The Digital Behaviour of Adult Consumer's Aged 45-65

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A dissertation submitted to Auckland University of Technology in partial fulfilment of the requirements for the degree of Master of Business

March 2022

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Abstract

The aim of this report is to synthesise literature regarding the digital behaviours of consumers aged between 45 – 65 years old as research regarding this topic is lacking compared to other age group and its importance is underrepresented. The global population is demographically changing with the over 65 age group is growing faster than any other, and their digital consumption is keeping pace with this growth. Research on technology has traditionally been targeted either towards the 'younger generations' or comparing the young and the old. So where does that leave the consumer in between?

The research methodology employed in this report is a systematic literature review which enabled a thematic view of the current information on digital consumer behaviour. This was achieved through a synthesis of research resulting in 51 peer-reviewed articles selected for analysis and discussion. The research objectives were to extract salient themes from the current literature, filter and select poignant articles for critical analysis, and compile potential directions for future research. The results of the literature synthesis indicate the research regarding 45 to 65-year-old digital consumers is fragmented in the conclusions and approaches. The findings show a disparity between the terms used to describe older consumers resulting in difficulties with study comparisons. Further, there are potential biases from persistent assumptions about the aging process that filter down to the middle-aged digital user seemingly affecting the validity of the research.

This review contributes a holistic summary of the literature on digital behaviour for the middle-aged consumer by identifying knowledge gaps and presenting opportunities for further investigation. The research findings highlighted key themes such as, but not limited to, an over reliance on using age as a behavioural predictor variable, the reporting of adoption rates for describing a sample population's digital use, a lack of post-adoption analysis for the 45 to 65 age group, and a dearth of research where context was factored into the conclusions drawn about digital use. Of note, the pandemic-inspired lockdowns have potentially altered digital behaviour for all ages and, with the working population *forced* to adapt to new digital solutions, the middle-aged digital user is arguably the most affected cohort. With the findings of this report in mind, the significance of this research is that it provides opportunities for future research by finding 'where we are' to enable the academic fraternity to find 'where to go'.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a University or other institution of higher learning.

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Acknowledgments

The writing of this dissertation is the culmination of years of learning at a Masters level and the many influences that have contributed along the way. A passion for learning and exploring the world we inhabit was central to the motivation for the learning journey, a journey that I will try to continue.

I would like to thank Dr Drew Franklin for providing valuable insight in a plethora of topics and for being a great influence on me while on this journey. Your feedback and encouragement throughout the last few years has been valuable beyond measure and has continually strengthened my resolve in times of wavering self-belief.

I would like to acknowledge Dr Crystal Yap for her incredible knowledge and experience that I have leaned on as much as possible which is a large part of why I am now in the position I am. Thanks you for your patience in dealing with my questions and for your feedback of which I will continue to seek because of the value I place on its honesty.

In addition, I'd like to thank Dr Roger Marshall for his mentoring-type role that he unwittingly fulfilled and for his explanations of subject matter that always provided clarity when confusion reigned supreme. His faith in me was inspiring and his support invaluable which, along with Dr Drew and Franklin and Dr Crystal Yap, has kept my belief far above where it was prior to the start of this quest. Thanks to all!

Chapter 1 – Introduction

This systematic literature review requires some background information to assist in determining the reasons behind its need. Chapter One will provide context for the review by discussing four identified key areas that shed light on what this review was based on. The four main areas: the ageing global population and the possible change that this has brought about; a discussion on global events and how they have shaped what may happen in subsequent years; the issue with the use of chronological age as a research parameter for digital behaviour; and the possible shrinking of the 'digital divide' where the proliferation of device use in society has affected the use of age as a behavioural predictor.

Following on from the background discussion, the dissertation moves to the statement of the problem and outlines the research objectives for which the report is driven and some questions that relate to the stated problem. The report then moves to highlight the significance of this research by discussing the importance of reviewing literature systematically on the topic of digital behaviours for older consumers aged 45-65 years old. Finally, the structure of the report is outlined to further guide the reader through the document.

