pre-existing interests. The researcher was exploring the relevance and uptake of technology within these four established classes only, therefore there was no collection of post-study data.

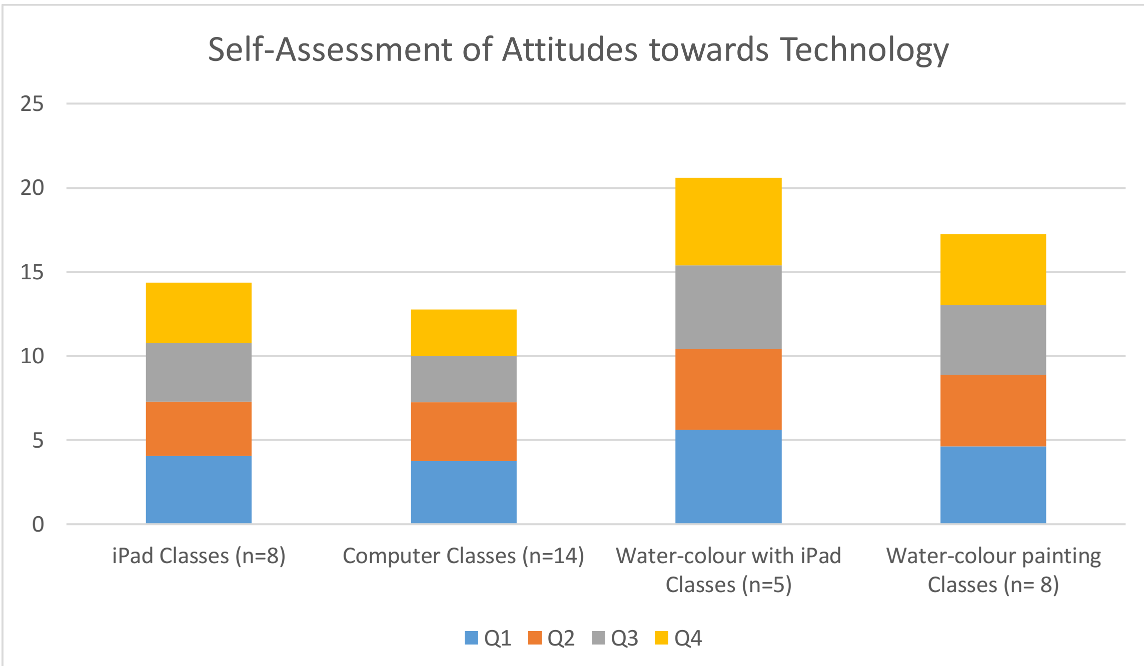


Figure 5.6. Data of participants' self-assessment of attitudes towards technology of individual activity classes based on four questions.

Participants from the iPad classes had the lowest average out of the four activity classes. This data correlates with participants' focus group interviews. Participants indicated that the iPad is still considered a *new technology,* even though it has been on the market since 2010. Participants either had no experience or very limited experience with the use of an iPad. The majority of participants in this activity class had experience with use of computers and only two participants had no experience at all. The low average in attitude towards technology is demonstrated by the steep learning curve with new technology and also without reference to participants' pre-existing interests. The average attitude of participants in the Water-colour Painting with iPad class is the highest amongst the four activity groups. When compared with those from technology only classes, the Water-colour Painting class with iPads had reference to participants' pre-existing interest. The majority of participants also had limited experience with use of this new technology, but their interest in water-colour painting supported their interest with uptake of technology. This enabled them to learn the use of Sketchbook Pro app and also other functionalities, for instance to use the camera app, check emails and surf the Internet to gather information about art galleries and artists.

Focus Group Interviews and Observations

iPad Classes for Older Adults

Participants had low interest in technology learning. Their goal was to master the basic use of their iPads, as they did not want to be left behind in conversations with their family and friends. Hence, they felt obliged to enrol to learn general technology use. Not all participants were interested in all activities taught. While they obviously were able to use the iPads and had specific individual interests and hobbies, these were not matched and built upon in class, but as separate activities. Nearly all older adults in iPad classes did not buy their own devices. iPads had been given to them as gifts, e.g. birthday and Christmas. They enrolled in class to please family members. In this instance, participants from the comparative study were in a similar situation as participants from the previous study (Chapter 4). They did not possess a high level of motivation towards technology uptake. Participants were usually confused with technical terminology used in class, such as Wi-Fi, 3G/4G, data and intranet. Participants were also confused with the numerous iPad models, plans and costs advertised by telecommunication providers. A majority mentioned that they need to practice often or they forget. However, some participants appreciated that the iPad is a very portable device. They used their iPad Mini while on the move as the device fits into their handbags, and they could check emails, surf the net, and check timetables of public transport (trams and trains), read newspapers and e-books. Participants also carried their iPads with them while travelling locally, interstate and overseas, as it was very handy to have it around compared to a laptop. Interviews suggested that the main driver was interest in communicating with their families, e.g. children and grandchildren.

Computer Classes for Older Adults

Similar, to the iPad class, the majority of participants attended Computer classes because they felt they needed to learn about technology to keep their knowledge up-to-date. Most participants had computers and/or laptops at home. A minority of participants did not have their own computers at home, so they came to class to keep in touch with technology on a weekly basis. Two participants lived alone, so it was the day they met up with their friends. Participants commented that they did not grow up with technology, so do not have any technology experience, which makes learning of technology a challenge, as they do not have a relevant technological foundation. Participants usually assist each other to work through weekly exercises allocated by the teacher. Not all participants were interested in all activities taught. A majority mentioned that they needed to practice often or they would forget what they learned. Participants are not familiar with new terminology, which they want to understand, even though they do not want to use it. Participants were usually confused with mouse click actions.

Water-colour Painting with iPad Classes

In contrast, all participants purchased their own devices (iPads) to support their pre-existing interest in watercolour painting. Three participants unanimously mentioned that "*the iPads were the best investment they had ever made in their life*". Participants had prior interest in painting and drawing, or wanted to discover if they had drawing skills, before attempting to enrol in an actual Water-colour Painting class at a later stage and investing in the necessary painting equipment required. They were also inclined to be creative and enjoyed pursuing their pre-existing interest. On a weekly basis, participants were provided with a sample photograph as point of reference, but had the flexibility to choose whatever subject they would like to paint, either one they found interesting or able to handle. In their spare time, participants also happily used their iPads for other activities such as surfing the net for information on art exhibitions and artists, taking photographs, checking emails and watching television programmes. Different from the other two technology (iPads and Computers) classes, participants had a high interest in technology learning, as classes were focused on their pre-existing interests of painting and drawing. Their goal was to develop paintings drawn on iPads into actual prints, and to learn for their own interest. All participants had their own devices (iPads). Participants learned to use Sketchbook Pro (app) to do painting and drawing. The tutor acted as a guide and mentor by providing professional advice and feedback. Demonstrations included painting principles such as basic techniques and colour contrast.

Water-colour Painting Classes

Similar to the Water-colour Painting with iPad classes, participants would either use a given photograph to copy from or choose their own image. Participants usually engaged in discussions and provided feedback to each other. Overall, this participant group was inclined to be creative and enjoyed pursuing their pre-existing interest. A participant mentioned she would like to enrol in the Water-colour Painting with iPad class, but she already had an Android tablet and her husband felt that it is a waste of money to purchase another device – the iPad. Participants' goal was to paint out of *interest*, giving away or keeping the paintings. Participants had a high interest in this pre-existing interest, and had their own painting equipment (papers, brushes, paint, palette, pencil, eraser, tissues, clips and boards) that they would bring along weekly to an art studio. Weekly demonstrations included painting principles, such as basic drawing and painting techniques and chromatics. Participants also sought professional advice and feedback from their tutor. Some were ambitious and planned to exhibit their paintings with local art studios and/or art exhibitions.

Collective Observations across Four Activity Classes

Baringer and colleagues (2004) commented that one of the main challenges faced by older adults when they return to a classroom environment, is their loss of independence and control, "*individuals grow to be independent in life, but as adults return to the classroom, they may fall back on the educational experience of their youth*" (p.550). In this study, both organisations have given independence and control to their members through promotion of social inclusion, generating of motivation, enthusiasm and sense of belonging to their local communities. Crawford (2004) pointed out that "*giving adult learners the ability to share their stories amongst a group of learners is highly desirable because it creates a feeling of collegiality among the group and helps reduce fear among some of the quieter students*" (p.6). Older adults from all four activity classes mentioned that they attended classes to socialise. Some of them have known each other through attending the same classes and have gone to other classes together and vice versa. In general, they talk to their fellow classmates about their private lives during classes and tea breaks. They shared stories such as their previous and current occupations, children, grandchildren, and plans for the weeks ahead and holidays.

Based on data gathered through focus group interviews and observations from the four activity classes, the study managed to categorise the data into themes. There were nine themes in total: (1) interest in learning technology, (2) reference to pre-existing interests, (3) motivation for learning technologies, (4) teaching approaches, (5) contents, (6) learning approaches, (7) goals, (8) social aspects and (9) views on lifelong learning. Referring to Table 5.10, the researcher chose “0” to represent no or low levels and “X” to signify medium to high levels for each themes. For instance, “*interest in learning technology*” had “0” allocated to both iPad and Computer classes but “X” was assigned to both Water-colour Painting with iPad and Water-colour Painting classes. This is because the majority of participants in iPad and Computer classes mentioned that they had minimum level of interest in technology. The primary reason that they enrolled in classes was because they had iPads given to them and felt obliged to acquire knowledge for this new technology, in order to please their families.

Table 5.10. Categories derived from four activity classes.

High or medium level (X) or Low or no (0) interest level	Computer Classes for Older Adults	iPad Classes for Older Adults	Water-colour Painting with iPad Classes	Water-colour Painting Classes
Interest in learning technology	0	0	X	X
Reference to pre-existing interests	0	0	X	X
Motivation for learning technologies	0	0	X	X
Teaching approaches	0	0	X	X
Contents	0	0	X	X
Learning approaches	0	0	X	X
Goals	X	X	X	X
Social aspects	X	X	X	X
Views on lifelong learning	X	X	X	X

Participants from all four activity classes emphasised the importance of “*social aspects*”. They felt that it was crucial that they get to socialise with their peers. These activity classes have provided a beneficial approach for older adults to keep in touch with their local communities. In addition, it helps to promote the building of friendships for older adults, as their social circle tends to get smaller as time progresses. As for the "*goals*" theme, older adults explained that they had come to class with a set of personal goals that they would like to achieve from the activity classes that they were enrolled in. For example, participants from both technology classes aimed to acquire new knowledge with use of iPads and computers. Whereas, participants in the other two activity classes aspired to gain skills and knowledge about water-colour painting. In the "*reference to pre-existing interest*" theme, participants in both technology classes were not taught based on their pre-existing interests. In this instance, curriculum was structured according to teachers' assumptions of *what* older adults would like to learn, instead of asking them to find out *what* they *want* and *need to learn* and additionally, *how* they would *like to learn*. In this situation, the "*reference to pre-existing interest*" theme is strongly associated with older adults' "*motivation for learning technology*" theme. At this point of the study, motivation might not be a pre-existing factor towards technology learning amongst the participants. However, when there is a reference made towards participants' pre-existing *interest*, then it increases their motivation to learn technology. This result is largely based on data gathered through focus group interviews with participants across four activity classes. This claim is further supported by Deci and Ryan's *Self-Determination Theory* (1985), and Carstensen's *Socioemotional Selectivity Theory* (SST) (1996). The study has since incorporated these two theories into the expansion and extension of the *Four-Phase Model of Interest Development* by Hidi and Renninger (2006).

5.7.2. Theoretical Framework

The theoretical framework was constructed through evidence gathered by the findings from the Exploratory Study (Chapter 4) and the Comparative Study (Chapter 5). The research has recognised the importance of structuring curriculum that caters for older adults' pre-existing interests in order to facilitate their learning of technology. *Self-motivation* was a pivotal factor that contributed to the success of the Water-colour Painting classes for older adults that participated. *Self-motivation* was mentioned in interviews by teachers from the Exploratory Study (Chapter 4) and researcher's observations of participants (Chapter 4 and Chapter 5), these were further supported by the results of participants' attitude scales towards technology. Therefore, "*self-motivation*" led the researcher to investigate literature related to motivation. There was a collection of different motivation theories. Some of the examples comprised of the Theory of Achievement Motivation (Atkinson, 1957), Hull's Drive Theory (Hull, 1943) and Attribution Theory (Weiner, 1973, Atkinson, 1968). In correlation with the data gathered from this study, the description of the Self-Determination Theory was the most appropriate. Consequently, the researcher incorporated into her conceptual framework a second existing theory. It was the *Self-Determination Theory* (SDT) developed by Deci and Ryan (1985). This theory comprises of three elements: (1) autonomy, (2) competence and (3) relatedness (Figure 5.7). According to Reeve (2005), *autonomy* represents listening and allowing others to work in their own individual way, while nurturing their inner motivational resources and thus promoting valuing. *Competence* is believed to increase over time, thus providing optimal challenges, skill-building, encouragement and tips and hints for progress to take place. *Relatedness* enables individuals to express affection, liking and appreciation. It then leads to sharing of personal resources, such as time, attention, energy, interest and other emotional support. These three elements are summarised in Table 5.11.

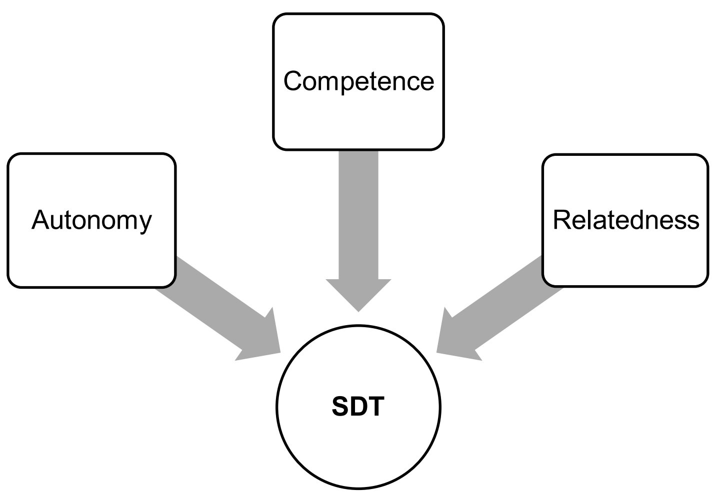


Figure 5.7. The Self-Determination Theory (SDT) by Deci and Ryan (1985).

Table 5.11. Elements and summary of Self-Determination Theory (SDT).

Elements	Explanations
Autonomy	Listens and allows others to work in their own individual way Nurtures inner motivational resources Promotes valuing
Competence	Increased competence over time Provides optimal challenges Provides skill-building Provides encouragement, tips and hints for progress
Relatedness	Expresses affection, liking and appreciation Shares personal resources such as time, attention, energy, interest and other emotional support

Source: Reeve, 2005.

This research is encouraging in building an extended framework for the adoption of new technology, such as mobile touch screen technology to support older adults' pre-existing interests. The core of this study is based on the *Four-Phase Model of Interest Development* by Hidi and Renninger (2006), and the current study explored the relationship between pre-existing interests and interest in learning of technology by older adults, also examining from the perspective of how the *Interest* model fits into the four different activity classes. The findings raised the question of the level of intervention required to motivate participants to develop their interests from phase one and phase two of situational interest and progress into phase three and four of individual interest. Data gathered was triangulated. These comprised of focus group interviews, observations, and questionnaires on attitudes towards technology among participants across four activity classes. This further confirmed that two out of three of the existing elements in SDT did not correspond with the researcher's findings from both previous and current studies towards the role of learning in mobile touch screen technologies for older adults. Autonomy remains the same. Those two elements to be replaced were *competence* and *relatedness*. They were to be substituted by *self-confidence* and *life-satisfaction* respectively (Table 5.12). These two elements are further discussed in the next section.

Table 5.12. Elements and summary of Self-Determination Theory for older adults (SDT-OA).

Elements	Explanations
Autonomy	Listens and allows others to work in their own individual way Nurtures inner motivational resources Promotes valuing
Self-confidence	Feeling of being respected, valued as an individual and being part of the community
Life-satisfaction	Fulfil purposes, using and share of interest, existing knowledge, life experiences and providing peer-support

Source: Reeve, 2005 and author, 2015.

Self-confidence

The *self-confidence* theme was based on interviews with teachers and corresponded with focus group interviews with participants. When older adults embarked on their journey towards learning of technology, they are not obsessed with the thought of being *competent* per se, because building up *self-confidence* is the foundation towards being competent over time. These two components are intimately intertwined, possibly because self-confidence is a dominating factor for older adults. This is because of its potential to be eroded overtime. For example, older adults practice the use of technology outside of classroom hours, i.e. use of technology at home and/or away during holidays. In addition, as people get older, they want to remain a part of their local community. The sense of connectedness, having the ability to continue to contribute their knowledge and experiences, makes them feel valued and respected as an individual, and also contributes to building up their self-confidence.

Life-satisfaction

As for *relatedness*, it is substituted by *life-satisfaction*. Staying on track with the theme of motivation, the researcher further investigated literature within this field. Relevant literature was explored and Carstensen's *Socioemotional Selectivity Theory* (SST) (1996) was found. It is also known as *Lifespan Theory of Motivation* – refer to Chapter 2. Carstensen's theory describes that when there is a limitation on time, it leads to motivational shifts. Human motivation changes with age due to perception of the time left. In other words, mortality places constraint on time and therefore time is fundamental towards human motivation. Consequently, humans emphasise emotional goals that lead to high level of *life-satisfaction,* instead of knowledge-based goals that lead to, for instance, building of career towards achieving promotion at work. In other words, older adults find that fulfilling a purpose in their lives leads to *life-satisfaction*. The other factors that contributed to it comprised of taking into consideration older adults' pre-existing interests, to be built upon by utilising their existing knowledge and life experiences.

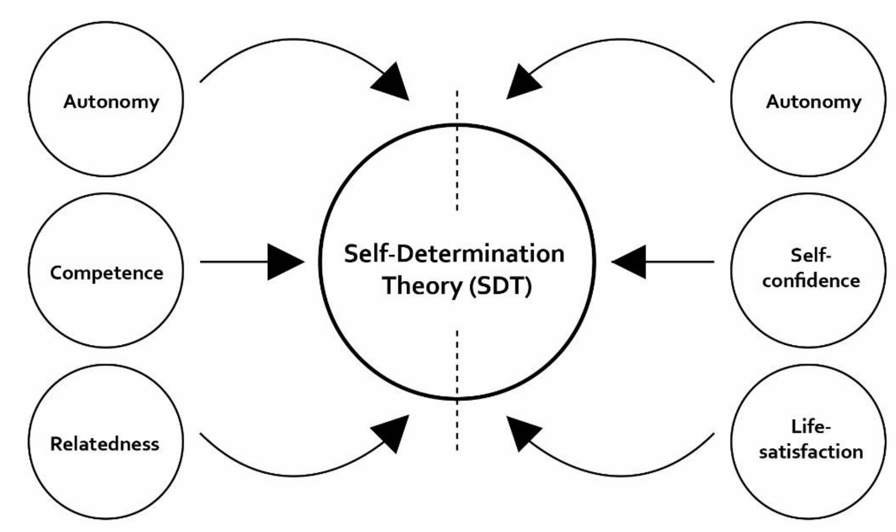


Figure 5.8. Left: SDT by Deci and Ryan (1985) and right: SDT for older adults by author (2016).

Figure 5.8 provides a vivid picture of the differences between the existing SDT elements and the SDT elements for older adults. The next stage of this research will investigate ways in which older adults can be encouraged to move to higher levels of interest in the *Four-Phase Model of Interest Development* (Hidi and Renninger, 2006). The next step is to carry out a study on employing the *Interest-Bridge Model*, where workshops will be run that include teaching technology based on pre-existing interest. The study will find out how the model will help older adults with uptake of mobile touch screen technologies, through their pre-existing interests, and the level of engagement required to enhance their learning experience. The roles of technology, interest in the uptake and long-term engagement of activities involving mobile touch screen technologies will be explored with groups of older adults using tablets to enhance their established individual interests and hobbies. This will also investigate whether well-developed interest in mobile touch screen technologies could be fostered in older adults, and if they follow the interest phases better when their pre-existing interests are included in their learning. These workshops will aim to use interests to move from "*Maintained Situational Interest*" (phase two) to "*Emerging Individual Interest*" in technology (phase three) of the *Four-Phase Model of Interest Development* (Hidi and Renninger, 2006).

5.8. Conclusion

In this study, four activity classes were put together to compare the four conditions: (1) interest in technology with touch screen, (2) interest in technology without touch screen, (3) interest in technology and pre-existing interest and (4) without interest in technology and pre-existing interest. Results show that there is a relationship between older adults' pre-existing interests and their *interest* in learning of technology. Participants in general were interested in technology, but not taking it up. For example, older adults enrolled to attend classes to learn technology because they were pushed by family members. Yet, older adults had the option to choose not to attend classes. Furthermore, results from data gathered through observations, focus group interviews and questionnaires across the four activity groups are not an accurate predictor of older adults' uptake of technology. An accurate predictor would be conducting of a study to look at approaches to connect older adults' pre-existing interests with technology, and discovered that if older adults' pre-existing interests could be harnessed, then it could influence their uptake of technology in the long-term.

Chapter 6.

Conceptual Study: Developing an Interest-based Teaching Strategy for Older Adults

For age is opportunity no less, than youth itself, though in another dress, and as the evening twilight fades away, the sky is filled with stars, invisible by day.

Henry Wadsworth Longfellow (1807-1882)

6.1. Overview

This study describes a pilot study also referred to as Conceptual Phase that comprised of the running of a six-week workshop with a few participants to develop teaching guidelines. In this chapter, the researcher reflects and provides accounts of her observations and data gathered from her participants whilst running the workshop. The Conceptual Phase introduces and describes the process that the researcher underwent with the development and refinement of teaching strategy and guidelines based on the adopted *Interest-Bridge Model* (2015). It is an extension of Hidi and Renninger's *Four-Phase Model of Interest Development* (2006) with a focus on older adults' learning of technologies. This study reflected on previous findings and the extended framework to construct a concept for teaching older adults based on their pre-existing *interests*. This study builds on the theoretical framework of Chapter 2 (Literature Review), and the results acquired from the two previous studies: the *Exploratory Study* (Chapter 4) and the *Comparative Study* (Chapter 5). In this chapter, the study provides an account of the tools that were developed based on the *Interest-Bridge Model* (Beh et al., 2015).

6.1.1. Aim

The main aim of the conceptual phase is to develop a set of guidelines to use for the application of the *Interest-Bridge Model* in practice to teach older adults. In the conceptual phase, the main focus is on the theory of *interest* and its use as a vehicle for the researcher to develop a particular form of teaching approach, in this case, an interest-driven curriculum and teaching strategy. The development of this approach is based on the data gathered to date from the previous studies (Chapter 4 and Chapter 5), and exploration of methods on how technology can best be taken up. The findings so far have confirmed that when technology complements and supports older adults' pre-existing interests, subsequently this helps to build their *interest* in learning of technologies. From the perspective of the *Four-Phase Model of Interest Development* (Hidi and Renninger, 2006), the conceptual phase seeks to harness older adults' pre-existing interests to move from "*Maintained Situational Interest*" to "*Emerging Individual Interest*" in technology use (Figure 6.1). In this instance, if older adults are not able to maintain their *interest* towards the learning of technology as soon as the classes come to an end, subsequently, it would lead to a regression of their *interest* phase (refer to

Figure 4.13). As older adults' interest phase moves onto the "*Emerging Individual Interest*", *interest* would reside in individuals. This phase is considered relatively stable. Older adults will connect with the experience and seek opportunities to engage with technology use and expand their knowledge towards learning of technology. Therefore, the *Self-Determination Theory* (Deci and Ryan, 1985) and *Socioemotional Selectivity Theory* (Carstensen, 1992) in the *Interest-Bridge Model* serve as a bridge to support the progression of older adults' *interest* with learning of technologies. This is further supported by interest and motivation literature. In this chapter, the *Interest-Bridge Model* (Figure 6.1) will be trialled in classes in order to find out in what manner the model would function in a real-life setting, such as teaching of technology to older adults in a classroom environment.

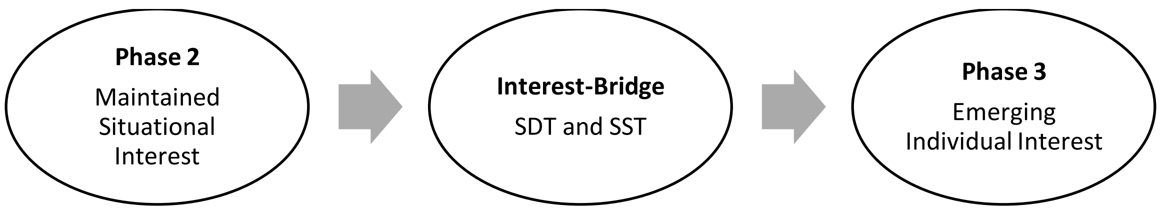


Figure 6.1 The Interest-Bridge Model showing movement from *Maintained Situational Interest* to *Emerging Individual Interest*.

6.1.2. Sub Research Study Question for the Conceptual Phase

The sub research question for the Conceptual Phase is:

SRQ3.1. How can the *Interest-Bridge Model* assist the transition from "*Maintained Situational Interest*" (phase two) to "*Emerging Individual Interest*" (phase three) of the *Four-Phase Model of Interest Development*?

The current study will address the sub research question above and also the overall research question.

6.2. Pilot Classes

In order for the study to develop a better understanding as to whether the efforts to extend on the *Interest-Bridge Model* would increase the uptake of technology amongst older adults, an environment was required to trial and translate the theory that was developed into practical guidelines and tools. In order to do so, a pilot class was organised to trial and assess the efficiency of the suggested teaching tools. The pilot classes took place over six weeks on a weekly basis and there were six sessions in total. The first three weeks of pilot classes focused on smartphones usages and the following three weeks centred on the use of mobile touch screen tablets. Both smartphones and tablets were chosen for this study because firstly, they were the two most commonly owned touch screen devices amongst older adults. Secondly, it was necessary to be certain that the activities running in classes were not dependent on a particular device only. For instance, tablets would be more advantageous than smartphones when it comes to sending and checking of emails. This is because a tablet has a larger screen compared to a smartphone. Lastly, this study seeks to explore and confirm the type of technology (smartphones or tablets) to focus on in the next study.

6.2.1. Participants

Initially, the pilot class had six participants. At the end of week two, two participants decided to withdraw from the pilot class due to family and health issues, while the rest of the participants stayed on. The table below (Table 6.1) provides an overview of the participants' background.

Table 6.1. Overview of participants' background.

Names[4]	Age	Gender	Occupation
Ann	72	Female	Retired plus volunteering
Trisha	78	Female	Retired plus volunteering
Pauline	68	Female	Retired plus volunteering
Graeme	75	Male	Retired plus volunteering

6.2.2. Background Demographics

This workshop comprised of participants recruited from a local community group via placement of flyers. There are three women and one man. All participants are above the ages of 65. One is in her 60s, while the rest are in their 70s. As the pilot class is conducted in the university, these participants who took part live within the vicinity. All were independent active individuals. None of the participants had any kind of hearing impairment, vision impairment or mobility issues. Participants originated from Australia,

[4] All participants' names have been changed.

Ireland and Malaysia. English is the main language spoken at home. Currently, they are all retired, but active volunteers with various organisations. These participants held professional occupations when they were younger. Their previous careers included being a civil engineer, an executive assistant and nurses. Three of them have Bachelor's degrees and one has a professional diploma. They can be considered as being quite highly educated, compared to other older adults of this generation in particular women. This will be further examined in the Discussion and Conclusion (Chapter 8).

6.2.3. Technical Background

All four participants have at least five years of experience with using either laptop or desktop computer or both. All participants have email accounts and use their accounts on a regular basis to stay in touch with families and friends. Three of the participants are attending weekly computer classes held at a local community centre. Two of the participants own iPads, one has an Android tablet and one does not own any tablet, but is keen to purchase one. Those three that own tablets have less than six months of experience with usage of a mobile touch screen tablet. Their common usages include sending and receiving emails, Internet search and photos. Two of the participants own smartphones, one is using an iPhone and the other an Android. They have one to two years of experience with using a smartphone. Their common usages include making and receiving phone calls, sending and receiving text messages and emails, using the camera and Google Maps. Out of the two that do not own a smartphone, one said that she is looking to purchase one, and the other said she would consider purchasing one in future when she needs it. At the moment, the iPad meets her current needs and she is trying to master the basic use of her iPad, before embarking on another journey to learn the use of a new technology – the smartphone. This group of participants meets the requirements of the study, because the older adults already possess a certain level of technological experience. These participants are regarded as a suitable demographic for the current study, because referring to the *Interest* model, these participants fit into the appropriate phases of the model. In this study, the researcher is exploring the move of older adults' interest in learning of technology from "*Maintained Situational Interest*" to "*Emerging Individual Interest*" (Figure 6.1). Therefore, these participants are a highly appropriate group to test out the theory of *interest*.

6.3. Data Collection

6.3.1. Preparation and the Baseline Measurement

Older adults participating in the Conceptual Study were provided with printed handouts (refer to the list below) that were carefully formatted for older readers with minimum font size of 14-point, clear headings and wide spacing as recommended in literature (Arch and Abou-Zhara, 2012). Participants were required to fill in the following forms before commencement of the pilot class:

1. Ethics consent instruments (Appendix A1)
2. Information statement
3. Background questionnaire (Appendix A6)
    - Gender, age, highest level of education
    - Technology literacy (years of computing and technology experiences)
    - Main purpose of using technology
    - Pre-existing interests
4. Pre-study questionnaire

At the end of week three, participants were provided with a mid-study questionnaire and at the end of week six, they were provided with a post-study questionnaire. Pre, mid and post-study questionnaires were applied at three points of time, in order to measure participants' attitude towards technology. In this instance, attitude measurement is essential, because it would support the triangulation of data in the analysis stage. Changes, if any, in participants' attitudes could be tracked across the study.

Focus Group Interviews

Each interview usually lasted about 30 minutes and was recorded and transcribed. Participants were interviewed at the end of week one, three and six of the pilot classes, summing up to a total of three interviews. These interviews conducted were semi-structured and conversational with no pre-determined response categories to ensure openness to the full range of possible themes and meanings.

Observations, Journaling and Note-taking

Throughout the workshop, the researcher's roles comprised of being a researcher and teacher. Therefore, she was wearing different hats at any one time that needed balancing. In order for her to concentrate on the running of the workshop, as both researcher and teacher she was unable to take notes at the same time, therefore, she recorded these pilot class sessions. After each class, she would reflect on the session and write down her observations and thoughts.

6.4. Theoretical Considerations

6.4.1. Pre, Mid and Post-Study Questionnaires

A set of questionnaires was developed and the four questions (Table 6.2) remained the same for pre, mid and post study. There were four seven-point Likert scale questions. These scales provided the researcher with channels of measuring participants' attitudes towards technology before, during and after the pilot classes. Additionally, in the post-study questionnaire, there were three open-ended questions (Table 6.3).

Table 6.2. Likert scale questions for pre, mid and post-study questionnaires.