1.1 Aging Global Populations & the Digital Divide

The over 65 age group is now the fastest-growing segment globally (Livingston, 2019). This macro trend has been developing for several years as population segments change in both makeup and needs/wants that each cohort exhibits (Nunan & Di Domenico, 2019). With populations around the globe featuring increasing over-65 age segments, there has been a subsequent increase in research targeting those who belong in this age group (Nunan & Domenico, 2019). This increase in research focus for the over 65 age group has provided insight regarding the adoption rates for device use which are now like those under 30 years of age (Moschis, 2012). Furthermore, there is increasing discourse regarding the normalisation of digital-enabled device use in modern or western societies as device proliferation within both the personal and professional realms becomes increasingly more difficult for consumers of any age to avoid (Pew Research Center, 2021).

This mega-trend of the growth in the older populations globally has helped shape this study and begs the question of why is the 45-64 age group not researched more? The mid-aged consumer now uses multiple devices throughout the day, in a similar vein to the under 30 age group, via a work/professional capacity along with recreation device-use outside the work environment (Melovifá et al., 2021). It is this regular use of devices for the middle-aged consumer group that

provides a rationale for further study as the 'working-aged' individual, arguably, interacts with more varied digital compared to other age cohorts. Furthermore, the over-65-year-old/retired user doesn't have as much of a need for device use in a professional capacity and the under 20-year-old consumer is also a predominately recreational user meaning the 45-65 age group consumes more digital content across many devices when both the work and play contexts are taken into consideration (Lellis, 2021).

With the older segments of populations getting arguably more focus due to their growing size, it would suggest the middle-aged consumer aged 45-65 could be the bridge between the young and the elderly (+65). This research, in part, posits that the learnings from the 45-65 age group can provide valuable insight into other consumers of varying ages.

Consumer behaviour is an oft-researched area as is the topic of older consumers. Digital behaviour is a maturing topic of research in a multifaceted and cross-discipline study area (Verhoef et al., 2021). The digital realm is forever changing, as is the nature of the industry, so the use of digital technology is posited to adapt along with those changes (Nunan & Domenico, 2019). There is an increasing appetite for research regarding older consumers' digital behaviour based on the growing over 65 age cohort and the global growth of consumers aged over 65 has resulted in this segment gaining research interest (Warf, 2018).

It is this increase in research focus for the over 65's that points to a further decrease in research focus for the middle-aged adult user (Nikou, 2015). This report looks to find research about the 45–65-year-old digital consumer as this age group is arguably more significant. Of note, this middle-aged group has among the highest digital consumption rates due to the amalgamation of device use in a professional and personal capacity (McClain et al., 2021). The increasing rates of digital consumption in the workplace, along with the increase in device use at home, suggest an overall higher consumption than other age groups (McClain et al., 2021). Furthermore, a global pandemic meant working was 'forced' to be conducted at home and in a virtual capacity, for a myriad of industries, at a time when business solutions were already becoming more digital (LaBerge et al., 2021). As the effects of the pandemic continue to be felt and the business/work environment keeps moving in a digital direction, the need for increased understanding of the middle-aged digital consumer can produce valuable insight for both now and the future as digital consumption in this age group has reached saturation (Friemel, 2014).

It is argued that the digital divide has shrunk over the past decade with the proliferation of device-use in modern society (Hong et al., 2013). Friemel (2014) stated that the digital divide was the gap between digital natives and immigrants, however, it is posited that the term digital immigrants may

be a redundant label for a user group that has become accustomed to using digitally enabled devices to the point of potential saturation. Of interest, the global push toward a digital economy has resulted in digital exposure to everyone in society (Friemel, 2014). Digital consumption, both direct and indirect, is now reaching saturation point for the 45-65 age group as a digital component now exists in most offices and jobs as well as most retail stores for which these consumers frequent (LaBerge et al., 2021). Of note, the global pandemic has potentially pushed digital consumption further forward to all age groups as a necessity (Mutsvairo & Ragnedda, s2019). For example, the humble supermarket shopping trip is now (at the time of writing) a digital-heavy experience where digital aspects such as contactless payment methods and the explosion of online grocery delivery have exposed all users of these services to digital. In certain respects, device use is now expected, encouraged, and enforced for all user-groups 'breaking' digital divides.