No.	Questions
Q1.	I think that working with technology would be enjoyable and stimulating
Q2.	The challenge of learning a lot about technology is exciting
Q3.	I like learning about technology
Q4.	I enjoy lessons about technology

Table 6.3. Open-ended questions for post-study questionnaire.

No.	Questions
Q5.	After attending this class, please describe how you think mobile touch screen technologies (e.g. iPads) could support you in maintaining your interests and/or hobbies?
Q6.	Any further comments about using mobile touch screen technologies and/or your interests?
Q7.	Any further comments about this class?

6.4.2. Reflection

Focus Group Interviews

The focus group interviews conducted with participants were semi-structured. The interview questions were categorised into: (1) personal, (2) motivation and (3) technology – mobile touch screen devices. For personal category, participants were asked to introduce themselves. As for motivation, participants were asked the following questions:

- What would you like to achieve from this workshop?
- Do you see any opportunities for use of technology in your everyday life?

For the technology category, questions presented to participants were:

- Are there any likes and dislikes of technology? Any stories to share with us?
- Are there any difficulties that you have encountered and would like to share with us?
- What do you use technology for? How often do you use technology?

One of the main advantages with focus group interviews is time limitation. It enabled these interviews to take place quickly with a small group of people on a particular topic. Therefore, a small group of people would be studied collectively. The other advantage of focus group interviews was the researcher created synergies and participants bounced ideas off each other. The discussions were stimulated and motivated by other members in the group as they became open with their feedback. Participants were given a voice to express their feelings. The disadvantage of focus group interviews was, they took up resources such as time and effort to organise and run. The focus group interviews conducted with workshop participants were analysed using content analysis. The workshops were recorded and at the end of each session, they were transcribed. These were further categorised into the main themes such as purposes, interface design, confidence, everyday uses, interests and hobbies and barriers towards technology use.

Observations, Journaling and Note-taking

Observations made included activities, interpersonal interactions, behaviours, conversations, actions and any other forms of observable human experience that can be documented. These observations were made in a social setting and record activities within that particular classroom setting. Journaling and note-taking were employed to aid reflection and correspondingly, to record information for further reference.

6.5. Conceptual Phase

6.5.1. Re-analysis

As step one of the Conceptual Phase, an interview with one of the teachers from the Exploratory Study (Chapter 4) was re-analysed. This teacher, Julie, had a very individually focused approach, based on older adults' pre-existing interests and also 20 years of teaching experience. She pointed out in particular the importance of individual abilities and methods of learning and pursuing new interests. She also stressed the significance of maintaining the adoption of new skills throughout life. The interviews were examined as to how best develop a teaching approach based on older adults' pre-existing interests.

6.5.2. Developing Guidelines

This study will provide a detailed explanation of the three individual elements that are pivotal in researching the manner that the interest framework can inform the way of teaching. Firstly, referring to the interviews conducted with teachers in the Exploratory Study (Chapter 4), there are six main themes and sub-themes within each. These findings (Table 6.4) contributed to the expansion of the *interest* model with a *bridge* between the "*Maintained Situational Interest*" phase and the "*Emerging Individual Interest*" phase for older adults' learning of mobile touch screen technologies. Secondly, the bridge was based on these three elements: (1) *life-satisfaction*, (2) *autonomy* and (3) *self-confidence* – refer to Table 6.5. Within these individual elements, there are sub-elements that are a means to achieve the main elements. In *life-satisfaction*, there are *purposes*, *goals* and *pre-existing interests*. *Autonomy* is comprised of *ownership of devices* and *decisions on curriculum*. As for *self-confidence*, it consists of use of handouts, *repetition* and *self-directed use at home*. Subsequently, Figure 6.2 illustrates the relationship between the three elements from the *bridge* of the Interest Model, which is crucial and consequently leads to older adults' *interest* in learning of technology. Lastly, descriptions of by what means these three elements ensured the "*flow*" that encourages older adults with learning of technologies simultaneously assisted with the development of a set of tools for the running of pilot classes.

Table 6.4. Summary of themes derived from interviews with teachers.

Impediments to Leaning Technology	Benefits of Technology	Student Attributes	Teacher Attributes	Strategies for Learning and Teaching	Philosophical Approach
Not born with technology	Portable device	Self-motivated	Patience	Repetition and reinforcement	Lifelong learning
Frustration	Communication	Confidence	Respect	Written instructions	Practical learning style
Lack of confidence	Social aspects		Experienced	Build on knowledge	Autonomy in use of technology
				Flexibility	Peer-supported environment
				Demonstrations	Purposes
				Analogues and metaphors	Cater for individual needs
				Presentation slides	Finding out about interests

The three elements presented in the Self-Determination Theory (SDT) for older adults, of *life-satisfaction*, *autonomy* and *self-confidence,* are inter-related (Figure 6.2). For instance, from the perspective of *life-satisfaction*, when older adults choose to learn technology, it is related to their emotional goals. According to SST, time is running out based on the human span, therefore older adults focus on goals that are meaningful to them. Subsequently, they require *autonomy* in their learning, being able to make their own decision on the type of mobile touch screen devices they would like to purchase, that meets their needs and budget. Correspondingly, everyone learns in their own individual way, therefore, providing older adults with the independence to decide for themselves on the contents of the curriculum. As for *self-confidence*, the ultimate outcome is to encourage older adults to use the skills acquired outside of the classroom environment. This could be achieved in conjunction with handing out materials and repetition of activities in classes.

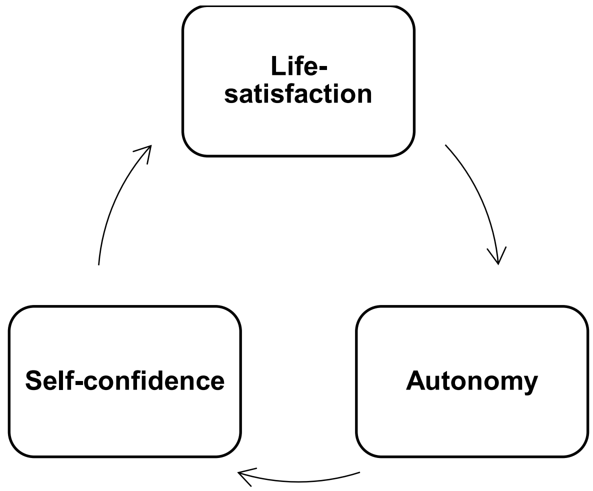


Figure 6.2. The relationship between the three elements – life-satisfaction, autonomy and self-confidence.

Life-satisfaction

In reference to *Socioemotional Selectivity Theory* (SST), this element is found within individuals even before they start to attend classes. Mainly because there is a time constraint on lifespan, therefore older adults need to understand in what manner the learning of technology could be of relevance to their individual purposes. In addition, older adults tend to be very goal-oriented. Individuals learn technology because they aim to achieve their personal goals. The interview with Julie shows that older adults are willing to travel to places where people understand them and are empathetic to their learning needs, regardless of the distance and travelling time. Finally, there is a need to focus on older adults' pre-existing interests, as it increases their levels of self-confidence and self-motivation to facilitate their learning of technology.

Autonomy

Time is required to foster autonomy. This includes ownership of devices and decisions on curriculum. Participants were asked at their first class session to share their pre-existing interests. The curriculum for these pilot classes was not definite. Participants were given flexibility to make their own decisions on the contents of the curriculum. In situations where participants did not own devices, then the researcher was able to provide advice on types of devices available, and subsequently participants had the autonomy to decide on the device that suited their individual needs. Pauline believed that this pilot class has helped her. She said:

> *"[In this class] what I think for me, it helped me to overcome a little. My fear of anything new, because you allow me to play with yours [smartphones], it gave me confidence to go and buy one, because otherwise it is just another piece of technology I wasn't using. And I have a long way to go, but have taken a few first steps."*

Comments from Julie provided insights into key elements, such as providing older adults with the autonomy to make their own decisions. They were encouraged to suggest a curriculum that they were interested to learn.

> "*[The classes in our Centre] they're not six weeks, see you later we don't ever see them again. So, quite often, the people that you're facing are the ones that have written feedback forms the year before so you've got an idea of what they were happy with, not happy with, things were yet to be covered that they wanted covered. So, that's usually the basis for us to develop our initial programme and then we're guided by their requests*."

Several of Julie's students have returned to her classes for over five years. She said that there are popular activities and interests that she would do repeatedly with her students in class. She could design and develop curriculum according to her students' needs and requests.

Self-Confidence

Self-confidence is considered fragile and insecure, and usually leads to people losing *interest* towards learning technology. Self-directed use at home helps older adults to build up *self-confidence*, while simultaneously being provided with handouts and repetition of contents during classes. This is supported by the interview with Julie. She said:

> *"An older person, perhaps, who needs that concept reinforced at week three that was done in week one, well, I've often been told 'we're not doing that this week'. 'I can't help you with that, we're not doing that this week', 'and it's not part of the curriculum.'"*

A majority of older adults are either living on their own or with their partners, therefore another barrier encountered by older adults is the lack of help when practising technology skills at home. Hence, it is necessary for older adults to be able to replicate class activities at home and vice versa, in order to facilitate their learning. Julie said that the structure of curriculum affects the outcome of older adults' learning, and needs to provide them with continuity. Therefore, there is a sense of security felt by older adults through having supporting reference materials. This constituents to the increase of self-confidence amongst older adults when learning the use of technology. Practice breeds familiarity and thus helps with the increase of older adults' level of self-confidence towards use of technology.

6.5.3. Guidelines

The guidelines help to support the cycle (Figure 6.2). The sub-elements (Table 6.5) within the table are inter-dependent and the outcome is derived from the Developing Guidelines section above. These were supported by themes stemming from interviews with teachers (Table 6.4), data re-analysed from a teacher interview, and motivational theories from SDT and SST. These are crucial requirements to facilitate the running of technology classes for older adults. In the next section, the sub-elements have been formulated into recommendations and are detailed in Table 6.5.

Table 6.5. Guidelines developed for running of classes.

Life-satisfaction	Autonomy	Self-confidence
Purposes	Ownership of devices	Use of handouts
Goals	Decisions on curriculum	Repetition
Pre-existing interests	---	Self-directed use at home

Recommendations

A detailed explanation is provided in the section below and is supported by literature (Chapter 3) and findings from the Exploratory Study (Chapter 4) and the Comparative Study (Chapter 5). The recommendations are comprised of:

- Purposes
- Goals

- Pre-existing interests
- Own devices
- Decisions on curriculum
- Handing out materials
- Repetitions
- Self-directed use at home

For *purposes*, older adults need to see the relevance of technology learning and usage that could complement and improve their lives. Therefore, providing assistance to participants help to guide them and made them realise the benefits of technology learning and usage. Successively, for *goals*, ask older adults about their short-term and/or long-term goals, that they would like to aspire to, work towards, and achieve. Celebrate every milestone in order to sustain their motivational level. As for *pre-existing interests*, the most crucial component is to find out about participants' pre-existing interests. Knowledge of these could be obtained through distribution of questionnaires, observations and conversations. Subsequently, with *own devices*, the technical jargon should be reduced through explanations and older adults should be encouraged to try out different types of devices. This would help them to find a device that would meet their needs and budget. Next, *decisions on curriculum*, is through asking older adults about the contents, allowing them the flexibility to plan their classroom curriculum based on their requests. Afterwards, *use of handouts*, by providing older adults with materials as a point of reference, with screenshots and instructions, which they could use outside of classes. Consequently, *repetition*, by repeat activities as requested by older adults, as this reassures them and helps to build up their level of confidence. Additionally, this would encourage them to use technology outside of classes. Finally, *self-directed use at home*, by helping to foster older adults' motivation and confidence levels, subsequently, it would encourage them to continue with learning and usage of technology outside of classes.

6.6. Initial Concept and Tools Developed

6.6.1. Card-sorting Exercise

Based on experience from previous studies (Chapter 4 and Chapter 5), when older adults were asked to fill in their pre-existing interests on paper, they usually encounter some difficulties. Therefore, the card-sorting exercise was designed to assist participants in determining and prioritising their pre-existing interests, which might not readily come to mind. At the same time, this exercise tracks changes in participants' pre-existing interests, if any, over the duration of the pilot classes. Blank cards with dimensions of 145mm by 105mm, interest worksheets and markers were distributed to participants to assist with recording of their pre-existing interests. This exercise was conducted in the first week and sixth week of the pilot classes. Participants were given ten minutes to write down their pre-existing interests on individual cards. Then, the researcher would consolidate these cards, arrange them and read them out to the participants. Subsequently, participants would fill in an interest worksheet, adding pre-existing interests to the columns of "*would choose*", "*would not choose*" and "*maybe*". With this exercise, participants were able to identify their pre-existing interests through brainstorming with their peers.

6.6.2. Presentations Slides

Teachers from the Exploratory Study (Chapter 4) usually presented slides to the older adults to provide better understanding, as the weekly curriculum is explained to them. Based on the data gathered from previous studies of older adults' technological knowledge, a set of presentation slides was designed in the Conceptual Phase to help answer some of their queries. The visual presentation consisted of general information about mobile touch screen devices. In week one, the focus was on smartphones and in week four, it was about tablets.

6.6.3. Course Materials

Materials developed were built upon with less text and more diagrams. These materials comprised of step-by-step instructions and diagrams (screenshots) so that the students could practice activities while away from classes, for instance, while at home.

6.7. Applications of Tools in Pilot Classes

The purpose of this pilot class, was to address the three elements of *life-satisfaction, autonomy and self-confidence,* derived from the guidelines from the previous study (Chapter 5). At the same time, taking into consideration that these three elements were of significance as building blocks towards improving older adults' uptake of technology. *Life-satisfaction* was based on finding out participants' aims towards learning of mobile touch screen technologies and striving to match it with their pre-existing interests. Whereas for *autonomy*, it was to find out about participants' pre-existing interests and from there, ask them for feedback on what they would like to learn as part of an interest-driven curriculum. *Self-confidence* was enhanced throughout with reinforcement and repetition of activities. This enabled participants to practice and get used to the steps required to achieve tasks.

6.7.1. Week One

The researcher introduced herself in the first week of the workshop, and thanked her participants for taking part (Figure 6.3). A summary of the research project was provided to the participants, and they were told that they are free to withdraw from the study at any time. Background questionnaires and consent forms were collected from participants, which were some of the tools she had developed. Afterwards, participants were asked to introduce themselves and share their reasons for attending this workshop.

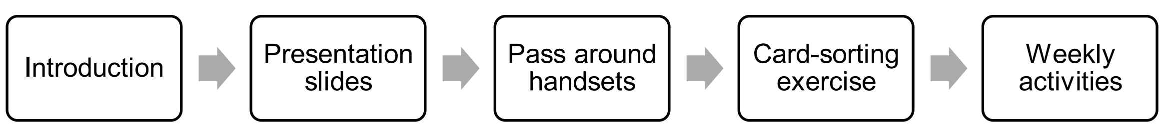


Figure 6.3. Structure of pilot class in week one.

After the initial introductions by participants, the researcher did a short visual presentation (Figure 6.4). The content for the presentation slides was developed based on findings from previous studies (Chapter 4 and Chapter 5). They comprised of interviews with teachers about teaching approaches, feedback from older adults about learning approaches towards technology, and observations of activity classes by the researcher. In addition, guidelines were implemented (Table 6.5) to be trialled in pilot classes. The general information section of the slides helped to explain to participants about the following contents: workshop schedule, introduction (about project and researcher) and the paperwork required. The main contents comprised of a history of mobile phones and their evolution, a comparison of functions between mobile phones and smartphones, the range of mobile operating systems, the two types of phone plans (pre-paid and post-paid), the brands available on the market, the functionalities and hardware specifications. Participants were provided with an overview of the market share of different operating systems and the demographics of mobile phone usage across the globe. The chalkboard template was selected as background to provide participants with a feeling of nostalgia, so they would not feel overwhelmed with the presence of a range of different technology in the workshop session. Participants thought it was a good idea to have a mix of old and new media. Firstly, older adults mentioned that they lacked general knowledge about mobile touch screen devices and other related topics. Secondly, due to the lack of this knowledge, they were often misled by sales assistants to sign up for phone plans and purchase handsets that were considered unsuitable for their needs. Therefore, knowledge gained would be an added bonus towards their purchase of mobile touch screen devices in future.

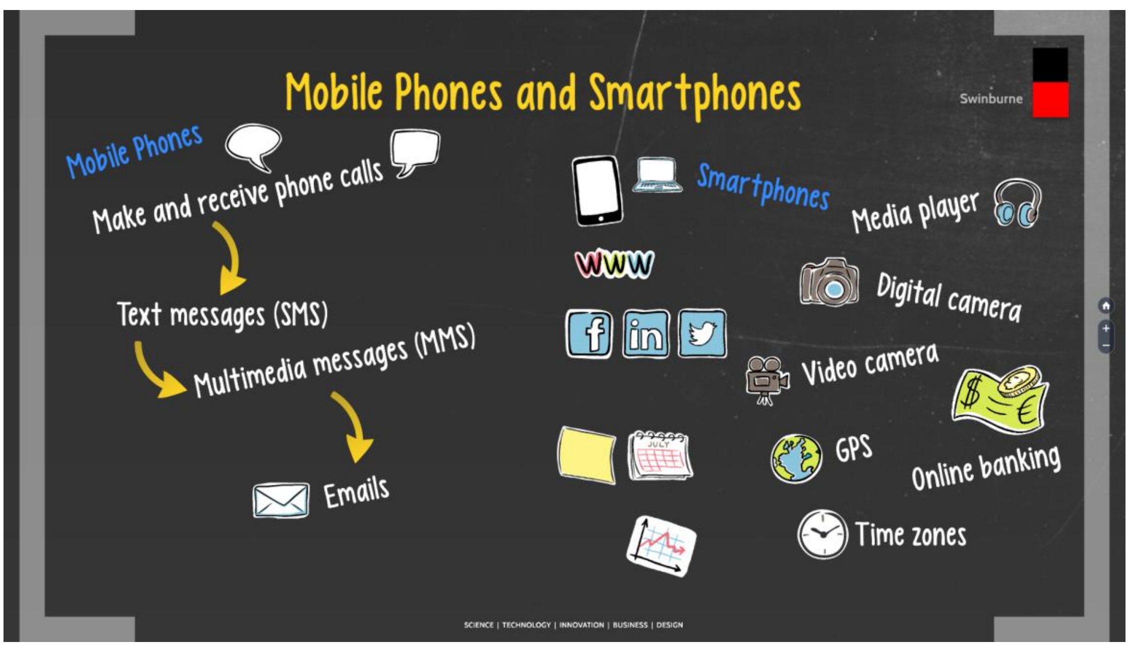


Figure 6.4. A sample of visual presentation slides on the differences between mobile phones and smartphones.

Findings from previous studies (Chapter 4 and Chapter 5) indicated that older adults are still having trouble trying to differentiate between a mobile phone and smartphone.

Therefore, the researcher brought to the pilot classes a few out of date handsets (e.g. Nokia) and passed them around with the current model of smartphones (e.g. Samsung and iPhone) for her participants to compare (Figure 6.5). Although the curriculum was planned according to the guidelines, the priority was to allow participants to choose the right devices, that suit their own needs and pre-existing interests (refer to Chapter 5).

Figure 6.5. Current and out of date mobile and smartphone handsets.

After the introduction of mobile handsets, participants were asked to take part in the card-sorting exercise (Figure 6.6). This study's main focus is to develop some interest-based techniques for teaching older adults technology use and at the same time, support their pre-existing interests. This was referring to the adopted *Interest-Bridge Model* (Figure 6.1). The researcher explained to her participants about playing a card game based on pre-existing interests, while discussing their pre-existing interests at the same time. Each participant compiled a list of their own pre-existing interests by writing them on the small stack of blank cards provided (Figure 6.7 and Figure 6.8).

Figure 6.6. Participants taking part in a card-sorting exercise to find out additional pre-existing interests.

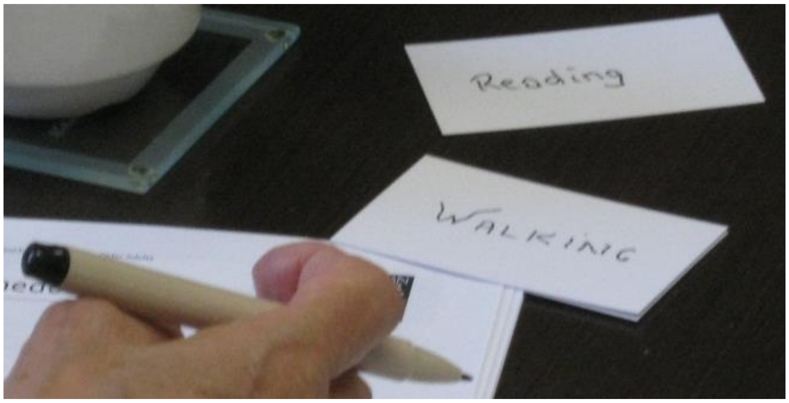


Figure 6.7. Participant writing additional pre-existing interests on blank index cards.

The researcher then collected all the cards and removed any identical pre-existing interests. Participants sorted through cards according to how much the activity interests them. Participants were asked to create three piles, comprising of (1) would choose, (2) would not choose and (3) maybe, based on whether they like to engage in that particular activity on the card or not and if it interests them. Participants review what they have sorted and move cards around if need be. The "*would choose*" pile was then prioritised according to their favourites and recorded on the "*My Interests*" worksheet (Figure 6.9). Participants were asked to repeat these steps, to fill in information for the "*would not choose*" and "*maybe*" columns.

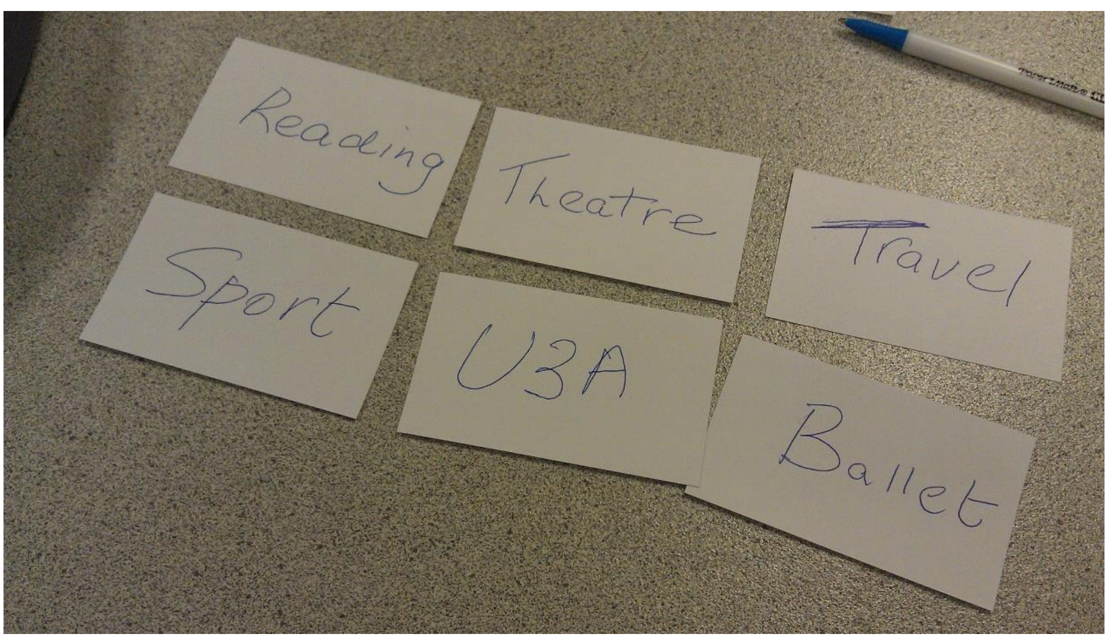
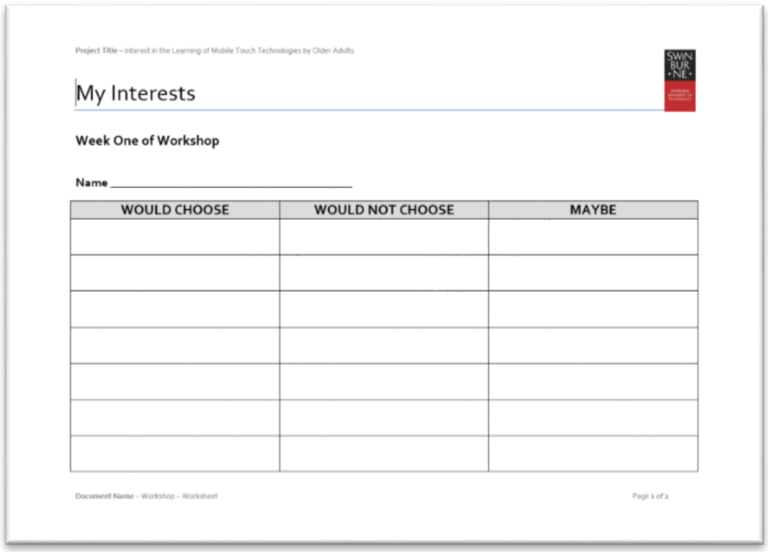


Figure 6.8. Card-sorting exercise with additional pre-existing interests.



Project Title – Interest in the Learning of Mobile Touch Technologies by Older Adults

My Interests

Week One of Workshop

Name ______________________________

WOULD CHOOSE	WOULD NOT CHOOSE	MAYBE

Document Name – Workshop – Worksheet

Page 1 of 2

Figure 6.9. Pre- existing interest worksheet for participants to fill in.

Table 6.6. Activities in class for week one.

Activities for Week One	
1.	Interaction gestures – basic actions
2.	Icons and symbols
3.	Sending and receiving text messages

After the card-sorting exercise, the researcher and participants took a 30-minute break. They returned to the learning of smartphone usage (Table 6.6). Due to time constraints, they were able to pick a few topics that everyone agreed would be of *interest* to learn. The activities included interaction gestures. These basic actions comprised of tapping, dragging, flicking, spreading and pinching. Participants were unfamiliar with the concept of pinching to zoom out and spreading the thumb and index finger to zoom in. They said that it felt different to control technology without the presence and use of the mouse and keyboard. The participants asked the researcher to explain the different icons displayed on the top right of the screen. They usually consisted of notifications of battery life, signal strength, Wi-Fi and 4G connections and Global Positioning System (GPS) activation. The researcher asked her participants what they would like to learn next. It was unanimous that they would like to learn more about sending and receiving text messages (SMS). The above request was supported based on the following comments, for example, Trisha, who has family members living in the United Kingdom, said:

> *"My sister-in-law uses texting all the time, even from overseas you text your children rather than phone call. And I can see myself using it more too."*

In order for Pauline to stay in touch with her grandchildren, she said:

> *"Texting is simpler. Leave messages instead of talking to them."*

The researcher then asked individual participants for their mobile number, she wrote it on the whiteboard and got participants to text and send messages to each other. There was laughter as they tried to type long messages, but realised that they "have fat thumbs" and were encountering issues with typing on the tiny keyboards on their smartphones. Before completion of the first week of the workshop, the researcher encouraged her participants to bring along any questions and/or problems that they had encountered while using their smartphones. She queried her participants about the contents they would like to learn about for the following week. They gave a few suggestions that all agreed upon and that would form the basis of the curriculum for the next workshop session. Some of the requests participants suggested were taking photographs with the phone camera and viewing the photographs taken. Graeme put forward his request to learn camera use, because he travels quite frequently and spends time with his children and grandchildren. He said:

> *"The other [thing] was I'm looking forward to having [was] some photos."*

Although, it was only week one of the workshop, but it was clear that older adults with stronger social relationships with their family and friends tend to favour activities that are of relevance to their day-to-day lives. Thus, social relationships are one of the motivations in encouraging older adults to take up learning of technology, in this case, mobile touch screen devices. This finding is consistent with data gathered from the previous study (Chapter 5).

6.7.2. Week Two

Participants were welcomed back to the second week of the pilot classes. Classes ran on an ad-hoc basis. The structure of the pilot class is illustrated in Figure 6.10. The activities demonstrated in class were as listed in Table 6.7. They were asked "*how has your week been? Do you have anything to share with us?*" Participants brought along technical questions and problems to share with the class. Some of the questions the participants shared were related to use of camera, viewing of photographs from the gallery, use of symbols for text messaging and creating new contacts for phone books. The researcher asked the participants if they would like to base today's workshop activities on the above questions that they have shared, which were similar to their suggestions from the previous week. They agreed.

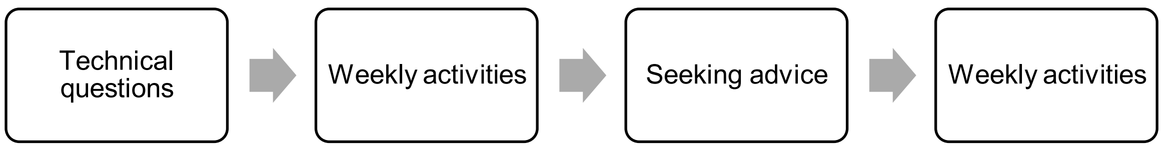


Figure 6.10. Structure of pilot class in week two.

Table 6.7. Activities in class for week two.

Activities for Week Two	
1.	Taking photographs with camera app
2.	Viewing of photographs with gallery app
3.	Creating new contacts for phone books
4.	Making and answering phone calls

A step-by-step demonstration on the use of the camera app was provided. The different camera modes available on participants' individual smartphones were explained. According to literature (Chapter 2), as humans learn better with practice, participants were asked to take three to five photographs of objects around the room. They immediately took on the allocated task successfully. Next, the researcher taught them to view the photographs that they have taken a few moments ago, through accessing the gallery folder. While she was explaining and demonstrating simultaneously, participants were taking down notes. This observation is consistent with findings from previous studies (Chapter 4 and Chapter 5), whereby older adults took notes during the four activity classes. Even though participants were provided with handouts, they still preferred to bring along their notepads to take down additional notes so that they have a point of reference later on, for instance, when they get home. The next activity, was about creating new contacts for phone books. Participants were asked to share mobile numbers and these were written on the whiteboard, with their first and last names next to each set of numbers. Participants saved each other's contact details in their phone books. Next, they were asked to access their phone books and try to ring each other. These practices have enabled them to have a better grasp of basic phone usage. A participant, Graeme, made a comment about technology learning. He said:

> "*The trouble is, things keep changing, moving around and I can't keep up with it. […] I think it is trying to memorise all the applications that you could do, any ways, flip, turn it over and say which one do I use? […] There are so many, a whole screen full of different things and I think, what's that for and you are scared to use it.*"

At another stage, Pauline brought in some catalogues from shops and newspaper cuttings of discounted smartphones. She asked the researcher for advice, as she wanted to upgrade her current handset to a smartphone. The researcher queried Pauline about her needs and suggested she visit a few shops, get a feel of those handsets and then decide on the one that meets her needs and budget. Getting a suitable handset is related to the *interest* model. According to the guideline (Table 6.5), under the element of *autonomy*, it is crucial that participants own their own devices and also that it is suitable for their needs and pre-existing interests. For example, if an individual has travelling as a pre-existing interest, then acquiring a suitable handset would help to develop his or her interest further, such as use of the Google Map app, the camera app for taking photographs, and the email app to attach and send photographs to family and friends.