Digital consumption has now crossed previously defined digital divide boundaries of income and age as all members of society were exposed to some form of digital consumption (Mutsvairo & Ragnedda, 2019). Mutsvairo & Ragnedda (2019) discuss that the digital divide is no longer a case between the 'haves' and the 'have nots' as digital consumption now affects consumers of all ages. This oft-discussed 'digital divide' was/is largely defined by one's age as the divide that separates groups. However, the aforementioned reasons show that the use of age as a predictor for digital behaviour is becoming less reliable (Nunan & di Domenico, 2019).

1.2 Global Events Can Bring About Change

Significant global events have been influencing the way people live their lives for decades. For example, the Global Financial Crisis (GFC) of 2007-2008 affected how large financial institutions are governed which affected users all over the globe (Foster & Magdoff, 2009; Claessens et al., 2010; Wilson, 2020). In addition, unforeseen events such as the terrorist attacks on the USA in 2011, which had far-reaching effects on the airline industry and its users (Passy, 2021), and the potentially disastrous effects that the 'millennium bug' had on global information systems in 1999/2000 can bring about a major change for societies regardless of geographic location (Kratofil & Burbank, 1999; National Geographic Society, 2012).

The proliferation of device-based adoption has seen a surge in recent times pushed to the forefront by the influence of the global Covid-19 pandemic which has arguably changed the course of society for the bulk of countries around the world (Sixsmith, 2020). Indeed, the benefits that certain digital solutions offered for a pandemic-hit world have meant that many digital-based projects had been forced to be brought to market much quicker than expected (Sheth, 2020). The Covid-19 situation,

much like the aforementioned events, has brought about a paradigm shift for the digital industry, among others, that is hard to ignore (Jílková & Králová, 2021).

The need for further investigation has been heightened by the global pandemic and market research can now fall into one of two categories: post or pre covid (referring to *pre*: before March 2020 and *post*: after March 2022 and beyond), such as the impact on digital consumers globally (Lai & Widmar, 2020). Interestingly, Lai & Widmar (2020) have recently investigated the effect of the global pandemic on the digital divide. They discuss how the pandemic resulted in households having more digital users and that the pandemic situation has pushed some households into different behaviours regarding their digital use.

1.3 The Current Issue

Literature on the digital behaviour of the middle-aged user aged between 45 and 65 is an area of academic research that hasn't had the coverage of other age groups. Previous research into digital behaviour has looked at younger users who have traditionally been considered prolific consumers of digital content (Tyrväinen & Karjaluoto, 2019). In addition, the phenomenon of global ageing is attracting research focus regarding the digital behaviour of consumers over 65. This contributes to the notion that literature is lacking regarding the digital behaviour for older consumers aged 45-65 (Nikou, 2015). Indeed, Nikou (2015) describes middle-aged users as the 'forgotten consumer' referring to this lack of digital behaviour research for this age group. Furthermore, previous research about digital behaviour/use has referred to adoption rates by grouping individuals into 'users' or 'non-users'. While this provided insights into the digital acceptance of various ages, it is no longer fit for purpose as digital use has reached all age groups (Mutsvairo & Ragnedda, 2019). In other words, the discourse about the adoption rates in previous research was more of a comparison of the young and the old. The middle-aged were deemed not necessary or important enough to garner significant academic attention.

With the maturing of digital use among all ages, certainly, in the majority of first world countries, the adoption rate for different age cohorts is now a moot point as digital exposure and consumption have permeated all aspects of society (Schimmele & Davidson, 2019). In particular, the adult/middle-aged consumer has usage rates comparable to the younger digital user (Moschis, 2012). Of note, adoption/usage rates of technology have also been steadily increasing for the over 45 age group and growing at a faster rate than other age groups (Azuddin et al., 2018).

In addition, mobile phones or hand-held devices have, in recent years, surpassed the use of other digital devices for all ages (Tyrväinen & Karjaluoto, 2019). This is significant because the use of a

handheld device is considered less complex, from a cognitive perspective, compared to other digital devices such as desktops or laptop computers. The less complex the use of a device is for someone to become proficient could have an impact on increasing the number of digital users and consumers (Enge, 2021). The decrease in complexity coupled with the increased propensity for digital adoption has contributed to the uptake among those society members who had found device use difficult which are generally the older user (Vogels, 2019).

Chronological age is an important concept to address regarding digital behaviour because it is posited that using chronological age for research about digital behaviour fails to adequately represent a given population. The chronological age of consumers is still the overriding demographic parameter that is used in research regarding digital behaviour and adoption rates (Nielsen, 2021). There is an assumption that digital uptake and use are related to an individual's chronological age. However, a relatively recent trend has been to look beyond age as a determinate of one's behaviours regarding digital device use (Barnard et al., 2013; Czaja & Lee, 2006). Market research providers, such as Neilson, have used age to display comparative differences for various data. For example, data depicting the effect that Covid-19 has had on consumers has been grouped into, among other categories, age cohorts to help show the apparent differences (Neilson, 2021). This age grouping is a well-known standard for publicly available research where subjects within a sample who fall into a predetermined set of ages are clumped together for the motivation of a 'like-for-like' comparison (Kiang et al., 2021). The issue with this is that digital behaviours are more difficult to put in a box delineated solely by chronological age.

These differences may also be contextual, as the digital arena offers many situations where characteristics of users don't necessarily fit into an age-based category. For example, the advent of digital gaming has affected all age groups so the characteristics of gaming enthusiasts can be the same for any age. A corporate manager in the 45-55 age group may be a gamer by night, much like a teenager who games at the same time of the day. In this case, using chronological age to describe digital behaviour may be ineffective in extrapolating behavioural characteristics to the wider population as no two digital practitioners use devices in the same way irrespective of age (Barnard et al., 2013).

The above shows that there is a need to review information regarding the digital behaviour of a particular age group systematically. The systematic approach allows for reproducibility which has benefits relating to comparisons between focus topics such as age groups or timeframes. For example, literature regarding the digital behaviour of users over the age of 65 may provide valuable insight when compared to literature for the middle-aged. Additionally, reproducing this literature

review for a different timeframe, whether past or future, can provide an understanding of the knowledge available between multiple decades about digital behaviour. The importance of understanding digital behavioural aspects, now that saturation regarding device usage within the middle-aged user has been reached, drives the need to review the literature systematically.

This report addresses the issue that there are few systematic literature reviews offering insight on both digital behaviour and consumers of digital content aged between 45 and 65 years old. The digital practices of middle-aged consumers are considered significant as this age group makes up a large proportion of the workforce and is projected to be the largest age cohort in the coming years (Slack, 2017). This working population, and the professional landscape, is changing with an increasing number of business processes going through digitisation, even before the pandemic pushed this digital shift into high gear (Soto-Acosta, 2020). The need to better understand this previously neglected age group has permutations for both the business and personal use cases.

Furthermore, the differences that exist within the age group are far less simple than past research has implied when using age to compare digital behaviours or that the differences that exist within the age group are a lot more nuanced than past literature has expressed (Moschis, 2012). Therefore, the research problem relating to this systematic review has been summarised into three questions:

Research Questions

1. What information does the research offer regarding the digital behaviours of adult consumers aged 45 - 65?
2. What are the gaps in the literature regarding the digital behaviour of adult consumers aged 45 - 65?
3. What themes about the digital behaviour of consumers aged 45 - 65 have emerged from the literature in the past 10 years?

To shed light on these questions, a review of the insights that currently exist regarding digital behaviours and practices of older consumers is needed. To achieve this, the report addresses research objectives that guide the literature review:

Research Objectives

1. To perform a systematic review to extract the key and/or interesting themes via a synthesis of current literature
2. To critically analyse selected literature regarding older consumers' digital behaviour
3. To offer possible directions for future research based on the thematic synthesis of the current literature about the digital behaviour of 45 to 65 year old users

The primary aim of this report is to synthesise the literature to extract key findings across multiple disciplines such as marketing, psychology, and behavioural sciences that relate to older consumers (aged 45 - 65) and their digital behaviours. Due to the nature of human behaviour, it is important to approach the research in a multi-disciplinary manner. As mentioned previously, the pandemic has affected many parts of society so it would be remiss not to explore different academic areas to gain a complete picture.