6.7.3. Week Three

Pauline came to the workshop with a new mobile handset that she had bought during the previous week. She also brought along the user manual. She asked if the researcher could help her to set it up. The researcher suggested that they go through the steps during the class session as part of the weekly activities, so that Pauline could get familiar with her new smartphone.

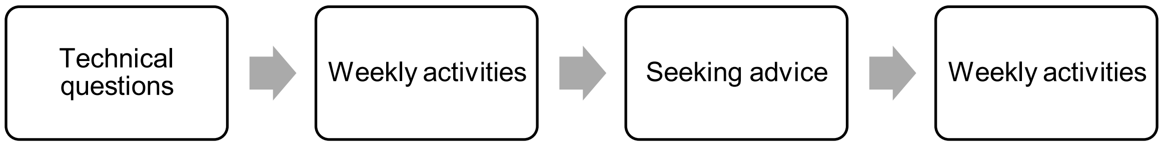


Figure 6.11. Structure of pilot class in week three.

For this week's class, the structure was similar to the previous week (Figure 6.11). Participants continued to bring along technical questions and problems to share with the rest. This week, one of the issues they have encountered was getting a massive monthly bill from their telecommunication company. Often, they could not understand the reason, because they had not been using their mobile phones and smartphones on a frequent basis. The researcher had a look at the breakdown of their telephone bills. Apparently, one of the main reasons was that participants had exceeded their monthly data allocation and were therefore being charged for over usage. It was suggested that they should always check the status of their smartphones, as to whether Wi-Fi and/or 4G function is switched on. The researcher explained to them that, the former required connection to a router that is provided via an Internet company, in their case, at home. Whereas, the latter is a service provided via their telecommunication company. She demonstrated to participants the steps required on how to switch on and off either or both Wi-Fi and 4G functions. She also checked on the settings for "*automatic downloading of data to update apps*" on their smartphones. She explained that they should check on it too, so that it would help with cutting the costs of their telephone bills. They took notes and wrote down the steps required.

Table 6.8. Activities in class for week three.

Activities for Week Three	
1.	Switching on and off of data connection
2.	Taking photographs with camera app
3.	Viewing of photographs with gallery app
4.	General settings
5.	Sending and receiving text messages

The researcher explained to participants that this would be the last week for learning about smartphones. When asked if there was anything else they would like to learn, participants suggested a repeat of activities presented over the past fortnight (Table 6.8). Subsequently, the repeated activities included use of camera, viewing photographs, general settings, texting and sending of text messages. Through the repetitions of these activities, Pauline, who bought a new handset, was able to practices and familiarise herself with the use of it, which was quite different from her previous handset – a non-touch screen phone. At the end of the workshop session, participants were asked to provide feedback. They provided insights, comprised of their learning, expectations, experiences and suggestions for improvement. Based on the researcher's observations, older adults are usually labelled as "*technophobes*", because they are simply too old to be trained, but the opposite is in fact true. When older adults have overcome their fear of use of technology, and realise the number of ways that technology could be integrated into their everyday lives, then they tend to embrace the change with enthusiasm. Graeme said:

> "*I must admit as time goes by, I can see myself using one more and more, probably in the long term, getting a better quality one, I can see the advantage of it*."

Ann described a scenario:

> "*I was just seeing, people were, for example using the mapping and stuff like that, you can use your GPS, I was just noticing the kids on the tram, for example, people from overseas, looking at tram stops, I can see in the long run if we are travelling around anywhere else overseas and we can see where we are at least."*

In the feedback provided by participants, there were statements like "*I can see the advantage*", "*just noticing the kids*". These are relevant to the interest-bridge element of *life-satisfaction*. Older adults are starting to reference technology usage from other people's lives and noticed the relevance. As a matter of fact, they are becoming aware of the advantages technology could bring into their lives. The above feedback has further cemented the need for creating learning activities that are related to older adults' everyday lives. This is related to the *life-satisfaction* (Table 6.5) element of the bridge. As soon as older adults could see the purpose of certain technological functions that are able to make a difference to their lives, then they would be willing to take the leap and embrace technology in the long run. Pauline commented that this pilot class had helped her, because the practice activities had built up her level of self-confidence. Based on triangulation of data from the guidelines (Table 6.5) and feedback provided by participants, it relates back to the Interest-Bridge Model (Figure 6.1). At the end of the session, participants were asked to fill in the mid-study questionnaire.

6.7.4. Week Four

This week, the participants were introduced to tablet technologies. Only one of the participants, Anne did not own a tablet and was using the iPad provided by the university. The pilot class structure is illustrated in Figure 6.12. The researcher did another short visual presentation, which this time was about mobile touch screen tablets (Figure 6.13). The contents comprised of the history of tablets, the functions of tablets, the operating systems available, the tablet plans (post-paid and pre-paid), the features and specifications, the brands available on the market, the different types of accessories and the natural gestures for tablet use. The researcher brought along a stylus and passed it around for the participants to trial.

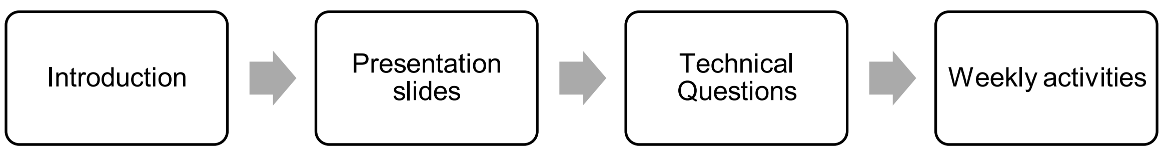


Figure 6.12. Structure of pilot class in week four.

Participants were asked what they would like to learn in this week's class. All three that owned tablets had less than six months experience. Therefore, some of the suggestions included installing and uninstalling of apps, adjusting brightness of screen, volume control, wallpapers, internet connections and privacy settings, such as location services (Table 6.9). These requests could be referred to as basic knowledge required by any end users in order to use a mobile touch screen device without encountering any major issues.

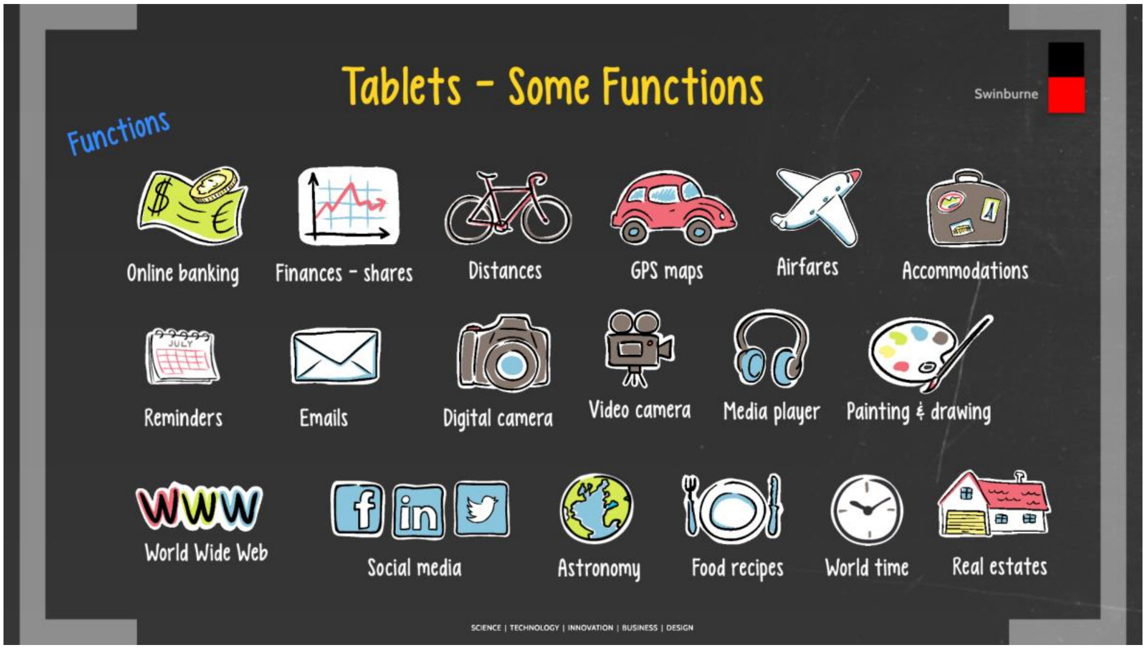


Figure 6.13. A sample of visual presentation slides on the functions of mobile touch screen tablets.

Table 6.9. Activities in class for week four.

Activities for Week Four	
1.	Installing and uninstalling apps
2.	Adjusting brightness of screen
3.	Volume control
4.	Wallpapers
5.	Internet connections
6.	Privacy settings – location services

Once the researcher started to demonstrate and explain about the general settings and introduce some of the general functions of a tablet, Ann said:

> "*Just to get something more modern […] I'm looking forward to using more and also this idea of apps, haven't got into that yet, but in time. […] I could download apps related to my life and purposes*."

The older cohort were usually concerned about privacy issues (Elueze and Quan-Haase, 2018; Tourangeau, 2017), so there were a lot of questions regarding whether they could be tracked by Google and how to protect themselves from viruses and scams online.

The researcher demonstrated the steps in switching on and off the location services option. She explained that this function assists with a higher level of accuracy when they are using maps and weather apps, but it could be used to tag the exact locations where photographs were taken, when they are uploaded and shared online. This process is known as *geotagging*. Participants also learned about restricting third party access to their personal information on another app. Participants were concerned about data over usage, so the steps required to switch their Wi-Fi and 4G functions on and off were demonstrated. All these requests are very specific concerns and are usually not taught in technology classes. However, addressing these individual concerns, links to the three elements of the interest-bridge, of *life-satisfaction*, *autonomy* and *self-confidence*. Participants were asked about their Internet plans. Graeme, Pauline and Trish have subscribed to unlimited plans, whereas Anne is on a fixed 50GB per month plan. It was explained to them that they did not have to worry about data over usage, as their current plans are more than capable to handle the amount of data usage. They could carry on with their daily activities of checking and sending emails, watching catch-up television programmes and listening to music from their favourite radio stations and/or YouTube. At the end of the session, participants were asked to share what they would like to learn for next week's session. They came up with suggestions such as calendar, photos, camera and maps.

6.7.5. Week Five

The structure of the pilot study is illustrated in Figure 6.14. Following on from the previous week's suggestions on apps, the researcher started her pilot class by asking how participants coped with technical issues when they were at home. Ann said:

> "*I find that if I come across problems, I just close off, because I'm on my own and there's no one to ask, just forget about it, so I never do it*."

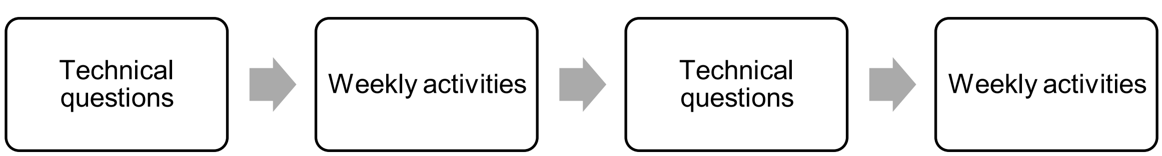


Figure 6.14. Structure of pilot class in week five.

She explained that coming to this workshop had been very helpful for her, as she had been encouraged by the researcher to discuss the technical issues and problems they faced. Anne had been to a few technology classes where there were too many students and the tutor could not provide sufficient attention for each individual. She likes the small class sizes and gets opportunities to ask a lot of questions. Anne finds that she is not alone, as others in the pilot class have also encountered the same issues and problems. They described how they feel safe to share and learn from each other without being judged. It has also helped that the researcher did her best to answer and solve their technical issues and problems. Subsequently, they felt able to move onto the next weekly activities using camera, gallery, attachments and Google Maps apps (Table 6.10).

Table 6.10. Activities in class for week five.

Activities for Week Five	
1.	Taking photographs with camera app
2.	Viewing of photographs with gallery app
3.	Attaching photographs and sending emails
4.	Google Maps

Firstly, the researcher demonstrated to participants the use of the camera app. She asked them to take five photographs of objects in the room. They got on to the activity immediately. They took photographs of furniture and each other. There was lots of laughter. After that, explanations were provided about accessing the photographs that they have taken, so they have to use the photos (gallery) app. Out of the blue, Graeme asked if the researcher could show them how to attach photographs to send to their children. It was to "*show-off*" to their children what they have learned in the pilot classes. There were jokes made when their children replied to their emails almost immediately. Messages from their children included "*well done, mom*!" and "*dad, is that a picture of your friends in class*?"

Trisha and Pauline said they were planning to go on holidays with their families and would like to take a look at these holiday destinations. Thus, a demonstration on the use of Google Maps was given. They were asked to type their home addresses into the search bar. They started to show each other pictures of the front of their homes. This followed by a demonstration on the use of tablet gestures, such as pinch and spread of the thumb and index fingers. They were able to follow the instructions and were in awe of the high resolution of these Google maps, compared to Melways street directory (the familiar hardcopy map). Next, they were asked to type in another destination, giving them the options to search for their children's homes and/or a holiday destination that they were going to. Trisha got excited and showed a map of her search of Rome, Italy. She shared her intended travel experiences with the rest. Before the conclusion of this week's pilot class, they were asked for a list of suggestions on what they would like to learn for next week.

6.7.6. Week Six

An announcement was made to the participants regarding week six being the final week of the pilot class. The structure for week six of the pilot class is illustrated in Figure 6.15. It was explained to the participants that the researcher would be running another card-sorting exercise similar to week one. It was to find out about their pre-existing interests. Based on the data gathered in week one of the class, the participants' list of pre-existing interests, based on the card-sorting exercise, is illustrated in Table 6.13. The most popular pre-existing interests shared by all participants were family, travel, continuing learning and learning new skills. The next popular pre-existing interests were family history, meeting people, reading, walking and watching television.

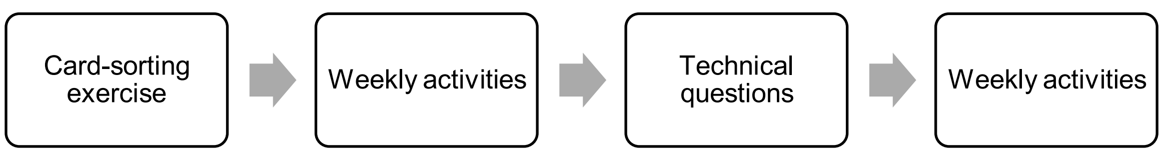


Figure 6.15. Structure of pilot class in week six.

Table 6.11. Participants' pre-existing interests derived from card-sorting exercise.

Pre-existing Interests	Popularity	Pre-existing Interests	Popularity
Concerts	1	Meeting people	3
Cooking	2	Reading	3
Cooking programmes	2	Grocery shopping	1
Family	4	Travelling	4
Family history	3	Friends	2
Gardening	1	Walking	3
Golf	1	Watching TV	3
Continuing learning and learning new skills	4	Window shopping	1
Listening to music	2		

The pre-existing interests covered in the six weeks of classes are highlighted in blue. Family history and reading were some of the popular pre-existing interests, but were not covered in classes (Table 6.13 – highlighted in green). This is mainly because of the use of different genealogy software, and participants are using computers to do their research into family history, rather than mobile touch screen technologies. Reading is another popular pre-existing interest, but participants tend to associate it with reading of books, rather than reading online. They still prefer the "*feel*" of books in their hands and furthermore, their eyes get tired from reading on screens. In situations where participants could not imagine how technology might link to their particular pre-existing interests, the researcher initiated an indirect approach. For example, for gardening and golf (Table 6.13 – highlighted in yellow), she would introduce participants to the weather app, then they could check the weather forecast and plan ahead to book a round of golf or spend a day in their garden. In order to support participants' pre-existing interests, equivalent apps were introduced to facilitate their learning of technology (Table 6.12). Even though, certain pre-existing interests are not popular, older adults are always willing and open to learning new skills and knowledge. This is supported by the "*continuing learning and learning new skills*" listed as one of the most common pre-existing interests provided by all the participants (Table 6.11 – highlighted in blue).

Table 6.12. Pairing of pre-existing interests and equivalent apps.

Pre-existing Interests	Equivalent Apps
Family, meeting people, friends	Phone, text, contact list, camera, gallery
Listening to music, watching TV	YouTube
Travel, walking	Google Maps

After the card-sorting exercise, all the materials were collected by the researcher. It was then break time. Participants shared stories about their private lives, information such as children, grandchildren, holidays and volunteering work. After that, the participants continued with activities of their choice. After the break, the researcher was asked to repeat activities demonstrated in week four and five of the pilot study. The activities are listed in Table 6.13. Activities comprised of the following apps: camera, photos, maps and emails. To begin with, participants were assigned a task to take five photographs of objects in the room then access the photographs they have taken and email them to either their friends or family members. The researcher went around the room to help them individually. While she was helping someone, the rest of the participants would try to help each other. They explained and demonstrated to each other, which was also part of the learning and teaching strategies.

Table 6.13. Activities in class for week six.

Activities for Week Six	
1.	Taking photographs with camera app
2.	Viewing of photographs with gallery app
3.	Attaching photographs and sending emails
4.	Google Maps

During the focus group interview, participants were asked to share their experiences in attending pilot classes. Regarding technology in general, Pauline said that:

> *"The barriers are within me, just anxious about using it."*

Nonetheless, Pauline explained that she will continue to use technology to keep practising and get used to it. I asked participants to comment on some of the information they have learned and find useful. Graeme said that:

> *"I think over the time, I have learned a little bit about, e.g. things like turning off Wi-Fi or be the other one is worrying about, concern was I got an enormous bill at one stage, $220. […] Obviously, I was unaware of, you are able to explain little bit earlier in the first lesson."*

Finally the pilot class ended with participants providing feedback and filling in the post-study questionnaires. Overall, feedback from participants has been positive. Mainly because the pilot classes ran according to the guidelines developed (Table 6.5), focusing on life-satisfaction, autonomy and self-confidence of the *bridge*. Participants agreed that it was a novel idea to run classes based on their pre-existing interests, instead of a structured curriculum that is usually offered at local community centres and houses. Ann said that:

> "*I have not been to a class (before) where my interests were being focused on. Usually it's the other way round*."

Participants enjoyed having the autonomy to learn knowledge that is of interest to them, instead of having information thrust upon them. Trisha said that:

> "*[…] The classes I used to attend were based on what the teacher wants to teach. Even though there may be things I'm not interested in but I still got to participate*."

Apart from basing the curriculum on their pre-existing interests, the teaching was very ad-hoc. Participants also said that they are interested to take part in any future classes.

6.8. Findings of Pilot Classes

6.8.1. Background Demographics

The data gathered from background demographics allowed the researcher to triangulate with other sources, for instance, observations, focus group interviews, pre, mid and post study questionnaires and card-sorting exercises. The data gathered was to provide the researcher with the means to analyse and triangulate this data for the next study (Chapter 7). An example of the data gathered from participants is shown below (Figure 6.16). A unique number is allocated to each individual participant (e.g. P1). Each question, such as gender, age, educational level, postcode, and so on, is assigned a code, e.g. question one is Q1, question two is Q2, enabling the researcher to filter the data and find its relevance. For instance, participants' responses, when asked to learn about basic gestures for interaction with touch screen devices, could be triangulated with their technological knowledge from background demographics, and also from focus group interviews.

What is your gender	What is your age in years?	What is your highest educational level?	What is your post code?	What is your current occupation?	What was your previous occupation?	What is your country of origin?	What is/are the language(s) spoken at home?
Female	79	Bachelor Degree	3123	Musician	Teacher	Australia	English
Female	66	Bachelor Degree plus Postgraduate Diploma	3121	Retired	Psychologist	New Zealand	English
Female	70	Bachelor Degree	3122	Retired	Teacher	France	English
Female	62	Bachelor Degree	3101	Home duties/ Retired	Public servant	Australia	English
Female	76	Bachelor Degree	3124	Retired	Teacher - secondary	New Zealand	English

Figure 6.16. An example of data gathered through background demographics.

6.8.2. Pre, Mid and Post-Study Questionnaires

At this stage, the role of data gathered via pre, mid and post-study questionnaires was not focussed on analysing the attitudes of participants as they progress from commencement to completion of the workshops. Instead, the data gathered was used to provide the researcher with the means to plan teaching and learning approaches for the next study (Chapter 7). For example, she could track participants' attitudes towards technology, after entering this data into Microsoft Excel spreadsheet (Figure 6.17) according to the questions (below). The average attitude across pre, mid and post-study is calculated and compared (Figure 6.18). This data from the questionnaires is further employed for triangulation with data from focus group interviews and observations. The four questions were similar to those found in section Table 6.2.

	PRE				MID				POST			
Part No	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
1	5	4	4	4	5	4	5	3	6	5	6	6
2	4	5	3	4	4	5	4	5	5	6	5	5
3	3	4	5	3	4	5	6	5	4	4	6	4
4	4	4	3	3	6	4	5	5	6	5	4	5
AVG	**4**	**4.25**	**3.75**	**3.5**	**4.75**	**4.5**	**5**	**4.5**	**5.25**	**5**	**5.25**	**5**

Figure 6.17. An example of data gathered through pre, mid and post-study questionnaires.

While there were only four participants in the conceptual phase, based on the initial data gathered, there was a positive rise in participants' attitude to technology across the six-week span. There was a tendency leaning towards learning of mobile touch screen technologies, when *interest*-driven curriculum is built on participants' pre-existing interests. This will be further explored in the next study (Chapter 7).

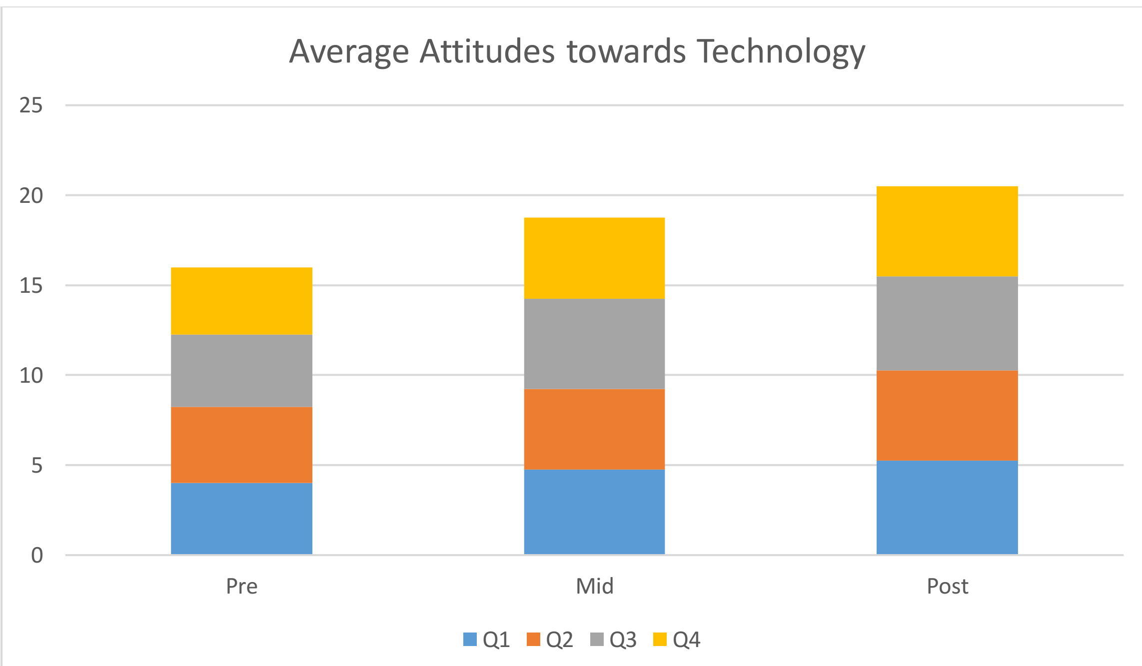


Figure 6.18. Averages gathered through pre, mid and post-study questionnaires.

6.8.3. Presentation Slides

Participants were introduced to general knowledge about mobile touch screen technologies – including both smartphones and tablets. This built a foundation that answered the queries they had before attending the pilot classes. Older adults found the presentation slides useful towards their learning. Mainly because the information on the slides provided them with a better understanding, such as mobile touch screen technologies as they are quite different from computers. Participants were able to ask questions and share stories with their peers.

6.8.4. Card-sorting Exercise

Even though the card-sorting exercises were quite time consuming, the researcher was able to gather in-depth information on her participants' pre-existing interests. This further added to the data provided in the background demographics, and enabled the triangulation of data at the end of the pilot classes. Participants were provided with opportunities to brainstorm. During the exercise, they learned that there were pre-existing interests that they were interested in, but had forgotten to write down when filling in the background questionnaires. Participants also unknowingly provided feedback about pre-existing interests that they might consider taking up or not take up at all. After the card-sorting exercises, the researcher was able to gather data on pre-existing interests that the participants were asked to identify as "*would choose*", "*would not choose*" or "*maybe*", by filling in the interest worksheet provided (Figure 6.9).

6.8.5. Guidelines

The guidelines (Table 6.5) assisted the study in the development of these classes. It acted as a checklist. The sub-elements under the three categories of *life-satisfaction*, *autonomy* and *self-confidence* were taken into considerations with the running of the pilot classes. This set of guidelines was developed with reference to Knowles' *six core adult learning principles* (Table 2.7), taking individual needs into consideration, such as person-centredness and participants' involvement in the co-designing of the curriculum. The guidelines have shown positive results. This is supported through data gathered from focus group interviews with participants and observations from the researcher. The guidelines are further illustrated below (Table 6.14).

Table 6.14 Table Guidelines developed for running of classes.

Life-satisfaction	Autonomy	Self-confidence
Purposes	Ownership of devices	Use of handouts
Goals	Decisions on curriculum	Repetition
Pre-existing interests	---	Self-directed use at home

Life-Satisfaction

Under the category of *life-satisfaction*, in the *purposes* element, older adults learned about the functions of mobile touch screen devices and tried to find relevance between technologies and their lifestyles. This enabled them to recognise the potential benefits if technology could be embraced and incorporated into their lives. For *goals*, before the commencement of classes, participants were asked to provide their list of short-term and/or long-term goals that they would like to achieve by the end of the classes. Older adults provided feedback at the end as to whether they have accomplished their goals, and share their feelings about realising their achievements. In *pre-existing interests*, participants shared their interests and built onto them with teacher's observations, so that equivalent apps could be paired with older adults' pre-existing interests.

Autonomy

Participants asked the teacher for advice on the types of devices that are the most suitable for them. The teacher requested that participants consider their own needs, budget and suitability, before *making their decisions*. Participants were able to try out different devices in class, without feeling obligated to purchase the ones recommended by sales assistants in the store, because the teacher was not endorsing any particular devices or product brands. Older adults get to understand these different devices and make their own decisions on what to purchase. Since the classes were organised based on participants' pre-existing interests, therefore, older adults were encouraged to *decide on the curriculum*, which is further paired with equivalent apps suggested by the teacher.

Self-confidence

Handing out of materials, based on the activities suggested by participants, assisted with their learning. They now have a point of reference outside of classes and will be able to continue with their learning, without depending on their children and/or grandchildren for help. *Repetition* of activities in classes reinforced their learning, because practice makes perfect. They are able to repeat the steps over and over again without supervision. *Self-directed use at home* is achieved when older adults have all the tools provided to them.

6.9. Insights from Pilot Classes

6.9.1. Timespan of Weekly Sessions

The workshop ran for three hours on a weekly basis. There were a few limitations that the researcher has to take into consideration for the next study (Chapter 7). Firstly, participants' attention span was significant. According to literature (Chapter 2), people are able to learn better based on shorter sessions. Therefore, the recommendation is the reduction of sessions from three hours to two hours, including breaks in the middle. Secondly, participants said that they had trouble finding free parking spaces and usually the time limit is two hours without getting a fine imposed on them. A solution was found for the time length but not the cost.

6.9.2. Upgrading of Operating Systems

Participants were usually quite reluctant to upgrade their operating systems. The previous operating system had icons and interfaces that participants had become familiar with over a certain period of time, but it has changed since then. This usually caused confusion amongst the older cohort, as they had to learn all over again in order to familiarise themselves with the changes. The researcher explained to the participants that they could choose not to upgrade their operating system immediately, but try to ease in bit by bit. The main reason is because, eventually, in a year or two, the manufacturers would make it mandatory for end users to update their operating systems, otherwise certain apps would not run smoothly on older versions.

6.9.3. Numbers of Students

Participants said that some of the classes they have attended previously had too many students. At times, the classroom ratio was one teacher to 20 students, therefore they were not able to gain much out of it. The class size for the pilot study was considered small, as there were only four participants. Ideally, the class should not have more than eight people at a time. This is to ensure that the researcher was able to move around the classroom and provide participants with effective one-on-one assistance with weekly activities, while accompanied with demonstrations and further explanations. Participants welcomed the classes with less student numbers.

6.9.4. Curriculum and Contents

Participants said that they now have a better understanding about mobile touch screen technologies and their functions. However, to a certain extent, the researcher did not expect her classes to be conducted on an ad-hoc basis. She was improvising as the classes moved forward. Some of the contents requested by participants included basic gesture interactions, information about privacy settings and viruses, and most importantly, advice about purchasing of mobile touch screen devices. They have opportunities to practice weekly activities in classes. Subsequently, participants felt that in order to motivate themselves to keep up with technology, it is important to be able to learn about new technologies and the various apps available.

6.9.5. Technical Questions and Problems

Participants appreciated being able to bring along their technical problems and issues to the workshop sessions. They were able to learn how to tackle the problems and issues they faced, without having to turn to their children and grandchildren, who most of the time lack the patience to provide older adults with a teaching approach that is jargon free and easy to understand. Also, participants enjoyed the peer-supported environment, where they feel safe and are able to share their problems and issues without being judged.

6.9.6. Adoption Outside of Pilot Classes

Course materials were distributed, which encouraged participants to practice at home, as they now have a point of reference including their own notes. A fortnight after the completion of the pilot classes, two of the participants contacted the researcher via email to share their experiences. A participant upgraded her existing mobile phone to a smartphone and another participant purchased an iPad at the end of the pilot classes. They have since used their mobile touch screen devices, even while travelling.

6.10. Concept Refinement and Development of Tools

In the Conceptual Phase, the concept trialled in this study comprised of the *Interest-Bridge Model* (Figure 6.19), background demographics, pre, mid and post-study questionnaires, card-sorting exercises and guidelines for running of classes for older adults (Table 6.15). The concept and tools developed were refined after the Conceptual Phase and will be employed in the next study (Chapter 7).

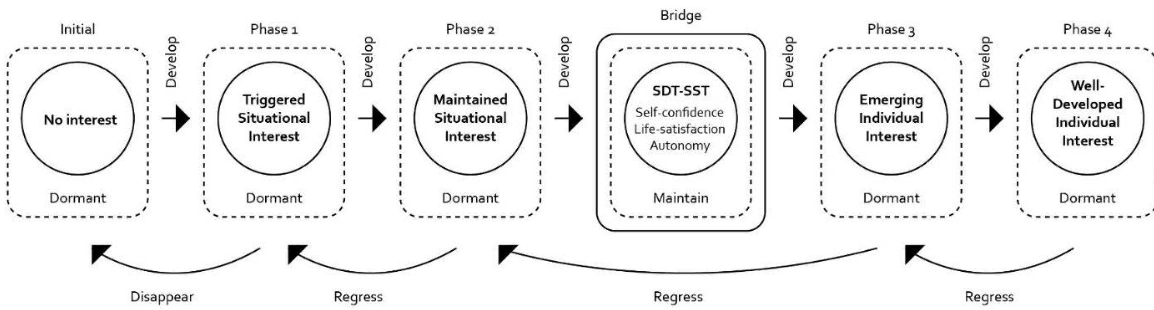


Figure 6.19. Interest-Bridge Model.

Table 6.15. Tools developed in Conceptual Phase.

Tools Developed in Conceptual Phase	
1.	Interest-Bridge Model
2.	Background demographics
3.	Pre, mid and post-study questionnaires
4.	Card-sorting exercises
5.	Guidelines for running classes

6.11. Conclusion

In the Conceptual Phase, the preliminary results were not the researcher's main focus. She was concentrating on the development of the guidelines and tools whilst trialling them with a small group of participants. The learnings obtained from the Conceptual Phase assisted the researcher with further development of the guidelines and tools. There was an overlap between two factors. Firstly, the technical concerns raised by older adults during workshop sessions could lead to interests because the classes encouraged and legitimised this behaviour. Secondly, when technical concerns were addressed, they support an increase of interest in learning of technology amongst older adults because they realised that they now have the support and tools required to facilitate their learning even when they are not in class. For instance, use of technology at home without having to depend on family members and friends for assistance.

In the Conceptual Phase, the study's main objective was to help older adults to move their *interest* in technology from the "*Maintained Situational Interest*" phase to the "*Emerging Individual Interest*" phase. The bridge element in the model was formed based on previous studies (Chapter 4 and Chapter 5) and had assisted the study enormously with the running of pilot classes. In order to achieve the study's objective, older adults need to overcome their motivational and control issues that were the main obstacles in their learning of technology. The Conceptual Phase (Chapter 6) has address the sub research question of: how can the Interest-Bridge Model assist the transition from "*Maintained Situational Interest*" (phase two) to "*Emerging Individual Interest*" (phase three) of the *Four-Phase Model of Interest Development*? which is set in the beginning of this chapter. The aim of the Conceptual Phase is to develop a set of teaching guidelines and tools that translate the *Interest-Bridge Model* into effective teaching practice. The guidelines functioned as a bridge, with inclusion of the three crucial elements of *life-satisfaction*, *autonomy* and *self-confidence,* and the sub-elements within. The guidelines developed for the running of classes were presented in Table 6.14 and the *Interest-Bridge Model* in Figure 6.19. Further findings from this study will be discussed in Chapter 8. Refinements of the guidelines and tools that were developed in the Conceptual Phase will be employed in the next study (Chapter 7). Subsequently, the next study will be a follow-up of the current study, but carried out with a larger number of participants.

Chapter 7. In-Depth Study: Evaluating Conceptual Phase

Ageing is not lost youth but a new stage of opportunity and strength.

Betty Friedan (1921-2006)

7.1. Overview

In Chapter 6 (Conceptual Phase), teaching guidelines were presented and preliminary results obtained from using these guidelines to run a set of pilot classes. It indicated that when older adults were taught with curriculum developed according to requests based on their pre-existing interests, subsequently they have the opportunity for deeper and more long-term engagement with technology than without. For example, the use of technology outside of classes, such as keeping in touch with family and friends through email and posting photographs on social media while travelling. The pilot classes indicated that the guidelines and teaching concept based on the *Interest-Bridge Model* (Figure 6.19) are promising. Therefore a larger study was undertaken in order to further explore the teaching concept and guidelines. In the current chapter, I describe this study which involved a larger sample of older adults across several classes. According to the model, *interest* is the main driver in adoption. Sixty independently living participants aged 60 and above took part in ten groups, participating in weekly mobile touch screen technology classes with four sessions each. The data collection consisted of observations, questionnaires and focus group interviews and spanned over 20 weeks. The study investigated whether a curriculum directed by both the pre-existing interests of older adults and the formulated guidelines, (Chapter 6), rather than a structured curriculum, would have a positive influence on their adoption of mobile touch screen technologies.

7.1.1. Aim

The aim of the current study was to evaluate three elements (*autonomy*, *life-satisfaction* and *self-confidence*) in classroom settings with older adults learning mobile touch screen technologies. Having developed a teaching concept of *interest* bridging, based on the *Interest-Bridge Model*, and derived a set of guidelines to inform teaching based on this model, a set of classes were run informed by the model and teaching guidelines. These classes served as a way of testing the model and teaching guidelines. The guidelines and model are merged. Through teaching the classes, there are many opportunities to observe guidelines and model in action. There are examples of learning moments and barriers that through reflection in and on action, one can iteratively refine an understanding of how the guidelines are working and whether the underlying model is valid and useful, flawed or inconsequential. This is all part of action research. Moreover, a large amount of qualitative data can be gathered, so that the researcher can further refine her understanding through analysis, and in order to distil key insights and present them in written form. Furthermore, the investigation would ascertain whether the *bridge* would assist with participants' interest in technology learning, moving from the "*Maintained Situational Interest*" phase to the "*Emerging Individual Interest*" phase. Subsequently, this could be achieved with a larger sample size. In addition, the choice of technology usage would now be focused on tablets only and not smartphones, because there was a higher percentage of tablet ownership amongst older adults. Furthermore, in this case, the majority of older adults primarily use smartphones for phone communications rather than apps.

7.1.2. Sub Research Question for the In-Depth Study

This study continues to investigate SRQ3.1 *How can the Interest-Bridge Model assist the transition from "Maintained Situational Interest" (phase two) to "Emerging Individual Interest" (phase three) of the Four-Phase Model of Interest Development*? However, the focus is on evaluation and refinement of the model based teaching approach through in-situ classes with realistic class size and duration.

7.2. In-Depth Study

7.2.1. Selection of Site and Participants

Older adults came to classes run on a university campus. Teachers' interviews indicated that the choice of site gives a feeling of empowerment to these older adults. They could tell their family and friends that they were going to classes at university. Participants were recruited through placing of notices in newsletters of local U3As and flyers at public libraries. Participants were recruited via local U3As. All participants were new to this study. This study involved older adults above the age of 60, who are living independently. They comprised of both semi-retirees and retirees. It can be assumed that participants were interested to learn about mobile touch screen technologies, because they had volunteered to participate in a four-week class running on campus at the university.

7.2.2. Classroom Setting

Each lesson ran for approximately two hours with breaks in-between when light refreshments were provided. Participants sat in a U-shape or horseshoe classroom arrangement (Figure 7.1) throughout the entire session. This setting was similar to activity classes run across the previous studies (Chapter 4, 5 and 6). This arrangement encourages group participation and discussions, with equal access to viewing demonstrations, as the teacher is able to foster connections and interact with all participants (Kaya and Burgess, 2007). Participants who owned their own iPads or Android tablets were encouraged to bring them along and use them in the class sessions. This was considered an important factor, as participants had the opportunity to continue with the use of tablets between class sessions. Participants who were interested to attend classes, but did not have tablets of their own, were provided with iPads and Android tablets by the university, for use in class sessions, but these were not available to participants when they left the classroom.

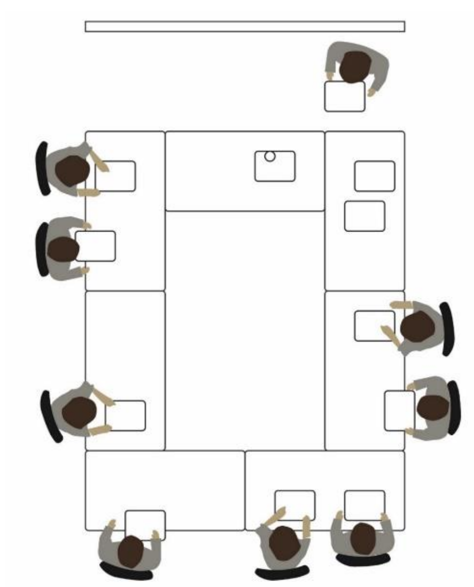


Figure 7.1. Classroom setting illustrated by author.

7.2.3. Distribution of Classes and Study Design

The diagram (Figure 7.2) below shows the distribution of classes, based on the number of participants that registered to attend each of the ten classes. The critical point here is that the study is designed to evaluate the model and the guidelines. By trialling ten classes of four sessions each with between four to eight participants, because it was felt that there was sufficient variety in the number of participants per class and across the ten groups in order to ascertain the extent to which the teaching method worked and to characterise the common patterns of learning occurring. The decision for the number of classes to run and the number of participants to recruit was based solely on the needs to ensure that the findings are generalizable and replicable for future studies.

Group One 5 participants	**Group Two** 7 participants	**Group Three** 5 participants	**Group Four** 6 participants
Group Five 8 participants	**Group Six** 5 participants	**Group Seven** 6 participants	**Group Eight** 4 participants
	Group Nine 6 participants	**Group Ten** 8 participants	

Figure 7.2. Overview of classes and participant groups.

Similar to the previous study (Chapter 6), participants recruited were required to possess a certain level of technological experience, in order to meet the minimum requirement. This is because the current study is continuing the exploration of participants' *interest* in learning of technology, moving from the "*Maintained Situational Interest*" phase to the "*Emerging Individual Interest*" phase (Figure 6.19). These participants were regarded as a suitable demographic as they fit into the appropriate phases of the model. These participants signed up to take part in the study, they have already displayed a level of enthusiasm with technology use. This, therefore fits into the "*Maintained Situational Interest*" phase of the model. 60 participants would be considered a substantial sample size, while exploring the different contents taught within ten individual groups. Subsequently, the findings would be of sufficient breadth and complexity to ascertain the outcomes.

7.2.4. Overview of Study

The overview of the current study (Figure 7.3) began by investigating participants' pre-existing interests. This took place before the commencement of individual classes. These pre-existing interests provided by participants were not related to technology. Additionally, participants were asked to provide the current technological barriers they faced and their technological experiences, with the intention of finding out the factors affecting their learning. The assumption was based on knowledge and confidence being the two main factors affecting older adults' uptake of technology. The materials handed out during classes, and the basic knowledge taught in classes, were influenced by the two factors mentioned above. Correspondingly, ad-hoc teaching took place in classes and these activities were based on participants' requests. As these activities were in response to completely new requests, instead of only resolving the current technological barriers faced by participants, new technological barriers were uncovered. Subsequently, these technological barriers could be managed through the repetition of activities during classes. Therefore, the factors mentioned above formed the basis of the conceptual model for the running of classes.

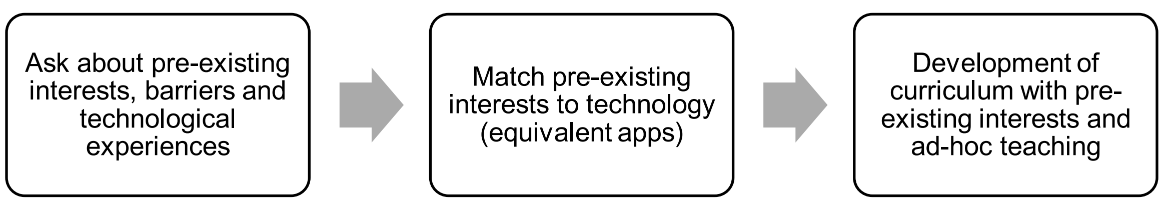


Figure 7.3. Overview of in-depth study.

7.2.5. Data Collection and Data Analysis

Background Demographics

The procedure for the questionnaires was similar to the previous study (Chapter 6). Before the commencement of classes, participants were provided with an ethics consent form, an information statement, and a background questionnaire on pre-existing interests, and short-term and long-term goals. In addition, participants were asked to provide details of their interest or motivation with use of technology and the main difficulties they faced with use of technology. Both questions were open-ended. The set of questions analysed consisted of background demographics and technology literacy. Participants' background demographics were recorded in Microsoft Excel. In addition, participants were asked to self-assess three dimensions of their health – dexterity, eyesight and memory, on a scale from one to five, representing very poor to very good.

Pre-existing Interests

Participants were requested to provide at least three of their pre-existing interests. The majority of participants provided more than three pre-existing interests. Therefore, there were 87 different pre-existing interests gathered from 60 participants. Each pre-existing interest was allocated a number for coding purposes.

Interest or Motivation with Use of Technology

In order to determine the factors that contribute towards participants' interest and motivation to learn technology, they were asked to fill in an open-ended question:

1. What would interest or motivate you to continue with use of technology like laptop, iPad or smart phone in the future?

Participants' responses were manually grouped according to common themes and ideas (Figure 7.4). A sample of some responses is shown in Table 7.1.

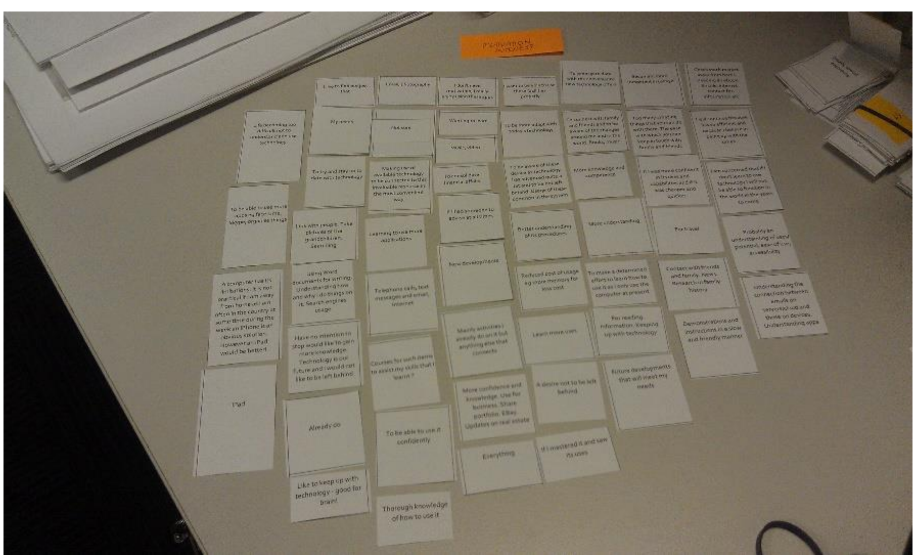


Figure 7.4. Manual sorting of main difficulties encountered with use of technology.

Table 7.1. Sample of some of participants' responses on interest and motivation.

Interest or Motivate with Use of Technology
A computer has its limitations. It is not practical if I am away from home as I am often in the country at some time during the week an iPhone is an obvious solution. However an iPad would be better
I am concerned that if I don't learn to use technology I will not be able to function in the world in the years to come
Probably an understanding of uses/ potential, ease of use, accessibility
Understanding the connection between emails on servers/cloud and those on devices. Understanding apps
To be able to use it confidently

Main Difficulties with Use of Technology

In order to find out the factors that contribute towards participants' main difficulties with technology learning, the following question was designed:

1. What are the main difficulties you have encountered with use of technology, such as computer or smartphone or tablet device?

Similarly, participants' responses were manually grouped according to common themes and ideas (Figure 7.4). A sample of some of the participants' responses are shown in Table 7.2.

Table 7.2. Sample of some of participants' responses on main difficulties.

Main Difficulties with Use of Technology
Keeping up with the advances of technology
Language used describing how to use. Feeling information is secure
Knowing what can be done and how to do it
Learning to use various formats
Not knowing how to do things

Short-term and Long-term Goals

Goals sit under the umbrella of the motivational literature (Chapter 2). Participants were asked to provide a list of their short-term and long-term goals, and were asked at the end of class sessions as to whether they had achieved their initial goals. Findings show that participants relate to having achieved their goals, when activities were developed based on their pre-existing interests. Participants were asked to provide as many goals as possible (short-term and long-term) that they would like to pursue. For instance, participants listed acquiring basic tablet skills as one of their goals (Table 7.3), so once they have achieved this skill through practice, then they feel motivated to continue with learning. These goals were categorised and grouped into themes. These themes relate to the overall analysis whereby the descriptions of short-term and long-term goals reflect on the three elements (autonomy, life-satisfaction and self-confidence) of the *Interest-Bridge Model*.

Table 7.3. Sample of some of participants' responses.

Short-term Goals	Long-term Goals
Learn how to download apps I want, delete apps I no longer want, cut and paste within emails	I am reasonably conversant with my iPad, but I understand there is much more I could learn… so hopefully by the end of course I will feel I have benefitted and learnt to use new applications. I find best way to learn is "hands on" so looking forward to class
Purchase an iPad with knowledge gained in this course. Select the most appropriate device for my use, iPad or Android?	Become familiar with the iPad and be able to use it for emails, google or other uses without being nervous after using it
Feel comfortable and in control of device. Not overly ambitious.	To be able to utilise more of the features on my iPad. To be able to book travel etc. online confidently

Pre, Mid and Post-Study Questionnaires

Each participant was supplied with printed handouts, consisting of four questions to record self-assessment of overall attitude towards mobile touch screen technologies. The pre-study questionnaire was given before the commencement of classes. The mid-study questionnaire was distributed after week two of the classes and the post-study questionnaire was given at the end of the last class. There were four statements with seven point scales (1 – strongly disagree, 2 – disagree, 3 – slightly disagree, 4 – neutral, 5 – slightly agree, 6 – agree and 7 – strongly agree) for participants to record their self-assessment. The four statements were:

1. I think that working with technology would be enjoyable and stimulating.
2. The challenge of learning a lot about technology is exciting.
3. I like learning about technology.
4. I enjoy lessons about technology.

In addition to the post-study questionnaire, there were three open-ended questions:

1. After attending this workshop, please describe how you think touch screen technologies (e.g. iPads) could support you in maintaining your interests and/or hobbies?
2. Any further comments about using iPads and/or your interests?
3. Any further comments about this workshop?

According to results and experiences from the previous study (Chapter 6), the implementation of pre, mid and post-study questionnaires, in the current study, enabled the tracking of changes in any of participants' attitudes towards the use of the technology. A statistics software was used for quantitative analysis. The software applied to the study to analyse the scales was SPSS (Statistical Package for the Social Sciences) statistics. Analysis mechanisms employed comprised of reliability testing, frequencies and distributions, Friedman Test and ranks and test statistics. At the end of the study, all data gathered via pre, mid and post-study questionnaires was entered into SPSS and coded according to the information provided by participants. Coding was organised with use of variables for each individual case. For instance, for participants' educational level, the column was titled "*edu_level*", and 1 was assigned for secondary, 2 for certificate or diploma, and so on.

Focus Group Interviews

Focus group interviews were conducted throughout the 20 weeks of classes, and all participants in the classes agreed to be interviewed and that answers could be audio recorded and transcribed. The focus group interviews conducted were semi-structured and conversational, with no pre-determined response categories, to ensure openness to the full range of possible themes and meanings. Focus group interviews formed the basis of establishing participants' perceptions of technology, their views on lifelong learning and how mobile touch screen technologies could complement their pre-existing interests and use of technology in their everyday lives. The entire group was asked questions and feedback was invited, rather than asking one person at a time to respond. No prompting was required from the researcher as all participants responded, indicating that they took these focus group interviews seriously and appeared keen to contribute. They also talked amongst themselves, which is desired for focus group interviews, and expanded on each other's ideas on ways to support and help to improve technology and teaching of technology to older adults long-term. Words, meanings, themes and ideas provided by the participants were analysed. Similar ideas and themes were grouped and analysed with content analysis method.

Card-sorting Exercise to Establish Pre-existing Interests

This exercise was the same as in the previous study (Chapter 6), where participants were asked to take part in a card-sorting exercise on the first week and fourth week of classes. Through the use of this exercise, participants were able to identify their pre-existing interests. This exercise was designed and developed to keep track of changes in participants' pre-existing interests. Participants were provided with blank cards (150mm x 100mm), marker pens and "*My Interests – Before*" worksheets. They were given 30 minutes to write down any pre-existing interests that came to mind. At the end of this session, participants sorted out cards, according to how much the activity was of interest to them. They had to sort the cards into three piles of "*Would Choose*", "*Would Not Choose*" and "*Maybe*", on the basis of whether they like to do the activity on the card or not and if it interests them. Participants are free to review their sorting and move cards around. The "*Would Choose*" pile should then be prioritised, according to their favourites and recorded on the "*My Interests*" worksheet. They were asked to repeat steps for "*Would Not Choose*" and "*Maybe*" columns. On week four, participants were asked to repeat the same exercise and were provided with "*My Interests – After*" worksheets. The researcher would be able to track any changes at the end of the study.

7.3. Findings before Commencement of Classes

7.3.1. Background Demographics

There were 60 independently living older adults in this study, 85 per cent were female and 15 per cent were male (Figure 7.5). Participants in this case were recruited with an enormous gender imbalance. This could be due to the common generalisation that males are more knowledgeable and technical by nature, thus not requiring assistance with learning of technology (Margolis and Fisher, 2003). The statistical portrait provided by CEPAR (2011) indicated that women have a longer life expectancy and therefore make up a greater proportion of the ageing population. This could be the other explanation of the gender imbalance in this study. Participants were above 60 years old, less than a third were in their 60s, over half of them in their 70s (55 per cent), less than a third in their 80s and one in their early 90s, with an average of 72 years of age (Figure 7.6).

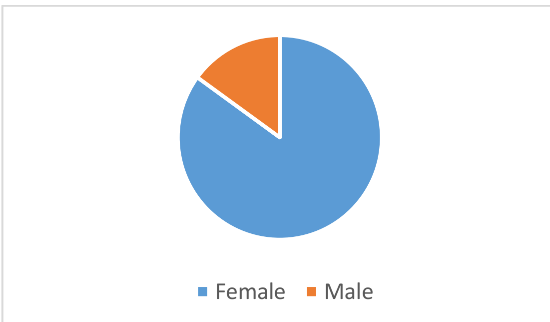


Figure 7.5. Gender split in participant sample.

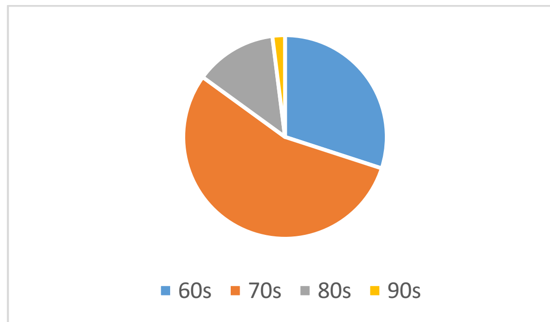


Figure 7.6. Age distribution across sample.

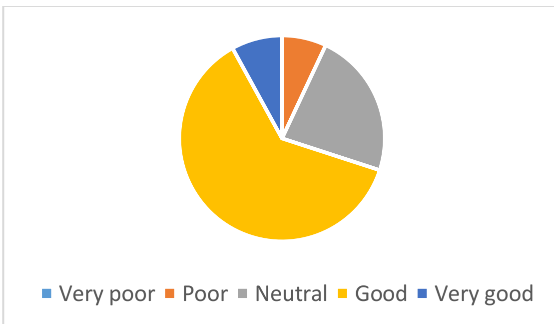
The sample was ethnically diverse, consistent with information provided by CEPAR (2011), indicating that there is a likelihood of a higher number of older Australians born in the British Isles. Participants came from different regions – Pan Pacific, Asia, United Kingdom, Europe and Middle East (Table 7.4). More than half of the participants were of Australian background (62 per cent). Less than a fifth were from Asia, 16 per cent were from UK and Europe and three per cent were from the Middle East. The main language spoken at home by the majority of participants was English. Second languages spoken comprised of Marithi, Hindi, Chinese Mandarin, Hokkien (Chinese dialect), Greek, Arabic, Croatian and Tamil.

Table 7.4. Country of origins of participants.

Regions	Countries	Per cent (%)
Pan Pacific	Australia, New Zealand	62.0
Asia	Singapore, Malaysia, India, Thailand, China, Sri Lanka	18.0
United Kingdom	England, Scotland, Ireland	10.0
Europe	Holland, Croatia, Czech Republic, Greece	7.0
Middle East	Israel, Egypt	3.0

Education

From the data obtained, participants were considered highly educated, due to the high number of post school qualifications (Figure 7.7). Slightly more than a fifth had completed secondary education, about a quarter had completed certificate level (equivalent to Tertiary And Further Education – TAFE or community college level affiliation). A small number (3 per cent) had undertaken an apprenticeship. Slightly less than half (45 per cent) of the participants had a Bachelor's degree and a small number had gone on to obtain a Master's degree.



Educational Level	Per cent (%)
Secondary	22.0
Certificate	25.0
Apprenticeship	3.0
Bachelor	45.0
Masters	5.0

Figure 7.7. Educational level.

Occupation

More than three-quarters (88 per cent) of the participants were retired and the rest were working on a part-time basis. These participants' previous occupations covered a wide range of sectors. They comprised of architecture (2 per cent), banking (3 per cent), business (12 per cent), community (7 per cent), design (2 per cent), domestic (3 per cent), education (25 per cent), engineering (3 per cent), hospitality (2 per cent), information technology (2 per cent), law (3 per cent), medical (13 per cent), retail (10 per cent), science (10 per cent), telecommunications (2 per cent) and travel (2 per cent).

Place of Residence

The university is situated in the eastern suburbs, administered by the City of Boroondara Council. Participants were recruited within Boroondara and its surrounding area. It should be noted that, these suburbs are well established and considered to be generally affluent. According to ABS (2013a; 2013b), Boroondara was recorded as the most advantaged Local Government Area (LGA) in Victoria, Stonnington and Manningham were also on the list. Data released by ABS (2011a; 2011b; 2012), indicated that the highest average total incomes in 2004-05 and 2008-09 were located in Melbourne's inner southern and eastern regions. These included Stonnington, Boroondara and Yarra. These participants are residents in Inner City, Eastern and South Eastern municipalities. The Inner City municipalities include City of Melbourne and City of Yarra. The Eastern municipalities consist of City of Boroondara, City of Manningham and City of Whitehorse. City of Glen Eira and City of Stonnington form part of the South Eastern municipalities. Approximately 5 per cent of participants reside in the Inner City, 65 per cent reside in the Eastern region and 30 per cent live in the South Eastern region.

Health

Participants were asked about three aspects of their health of relevance to this study – hand dexterity, eyesight and memory. No participant had a very poor condition for dexterity of his or her hands and fingers, 3 per cent listed it as poor, 8 per cent as neutral, 55 per cent as good and 34 per cent as very good. No participant has chosen very poor or poor condition for their eyesight, 30 per cent listed it as neutral, 58 per cent as good and 12 per cent as very good. None of the participants rated their memory as very poor, 7 per cent listed it as poor, 23 per cent as neutral, 62 per cent as good and 8 per cent as very good.

Interest in Technology

Participants were asked about their technology literacy. The questions comprised of ownership of type of technology (e.g. laptop, desktop and tablet), duration of ownership of type of technology, email accounts, reasons for owning mobile touch screen devices and common usages with these devices.

Computers – Desktops and Laptops

A high number of participants owned their computers. Slightly more than a third (39 per cent) of participants owned desktop computers, about a third (33 per cent) owned a laptop, a fifth (20 per cent) owned both a desktop computer and a laptop and a small number did not own either a desktop computer or a laptop. Only one participant did not have an email account.

Mobile Touch Screen Devices

More than three quarters (87 per cent) of participants owned a mobile touch screen tablet. Amongst the participants who had mobile touch screen tablets, 31 per cent had owned it for six months or less, 38 per cent had owned it for between one to two years and the rest (31 per cent) had it for two years and more. Of these participants, 67 per cent bought their own tablets and the rest received their tablets as gifts from their family members.

Technology Usage for Mobile Touch Screen Devices

Participants were asked about their most common usages of their mobile touch screen tablets. There were 26 different usages in total (Table 7.5) itemised according to popularity. From this list, most participants had newspaper subscriptions from their local newsagents and used to have newspapers delivered to their homes on a daily basis. Due to the shift towards online, participants with newspaper subscriptions have found it cheaper to access through online news sites. As for communications, participants used Skype and Face-time to stay in touch with family and friends.

Table 7.5. Participants' common usages of their mobile touch screen tablets.

Common Usages with Mobile Touch Screen Tablets			
Usages	**Popularity**	**Usages**	**Popularity**
Email	40	Travel	3
Internet	30	Bookings	2
Photos	12	Recipes	1
Books	7	eBay	1
Catch-up TV	6	Entertainment	1
Newspapers	6	Foreign language	1
Communications	6	Maps	1
Games	6	Camera	1
Music	5	Diary	1
Facebook	5	Pinterest	1
Banking	4	Thesaurus	1
Video	4	Writing reviews	1
Google	4	Weather	1

Email and Internet dominated, and were at the top of the list, followed by photos, then reading books. Catch-up TV, communications, games and reading newspapers were next, with Facebook and music making it into the list as well. From the data gathered above, these common usages were further grouped into the following categories: business, communications and social media, entertainment and leisure, games, Internet and travel (Table 7.6).

Table 7.6. Participants' common usages of their mobile touch screen tablets – categorised.

Common Usages with Mobile Touch Screen Tablets	Categories
Online banking	Business
Email, Facebook, Pinterest, Communications	Communications and Social media
Catch up TV, entertainment, reading books and newspapers, recipes, learning foreign languages, listening to music, video	Entertainment and Leisure
Crossword puzzles, Candy Crush, Scrabble and Thesaurus	Games
Surfing net, information search with Google, online shopping (eBay)	Internet
Booking of flights and accommodations, travel information, weather, timetables of public transport, maps, taking and browsing photographs, writing diary and reviews	Travel

Assistance with Technology

Out of the 60 participants, 13 per cent did not own their own mobile touch screen tablets, slightly more than half (52 per cent) said they received assistance of various kinds when they encounter technical issues. Almost a third (30 per cent) have no assistance available to them and 5 per cent stated that they could use their mobile touch screen tablets independently. As for provision of assistance, slightly more than a third (35 per cent) of participants did not receive any form of assistance. This is consistent with statistics provided by ABS, indicating that a large number of older adults are living on their own. They include people without children and those whose children are living interstate or overseas. Less than a fifth (8 per cent) were capable of using their mobile touch screen tablets independently. Slightly less than a quarter received assistance: 5 per cent from partners, 27 per cent from children and seven per cent from grandchildren while, almost a fifth attend classes to receive assistance. For locations for assistance, excluding the 35 per cent of participants that did not receive any form of assistance, 65 per cent listed getting help. Out of these participants, slightly less than half (48 per cent) received help at home and 17 per cent went to attend classes to seek help with technical problems. As for attending classes, although the majority of these participants were recruited via U3As, slightly more than half (52 per cent) were actively involved with attending classes on a regular basis. The rest (48 per cent) kept their memberships, so that they would be kept up-to-date on news and courses. Participants also attended technology classes that included computers and iPads.

Pre-existing Interests

Based on the data gathered, participants listed 87 different pre-existing interests. These pre-existing interests were further categorised into 23 groups. The top ten most common pre-existing interests were exercises/sports, reading, gardening, arts audience (consumers of art related pre-existing interests), food, travel, craft, education, family/pets and games. The following (Table 7.7) summarised participants' most common pre-existing interests according to popularity.