In addition, this study aims to use a systematic approach to amalgamate key themes from the reviewed literature so future researchers can utilise the same methods to gather information on current knowledge and to expand on this report's findings. A 'nod' to the future is an important aspect of this report's conclusions/findings and the pandemic has resulted in many unknowns coupled with a certain maturation of the digital realm in society through penetration into all age groups (Schimmele & Davidson, 2019).

The rationale for selecting the upper limit for this specific adult consumer age group is that past research from several disciplines, such as behavioural and computer sciences, has suggested that cognitive decline begins at 65 years old (Szmigin & Carrigan, 2001; Hong et al., 2013). There is also a societal view that the retirement age is to be at 65 and those who have retired at this age are implied to be embarking on a different life course at a particular age (Czaja & Lee, 2006). These two points, along with the traditional focus on the younger consumers' digital behaviours, seem to be potential reasons why the middle-aged are less researched than other age groups. It is to this lack of research focus that the adult consumer needs more attention to better understand the behavioural aspects of this age group from a digital perspective.

Exemplar Reviews

Several systematic literature reviews were referenced to benchmark. These systematic literature reviews offered insight into how to conduct the review and how the structure of a review can guide the reader in the intended direction (Young et al., 2020; Sahu et al., 2020; Nguyen et al., 2018; Bartels et al. 2019; Nurgalieva et al., 2019; Hettich et al., 2017; Alder et al., 2019). These benchmark reviews were used to provide exemplar procedures, particularly to aid in the creation of the planning phase of this research. The use of example reviews similar in subject matter was as a comparison of this research to help validate the proposed plan.

Nguyen et al. (2018) investigate literature, using the systematic approach, on the topic of online consumer behaviour looking at peer-reviewed articles from 2000 to 2015. Of note, the techniques utilised by Nguyen et al. (2018) involve screening articles by TITLE for suitability, then further

screening based on ABSTRACT. This approach yielded time efficiencies by excluding articles that were not suitable before the full-text review stage could begin. This waterfall-style of screening was adopted in this report to use the time more efficiently when screening for articles. This process also assumed that article suitability could be judged, for the most part, on the title alone before moving to the next screening phase. Initial searches performed at the start of the planning stage showed the title of articles to be a reliable measure by which to filter articles. The digital consumer behaviour field was shown to regularly include topic-related keywords in its title which helped validate this part of the selection process.

Bartels et al. (2019) was a review that researched middle-aged adults over 45 years old via reviewing literature systematically. Interestingly, part of their review criteria was to limit the publication period to ten years between 2008-2018 inclusive. The year limit applied for this report was also restricted to a ten-year timeframe like Bartels et al. (2019) as the ubiquity of digital device penetration has somewhat matured since the inception of the smartphone/device in 2007 (Bartels et al., 2019). The Bartels et al. (2019) review was also limited to ten years due to the stated 'not exhaustive' approach to their research. It was considered an 'initial picture' of their research topic so reviewing articles outside this time frame was considered counterproductive in determining viable themes that describe their data. Their approach was adopted for this research because of the similar goal of producing a picture of where the research is now. This 'snapshot' of literature from the past decade is posited to contribute more to the field of digital behaviour than including all possible studies from previous years.

The topic of consumer behaviour is a broad subject as it encompasses aspects of decision-making and many results are found when searching for terms such as 'consumer behaviour' or 'decision-making'. Hettich et al. (2017) reviewed literature that investigated 'older consumer decision making' over a 45-year period. This literature review is considered a benchmark paper as it summarises a broad time frame of literature from which to draw insights regarding older consumers. Of particular interest, the article utilised the 'snowballing' method to manually include articles of interest to the data being considered for the literature review. This method was adopted for this research as it provided a way to include articles that didn't appear using search strings.

The results from the Hettich et al. (2017) study gave insight into consumer behaviour before 2015 and noted the ageing populations as being a challenging situation globally. Interestingly, their research identified potential difficulties using chronological age as a predictor in behavioural research concluding that more research needs to be done to understand the complexities within age groups. The process of identifying research gaps garnered from the article synthesis was also a key

takeaway to be adopted for this paper. Building on those gaps in consumer behaviour research and applying a digital lens to the findings helped form the research questions for this report and provided clarity regarding the potential significance of performing a literature review on digital behaviour using a systematic approach.