Table 7.7. Participants' pre-existing interests according to popularity and categorised.

Pre-existing Interests	Popularity	Categories
Being active, bicycle riding, bushwalking, camping, croquet, golf, gym, lawn bowling, mediations, mountaineering, Pilates, skiing, swimming, Tai Chi, tennis, walking, water exercises, Yoga	32	Exercises/sports
Reading	28	Reading
Gardening	23	Gardening
Movies, music, musical performances, opera, orchestra concerts, the arts	21	Arts audience
Baking, cooking, dining	17	Food
Travel	17	Travel
Art and craft, clay work, drawing, embroidery, knitting, painting, patchwork and quilting, photography, sewing, woodwork	14	Craft
General knowledge, health, history, learning, literature, U3A classes, writing	14	Education
Animals, grandchildren	13	Family/pets
Bridge, crosswords, Mah-jong, Scrabble, Solo	11	Games
Conservations, current affairs, environmental issues, newspapers, online activism, politics	8	Current affairs
Book club, clubs, interactions, people, socialising	7	Social
Volunteering	6	Service
French, Italian, Latin	5	Languages
Philosophy, religion	5	Philosophy/religion
Dancing, playing recorder, singing	5	Arts creation
Design and concept, fashion, interior design, model railway	4	Design
Genealogy	3	Family history
Business, financial	3	Finance
Catch-up TV, television	2	Television

Racing, watching sports	2	Watching sports
Facebook, podcasts	1	Social network
Technology	1	Technology

Interest or Motivation with Use of Technology

Out of the 60 participants, seven per cent did not provide an answer. From those that provided an answer, 62 per cent stated that they wanted to make use of technology in order to accommodate their pre-existing interests. These pre-existing interests included Face-time, Skype, emails, finances, reading books, news, travel, eBay, real estate, Microsoft Word, photography, music, video and internet. Slightly less than a fifth (16 per cent) wanted to stay up-to-date with technology so as not to be left behind and to be able to function in years to come. Slightly less than a fifth (13 per cent) wanted to learn and gain more knowledge about technology. Their answers included understanding of uses, the processes, its potential, ease of use, accessibility, memory, and cost of usage, data, servers and the cloud. The remaining two per cent suggested convenience.

Main Difficulties with Use of Technology

Five participants did not provide an answer. The rest of the participants provided several of the difficulties they encountered with use of technology. Slightly more than a quarter (28 per cent) mentioned that they lack the basic skills to understand the way technology works. Some of the examples included copying and pasting of texts, downloading and deleting of apps and using the functions of apps. Less than a tenth (8 per cent) pointed out that they lacked assistance. Mainly it is associated with not being able to fix problems and in general, having no one to turn to for technological advice. A tenth (10 per cent) of participants pointed out that it is related to memory retention. They have trouble remembering the steps required to get their work done. Nearly half (42 per cent) of the participants had issues related to technology. These comprised of hardware, software (operating systems), Wi-Fi connection, costs, vague instructions written in a technical language that is difficult to understand, screens and keyboards are too small.

Short-term and Long-term Goals

According to motivation literature, goals are part of achievement motivation and therefore are closed linked with *interest*. The study wanted to find out if the participants' short-term and long-term goals were related to their pre-existing interests and whether their goals and pre-existing interests correlates with the data gathered via focus group interviews, pre, mid and post-study questionnaires, card-sorting exercises and observations.

Short-term Goals

Participants were supplied with open-ended questionnaires to list short-term goals that they would like to achieve in the classes. The short-term goals provided by participants were compiled and split into three categories: increase knowledge, become a competent user and accommodating to their needs. In the "*increase knowledge*" category, there was 16 per cent. Knowledge listed included copy and paste texts in emails, download and delete apps, understand the technical terminology and knowing the differences between operating systems. Slightly less than half (40 per cent) of participants sought to become a "*competent user*". This comprised of being able to troubleshoot and fix technical problems without assistance, to feel comfortable and be confident with use of mobile touch screen technology, so as not to be anxious and to understand the basic functions. Approximately a fifth (22 per cent) would like their mobile touch screen devices to "*accommodate their needs*". The needs provided by participants include transferring and organising photographs, attaching photographs, emailing and use while travelling. From the data gathered, thirteen participants (22 per cent) did not provide answers to their short-term goals (refer to Table 7.8).

Table 7.8. Participants' Short-term goals.

Description of Activities	Percentage of Participants
Increase knowledge	16%
Become a competent user	40%
Accommodating their needs	22%
Did not provide answers	22%

Long-term Goals

Referring to Carstensen's Socioemotional Selectivity Theory (SST), even though participants are aware of time constraints on their lifespan and find that short-term goals are more achievable compared to long-term goals. However, in this study, the information gathered from long-term goals were similar to short-term goals. This could be related to participants' educational background and technological skills (refer to data gathered from demographic background). The three categorises were: *increase* *knowledge, become a competent user* and *accommodate their needs*. The "*increase knowledge*" category was chosen by 13 per cent of participants. Knowledge listed included email, Google, reading newspapers, keeping up with finances, travel, photographs, eBay and booking of holidays. Slightly less than a third (28 per cent) sought to become "*competent users*". These consisted of utilising the features of the tablet, master the use to use it efficiently and obtain a level of competence and maintaining of the tablets. Slightly less than a fifth (17 per cent) wanted mobile touch screen technologies to "*accommodate their needs*". Some of the needs comprised of efficient use of tablets for their needs and to be able to help others. 42 per cent of participants did not provide information on their long-term goals, suggesting they are more focused on immediate goals. Of the remainder that did; there was a certain level of consistency shown between short-term and long-term goals (refer to Table 7.9).

Table 7.9. Participants' long-term goals.

Description of Activities	Percentage of Participants
Increase knowledge	13%
Become a competent user	28%
Accommodating their needs	17%
Did not provide answers	42%

Card-sorting Exercises to Establish Pre-existing Interests

Four participants from Group One took part in the exercise. The most common "*would choose*" pre-existing interests listed by all were: theatre, U3A, travel and reading. Three participants listed the following: social engagement, music and current affairs. In Group Two there were seven participants. Their most common "*would choose*" pre-existing interests were: reading, cooking, travelling, photography and iView (catch-up TV). Comparing these two groups, the common pre-existing interests were reading (highlighted in blue) and travelling (highlighted in green) – refer to Table 7.10. The pre-existing interests provided by participants were not technology related, but could be supported by technology. For example, reading could be assisted via online newspapers and e-books apps. Travelling could be facilitated by apps such as Google Maps, TripAdvisor and Skyscanner.

Table 7.10. Card-sorting exercise.

Group One		Group Two	
Would Choose	**Popularity**	**Would Choose**	**Popularity**
Theatre	4	Reading	6
U3A	4	Cooking	5
Travelling	4	Travelling	5
Reading	4	Photography	4
Social engagement	3	iView	4
Music	3		
Current Affairs	3		

Classes

Orientation

At the beginning of the first session, participants were presented with an information pack. The information pack included: safety information and class schedule (morning or afternoon). Safety information consisted of instructions of "*what to do in a fire emergency*" and a map of campus assembly areas. The schedule provides all participants with an overview of classes across the four weeks. The majority of participants owned iPads, so the general content provided to all participants comprised of materials such as Apple Password, iTunes Store and iBook Store Accounts, instructions on iPad Basics and App Categories. Participants that owned Android tablets were also given a set of materials on Android Basics and Android status icons. Participants were provided with App Categories. This list was compiled from information gathered via participants' background demographics. It focused on participants' common usages of their mobile touch screen tablets and their list of pre-existing interests. The list of apps were categorised as follows: books, business, catalogues, education, reference, navigation, medical, finance, food and drinks, lifestyle, games, music, news, newsstand, photo and video, productivity, sports, entertainment, weather, social networking, travel and health and fitness.

Week One

At the first session (Figure 7.8), participants were asked to introduce themselves to their fellow participants and share their pre-existing interests, reasons for coming and what they would like to achieve in the classes. A short slide presentation gave participants an overview and helped to clarify some of their questions in regards to types of devices, connections and data plans. Participants were given the option to share personal stories about their likes and dislikes of technologies, uses of technologies and the difficulties they have encountered in the past. The researcher also encouraged participants to bring along their list of queries, that they might need help with resolving in the next few weeks.

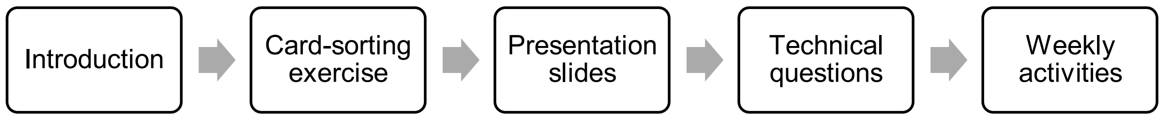


Figure 7.8. Class structure in week one.

Participants were asked to take part in a card-sorting exercise (refer to section on Card-sorting Exercise). After that, a short visual presentation was given to explain to the participants about basic gestures for tablet use. It included tapping, tapping and holding, dragging, double tapping, flicking and pinching (Figure 7.9). Participants were given a brief history of tablets. The participants were usually confused with the following:

- Different operating systems, such as Apple, Android and Windows
- Price differences between tablets
- Technical terminologies

The above topics were covered based on participants' requests and also from the background demographics provided. The topics covered minimal basics and how to make tablets usable to support participants' pre-existing interests. This was mainly because participants were unsure of the functionalities of tablets and what these tablets could offer them. Even though the exterior of tablets may look similar, explanations were provided to the participants that it is the internal hardware that determines the costs of tablets (Figure 7.10). The functions to look out for, included camera resolution, processor chip, and screen display and storage capacity. Participants were also perplexed with technical terminologies such as 3G/4G, Wi-Fi, internet and intranet. They also raised questions regarding iTune store, Apple ID and general functions of an iPad.

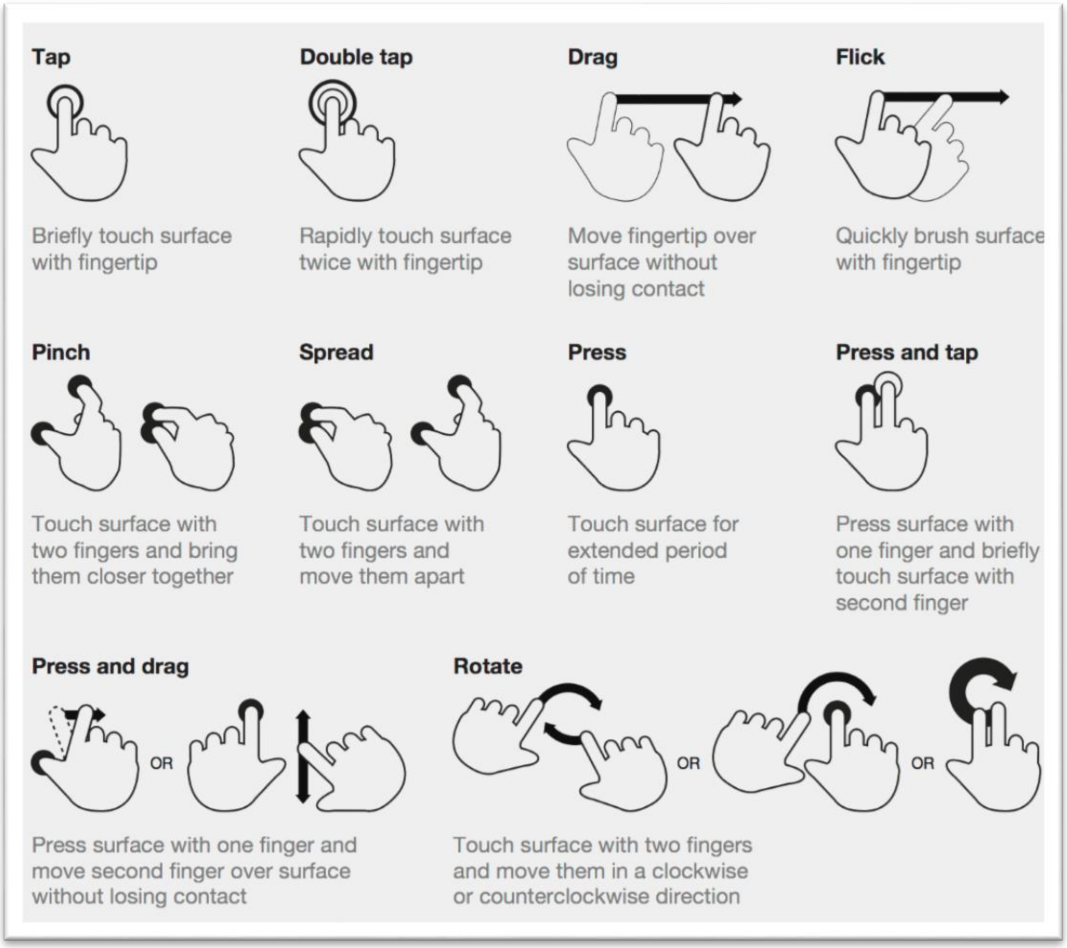


Figure 7.9. Teaching material – Gestures for touch screen tablets.

Source: Crooks, 2014.

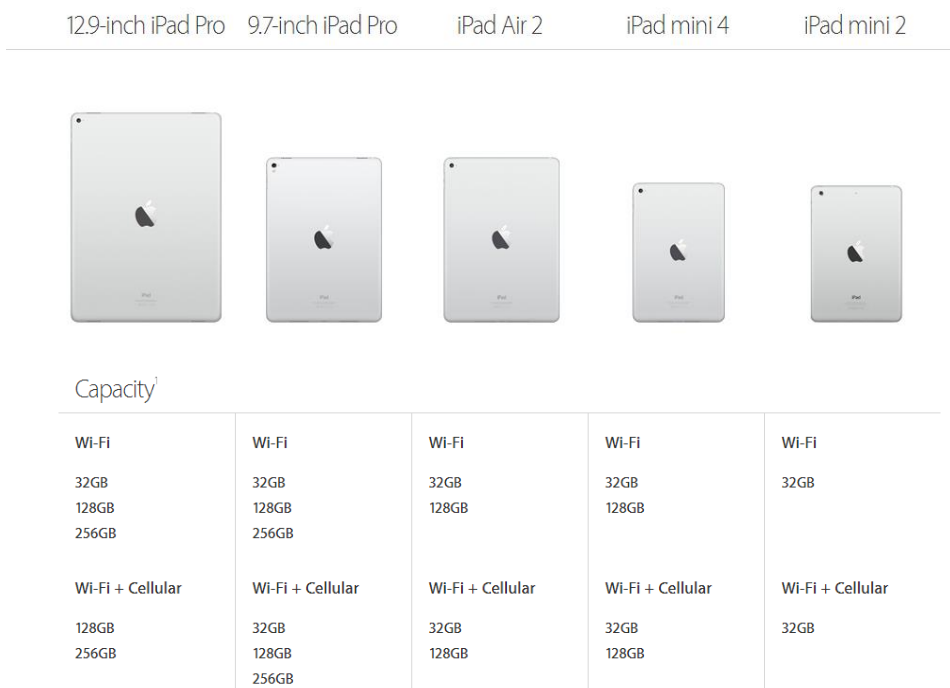


Figure 7.10. Teaching material – Comparisons of iPads.

Source: Apple, 2017.

Participants were confused with the different models of iPads available on the market (Figure 7.10). The majority mentioned that all models looked similar, but the prices were not. So, explanations about internet components were provided to the participants. The researcher was able to provide the participants with an overview of functional specifications of tablets, that included bundle plan, screen display, processor, storage capacity, external storage, audio and video, weight and memory. Issues with post-paid and pre-paid plans, offered by the two major telecommunication companies in Australia, were also addressed. The study also introduced participants to a series of accessories that are available on the market. They comprised of covers, cases, keyboards, earphones/headphones, speakers and stylus. Samples of covers, cases and stylus were brought into classes for participants to pass around and try out. A few participants have already bought their own stylus. They commented that it is much easier for them, given that using finger tapping on screens, at times could be a bit of hit and miss. Participants also queried about differences between an app and a website. Explanations were provided with reference to real-life analogies that older adults could relate to, and materials were provided to participants. For example, an app is downloadable and installed onto a tablet, whereas, a website is accessible through use of a web browser (Table 7.11).

Table 7.11. Teaching material – differences between an app and a website.

Mobile Apps	Mobile Websites
Download from App Store or Google Play Store	Access from web browsers such as Safari, Google Chrome, Mozilla FireFox by typing website URL in the address bar
App is saved on device, most cases, do not require internet connection – work offline	No download is needed but internet connection is required to gain access – work online
Requires authorisation from user to download each update	Usually update without user realising as it is an automated online process
Serve a single purpose, usually a specific task. Complete a single goal in as few taps as possible. Without fuss.	Contents are informative
Action oriented rather than information oriented	Information oriented rather than action oriented
It can be launched in a single step	Usually takes at least three steps
Designed and developed for a tactile device and fingers and thumbs	Compatible across different devices such as brand, operating systems

Participants raised questions about the functionalities available and what the iPad and Android tablets could offer them, so finally, the participants were presented with some of the functions available through both the iPad and Android tablets. The functions included online banking, keeping track of a share portfolio, maps and GPS, searching for prices of flights and accommodation, setting reminders and events, keeping track of time zones, downloading of recipes, painting and drawing, media player, camera and video, internet and social media. It gave participants an idea of the uses available that could complement and support their pre-existing interests and everyday use.

As the study continued, participants further learned about the basic use of their iPad and Android tablets, through practical demonstration shown by the researcher. The topics covered during classes included general settings such as on/off switch, home button, camera and video, status bar, volume control, screen orientation, Nano SIM tray and screen capture functions. Participants were taught about connecting their tablets to Wi-Fi and internet through the general settings. The researcher compiled and developed materials based on participants' requests, such as communications using Skype and

Face-time, differences between camera roll and photo stream, and transferring of photographs between iPad or Android and computers.

Week Two

The overall class structure for week two is depicted in Figure 7.11. Materials distributed to participants were based on their requests for the topics of interest they would like to learn about in that particular week. Participants mentioned that they would at times miss watching their favourite programmes on television due to prior commitments and therefore were interested to learn about catch-up TV using ABC iView. Systematic instructions (Table 7.12) were provided to participants. Demonstrations were shown to participants and they followed, asking questions and seeking assistance at the same time. Participants were introduced to other TV programme apps such as 7 Plus, 9 Now, 10 Play and SBS on Demand. Although very few participants were using social media apps, the majority were interested to learn about them, in order to keep up with technology developments. Instead of being ignorant and avoiding the topic, this new knowledge obtained would enable participants to converse with their children and grandchildren even if they would not use it themselves.

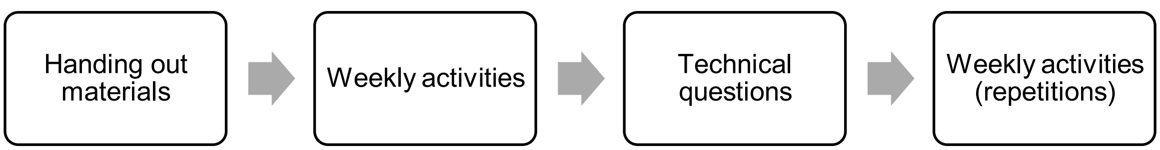


Figure 7.11. Class structure in week two.

Table 7.12. Teaching material – instructions on how to download ABC iView app.

Instructions to download ABC iView	
1.	Tap on the App Store or Google Play Store icon
2.	Search for the ABC iView app by tapping on the search bar and type in ABC iView
3.	Tap on the search button
4.	Tap on Get button to download app
5.	Tap to open app
6.	Search for TV programme
7.	Play TV program
8.	Adjust volume
9.	Repeat above activity from step 5

In week one, participants were encouraged to bring along their list of queries that they might need help with resolving. Some of the questions include the differences between Wi-Fi and 3G/4G, changing of wallpapers, and copy and paste function through use of notepad app. Participants use emails on a very frequent basis, so they have posted queries in regards to file and/or photograph attachments. They were taught to use the app extension function as their sharing option. Participants receive attachments from their family and friends, subsequently, it was requested that they should be provided with instructions to download attachments onto their mobile touch screen tablets. A majority of participants have subscribed to internet plans with at least 20GB of data, therefore they are no longer paranoid with additional charges incurred through over usage of data. At the end of the session, mid-study questionnaires were distributed to the participants. The researcher interviewed participants to find out whether the activities demonstrated during class sessions were related to their pre-existing interests.

Week Three

In week three of classes, the overall class structure is depicted in Figure 7.12. A large number of participants were planning holidays both locally and overseas, so in many of the classes a travel activity was developed to assist participants with their research. They practiced all the basic gestures (e.g. tap, drag, pinch, spread and rotate) and other functionalities. Materials consisting of a list of popular travel apps were distributed to participants (Table 7.13).

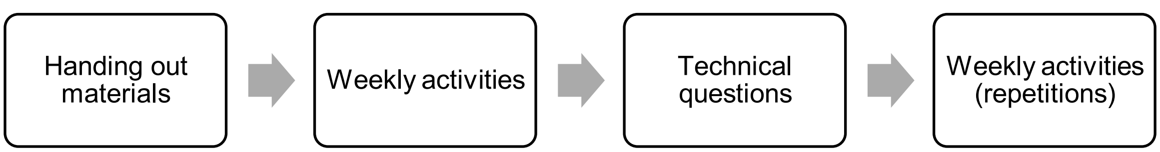


Figure 7.12. Class structure in week three.

Table 7.13. Travel app categories.

Travel App Categories	
Flights	Accommodations
Reviews	Currency converters
Guides	Maps
Wi-Fi Finder	Car rentals
Cab hire	Language translators
Restroom finders	Petrol prices

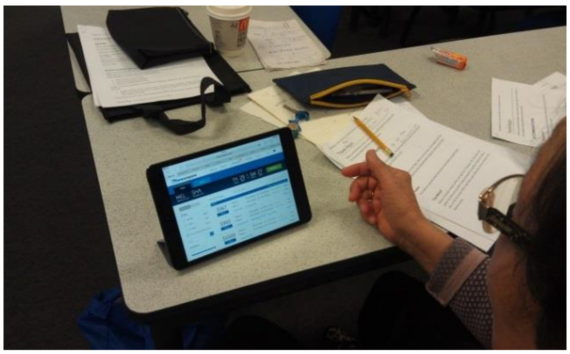


Figure 7.13. Participant using a travel app to search for return flights.

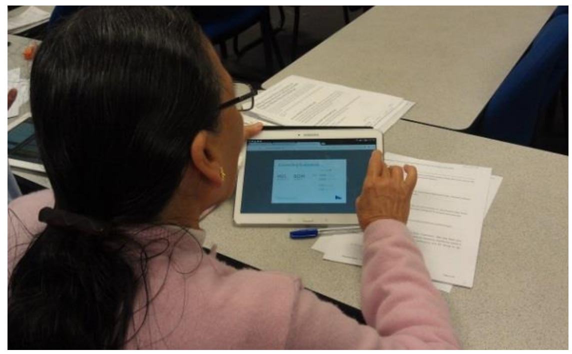


Figure 7.14. Participant using a travel app to search for accommodation.

Participants learned to use the TripAdvisor app. They were able to access information such as reviews and photographs of accommodation. Participants also learned to search and download travel apps through the app store (Figure 7.13). For the flight app (e.g. Skyscanner), they put in all the necessary information such as destination, date of departure and arrival, and used different filters to narrow down their search results (Figure 7.14). Participants were provided with systematic instructions (Table 7.14). The researcher explained and went through the different filters available. Participants took note of the prices and got their travel agents to provide them with a better offer. Participants were interested to try out other travel related apps such as TripCase. It manages all critical travel information and keeps end users up-to-date with change of flight times and gate numbers. Language translation was also another popular request. A few participants were fluent in French, Italian and German. They were also students of the U3As language classes. They commented that Google Translate is considerably accurate. To date it is probably one of the most reliable translation apps that is available for free. It is quite intuitive, so participants acquired the knowledge within a short period of time.

Table 7.14. Teaching material – instructions on how to download Skyscanner app.

Instructions to download Skyscanner app	
1.	Tap on the App Store or Google Play Store icon
2.	Logging into accounts using valid usernames and passwords
3.	Search for the travel app by tapping on the search bar and type in Skyscanner
4.	Tap on search button
5.	Tap on get button to download app
6.	Open app
7.	Input all the necessary data such as destination, date of departure and date of arrival
8.	Tap on search
9.	Repeat the above exercise

Week Four

In week four of classes, the overall structure is depicted in Figure 7.15. Participants requested to go through certain activities taught over the preceding three weeks, in order to refresh their memories. This repetition helped to enforce participants learning of technology and clarified any queries they might have. As participants use public transport on a frequent basis, they were interested to learn about the use of TramTracker and Public Transport Victoria (PTV) apps to check timetables. This was another typical activity developed to help incorporate technology into participants' lifestyles. They went on the app store to download the above public transport apps and learned to input information for their search. Google Maps was another popular app amongst the participants. They were able to input information and look at places such as their own homes. Participants were very concerned about security and privacy issues, hence they learned safer behaviour such as to clear their web browser's history and cookies. At the end of the session, post-study questionnaires were distributed. The researcher interviewed participants to find out whether the activities demonstrated in classes were related to their pre-existing interests. In addition, whether these activities have met their expectations. Participants queried the differences between web browsers such as Mozilla FireFox, Google Chrome and Safari. Participants were very concerned about security and privacy issues. Hence, they learned safer behaviours, such as to clear their web browsers' history and cookies.

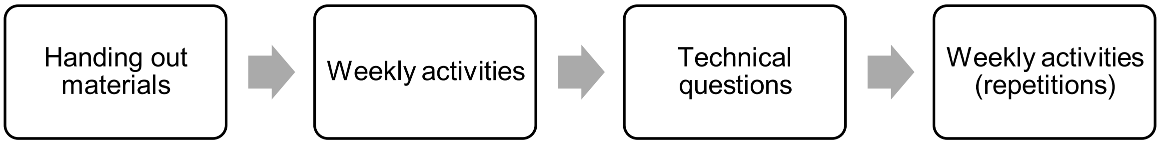


Figure 7.15. Class structure in week four.

7.3.2. Findings upon Completion of Classes

Background Demographics

There is an imbalance between genders. Mainly because the researcher was working with a natural group and was unable to control the balance. Yet, another explanation could be that technology is associated with being a "*guy*" toy (Margolis and Fisher, 2003). Therefore, men are considered more technical and usually would not seek assistance. These participants are ethnically diverse, due to immigration from different countries, so the study was able to get a snapshot of feedback from across a range of cultures. Based on participants' self-assessment, they were generally in good health condition for dexterity, eyesight and memory. Due to the location where the study was being conducted, participants are considered to be affluent and thus have a higher educational level. The majority of the participants are members with their local U3As and attend classes either on a weekly or monthly basis. They also attend classes held outside of U3As.

Technology Literacy

The majority of the participants are technology literate in desktops and/or laptops or mobile touch screen technologies. Almost a third of each group has owned their touch screen tablets for at least six months to two years. The common usages include email, internet, photos, reading and catch-up television. Thus, a relationship is established between participants' technology usage and their pre-existing interests. Looking at traditional forms of communication versus new technology, email has replaced traditional forms of communication, camera rolls (gallery) have replaced physical copies of photo albums, reading of books has been replaced by e-books and there is now freedom to watch any television programme at any time via television on demand.

Pre-existing Interests

Even though more than three-quarters of participants are retirees, they remain very active. Their pre-existing interests are extremely diverse and varied from exercises/sports to reading, gardening, appreciation of the arts, food and travel and education. Participants' list of pre-existing interests (Table 7.7) helped the researcher to determine the equivalent apps to support and maintain their interests (Table 7.19). For example, with travelling, besides employing apps that participants were already familiar with, new apps were introduced.

Interest or Motivation with Use of Technology

Looking at the feedback provided by the participants, learning of technology is fundamentally related to their pre-existing interests and motivation. Pre-existing interests comprised of emails, reading, travel, photography and internet. As for motivation, participants wanted to be up-to-date with technology, to be able to utilise their tablets and to increase their knowledge about technology. Furthermore, it was uncovered that *portability* is a crucial factor for this demographic when it comes to mobile touch screen tablets. A large number of participants mentioned that the portability of an iPad made it very convenient for use, regardless of their interests and no matter where they are. Renee pointed out that:

> "*It is so convenient to access anything you want to know about*."

Sunil mentioned:

> "*It is very useful. It is very light in weight to carry everywhere*."

Peggy provided advantages of iPads that have changed her habit and usage of technology when she was out on her farm and needed to look up information. She shared:

> "*The potential of an iPad would greatly assist in many situations and would give the option of instant and quick answers to queries and questions when I am not able to access the PC*."

The portability of the mobile touch screen device has significantly increased participants' usage, for example, reading while sitting in bed, and checking emails while catching public transport. In addition, they can learn on the same device that they are familiar with both in and outside of classes.

Main Difficulties with Use of Technology

The majority of participants mentioned that they lack basic skills required to understand the workings of technology. According to Nielsen (2002), older adults simply were not brought up with a good conceptual framework of technology and therefore, lacked the foundation. The number of older adults living independently is increasing (CEPAR, 2014), therefore leading to a lack of assistance available at the "*snap of their fingers*". Participants also commented on memory retention. They have trouble remembering steps to complete tasks. Hence, distribution of hardcopy of class materials would reinforce their learning, in addition to enabling repetition of activities.

Short-term and Long-term Goals

The short-term and long-term goals were tasks that participants would like to achieve – whether based on their needs or lifestyles. Generally, this covers their aspirations of increasing their knowledge base about mobile touch screen technologies, becoming competent with the use of their tablets and accommodating functionalities of technology suited to their needs. At the same time, it was important to utilise their existing knowledge to build up their level of self-confidence. Based on observations, questionnaires, weekly activities requests and feedback from participants, it has been shown that there is a relationship between older adults' pre-existing interests and their short-term and long-term goals. For example, some of the short-term and long-term goals provided by participants included learning to delete apps, learning about the functions of tablets, viewing of television programmes and transferring of photographs between devices. These were all taught and demonstrated in weekly classes, and materials were developed and distributed to participants.

Pre-Study Questionnaires – Open-ended Questions

The data shows the percentage of responses provided by participants from pre, mid and post-study questionnaires. The Table 7.15 indicates that the number of participants who chose between 5 and 7 on the Likert scale for these four questions, have outnumbered those who chose between 1 and 3. In the pre-study, generally, a minority of participants indicated their attitudes in the 1 to 3 range, while, the majority of participants were in the

4 to 7 range. Moving onto the mid-study, the percentage of participants in the 1 to 3 range has reduced, as it was indicated by zero. Progressing onto the post-study, there was a slight increase with the 1 to 3 range. However, overall results suggested that participants' attitudes towards technology have been positive throughout the classes. For example, at least half of the participants were in the 7 scale range. Additionally, this result correlated with participants' interviews and feedback (discussed in further sections below).

Measurement of Attitudes to Technology from Pre, Mid and Post-Study Questionnaires

Reliability

Before the commencement of the statistical test, alpha level has to be determined. Alpha value also known as "significance level" is defined as the probability of rejecting null hypothesis when null hypothesis is true. Alpha values range from 0 to 1. For example, a significance level of 0.05 indicates a 5% risk of concluding that a difference exists when there is no actual difference. The analysis plan is to test the hypothesis of whether there is a change in participants' attitude towards technology across three measurement time-points (T1 – Pre, T2 – Mid and T3 – Post). There is a need to check for reliability of the data gathered. Results obtained through individual questions one to four of each test from pre, mid and post study questionnaires. Secondly, the alpha for pre-study was .937, moving onto mid-study, the alpha was .924 and .961 for post-study. An alpha value greater than 0.7 is defined as reliable. An alpha value greater than 0.9 is identified as excellent reliability (Larose and Larose, 2014; Francis, 2013; Crawley, 2012; Hair et al., 2010).

Frequencies and Distributions

There is a need to look at the distribution of data, in order to decide on the statistical method to employ for the analysis of data gathered. In the pre-study, generally, the minority of participants indicated their attitudes in the 1 to 3 range (1 being "*strongly disagree*" and 7 being "*strongly agree*"), while, the majority of participants were in the 4 to 7 range. Moving onto mid-study, the percentage of participants in the 1 to 3 range had reduced by zero. Progressing onto post-study, there was a slight increase within the 1 to 3 range. However, overall results suggested that participants' attitudes towards technology have become more positive throughout the classes. For example, at least half of the participants chose "*strongly agree*" (on the scale of 7) to indicate their level of attitude towards technology. Additionally, this result is consistent with participants' interviews and feedback (discussed in sections below). However, the distribution of data is skewed towards the left and also recognised as not normally distributed. Therefore, the use of mean value to analyse data is not recommended. Subsequently, the mean rank was chosen instead. Ranking is used to recode the data into their rank ordering from either the smallest to largest or vice versa. In this set of data gathered, the researcher chose the former. The Mean Rank column provides readers with information regarding the output of the actual Mann-Whitney U Test. It shows mean rank and sum of ranks for the three sets of questionnaires (pre, mid and post) tested. In addition, due to a not normal distribution, a non-parametic test had to be employed. Part of the process involved making sure that the data to be analysed is appropriate and have passed the following four assumptions (Friedman, 1937):

- Assumption 1: one group that is measured on three or more occasions
- Assumption 2: group is a random sample from the population
- Assumption 3: dependent variable should be measured at the ordinal level
- Assumption 4: samples do not need to be normally distributed

The data gathered met the required assumptions to employ the Friedman Test for analysing. However, if an overall significant Friedman Test difference is found, I will explore this further using pairwise Wilcoxon signed rank tests, comparing baseline (pre) versus week two and week two versus week four, applying an adjusted alpha of .025 to control for multiple comparisons.

Friedman Test

There were 60 participants in total and they were from the same group and measure were taken at three-point intervals (T1 – Pre, T2 – Mid and T3 – Post). Participants were all above the age of 60. The type of variable gathered was on a 7-point Likert scale and therefore considered as ordinal and the sample gathered was not normally distributed. The results are summarised in Table 7.15.

Table 7.15. Results from four questions across three-point intervals.

	T1 - Pre	T2 - Mid	T3 - Post	Test Statistics		
	Mean Rank	Mean Rank	Mean Rank	Chi-Square	Df	P-value
Q1. Working with technology enjoyable and stimulating	1.88	2.13	1.99	4.23	2	.12
Q2. Challenge of learning a lot about technology is exciting	1.77	2.18	2.06	10.27	2	.006
Q3. Like learning about technology	1.76	2.25	1.98	13.32	2	.001
Q4. Enjoy lessons about technology	1.70	2.22	2.08	17.	2	.000

Here the results for the four questions are presented:

Q1. I think that working with technology would be enjoyable and stimulating.

The median attitude towards if *Working with technology would be considered enjoyable and stimulating* before the participants attended the classes was 6.5 (IQR=2). This increased to 7.0 (IQR=2) at the end of week two. However, there was no significant difference in attitude across the three time points, $X^2(2) = 4.23$, $p = .12$.

Q2. The challenge of learning a lot about technology is exciting.

The median attitude towards if *Challenge of learning a lot about technology is exciting* before the participants attended the classes was 6.0 (IQR=3). This increased to 7.0 (IQR=2) at the end of week two of classes. However, there is no difference between week two and week four of classes. A Friedman test found that over all three time points a significant difference in attitude was evident, $X^2(2) = 10.27$, $p = .006$. Post-hoc testing using pairwise Wilcoxon signed ranks tests (with an adjusted alpha of .025) found that the difference between baseline and week two was significant ($p = .001$), but the difference between baseline and week four was not significant ($p = .20$).

Q3. I like learning about technology.

The median attitude towards if *learning of technology is liked* before the participants attended the classes was 6.0 (IQR=2). This increased to 7.0 (IQR=1) at the end of week two. A Friedman test found that over all three time points a significant difference in attitude was evident, $X^2(2) = 13.32$, $p = .001$. Post-hoc testing using pairwise Wilcoxon signed ranks tests (with an adjusted alpha of .025) found that the difference between baseline and week two was significant ($p < .001$), but the difference between baseline and week four was not significant ($p = .042$).

Q4. I enjoy lessons about technology.

The median attitude towards if *lessons about technology is enjoyable* before participants attended the classes was 6.0 (IQR=3). This increased to 7.0 (IQR=2) at the end of week two. A Friedman test found that over all three time points a significant difference in attitude was evident, $X^2(2) = 17.12$, $p < .001$. Post-hoc testing using pairwise Wilcoxon signed ranks tests (with an adjusted alpha of .025) found that the difference between baseline and week two ($p < .001$), and baseline and week four ($p = .005$) was significant.

Ranks and Test Statistics

Ranking is used to recode the data into their rank ordering from either the smallest to largest or vice versa. In this set of data gathered, the researcher chose the former. The Mean Rank column provides readers with information regarding the output of the actual Mann-Whitney U Test. It shows mean rank and sum of ranks for the three sets of questionnaires (pre, mid and post) tested. Individual questions across three time-point were analysed. The Table 7.15 illustrated the mean rank and test statistics of each individual question. The significance is also presented. There was no significance change in question 1 (df=.121) between different measurement points, however there was a significant change in questions 2 (df=.006), 3 (df=.001) and 4 (.000). There was a consistency across data gathered from the pre, mid and post-study questionnaires. Results from pre-study would usually increase leading into mid-study and decline slightly after post-study (Figure 7.16).

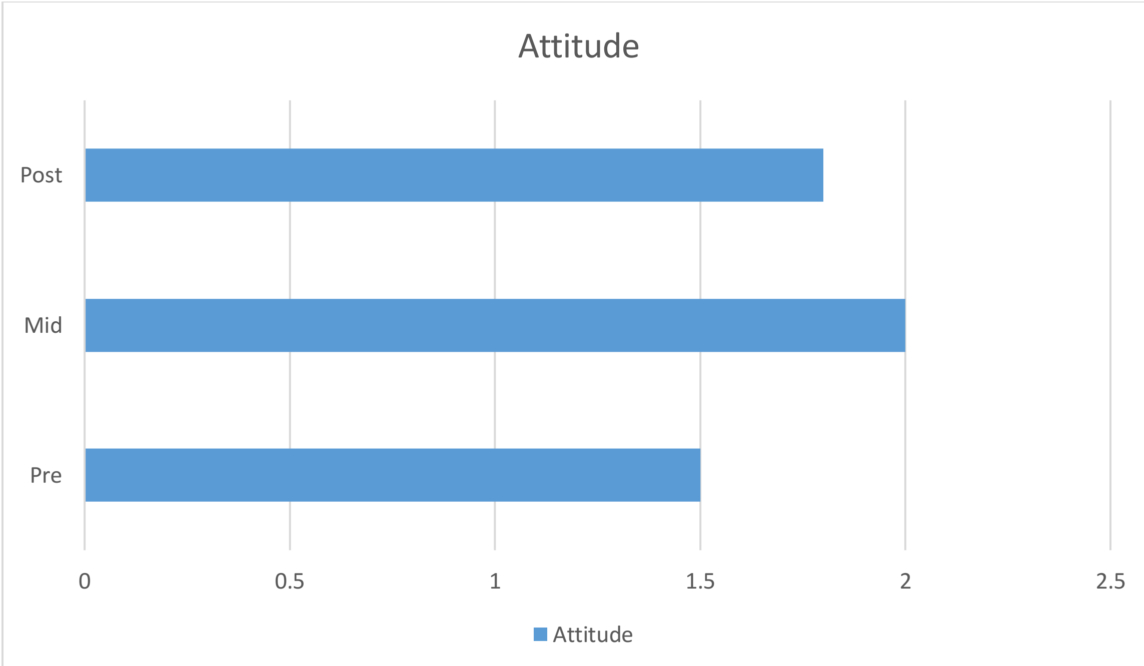


Figure 7.16. Change in attitude across three time-points across all four questions.

From the median value of participants' attitudes, the assumption was, in the beginning, participants were excited to take part in the classes, and therefore there was an increase in the median value of their attitude. After the second week of study, as they learned more about technology, and reality set in, they were probably overwhelmed with the information and faced challenges with technology uptake; therefore, their median value in attitude dropped a little. This could also be attributed to additional barriers encountered with learning of a new type of technology, in this case, mobile touch screen devices. At the end of classes, their median value in attitude increased but remained slightly higher than pre but lower than mid study. Based on focus group interviews and feedback from participants, the results indicated that older adults have achieved their goals (short-term and long-term) and have increase their knowledge on use of mobile touch screen technologies.

Attitudes towards Technology Use

Referring to the results, participants' attitudes towards technology learning have been very positive. They were excited to learn new skills and when reality strikes, their level of confidence declined slightly. This could be because of a rise in demand and expectations that older adults placed on themselves. For instance, wanting to learn more skills in order to attempt difficult tasks and therefore, these could require some complexity of skills. After learning more about the use of technology and techniques, it relates to their pre-existing interests, and then participants were able to regain their level of confidence. Being open minded, it encourages them to try out new apps and learn new skills from others at the same time. However, there was a slight decline due to realisation of how much there is to be learned.

Feedback from Post-study Questionnaire

Based on the feedback provided by participants, classes have been a success. There was a consensus from a large number of participants in written feedback. They confirmed that they had enjoyed the classes and had increased their knowledge of mobile touch screen technology use. Success of these classes is illuminated from the feedback provided by the participants. Some of the comments were about upskilling:

> "*Being open-ended has been fabulous. I have come with my own query list and [tutor] has cheerily upskilled me greatly*! […] *My queries have been answered so I feel more empowered and less exasperated – thanks [tutor]. My daughter has been relieved of helping me out – at least for a while*" – Participant 1

> "*Thanks to [tutor] for her patience with our silly questions. I have to spend more time on my iPad. The notes have been useful*." – Participant 55

Teaching through participants' requests based on their pre-existing interests:

> "*[Tutor] was most obliging in covering everything that we expressed interest in*" – Participant 38.

> "*The benefits of the classes are due to the expertise of the tutor, offered new approaches to the iPad learning*" – Participant 19

> "*Thank you for your enthusiasm and willingness to impart your knowledge in answering our questions and following our interests. […] very useful for travel. But I was starting from base – I didn't even own a tablet when I started. […] it has stimulated me to purchase an iPad*." – Participant 5

Regarding class size and atmosphere:

"*I have enjoyed the relaxed nature of the class – able to ask questions and find a solution to problems*." – Participant 23

Finally, on the subject of overall success of the classes:

"*Very inspiring. [Tutor] is a very good, patient teacher. I would like to do more classes with her*" – Participant 8

"*There should be more classes on iPads. [Tutor] has done an excellent job on iPad learning. All participants were very keen learners!*" – Participant 12

Data gathered from both post-study questionnaires and interviews indicated that the participants have achieved their original goals (short-term and long-term as provided in pre-study questionnaires). The data provided from statistics, showing the alpha value at the end of the class, was higher than before participants started attending classes. The following four strategies are seen as crucial for the success of the classes based on the findings.

Focus Group Interviews

All names of interviewees (participants) are pseudonyms to ensure their anonymity. From the information provided by participants through focus group interviews, the key themes were categorised as barriers and resolvers (Table 7.16). These three themes were inter-related to each other. The lack of knowledge is due to lack of assistance available that in turn led to lack of confidence in usage of technology.

Table 7.16. Themes from focus group interviews.

Barriers	Resolvers
Lack of confidence	Confidence
Lack of knowledge	Learning
Lack of assistance	Interests-supported learning

Lack of Confidence

Older adults did not have opportunities to use technology either during their school days or at work, therefore, it was considered quite a new skill for them to acquire. Some of the typical responses from participants were:

"*[…] have confidence to work out what I need to do and feel confident about each new development with iPads and embrace them*." – Donna

Similarly Meg mentioned:

"*[Trying to] understand what iPad can do and how I can confidently take advantage of what it has to offer, [so that I would] be confident about using all aspects of this technology*."

Pete said he would like to:

"*Be confident in using the iPad for the scope and range of its capabilities. But overall improvement in confidence and ability to use my iPad*."

Based on findings from the previous studies (Chapter 6 – Conceptual Study), it was indicated that when older adults were able to gain confidence with use of their mobile touch screen devices, they embrace the use of this new technology easily.

Confidence

Crawford (2004) proposes that a peer-supported environment is ideal for learning. It was one of the strategies for addressing impediments faced by older adults learning technology. Pauline said:

"*I enjoyed the course very much. It was friendly and not in any way confrontational. I would be happy to learn more. I am more accepting now of the use of an iPad*."

Supporting the views of Crawford (2004), Margie stated:

"*I have enjoyed [the classes]. Basically losing my apprehension regarding whether I can learn how to use iPad […] good to discuss one's concerns, thoughts with others in like age group. I would like the opportunity to do more classes to increase my knowledge*."

Marion has always been sceptical about adopting new technology and learning to use a touch screen device has taken her a while to get used to. She said:

> "*This course has helped me to feel a bit more comfortable with the concept and use of an iPad. It doesn't seem to be quite the totally foreign piece of equipment that I have often viewed it as being! […] I feel confident in pursuing interests and finding information on the iPad. For example, using maps and accessing new apps for entertainment and education*."

It is crucial to build up participants' level of confidence, as it largely affects their ability to learn the use of mobile touch screen technology.

Lack of Knowledge

Although semiotics was created to increase the interactions and understanding between end users and usage of applications (Marcus, 2003), participants drew attention to difficulties they had in understanding the icons and symbols used. The following quotes were given by participants. Pauline said:

> "*I have difficulty with the intuitive aspect of this technology and that most of it does not come naturally. My training was always with words. Icons do not make for easy communications*!"

Melissa mentioned that:

> "*[…] problems with language, what things and words mean, instructions become incomprehensible*."

Rita said that:

> "*[…] knowing what the symbols mean and accessing the facilities*."

In the meantime, while older adults are struggling to understand the meanings of new icons and symbols, they are also straining to learn the use of mobile touch screen technologies. Gaby pointed out that due to her lack of knowledge, she was not able to depend on herself to resolve any technical issues. She said:

> "*[…] not being able to fix problems without assistance. For example, I might have been using a device successfully for some time, when something changes, and I cannot fix it*." – Gaby

This barrier could be addressed through running of walk-in help sessions at public libraries and workshops at public venues, through collaboration with local councils and local community organisations.

Learning

Participants were taught and acquired knowledge for exploring their pre-existing interests through apps available from the app store. June mentioned:

> "*There are many more apps, which I will investigate and use now that I have basic knowledge of how to use and find them*."

Daniel was a keen photographer and was amazed with finding and learning new information to support one of his main pre-existing interests. He said:

> "*Thoroughly enjoyable and it furthered my iPad knowledge and encouraged me to search further*."

Learning is one of the factors that support participants' long-term engagement with technology, thus leading to acquiring individual interest in the uptake of technology.

Lack of Assistance

Participants tend to live on their own. In this particular situation, Meredith does not have any children and she mentioned:

> "*[…] not having household backup when I encounter a problem. Needing expert advice regarding the purchase of the most suitable device for my usage*."

Participants agreed that they did not like to bother their children with too many questions. Jaclyn revealed:

> "*[It is] often frustrating when something happens and I have to resort to asking my son.*"

Melinda said:

> "*[…] just finding out functions et cetera. Had to rely on my daughter to explain things*!"

According to feedback from participants, their children showed them the steps required in order to complete particular tasks, but usually do not have the patience to explain in detail. Often their children run through it very quickly, leaving older adults with more questions than answers.

Interests-supported Learning

Participants commented that they were fond of this novel idea of learning technology, whereby their pre-existing interests were being focused on, instead of focusing on the technology itself. Annie said:

> "*I like the way it was framed around our interests. Make it much more user-friendly*."

Data obtained from previous studies (Chapter 4, 5 and 6) indicated that frustration was one of the impairments for older adults learning of technology. Jack mentioned that he now had a better understanding about his pre-existing interests and it helped with searching of apps, thus reducing the level of frustration.

> "*More ready access to information is always good. Saves on frustration. Now have apps to give me a better understanding of my interests*."

As the classes catered to participants' requests, Jeanette said:

> "*Using an iPad is a very efficient way of finding information to support my various interests on bookings for hotels, travel, language translation, maps photos and cooking are the main ones*."

Louise was quite apt with using her touch screen device for emailing, Skyping and social media, yet she said:

> "*Before attending this class, I was unaware of all the great apps I could download to help with me enhancing my interests and hobbies*."

Based on the positive feedback obtained, it is indeed relevant to find out about participants' pre-existing interests, and support them, in order to increase their uptake of mobile touch screen technology.

Card-sorting Exercise to Establish Pre-existing Interests

Even though the card-sorting exercise ran smoothly in the previous study (Chapter 6), the researcher encountered some difficulties, as the card-sorting exercises did not work according to the plan for the current study. The previous study comprised of four participants in the pilot class and therefore, was a much more manageable size, when compared to the bigger classes of up to eight participants in the current study. It was partly due to some participants being unable to attend either the first week or the fourth week of class sessions and therefore, the researcher was unable to track the changes in participants' pre-existing interests across the four weeks of classes. This exercise was trialled with group one and two, but as soon as the researcher realised that there will be inconsistencies in the data gathering procedure, she immediately ceased running this exercise with the remaining eight groups of participants.

7.3.3. Interest-based Classes

There was no particular curriculum structure developed for these classes. Classes ran based on participants' mobile touch screen usages (Table 7.5), pre-existing interests (Table 7.7) and their requests (Table 7.17). The tailoring of contents has led to very different contents taught across these ten groups, while, some of the contents taught was more popular than others. Classes were, to a certain extent, ad-hoc based. Participants made completely new requests and suggestions. For example, from basic activities such as creating and deleting folders, to more advanced activities such as transferring photographs between devices and backing up data (Table 7.17).

Table 7.17. Activities requested by participants based on individual groups.

Group	Activities Requested
1	Skype, Face-time, emails, sync with other devices (smartphones and laptops)
2	Camera, video camera, camera roll, photo transfers, photo stream, delete photos
3	Downloading photographs from emails attachments, contact lists, photo transfers
4	iCloud, e-books, newspapers, email attachments, organise photos
5	E-books, newspapers, backing up of data, YouTube, iCloud, email
6	Organise photos, online banking, share portfolio, online shopping, ad-blocks
7	iCloud, backing up of data, calendar, online shopping, updating of operating system
8	Bookmarks (web pages), iCloud, online shopping, backing up of data, podcast
9	E-books, pay bills, online shopping, Microsoft Word, search history, iCloud
10	Camera, camera roll, photo transfers, photo stream, Facebook, printing

For example, the majority of participants from group one had children and relations living overseas, therefore their requests were to learn more about communication apps, such as Skype and Face-time, in order to stay in touch with their family and friends. Due to the different time zones, most participants try to keep in touch with their children and relations through emails. Participants from group two requested to learn about photography, which included the use of still camera, video camera and photo gallery. Participants were also interested to acquire skills, such as transferring of photographs from their mobile touch screen tablets, to desktop computers and/or laptops as backups. They also requested to learn about sorting of photographs, such as creating folders, renaming folders and categorising. Some of the participants were committee members of U3As. As their roles include organising meetings and allocating spaces for courses, they requested to learn about Microsoft Word, in order to keep track of meeting minutes and to create newsletters for other members. The researcher went through the basic functionalities with the participants, such as font type, font size, font colour, alignment, insert images and saving of documents (Table 7.18).

Table 7.18. Teaching materials developed for all classes.

	Materials Developed	No. of Pages
1	App categories	3
2	Apple password	4
3	Communications – Skype and Face-time	14
4	iTunes Store	6
5	Travel apps	6
6	Mobile websites and mobile apps	1
7	Apple iCloud	5
8	iPad basics	10
9	Camera roll and photo stream	5
10	Transferring photographs	8
11	Android basics	19

Throughout the 20 weeks’ duration of classes, based on the feedback and participants’ pre-existing interests, the researcher was able to pair pre-existing interests with equivalent apps (Table 7.19). These equivalent apps were based on common usages by participants. For instance, for entertainment, ABC iView, Plus 7, 9 Now, 10 Play and SBS on Demand were chosen. This is because access is usually denied to Australian locals from overseas channels due to copyright issues. As for travel, participants were already familiar with apps such as Google Maps, Google Translate and Trip Advisor.

Throughout the ten classes, a large number of participants were confused with technical terminologies such as data, Wi-Fi, 3G/4G and the different operating systems for mobile touch screen devices (e.g. iOS, Android and Windows). These were discussed on a weekly basis, as different participants raised questions about it. Participants were especially concerned with security and privacy. They were usually worried about home Wi-Fi networks being hacked (piggyback), thus leading to massive bills issued by telecommunication companies. Other concerns also include protecting their tablets against viruses, receiving spam on their email accounts and protecting personal information.

7.3.4. Social Settings and Peers

A peer-supported environment has enabled participants to assist one another's learning pace. According to participants, it is important that they have a non-judgemental environment available, to share similar experiences and discuss coping mechanisms. Participants feel safe knowing that there is support available from their peers. Participants were delighted to help each other and shared their experiences with fellow participants. According to Hazel, one of the participants "*[it was] good to discuss one's concerns, thoughts with others in like age group*." Besides learning, participants exchanged contact details to stay in touch, while socialising over breaks. This is highly encouraged, because as they get older, it gets more difficult for older adults to remain connected to their local communities and to find a sense of belonging. These classes provide opportunities for participants to develop friendship networks, thus, widening their social circle of friends.

Table 7.19. Pairing of pre-existing interests with equivalent apps.

Pre-existing Interests by Categories	Equivalent Apps
Banking	ANZ Bank, Commonwealth Bank, NAB, Westpac
Communications	Messenger, Vibe, LINE, Whatsapp, Skype, Face Time
Cooking	Taste.com, Epicurious Recipes and shopping
Education	TED, brain training, Quiz, ancestry.com
Entertainment	ABC iView, Plus 7, 9 Now, 10 Play, SBS on Demand
Finance	ASX, XE currency converter, CommSec, PayPal, Citibank
Games	Candy Crush, Scrabble, Sudoku, crosswords
Gardening	ABC Gardening Australia
Languages	French, Italian, Spanish, German, Chinese, Japanese
Lifestyle	Gumtree, eBay, Real Estate, Domain
Music	ABC radio, Triple J, ABC Classic, 774 ABC, podcast
Musical instruments	Piano, guitar, drum kit, ukulele
Newspapers	The Guardian, The Daily Telegraph, The Age, Herald Sun, The Australian, The Financial Review, The New York Times
News	ABC iView, 7 news, 9 news, 10 news, SBS news
Photo and Video	YouTube, Pinterest
Productivity	Yahoo mail, Gmail, Hotmail, Microsoft Word, Drop Box, Google Drive, One Drive
Reading	E-books
Searching	Google Chrome, Safari, Mozilla FireFox
Social Media	Facebook, Twitter
Travel	Skyscanner, Expedia, Trip Advisor, Trip Case, Google Translate, Tram Tracker, Public Transport Victoria, Google Maps, Google Earth, Word Lens
Weather	Weather zone, AUS Weather, World Radar Free

7.3.5. Improvement of Guidelines

Based on results triangulated from background demographics, pre, mid and post-study questionnaires, and activities requested by participants in classes, an improvement of the existing guidelines has been achieved.

Building on Participants' Pre-existing Interests and Experience

The pre-existing interests of older adults guided the class curriculum. Throughout the 20-weeks duration, based on feedback from participants, the researcher paired the older adults' pre-existing interests with equivalent apps (Table 7.19). For example, a large number of participants mentioned that they use the camera app frequently, in particular while travelling and at social gatherings. From what they knew, they queried the unused functions available on the camera app. Participants learned that the app has dual functions as camera and video camera. They gained knowledge on adjusting the zoom, on switching between front and back cameras, and also on using the "*take a picture*" or "*record a video*" button. Participants were introduced to unknown additional functions such as panoramic, time-lapse, timer and filters. The objective of the classes was to not only support participants' pre-existing interests, but also to expand on them. Based on feedback from Nolan, the classes provided an opportunity to extend existing knowledge and interests: "*[…] I have widen[ed] my interests because everything is available through the iPad*."

Learning of Basic Tablet Interactions

Participants using desktop computers and laptops were accustomed to input devices such as keyboards and mice. Mobile touch screen devices function in a different way. The input and output components have been amalgamated into a single hardware component, operated through gestures, which older adults were unfamiliar with at the start of these classes. After four weeks of classes, participants were able to acquire basic iPad interaction gestures such as tap, swipe, pinch, zoom and drag, through activities that were developed in the context of real world applications. For instance, one of the participants said:

> "*[…]* v*ery supportive environment with small number of participation giving everyone opportunities to learn*." – Mabel

Another said:

> "*[…] it was covered very well considering the age of the students*." – Agnes

Even though, participants might have different learning speeds, the activities included use of a wide range of apps, that required participants to familiarise themselves with use of basic gestures.

Applying Learnings to a Real World Context

Activities and apps requested by participants tend to be related to their lifestyles and purposes. For example, banks charge customers a nominal fee for request of hardcopy of monthly statements hence older adults have to learn to use online banking in order to download these. Weekly class activities differed between groups, depending on individual choices. For instance, participants took note of costs of airfares, and in their spare time, visited their travel agents to request or match the offer. The task developed is relevant and participants could follow up on it in real life through interactions with their travel agents.

Repetition of Activities

Findings from the current study indicated that a crucial component for learning was the repetition of activities in the classes. In this case, a similar conclusion was derived as Wright (2016) had obtained. Both Wright and the current study found that older adults should be encouraged to practice activities often, so that they remember the steps required to complete particular tasks (Wright, 2016; Beh at al., 2016). Furthermore, this leads to building up of their confidence and enables them to apply what they have learned from classes to real life applications. These include activities such as sending and receiving emails, watching video clips on YouTube and reading articles from newspapers. The repetition of tasks depends greatly on participants' requests. Therefore, activities differ from week to week and also between individual groups.

Purchase Advice

Participants also queried price differences between similar devices, as they were unfamiliar with technical specifications, such as storage capacity, processor chips and connectivity (Wi-Fi only or Wi-Fi and 3G/4G enabled devices). Seven out of eight participants who did not own any mobile touch screen devices, made their purchase either while still attending classes or upon completion of classes. Maurice purchased an iPad after completion. He said "*it has stimulated me to purchase an iPad. Many of my questions have been answered in the class.*" Dave purchased his touch screen device after the second week of class. He pointed out "*it has encouraged me to go ahead with my plan to purchase an iPad*." Aileen went to the Apple Store with her daughter to get an iPad. She brought it with her on the third week of class. She said, "*I feel more confident and interested in having an iPad*."

7.3.6. Guidelines for Running Classes

The model of interest-based class was able to achieve the bridge between the "*Maintained Situational Interest*" phase and the "*Emerging Individual Interest*" phase. The positive feedback indicated that once older adults understand the benefits and purposes of technology, then it increases their uptake of mobile touch screen technology uses (Waycott et al., 2012). The current study was on the evaluation of guidelines for running of classes for older adults to learn mobile touch screen technologies. This initial set of guidelines (Table 6.5) acted as a checklist and has assisted the researcher with the planning and running of classes. This set of guidelines is built on Knowles' *six core adult learning principles* (Table 2.7), while focusing on individuals' needs and their involvement with co-designing of curriculum. At the conclusion of these classes, participants provided very positive feedback (refer to section on Feedback from Post-study Questionnaire). However, the findings have also contributed to revising the initial set of guidelines. It has since been updated and the conclusive version is presented in Table 7.20.

Table 7.20. Guidelines developed for running of classes – final version.

Life-satisfaction	Autonomy	Self-confidence
Purposes	Own devices	Having handouts to refer to
Goals	Decisions on curriculum	Repetitions of activities
Pre-existing interests	Purchase advice	Self-directed use at home
Build on life experiences	Basic tablet interactions	Apply learnings to real-world context

7.3.7. Discussion

7.3.8. Reflecting on the Conceptual and Theoretical Framework

This study has adopted Hidi and Renninger's *Four-Phase Model of Interest Development* for older adults and their learning of mobile touch screen technologies based on their pre-existing interests. However, findings from the Exploratory Study (Chapter 4) indicated the need to expand on the model, because participants did not have prior technological skills and were introduced to a new form of technology – mobile touch screen devices. Hence, they were not in the "*Triggered Situational Interest*" phase and therefore, a "*No Interest*" phase was added into the model. In the Comparative Study (Chapter 5), findings suggested that the current *interest* model could facilitate older adults with their learning of mobile touch screen technologies via a *bridge*. Upon examination of numerous motivational theories and results, the incorporation of the *Self-Determination Theory* (SDT) consisting of *autonomy, competence* and *relatedness* would assist in the transition from situational interest to individual interest. This extended model was labelled as the *Interest-Bridge Model* (Figure 6.19). However, two of the existing elements in SDT did not cater to older adults' requirements for learning of mobile touch screen technologies. This is primarily because older adults have different needs and priorities, when compared to children and younger adults. Additionally, *Socioemotional Selectivity Theory* (SST) was also incorporated into the extended model. Consequently, *autonomy* remained but *competence* was replaced by *life-satisfaction* and *relatedness* by *self-confidence* (Table 6.5). In order to demonstrate and ascertain that the hypothesis on interest transitioning from one phase to the next is achievable within a short timeframe, the Conceptual Phase (Chapter 6) was conducted to trial the teaching concepts, guidelines and tools developed. Subsequently, for the In-Depth Study (Chapter 7), a larger sample size assisted with the refinement of teaching concepts, guidelines and tools developed in the Conceptual Phase. The concept of interest-based learning has helped with the reduction of barriers faced by older adults. These barriers included lack of knowledge, lack of assistance and lack of confidence. Across these four studies, the results from each have answered the sub research questions posed within each individual study. The approach of harnessing older adults' pre-existing interests has also facilitated their learning. Thus, it has ultimately demonstrated that the *Interest-Bridge Model* is able to represent older adults' transition of mobile touch screen technology learning from situational interest to individual interest in a classroom setting. Additionally, *interest* as the main driver, has increased their uptake of mobile touch screen technologies.

Chapter 8.

Discussion and Conclusion

Grow old along with me! The best is yet to be.