Research Significance

The motivation behind this research is based on the recent pandemic and its potential changes to many facets of 'modern' life. The Covid-19 disruptions happened very quickly and affected so many people globally that societies around the world have been playing catch up with varying success and speed (Jílková, P., & Králová, 2021). The pandemics' permutations will be felt for several years according to various sources (Jílková, P., & Králová, 2021; Sixsmith, 2020). These consequences have already affected many areas of society and the idea of normal in terms of daily life may have changed forever. It's because of this that investigating what information or knowledge is available regarding consumer behaviour is considered important to ascertain possible future directions. With a particular focus on consumer behaviour regarding device interaction, the pandemic has arguably created a situation that is tailormade for digital. A contactless, hands-free revolution of sorts has been initiated with an industry that was already infecting (pun intended again) an increasing number of areas in modern life. It is fascinating to find out if and how people have been forced to change and whether the digital arena has been kicked into high gear.

This research investigates the literature on the older consumer/digital user regarding their digital behaviour and attempts to identify areas in the current research that warrant further investigation. The intended contribution of the research is to extend the knowledge on the digital behaviour of the older/middle-aged consumer and to lead to new theory development regarding the differences between device users within the target age group. Research on the effects of digital behaviour since the advent of the Covid-19 pandemic is in its infancy so gaining insight into the existing knowledge can allow comparisons with post-pandemic behaviour. This research intends to contribute a synthesis of current knowledge of digital practices as it points to a need to research altered or emerging behavioural trends (Lai & Widmar, 2020). Furthermore, previous research discusses older digital consumers in terms of adoption rates and the health sector.

The focus on adoption rates is a hangover from studies since the inception of the smartphone (2007) (Bartels et al., 2019). This approach seems somewhat outdated based on the usage rates of consumers over the age of 45 coupled with the uptake is smart device ownership (Pew Research Center, 2021). One could surmise that the older consumer is assumed to be technologically disadvantaged and that the only research needed is to ascertain whether a device is used or not. It is

posited that this over 45 age group is far more nuanced with their digital behaviour than previously reported.

The seemingly Boolean approach to answering 'yes' or 'no' to the question 'Do you use a smart device?' of previous research also pertains to the overrepresentation of research on the older consumer from the area of health sciences with an end to highlight outcomes of technology use by disadvantaged individuals for reasons of ill health. Wilson-Nash & Julie Tinson (2021) describe research regarding the older consumer as more slanted towards 'assistive technologies' which is more of a specific use case. Indeed, Wilson-Nash & Julie Tinson (2021) bemoans the lack of research in the marketing and consumer behaviour disciplines and suggest that the cohort has been overlooked when researching the everyday use of available consumer technologies.

1.4 A Brief Outline of the Scope

The scope of the report is based upon keywords relating to the research question of "What information does the research offer regarding the digital behaviours of adult consumers aged 45 - 65?" Due to the behavioural aspect of the question, the review is concerned with users of digital devices. This point contributes to the definition of the scope of the review as the search for information is focused on an individual's device use and not whether they are a user or not. The research attempts to derive insight into the literature that is concerned with regular users of digitally enabled devices and excludes that literature that deals with users who don't engage with digital.

The scope of this research is discussed in more detail in Chapter Two and indirectly in Chapter Three where the research design is outlined. As this is a systematic literature review, there will be a set of inclusion and exclusion criteria that will determine which articles are selected and which are decarded. Of note, the article selected for the study will be limited to English language versions only and consist of peer-reviewed articles to ensure quality resources are analysed.

1.5 Structure of the Dissertation

The review structure follows general guidelines for the scientific level numbering format for the document headings (AUT Library - Reports, n.d.). This format was utilised to present the research in an orderly manner to guide the reader systematically while allowing for ease of navigation of topic areas which was deemed important so readers can move to sections of interest. Each chapter begins with a brief outline of its contents to help guide the reader and to give a synopsis of what is to come to allow for a selective reading of salient points.