Robert Browning (1812-1889)

8.1. Overview

8.1.1. Summary of Findings

This thesis has addressed the interest in the learning of mobile touch screen technologies by older adults, with questions surrounding older adults' uptake of technology usage from several discipline perspectives (information communications technology, psychology, gerontology and education). An overview of the key findings from this thesis, and discussions of its implications, will be further addressed in this chapter. It commences with a review of the research aims, followed by key contributions, recommendations, and future research direction, and closes with concluding comments.

This thesis started by acknowledging that, although *The Four-Phase Model of Interest Development* (Hidi and Renninger, 2006) could support and maintain children and younger adults' learning in a classroom setting, there is an absence of an *interest* framework for older adults to learn mobile touch screen technology. In the Exploratory Study (Chapter 4), participants did not have prior experience with use of information technology, in particular mobile touch screen tablets. Results from the Exploratory Study suggested a necessity to incorporate a "*No Interest*" phase into Hidi and Renninger's existing *interest* framework. Primarily because there will be individuals who have not been exposed to technology, based on their pre-existing interests. Therefore it is suggested here, that the "*No Interest*" phase is lying in a state of dormancy, until it has been triggered either by the environment or by peers via exposure to technology. To a certain extent, the "*No Interest*" phase is considered an unavoidable phase. This could be due to the fact that the study was looking into learning and uptake of technology, and some people's interest has not been triggered yet. Therefore, as technology today has extensively permeated our lives, only a minority of people would now by choice remain in the category of "*No Interest*" in technology. Additionally, older adults might not be as familiar with use of this new technology of touch screens, as their younger counterparts. As a result, the "*No Interest*" (initial phase) has been placed before the "*Triggered Situational Interest*" (phase one) of the existing model.

In the Comparative Study (Chapter 5), four activity classes were observed simultaneously. The technology-based classes comprised of (1) computers and (2) iPads. These classes were run without reference to participants' pre-existing interests.

The interest-based classes consisted of (3) Water-colour painting with iPad and (4) water-colour painting only. Both classes were focused with reference to participants' pre-existing interests – in this case, water-colour painting. As soon as the Comparative Study concluded, the results were compared across the four activity classes. Findings indicated higher uptake of technology by older adults, furthermore, the level of interest could be enhanced when class curriculum focused on older adults' pre-existing interests and use of technology concurrently. Therefore, the presence of interest-based curriculum and self-motivation were essential to maintain and increase older adults' uptake of technology. At this stage, *Self-Determination Theory* (SDT) by Deci and Ryan (1985) was added into the interest framework. It acted as a bridge to link "*Maintained Situational Interest*" (phase two) and "*Emerging Individual Interest*" (phase three). There were three elements in SDT – *autonomy*, *competence* and *relatedness*. Not drifting away from the theories of motivation, Carstensen's *Socioemotional Selectivity Theory* (1992) was selected, as it corresponds with findings from the Comparative Study. This was for the reason that two of the elements in SDT did not relate to older adults' adoption of technology into their lives. Consequently, the study updated SDT for older adults with the following elements – *autonomy*, *self-confidence* and *life-satisfaction*. The *interest* framework was again further expanded and extended and named the *Interest-Bridge Model*. The bridge supports older adults' learning of technologies, transitioning from phase two to phase three. In other words, moving from being affected by external factors to achieving self-directed motivation, thus maintaining their interest in learning of technologies over a longer time span.

The Conceptual Phase (Chapter 6) was based on running of classes with the implementation of a newly created teaching approach, a set of guidelines and trialling of the *Interest-Bridge Model*. In this instance, a small study was conducted to better understand the implementation of the *Interest-Bridge Model* in a classroom setting. A set of unstructured pilot classes were run. These classes were based on a person-centred approach, with an *interest*-based curriculum constructed around participants' pre-existing interests and their weekly requests. Older adults were given full control (autonomy) over the class contents. In other words, they identified their pre-existing interests and this would in turn assist with increasing their uptake and learning of mobile touch screen technology. Subsequently, participants' pre-existing interests were paired with equivalent apps. Participants were able to apply the skills learned in classes to activities outside of the classroom environment.

The final stage of this research consisted of an In-Depth Study (Chapter 7). It was organised to evaluate the *Interest-Bridge Model*, the guidelines for running of classes, and teaching concepts that were focused on a much larger sample of several classes. Class sessions were run based on the newly developed *interest*-based curriculum, which was derived from the promising findings of the pilot study (Chapter 6), where there was no content planned prior to class sessions. Participants had full control (autonomy) over the content of the class curriculum. Older adults pointed out their pre-existing interests and equivalent apps were paired with these. This approach, with participants' pre-existing interests in mind, has also enabled older adults to identify and further explore apps that they would otherwise have been apprehensive to pursue. In general, this study has revealed that learning using *interest*-based curriculum is a novel, effective, feasible and practical channel for engaging older adults in their uptake and learning of mobile touch screen technologies. In conclusion, the *Interest-Bridge Model* supports older adults' transition of *interest* in learning of technology from the situational phase to the individual phase, thus maintaining long-term engagement. Furthermore, the classes support older adults to overcome the challenges they encounter, regarding their level of technical knowledge. As a result, it will help to build up their self-confidence (one of the three main pillars of the bridge element) and allow them to experience the purpose of the technology in order to maintain and explore their pre-existing interests. It can be expected that this also leads to increased life satisfaction.

8.1.2. Addressing the Aims of this Research

At present, there is a lack of an *interest* framework to increase older adults' uptake of mobile touch screen technologies based on their pre-existing interests. The challenge was to develop a better understanding between human interest, motivation and older adults' learning of technology. In the introduction (Chapter 1) of this thesis, five major aims (Figure 8.1) were formulated and these formed the basis of the present research:

1. Explore the concept of human interest and its implications for the learning of technologies (Chapter 2)

2. Extend and expand on *The Four-Phase Model of Interest Development* (Hidi and Renninger, 2006) for older adults (Chapter 4)

Due to the basis of the study, aims three to five were not formulated at the beginning of the study but were subsequently developed based on findings of the earlier study.

3. Develop the *Model* for older adults (Chapter 5)
4. Trial the *Model* for older adults (Chapter 6)
5. Evaluate the *Model* for older adults (Chapter 7)

The present research has assisted in navigating ways towards a better understanding of the uptake of mobile touch screen technologies by older adults. Diagrams of the evolution of models are presented in the following section, in order to provide readers with convenient reference without having to return to Chapter One.

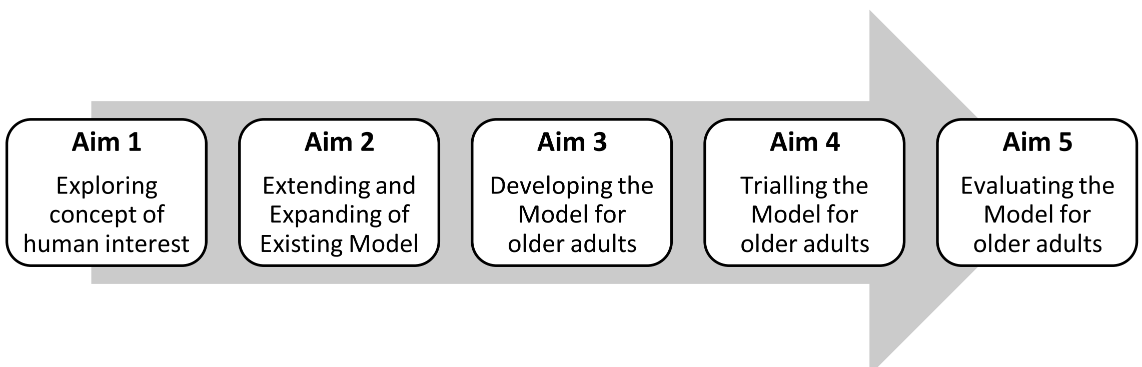


Figure 8.1. The five aims of this research.

Aim One – Exploring the Concept of Human Interest

The stereotype understanding that older adults are not interested and/or motivated to learn the use of technologies and therefore are usually excluded from the digital world formed the basis of this research. The *interest* framework was based on current literature (Chapter 2). In the human lifespan and ageing section, *Theory of the Third Age* by Laslett (1991) and *Theory of Psychosocial Development* by Erikson and Erikson (1987) were explored. This was followed by *Adult Learning Principles* by Knowles (1998) and *Basic Needs for Educational Gerontology* by McClusky (1974) for the lifelong learning section. Psychological theories based on human *interest*, motivation and lifespan were also examined. From the perspective of interest, Hidi and Renninger's

Four-Phase Model of Interest Development (2006) was adopted in this study. This was followed by motivation theory by Deci and Ryan (1985) and the *Self-Determination Theory* by Deci and Ryan (1985). Finally, it was Carstensen's *Socioemotional Selectivity Theory* (1992). These theories formed the main part of the current literature and provided an *interest* framework that laid a foundation and enabled the planning and conducting of the next stage of the research.

Aim Two – Extending and Expanding the Existing Model

There were two sub research questions posed in the Exploratory Study (Chapter 4) that helped with addressing the overall research question. They were:

- **SRQ1.1** – How can engaging older adults' interests influence and support their uptake of mobile touch screen technologies?
- **SRQ1.2** – What are the most effective approaches to encourage older adults to adopt and maintain technology use?

The Exploratory Study involved a group of 32 older adults who had no prior experience with use of information technology, in particular mobile touch screen technologies. The aim was to introduce a new device into their lives. However, as the researcher built up rapport through conversations and found out about their pre-existing interests in general, then, participants started to embrace technology one step at a time. The next stage was to harness and explore participants' pre-existing interests, and to find out how older adults' pre-existing interests could help with their learning of a new device. The researcher encountered a few challenges while conducting this study. Primarily, participants did not have prior experience or knowledge of the use of mobile touch screen tablets. Thus, they were anxious in the beginning with use of the iPads. At the same time, with Italian participants, challenges included illiteracy and problems in speaking and reading of English. Besides the lack of English literacy, Italian participants also struggled to read in their native language (Italian and regional dialects) as the majority of them had completed their early education up to the equivalent of year three or four. Fortunately, staff members were on-site to assist. Thereafter, findings from interviews with teachers helped to identify strategies for teaching and learning. Additionally, strategic approaches were identified for addressing the learning impediments faced by older adults with uptake of technologies. Consequently, the findings from this study led to the extension of the *Four-Phase Model of Interest Development* by Hidi and Renninger (2006) – refer to Figure 8.2.

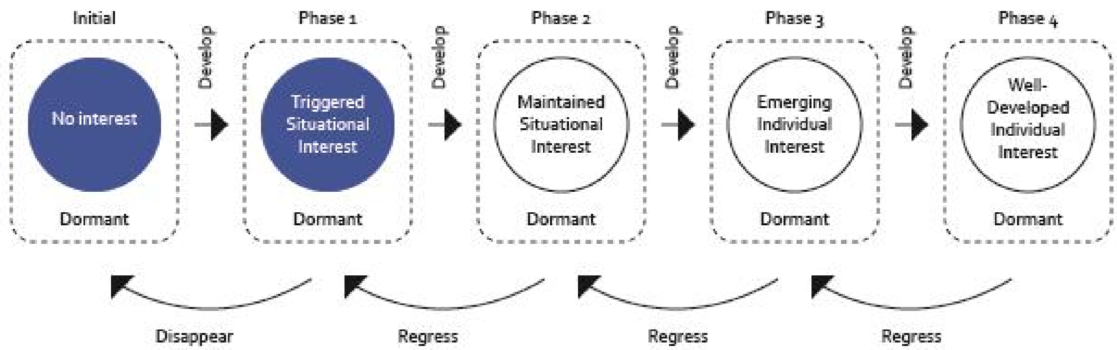


Figure 8.2. Extending "*No Interest*" phase to the Four-Phase Model of Interest Development.

Aim Three – Developing the Model

In the Comparative Study (Chapter 5), one sub research question was put forward to find out approaches to how the *interest* framework could be implemented into real-life settings. The question was:

- **SRQ2.1** – How can the *Four-Phase Model of Interest Development* be applied to explore the relationship between pre-existing interests and learning of technology by older adults?

The researcher needed to observe existing activity classes and learn whether there were any differences between participants' level of *interest*. Therefore, a collaboration with the local community centre and U3A was formed. Data was gathered across four activity classes with 35 participants, for instance technology-based (computers and iPads) only class, *interest*-based class (water-colour painting) and *interest*-based technology class (water-colour painting with iPad class). After having completed study one (chapter 4), I observed four activity classes in order to explore the relationship between participants' pre-existing *interests* and *interest* in technology. Furthermore, wanted to explore participants' interest development moving from "Triggered Situational Interest" to "Maintained Situational Interest" (Figure 8.3).

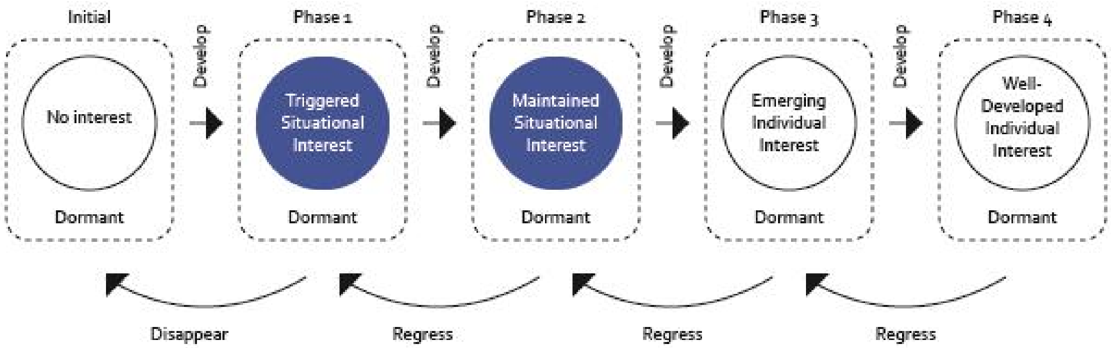


Figure 8.3. Moving from "*Triggered Situational Interest*" to "*Maintained Situational Interest*".

The results from this study have shown that participants from the classes that focused on *interest*-based activities displayed a higher level of *interest* in technology uptake, when compared with participants in the technology-based classes. Participants from interest-based activity classes showed positive attitudes towards the uptake of technology compared to those from technology-based activity classes only. For example, in the interest-based only classes, older adults used their iPads to take photographs of landscapes that they could use as point of reference in their weekly water-colour painting classes. In the *interest* and technology-based classes (water-colour painting classes), older adults painted using different media learned throughout their classes and could email their works to their family and friends via email.

Results from both the Exploratory Study and the Comparative Study guided the researcher towards literature on the topic of human motivation (Chapter 2). After looking through several models on motivation, the *Self-Determination Theory* by Deci and Ryan (1985) was the most applicable to the current study.

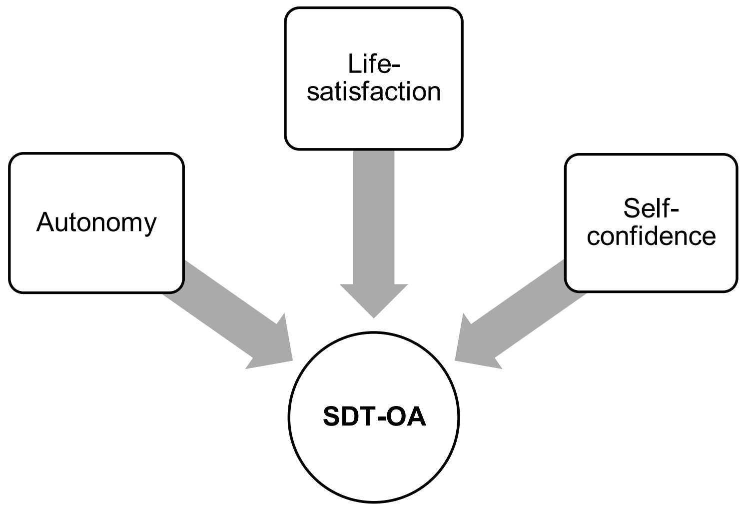


Figure 8.4. Elements for Self-Determination Theory for Older Adults.

Deci and Ryan's model was commonly employed for studies associated with education from early childhood to higher education, and workplaces for younger adults. Based on the data gathered from this research and in addition to Carstensen's *Socioemotional Selectivity Theory* (SST) (1992), two out of three elements in the existing SDT were unsuitable for older adults. They were *competence* and *relatedness*. Therefore, a *Self-Determination Theory for Older Adults* (SDT-OA) would consist of *autonomy*, *life-satisfaction* and *self-confidence* (Figure 8.4). Subsequently, this led to the extension and expansion of the existing *interest* framework to become the *Interest-Bridge Model* (Beh et al., 2015) – refer to Figure 8.6. Subsequently, the interviews with eight teachers were pivotal contributions towards this study. The qualitative analysis formed the basis of the key concepts for teaching older adults technology. The emergence of the *Interest-Bridge Model* then advanced the current study, with the trialling of the model through running of pilot classes.

Aim Four – Trialling the Model

In the Conceptual Phase (Chapter 6), the study was looking to explore the transition from "*Maintained Situational Interest*" (phase two) to "*Emerging Individual Interest*" (phase three) – refer to Figure 8.5. At the same time, the Conceptual Phase with a pilot class would assist with the trialling of the *Interest-Bridge Model,* and developing a set of guidelines and teaching concepts. Hence, a sub research question was posed to assist with this study.

- **SRQ3.1** – How can the *Interest-Bridge Model* assist the transition from "*Maintained Situational Interest*" (phase two) to "*Emerging Individual Interest*" (phase three) of the *Four-Phase Model of Interest Development*?

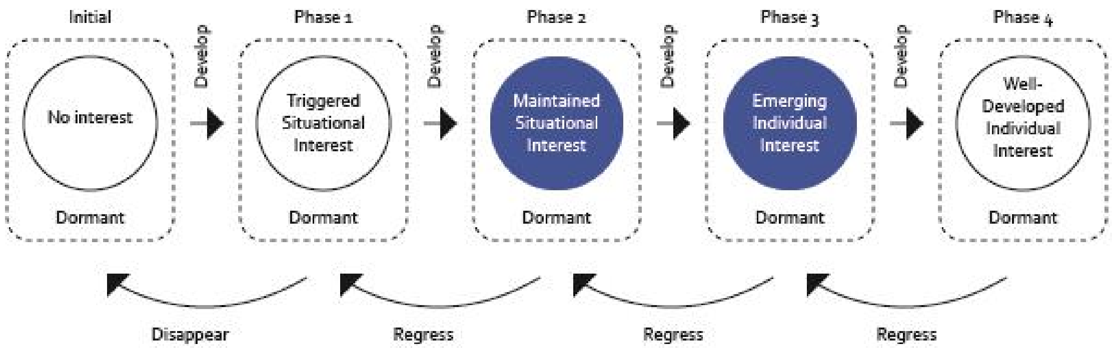


Figure 8.5. Moving from "*Maintained Situational Interest*" to "*Emerging Individual Interest*".

This study creates a practical approach for teaching technology to older adults based on the *Interest-Bridge Model*. This model was formulated from findings derived through previous studies (Chapter 4 and Chapter 5). The elements of *autonomy*, *life-satisfaction* and *self-confidence* in the bridge assisted with the transition from *situational interest* to *individual interest* for older adults' uptake of technology. Classes had a curriculum structure based on participants' pre-existing interests and their requests. This format established a person-centred approach, where participants were involved in the co-designing of class curriculum. During the planning phase of the classes, some issues were identified, such as class size and duration, as well as individual difficulties encountered by participants, such as health, prior commitments, public transport and parking. For the next stage of the study, the researcher tried to anticipate the unavoidable issues and variables of working with people in real-life situations. The feedback provided by the participants was invaluable. They were fond of the novel idea of curriculum based on their pre-existing interests and the option to revisit content many times. At the completion of the Conceptual Phase, the *Interest-Bridge Model*, the set of guidelines and the teaching concepts were refined, based on the feedback provided. Following this, the developed set of guidelines for running classes with an interest-based curriculum for older adults was put together. Plans for the next study were to evaluate the model, the set of guidelines and the teaching concepts, through running of classes with a larger sample size.

Aim Five – Evaluating the Model

For the In-Depth Study (Chapter 7), the sub research question was similar to the sub research question posed in the previous study (Chapter 6). However, at this stage, this study focused on evaluating the *Interest-Bridge Model*, set of guidelines and teaching concepts which were only piloted before the In-Depth Study. Therefore, the sub research question has been slightly modified:

- **SRQ4.1** – How can the *Interest-Bridge Model* assist the transition from "*Maintained Situational Interest*" (phase two) to "*Emerging Individual Interest*" (phase three) of the *Four-Phase Model of Interest Development*?

A similar study, but with a larger sample size was planned. There were 60 participants who took part across ten class sessions. As anticipated in the previous study (Chapter 6), some participants encountered issues related to health, family, prior commitments, public transportation and so on. Similarly, participants in this study were not expecting to have full autonomy of the contents of the workshop curriculum. They thought it was a novel concept and were very enthusiastic about it. The format for this study was similar to the previous study (Chapter 6), where participants were involved in the co-designing of a class curriculum, incorporating a person-centred approach. Analysing the data gathered, the requests of curriculum from individual groups were quite different. Groups that have participants that are semi-retired or volunteering with organisations, tend to have requests on productivity. Participants in groups that have interests in travelling leaned towards requests on travel. From the above examples, it shows the relevance of experiencing applications of technological skills in real life situations, which are therefore serving a purpose for the participants.

The *autonomy* component of the bridge provided participants with the choice to decide on the class curriculum. As older adults learn skills required to operate a mobile touch screen tablet, it enabled them to find the relevance between technologies and their lifestyles, thus achieving *life-satisfaction* for individuals. *Self-confidence* is attained when participants have materials handed out to them as a point of reference. This enabled them to continue their learning outside of classes and without being dependent on their children and/or grandchildren for help. In addition, the repetition of activities and tools will encourage self-directed use of technologies at home. The key findings from this study have shown that when participants' pre-existing interests, requests and common usages were paired with equivalent apps, it subsequently leads to a higher uptake of mobile touch screen technologies amongst older adults. A sub-component that derived from the study was social settings and peers. Participants enjoyed classes attended with their peers. Besides, sharing of similar experiences about technology and its barriers, they also discussed coping mechanisms. Furthermore, opportunities were provided to widen their social circle.

Common teaching and learning approaches, such as learning from children and grandchildren, were not considered as ideal, because they usually lack the patience. Participants were thus encouraged to bring along technical questions that they had encountered while outside of workshop sessions. This sharing of problems, in a non-judgemental learning environment, helped participants to learn from and also support each other. It also helped to keep participants up-to-date with troubleshooting skills. Participants were apprehensive with a new device, so were not adventurous with exploring of functions and available uses. Therefore, the researcher would take them on a journey by creating awareness. This was accomplished through introduction of functions, such as Calendar, General Settings, Clock and App Store, to participants. As there are a large number of apps available on the market, participants had no idea from which direction to approach these. Through listening in on their conversations with each other and taking part in their conversations, the researcher was able to get initial insights into their pre-existing interests and background. From this approach, participants were introduced to new apps, while their pre-existing interests were paired with equivalent apps. These examples were about helping older adults to make the right choices and were based on their pre-existing interests. The findings revealed that participants' attitudes towards technology across the duration of the classes, firstly increased at a steady rate and then showed a slight decline. However, they asked to be notified regarding similar future classes. Besides, widening of their technological skills and knowledge, participants enjoyed the socialising aspect. They chatted about their lives, pre-existing interests and families. At the conclusion of these classes, the model (Figure 8.6), set of guidelines and teaching concepts were evaluated.

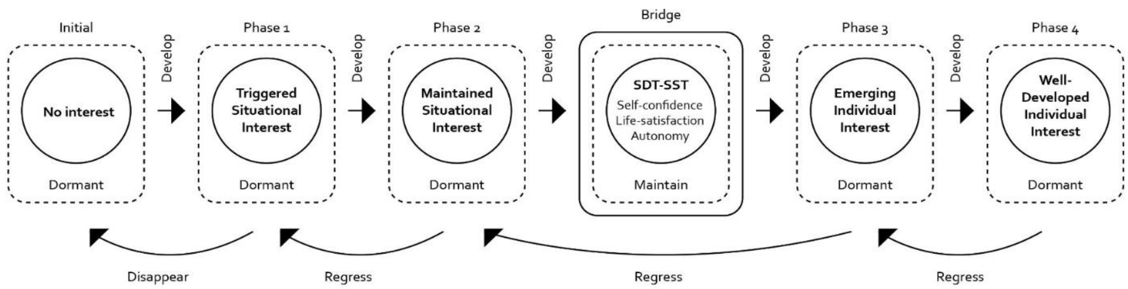


Figure 8.6. Interest-Bridge Model – final version.

In conclusion, human *interest* is the main focus of this research and this study has helped to answer the following overall research question of "*how can individual interest engender and maintain interest in technology use in older adults*?" The next section focuses on the contribution of the present research towards literature and knowledge.

8.2. Contributions to Literature, Method and Practice

Taking into consideration the entirety that was previously discussed, the contribution of the present research is summarised into contributions to literature, method and practice, that comprised of the application of non-traditional action research methodology with a Living Lab approach, followed by the Interest-Bridge Model, guidelines and teaching concepts. Non-traditional Action Research methodology and a Living Lab approach were employed in both the trialling stage (Chapter 6) and evaluating stage (Chapter 7) of this research. Participants were highly involved in the development of their class curriculum, as it was based on their pre-existing interests and also on their individual requests. It provided them with the autonomy to make their own decisions. For instance, they decided on what they would like to learn, what they were interested to learn and how they could create an enjoyable learning atmosphere at the same time.

The *Interest-Bridge Mode*l was a conceptual framework that expanded and extended upon the works of Hidi and Renninger's *Four-Phase Model of Interest Development* (2006). This was in order to facilitate older adults' learning of technologies and maintain their uptake. Their learning transitioned from being influenced by external factors to being controlled by individuals. A conceptual model was developed of the four different phases and the bridge to facilitate older adults' learning of technologies and maintain their uptake. The *Interest-Bridge model* (Figure 8.6) was built on the foundation of Hidi and Renninger's *Four-Phase Model of Interest Development* (2006), Deci and Ryan's *Self-Determination Theory* (SDT) and Carstensen's *Socioemotional Selectivity Theory* (SST) (1992). An *interest* model has been established to assist with the running of classes for older adults to learn technology, based on their pre-existing interests and the autonomy to design their own curriculum developed from individual requests. The results were obtained from both qualitative and quantitative methods, through the employment of the *Interest-Bridge Model* (Figure 8.6) in the context of an actual classroom setting. The guidelines developed, reflect on the work of Knowles' *six core adult learning principles* (Table 8.1). These principles are based on a truly individual approach, which with the increasing recognition of person-centredness, is of immense relevance. This set of principles is particularly significant for older adults' uptake and learning of technology, where the focus is on the individuals' needs. Both the set of guidelines and teaching concepts were refined and employed in the running of classes for older adults to learn mobile touch screen technology.

Table 8.1. Six core adult learning principles.

No.	Learning Principles
1	Learner's need to know
2	Self-concept of the learner
3	Prior experience of the learner
4	Readiness to learn
5	Orientation to learning
6	Motivation to learn

Source: Knowles, 1998.

8.3. Recommendations

Experiences of face-to-face engagement with older adults, and their quest to increase knowledge about technology learning, is an ever growing field for more research and innovation to take place. Throughout the course of this present research, a few recommendations became evident. In this section, some of the possible recommendations are presented.

8.3.1. Overall Considerations for Future Research on this Theme

For future research on this theme, the researcher would like to invite participants from the In-Depth Study (Chapter 7) back, to investigate and find out whether there is ongoing *interest* in the usage of technology, and whether their pre-existing interests have been enhanced by the ongoing use of technology after attending the class sessions. This will provide a more detailed insight into whether the *interest*-based curriculum is sustainable in the long run, after the participants have left these classes. The researcher would also like to encourage the adoption of the current approach by others to run similar classes, and further explore whether the learning and uptake of technology is sustained in the long run via this approach based on participants' pre-existing interests.

8.3.2. Specific Activity Groups and Gender Balance

There could be consideration of future collaborations with organisations such as U3As and local community centres, to run workshops and trial *interest*-based curriculum for specific activity groups. There are some pre-existing interests which rely on an activity group for facilitation, for instance, book clubs, as they consist of reading of particular books at home and followed by social engagement and sharing of responses. Then, there are some pre-existing interests that could tend to be gender specific, for example, men's shed and women's knitting groups. These groups already contain a shared focus area of pre-existing interest, and could benefit from an introduction of mobile touch screen technology appropriate for their specific needs. Here the knowledge acquired is being applied into a real-world context.

There is also a need for a more homogenous pool of older adults, in terms of gender balance, to participate in the study. Across the four studies, there was a much greater number of female participants compared to their male counterparts – at least three times or more. As the study was conducted in natural settings in collaborations with local organisations or through recruitments, it would not have been appropriate to deny anyone the opportunity of participating in these activity classes. Reasons for this imbalance of gender were not investigated, but it may be because women have a longer average lifespan, or a greater desire to take up the opportunity to engage with these technologies. Future studies might make a concerted effort to explore this imbalance and include more male participants.

8.3.3. Hand Gestures and Dexterity, Symbols, and Interface Updates

During the classes, there were some issues raised by older adults and supported by the researcher's observations. Firstly, for instance, the use of hand gestures. Older adults were accustomed to the use of keyboard and mouse input, therefore they had difficulties with the navigation of a touch screen tablet and hand movements required. Another reason could be, as human ages, the level of dexterity usually decreases, the skin dries out more, and therefore the touch function is less sensitive. Secondly, the participants were confused with interpretations of symbols. Even though older adults have used all sort of symbols, for example, road signs, the recognition of symbols did not come naturally to them in the world of information technology. For example, a shopping cart is associated with checking out, but data gathered has shown otherwise. Lastly, interfaces of websites and apps change on a regular basis, therefore participants stated that it is a challenge that they find most difficult to overcome. As soon as they get used to an interface, it updates to another without any prior notification from companies. Consequently, they have to learn this all over again. These problems could be resolved through teaching of basic tablet gestures, providing explanations of symbols and icons and encouraging older adults to keep practising, so that their capacity to adapt increases.

8.3.4. Technologies and Devices

Participants were unsure about the type of devices they owned – mainly between iPad and Android tablets, thus leading to a mixture of devices being used in individual classes. Both devices function differently, especially with Android tablets, whereby the interfaces and icons differ from one brand to the next. In order to assure time is well spent on learning, it is recommended that classes should be split into two categories – Apple iPad and Android. This would enable the teacher to concentrate on providing quality time focused on the participants. Consistent explanations, demonstrations and question and answer sessions could be given, according to the specific requirements of these devices. Apple Inc. has been allocating enormous funds for marketing and advertising their range of iPad products. The word *iPad* has become a household name so that some older adults would also use it to refer to Android devices. Some students used the word *iPad* as a generic term for any tablet and would turn up to classes with an Android device. Therefore, a flyer could be distributed to future participants explaining the differences between an iPad and Android devices, to assist their decision-making before commencement of classes. In the planning stage, it was indicated that the study would only focus on older adults who owned and/or were interested in the learning of iPad. As most classes held in local community centres cater towards iPad owners, the researcher did not anticipate the significant response from Android users, which occurred. This indicated that Android owners felt left out and there is definitely a market for them, when considering the planning and running of future classes.

8.4. Concluding Comments

As life expectancy continues to increase, the quality of life does not necessarily increase at the same rate. Increased life expectancy could equate to people living in ill health for a longer period of time, however, as science and technology continue to advance, *adding years to life* could be achieved by the compression of morbidity, whereby ill health is concentrated in the last few years of the human lifespan (Ismail et al., 2016). In simple terms, we are getting a longer timespan for our *third age*. So, the period of ageing is seen as an opportunity for older adults to pursue new interests to challenge themselves and learn new skills. However, the low uptake of technology amongst older adults is causing concerns within government and local organisations. Reports have shown that older adults are slower in the adoption of technology when compared to their younger counterparts. The digital gap among this cohort is widening as they get older. Even though technology has been claimed to support many of our daily activities and has been promised to "*make our lives easier*", in fact it has not done so for everyone. Many older adults are feeling frustrated, as they are constantly trying to keep up with the emergence of new technologies.

This thesis has examined older adults' pre-existing interests, and approaches by which they could be harnessed to support their learning and uptake of mobile touch screen technologies. This cohort has provided insights into barriers they have encountered with adoption of technology. They volunteered and persevered through learning of basic tablet interactions and applying the learning in real world contexts. Their self-empowerment and engagement with their interests has widened, because of their willingness to embrace technology into their everyday lives. By applying their thirst for knowledge to learning about technology, through their pre-existing interests, they have obtained greater autonomy, self-confidence and life-satisfaction.

This thesis set out to extend and expand on an existing *interest* framework of the *Four-Phase Model of Interest Development* by Hidi and Renninger (2006) and has achieved its aims and goals with assistance from Deci and Ryan's *Self-Determination Theory* (1985) and Carstensen's *Socioemotional Selectivity Theory* (1992). The outcome was the *Interest-Bridge Model* (Figure 8.6), a set of guidelines, and teaching concepts for running classes with older adults. The end result presented the implementation of an *interest*-based curriculum as a novel learning technique for older adults to take up mobile touch screen technologies. Simultaneously, assuring that the activities designed and developed in class sessions were associated with participants' pre-existing interests that could be incorporated into their everyday lives.

In closing, the existing *interest* model by Hidi and Renninger (2006) catered towards children and younger adults in the school environment. This research has contributed towards the extension and expansion of the existing *interest* model for older adults, to support their learning and uptake of technology and in this case, mobile touch screen technologies. The skills that older adults obtain through attending these classes would assist with building up their technological knowledge and self-confidence, thus, leading them towards the full use of and engagement with the range of products and services that should be available to everyone regardless of their age group.

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List of Publications

During her PhD candidature, the researcher has written a list of the following publications across a range of categories – book chapter, journal articles, reviewed conference papers, conference abstracts, workshop papers, doctoral consortium and poster presentations.

Book Chapter

Beh, J., Mascitelli, B. and Pedell, S. (2018). Encouraging social inclusion for older adults through "interest"-led technology use. Mental health policy, practice and service accessibility in contemporary society.

Journal Articles

Beh, J., Pedell, S. and Mascitelli, B. (2018). Achieving digital inclusion of older adults through interest-based curriculums. Journal of Community Informatics, Special Issue in Designing Participation for the Digital Fringe.

Beh, J., Pedell, S. and Doubé, W. (2016). Where is the 'I' in iPad? International Society for Gerontechnology (ISG), vol.15, no.30s. Nice, France.

Reviewed Conference Papers

Beh, J. and Pedell, S. (2017). When interest pays off: The relationship between motivation, wellbeing and learning of technologies by older adults. Design 4 Health. Fourth International Design4Health Conference. 4th to 7th December 2017. Melbourne, Victoria, Australia.

Beh, J., Pedell, S. and Doubé, W. (2016). Evaluation of interest-bridge model: Older adults meditated learning of mobile technology. Published in proceeding OzCHI'16 Proceedings of the Annual Meeting of the Australian Special Interest Group for Computer Human Interaction, pp.293-301. Connected Futures, 29th November to 2nd December 2016. Launceston, Tasmania, Australia. DOI > 10.1145/3010915.3010943

Beh, J., Pedell, S. and Doubé, W. (2015). Where is the 'I' in iPad?: The role of older adults' interest in learning mobile touch screen technologies. Published in proceeding OzCHI'15 Proceedings of the Annual Meeting of the Australian Special Interest Group for Computer Human Interaction, pp.437-445. Being Human, 7th to 10th December 2015. Melbourne, Victoria, Australia. DOI > https://doi.org/10.1145/2838739.2838776

Conference Abstracts

Beh, J. (2017). When interest pays off: the relationship between motivation and the learning of mobile touch screen technologies by older adults. Swinburne University of Technology. Constructing Futures. 1st of November 2017. Melbourne, Victoria, Australia.

Beh, J. (2017). When interest pays off: the relationship between motivation and the learning of mobile touch screen technologies by older adults. Swinburne University of Technology. Swinburne Celebrates Research Conference. 22nd to 23rd of June 2017. Melbourne, Victoria, Australia. – won in category for best PhD presentation.

Beh, J. (2016). The learning of mobile touch screen technologies by older adults, starts with an interest. Swinburne University of Technology. Engaging Publics. 2nd November. Melbourne, Victoria, Australia.

Beh, J., Doubé, W. and Pedell, S. (2016). Bridging interest and learning of mobile touch screen technologies for older adults. 15th National Conference of Emerging Researchers in Ageing (ERA). Pathways to Ageing Well. The Australian National University. 31st October to 1st November 2016. Canberra, ACT, Australia.

Beh, J. (2015). Interest in the learning of mobile touch screen technologies by older adults. Swinburne University of Technology. Critical Encounters. 1st of November. Melbourne, Victoria, Australia. – won 2nd place in the category for best article

Workshop Papers

Beh, J. (2016). When interest pays off: The relationship between motivation and the learning of mobile technologies by older adults. Annual Meeting of the Australian Special Interest Group for Computer Human Interaction. Connected Futures, 29th November to 2nd December 2016. Launceston, Tasmania, Australia.

Beh, J. (2013). Interest in the learning of mobile touchscreen technologies by older adults. Annual Meeting of the Australian Special Interest Group for Computer Human Interaction. Augmentation, Application, Innovation, Collaboration, 25th to 29th November 2013. Adelaide, South Australia, Australia.

Doctoral Consortium

Beh, J. (2015). Where is the “I” in iPad? The role of older adults’ interest in learning mobile touch screen technologies. Annual Meeting of the Australian Special Interest Group for Computer Human Interaction. Being Human, 7th to 10th December 2015. Melbourne, Victoria, Australia.

Beh, J. (2014). Interest in the learning of mobile touch screen technologies by older adults. Annual Meeting of the Australian Special Interest Group for Computer Human Interaction. Designing Futures: The Future of Design. 2nd to 5th of December. Sydney, New South Wales, Australia.

Poster Presentations

Beh, J. (2017). Interest in the learning of mobile touch screen technologies for older adults. Swinburne Celebrates Research Conference. 22nd to 23rd of June 2017. Melbourne, Victoria, Australia. – won 2nd place in the category for best PhD poster presentation

Beh, J. (2013). Interest in the learning of touch technologies by older adults. Australian Council for Educational Research (ACER). How the brain learns: What lessons are there for teaching? 4th to 6th August 2013. Melbourne, Victoria, Australia.

Appendix A.

A1. Ethics Approval

From: [redacted]
Sent: Tuesday, 7 January 2014 2:38 PM
To: Wendy Doube; Jeanie Beh
Cc: RES Ethics
Subject: SUHREC 2013/306 Ethics clearance

Dear Wendy and Jeanie,
SUHREC 2013/306 Interest in the learning of touch screen technologies by older adults

Dr W Doube Ms J Beh FLSS

Approved duration: 07/01/2014 To 07/01/2015

I refer to the ethical review of the above project protocol undertaken on behalf of Swinburne's Human Research Ethics Committee (SUHREC) by SUHREC Subcommittee (SHESC1) at a meeting held on 17 December 2013. Your response to the review as e-mailed on the 23 December was reviewed by a SHESC1 delegate.

I am pleased to advise that, as submitted to date, the project may proceed in line with standard on-going ethics clearance conditions here outlined.

- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the current *National Statement on Ethical Conduct in Human Research* and with respect to secure data use, retention and disposal.

- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor requires timely notification and SUHREC endorsement.

- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/ clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants and any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.

- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project.

- A duly authorised external or internal audit of the project may be undertaken at any time.

Please contact the Research Ethics Office if you have any queries about on-going ethics clearance. The SUHREC project number should be quoted in communication. Chief Investigators/Supervisors and Student Researchers should retain a copy of this email as part of project record-keeping.

Best wishes for project.

Yours sincerely,

[redacted]

[redacted]

[redacted]

[redacted]

Swinburne University of Technology

A2. Generic Interview Questions for Participants

1. What do you like to be referred to as? E.g. older adults, seniors, elderly etc
2. What do you think is important about life-long learning?
3. What would you like to achieve from this workshop?
4. What are your short-terms goals? Weekly goal
5. What is/are your long-term goals? At the end of 4 weeks
6. Do you see any opportunities for use of technology in your everyday life?
7. Are there any likes and dislikes of technology? Stories to share with us
8. Are there any difficulties that you have encountered and would like to share with us?
9. What do you use technology for? How often do you use technology?

A3. Sample of Participant Interview Transcript

Interviewer: Could you give me some feedback on the last three weeks of the workshop that we did on the tablets?

Respondent 1: What I think for me that helped me overcome a little, my fear of anything new because you allowed me play with yours, gave me confidence to go and buy one because otherwise it is just another piece of technology that I wasn't using and I have a long way to go but at least I have taken my first few steps (laughter).

Respondent 3: Over the time I have learned a little bit. Things like turning off Wi-Fi. The other one is worrying about… Concern was I got an enormous bill at one stage $220 but and I haven't been using the phone and the thing has been downloading stuff obviously which… that I was unaware of and you were able to explain a little bit in the early in first lesson anyway and what was happening then and showed me how to disconnect.

Interviewer: Do you think the tablet fit into your everyday life?

Respondent 1: In time. We hope it will. I'm sure once I have the course a few times while you are around I'll be fine. Like finding the text this morning and I knew it should be but (laughter) I haven't switch it on (laughter) oh dear.

Interviewer: Will you agree or disagree if you will feel more confident after practice?

Respondent 1: Yes.

Respondent 3: Yes. I think it's trying to memorise all the applications that you can do anyway because you flip and turn it over and which one do I use. There are so many and you see a whole screen full of different things and think what that is for and you are scared to use it.

Respondent 1: Yes.

Respondent 2: I found that when I come across problems I just close off because I'm on my own and I just forget about it and so I never do it. They have to be around at the time otherwise I forget about it.

Respondent 1: I'm very pleased that I can start using the tablet now. I have moved into the present century (laughter).

A4. Generic Interview Questions for Teachers

1. Would you provide a bit of background about the work you have done and your years of experience in this field?

2. When you say older adults, when do you think that usually begins, as in age range?

3. What are the reasons that older adults come to your class?

4. What are the reasons that older adults want to learn how to use technology?

5. What do you think older adults want to achieve through learning how to use technology?

6. How do you think that technology can support older adults' interests?

7. How do you know if your students are engaged in a particular activity and how do you keep them engaged or interested? Is there any example?

8. What is your key(s) to teaching older adults? What learning and/or teaching methods have you implemented in the course?

9. Are there any specific ways with teaching older adults? Do you have any particular methods that you follow or is it based on your experience?

10. What difficulties have you encountered with teaching older adults?

11. What difficulties have older adults encountered with technology compared to their younger generation?

12. How do you get feedback from older adults about how they are able to integrate technology into their lives?

13. What do you think is important about lifelong learning?

14. What are the areas in which older adults are most interested to learn?

A5. Sample of Teacher Interview Transcript

Interviewer: How do you know if you're students engage in a particular activity and how do you keep them engaged? Is there any example?

Respondent: The activity I'm assuming you mean not I.T related, but just a general activity? Certainly, it's not a question we ask on students' application forms or enrolment forms, you know, what are your interests? Those interests, as far as my experience is concerned, you learn about peoples interests simply by interacting with them, listening to conversations the students have between each other. And then you discover what their interests are by what you see them searching on the net, what you seem them choosing as topics to look at when there's available time for them to do internet research. But certainly we don't ask for peoples interests, it's something that you as a tutor gleam through being around the students or observing what it is that they're using the technology to investigate and explore.

Interviewer: How do you think that technology can support their interests?

Respondent: I think technology is a wonderful way for people to build on their knowledge, search far and wide for information and support what it is that their interests are by linking them with groups, organisations and other people who share a common interest. I'm not sure if, in the classrooms nowadays in our organisation Pinterest is something that is taught, but that certainly would be a way of people exploring connections associated with their own interests. And I'm not sure if I've answered your question?

Interviewer: Do you get feedback from students about how they're able to integrate technology into their lives?

Respondent: Again yes, through discussion of whether some students only use the computer when they're actually in the computer classrooms, or whether or not they have the facility to go home… majority of the students that we have, have their own technology at home and so then have the opportunity to follow it up at home. Some lack confidence in exploring too much unsupervised despite lesson for many years, some still lack that confidence and it could be because of the language barrier, because their English is not their first language, or just simply confidence. But the majority of those students in the years that I've taught them, practice, go home, utilise their skills that they've been taught and then come back and question and clarify issues that they have. So, use of technology goes beyond the classroom, yes and certainly I imagine people with iPads would be using them on a very regular basis because they're a portable device.

A6. Background Demographics Questionnaire

Q1. What is your gender?

Q2. What is your age in years?

Q3. What is your highest educational level?

Q4. What is your post code?

Q5. What is your current occupation?

Q6. What was your previous occupation? (If any different from current)

Q7. What is your country of origin?

Q8. What is/are the language(s) spoken at home?

Q9. When your hear the words "*older adults*", at what stage and/or point would you say that usually begins?

Q10. Please rate your dexterity – ability to use your hands and fingers

Q11. Please rate your eyesight

Q12. Please rate your memory

Q13. Please add any comments about your health, memory and mobility (optional)

Q14. What are your main interests and/or hobbies? (Please enter at least three)

Q15. What would you least likely to be interested in? (Please enter at least three)

Q16. Do you use a computer and/or laptop?

Q17. Do you have an email account?

Q18. Do you own an iPad or other touch screen devices?

Q19. How long have you owned an iPad or other mobile touch screen devices?

Q20. Did you purchase your iPad or mobile touch screen device for yourself?

Q21. Who got you your iPad or mobile touch screen device?

Q22. Why did you (or they) decide to purchase an iPad of mobile touch screen device?

Q23. What are your three most common usages of the iPad or mobile touch screen device? (For example – email, internet, books, music, video, etc.)

Q24. Is there anyone available to help you use an iPad or mobile touch screen device?

Q25. The place where you receive assistance with use of iPad or mobile touch screen device?

Q26. How often do you receive assistance with use of iPad or mobile touch screen device?

Q27. Do you own a smartphone? (Touch screen like an iPhone, Samsung, HTC etc.)

Q28. How long have you owned your smartphone?

Q29. What are your three most common usages of your smartphone? (For example – email, internet, books, music, video etc.)

Q30. What would interest or motivate you to continue with use of technology like laptop, iPad or smartphone in the future?

Q31. Do you attend any other classes and/or courses?

Q32. What are the main difficulties you have encountered with use of technology, such as computer or smartphone or tablet device?

A7. Sample of Class Materials Developed

Transfer Photographs from iPad and/or Android to Computer and/or Laptop

<u>FOR IPAD TO COMPUTER</u>

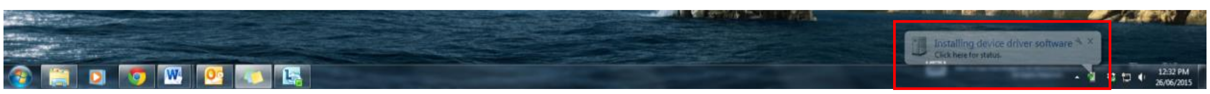
1. Connect your iPad. Plug **Lightning connector** to your **iPad**, plug **USB** end into any available **USB port** on your **PC**.

<u>FOR ANDROID TO COMPUTER</u>

1. Connect your Android. Plug **USB connector** to your **tablet**, plug **USB** end into any available **USB port** on your **PC**.

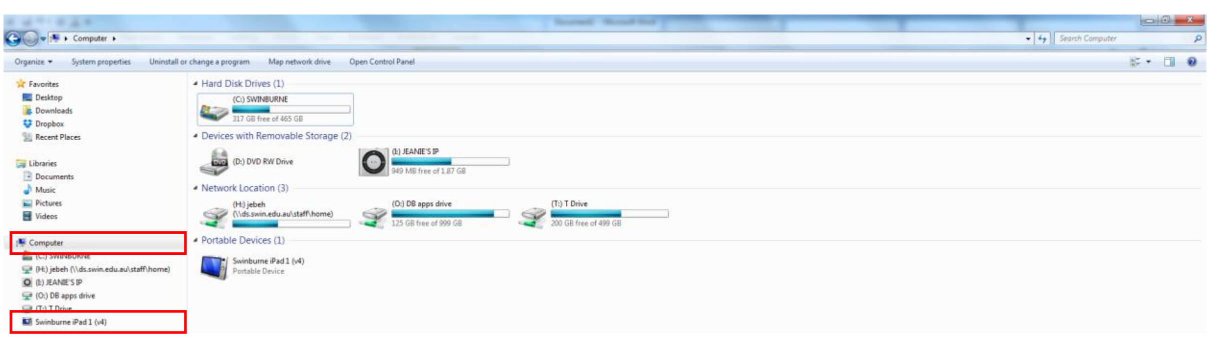
<u>NOTIFICATIONS</u>

2. After your iPad or Android is connected to your PC, a notification is shown on bottom right of screen displays a message “**Installing device driver software**”.

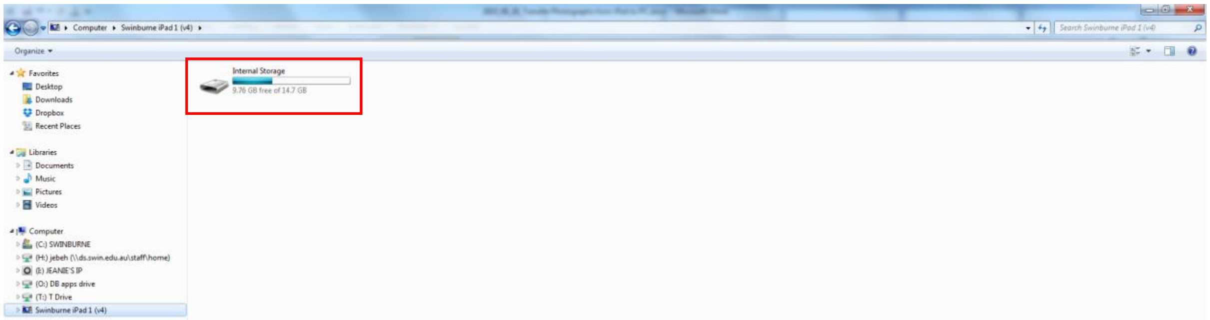


3. **Left-click** on **Windows Explorer** (yellow icon) next to the **Start** Button.

4. On your iPad, tab on “**Trust**”.
5. **Left-click** on **Computer**. It displays a list of devices.
6. **Left-click** on Name of Your iPad or Android tablet.



7. **Double left-click** on Internal Storage.



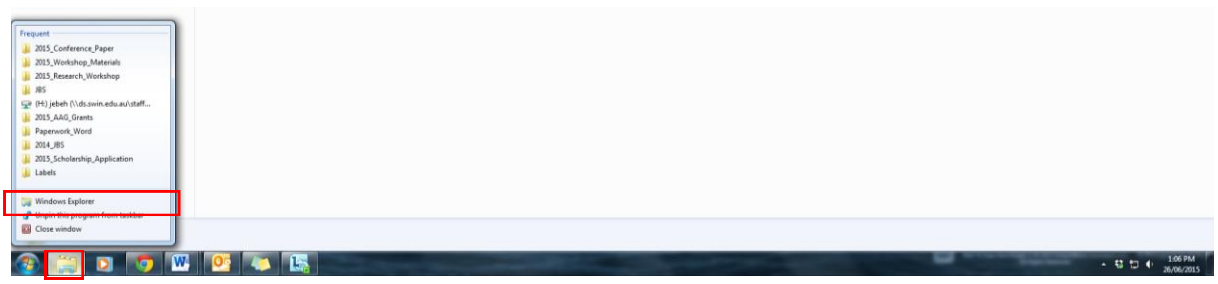
8. **Double left-click** on DCIM.

   A list of folders is displayed on screen.

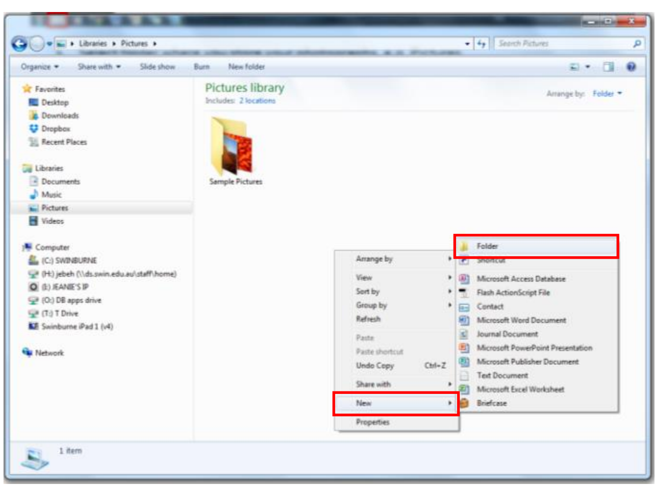
9. **Double left-click** to open individual folders.

   A list of items is displayed on screen (photographs and video clips).

10. **Right-click** on **Windows Explorer**.
11. From the list, **left-click** on **Windows Explorer**.

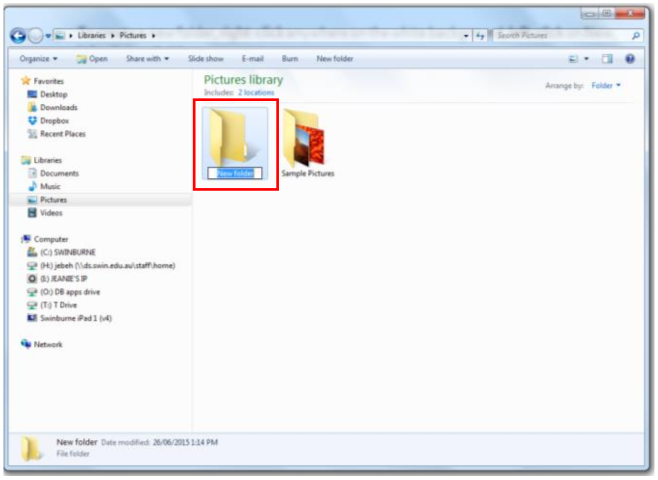


12. Select folder where you store your photographs, e.g. Pictures.
13. **Double left-click** to open folder.
14. To create a new folder, **right-click** anywhere on the white background, **left-click** on **New**, **left-click** on **Folder**.



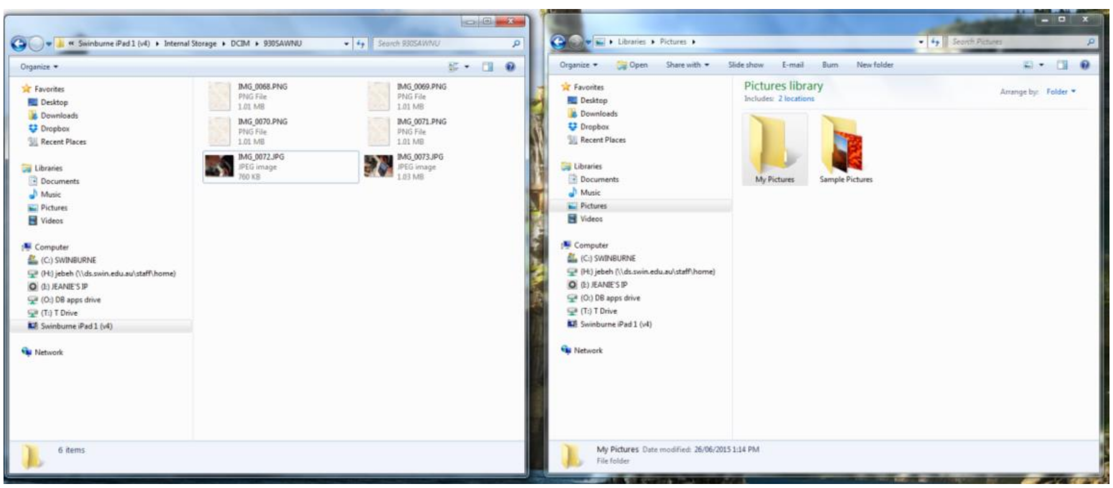
15. Type a name for your folder. Press **Enter** on keyboard to confirm creation of new folder.

    New folder will display name you typed.



16. **Double left-click** to open folder.

    There will be **two Windows Explorers** opened on your screen (one for files on your iPad and one for your PC).



A8. Sample of SPSS Data

	PartID	Workshop_No	Session_No	Gender	Age	Edu_level	Post_code	Municipality	Cur_Occ	Prev_Occ	Count_Orig	Count_Reg	Lang_Spok1	Lang_Spok2	Lang_Spok3	Older_Age	Deterity	Eyesight	Memory
1	1	1	m	1	65	4	3122	2	1	1	1	1	1	0	0	70	4	4	4
2	2	1	m	1	73	2	3121	2	1	2	1	1	1	0	0	75	4	3	4
3	3	1	m	1	73	4	3105	2	1	3	1	1	1	0	0	65	4	3	2
4	4	1	m	1	72	2	3122	3	1	2	1	1	1	0	0	65	5	5	4
5	5	1	m	1	78	4	3127	2	1	1	2	2	1	0	0	65	3	3	3
6	6	2	a	1	76	2	3123	2	1	17	3	2	1	3	2	65	4	4	4
7	7	2	a	1	78	4	3102	2	1	4	3	2	1	2	0	65	4	4	4
8	8	2	a	1	79	1	3123	2	1	5	1	1	1	0	0	85	4	4	4
9	9	2	a	1	76	1	3103	2	2	6	1	1	1	0	0	65	4	4	4
10	10	2	a	1	85	4	3002	1	1	2	1	1	1	0	0	70	2	4	3
11	11	2	a	1	70	4	3122	2	1	2	4	2	1	4	0	70	4	4	4
12	12	2	a	1	80	2	3128	2	1	7	5	2	1	5	0	70	5	4	3
13	13	3	m	1	63	4	3144	3	1	9	1	1	1	0	0	65	4	4	4
14	14	3	m	1	62	2	3122	2	1	2	1	1	1	0	0	60	4	4	3
15	15	3	m	1	65	4	3124	2	1	9	1	1	1	0	0	65	4	3	3
16	16	3	m	1	74	4	3122	2	1	1	1	1	1	0	0	75	4	3	3
17	17	3	m	1	73	4	3101	2	1	1	1	1	1	0	0	75	5	4	4
18	18	4	a	1	75	5	3125	2	1	4	1	1	1	0	0	70	4	3	4
19	19	4	a	1	84	4	3123	2	2	2	6	3	1	0	0	75	4	4	3
20	20	4	a	2	85	1	3123	2	1	10	1	1	1	0	0	70	5	4	5
21	21	4	a	1	71	4	3146	3	1	1	1	1	1	0	0	65	5	4	4
22	22	4	a	1	75	2	3146	3	1	2	1	1	1	0	0	65	5	5	4
23	23	4	a	1	69	1	3124	2	1	6	1	1	1	0	0	75	5	4	4
24	24	5	m	1	77	1	3143	3	1	5	1	1	1	0	0	65	4	4	5
25	25	5	m	2	74	5	3124	2	1	1	7	3	1	0	0	60	5	4	2
26	26	5	m	1	87	1	3143	3	1	6	1	1	1	0	0	80	5	5	4
27	27	5	m	1	77	2	3141	3	1	1	1	1	1	0	0	65	4	4	4
28	28	5	m	1	68	2	3128	2	2	5	1	1	1	0	0	60	4	3	2
29	29	5	m	2	76	4	3144	3	1	3	8	1	1	0	0	60	4	5	4
30	30	5	m	2	72	3	3124	2	1	11	9	3	1	0	0	60	5	5	5
31	31	5	m	1	81	4	3123	2	1	9	1	1	1	0	0	70	4	4	4
32	32	6	a	2	92	4	3144	3	1	6	1	1	1	0	0	80	4	4	4
33	33	6	a	1	70	4	3144	3	2	5	1	1	1	0	0	65	3	3	4
34	34	6	a	2	75	4	3123	2	1	7	10	3	1	0	0	60	4	4	3
35	35	6	a	1	75	4	3103	2	1	1	1	1	1	0	0	70	5	4	4
36	36	6	a	1	67	4	3103	2	1	12	1	1	1	0	0	80	5	4	4

	PartID	Workshop_No	Session_No	Gender	Age	Edu_level	Post_code	Municipality	Cur_Occ	Prev_Occ	Count_Orig	Count_Reg	Lang_Spok1	Lang_Spok2	Lang_Spok3	Older_Age	Deterity	Eyesight	Memory
36	36	6	a	1	67	4	3103	2	1	12	1	1	1	0	0	80	5	4	4
37	37	7	m	1	72	4	3103	2	1	1	1	1	1	0	0	65	3	3	3
38	38	7	m	1	65	2	3127	2	2	6	11	2	1	0	0	75	4	3	4
39	39	7	m	1	65	2	3103	2	2	4	3	2	1	0	0	65	4	3	2
40	40	7	m	1	68	2	3127	2	1	6	1	1	1	0	0	55	5	3	4
41	41	7	m	1	63	1	3151	3	1	13	12	4	1	0	0	65	4	4	4
42	42	7	m	1	86	4	3104	2	1	4	9	3	1	0	0	70	4	3	4
43	43	8	a	1	67	1	3142	3	1	17	13	3	1	6	0	65	5	4	4
44	44	8	a	1	68	4	3144	3	2	1	9	3	1	0	0	65	4	4	4
45	45	8	a	2	76	1	3129	2	1	14	1	1	1	0	0	55	4	4	4
46	46	8	a	1	66	2	3122	2	1	12	1	1	1	0	0	60	5	3	4
47	47	9	m	1	72	4	3129	2	1	1	1	1	1	0	0	60	4	4	3
48	48	9	m	1	81	1	3127	2	1	15	1	1	1	0	0	75	4	4	5
49	49	9	m	2	75	1	3125	2	1	6	1	1	1	0	0	70	4	4	4
50	50	9	m	1	74	2	3125	2	1	9	1	1	1	0	0	60	5	3	4
51	51	9	m	1	78	4	3103	2	1	1	4	2	1	0	0	65	5	4	4
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59	59	10	a	1	64	4	3124	2	1	1	17	2	1	0	0	65	3	3	3
60	60	10	a	1	66	2	3122	2	1	4	1	1	1	0	0	60	4	4	3