The analysis of the articles that are selected based on the inclusion criteria set out in Chapter Three will be based on the salient themes that are apparent in the article content. These themes will be displayed chronologically to offer some insight into the timeline of theme development. The report is thematic in approach but chronologically shows those themes. The interest in showing the themes chronologically is related to the constantly changing nature of the digital landscape and to show the potential paradigm shift that the pandemic may have had on the research conducted.

In terms of the particulars of the report, the structure begins with some background information in the current chapter (Chapter One) to provide insight into the dissertation topic. Following Chapter Two, key terms are discussed to provide some contextual reference to common phrases used in the report. A rationale for each term is also provided to give some clarity regarding the use of the key term(s) within this document. This was deemed necessary as there is ambiguity present for certain phrases such as 'older consumers' so a contextual discussion is offered to help define a meaning related to this report. Other key issues are also described to provide a further understanding of the context in which the document is based on. It will also provide some clarity around terms used in Chapter Four which is centred on the analysis of the literature selected for review.

Chapter Three discusses methodologies applied in the literature investigation and begins by describing the process used to formulate a keyword list to be tested in article searches. The method of inclusion/exclusion of certain words or phrases was an important step in the selection process and was iterative as the terms derived from the research question were broad. Xiao and Watson (2019) describe how an effective strategy for article searches includes a robust compilation of search terms. That focus is adopted for this report as it offered a scientific approach to keyword selection and the documentation of said processes helps in reproducibility for other practitioners to follow which is a key component of a systematic review (Young et al., 2020).

Chapter Four will analyse the selected research for the report and cast a critical view over the extant literature to tease out the salient themes. Articles of particular interest and/or relevance will be directly referred to, but much of the chapter will focus on the theme existing in the body of literature selected. It is a summary of sorts around the topic of older consumers' digital behaviour, so the goal is to lend to future research as it is posited that the global pandemic is a 'moment of truth' for the digital industry.

Finally, Chapter Five provides a synthesis of common themes that are apparent in the findings from Chapter Four. Chapter Five continues by concluding the findings regarding future research. A key goal of this document of to find possible or interesting directions for subsequent study. The findings provide a backdrop to a discussion on gaps in the research found in the literature and some

limitations of the document will also be outlined. The limitations are important to highlight as the digital industry, along with the research community, is in a constant state of change (Duderstadt et al., 2005). While these limitations were mitigated as much as practical, outlining important limiting factors helps inform the academic community about the context for which the conclusions are drawn.

Chapter 2 – Research Scope, Definitions & Clarifications

The purpose of Chapter Two is to discuss the context regarding the key terms from Chapter One and to highlight certain points related to the research topic. This is to provide an understanding of these key terms and points as they are talked to in Chapter Four where the selected literature is analysed. It is important to give more clarity to certain terms or issues as they are broad and, therefore, require a discussion of scope regarding the meaning of each term as it relates to this review.

To achieve the above, Chapter Two will point out the salient key terms and give clarity for each one, a rationale is then discussed as to why the term(s) need more clarification. The highlighting of important contextual factors regarding certain terms is to provide clarity with how they are referred to in the report. The definitions and clarification in Chapter Two will lend focus to Chapter Four as they are related to the analysis of the literature.

In addition, Chapter Two will discuss the boundaries for the review so the length of this chapter will be shorter in length than the other sections of this report. This is due to the nuanced detail regarding the boundary are explain in Chapter Three via the Inclusion and Exclusion criteria for article selection.

2.1 Definitions

‘Older Consumers’

When planning for the literature investigation for this review document, the term ‘older consumers’ related to many different age groups. A consensus amongst authors was difficult to ascertain based on the results of the initial literature searches. The age ranges covered were anywhere between 45 – 80+ which made it difficult to compare research. There was a certain amount of ambiguity for the ‘older consumer’ term or related terms such as ‘middle-aged’ etc, and some clarity on the ages encapsulated within each common term.

For this review, the term ‘older consumers’ refers to the consumption of digital content by individuals of an age between 45 – 65 years old. As previously mentioned in Chapter One, the age group has somewhat been forgotten in research circles regarding digital behaviour as the study of older consumers shifts focus to the over 65 group which is an increasingly relevant population segment. The word ‘consumer’ was used in the research question to highlight an individual’s consumption of content. However, there is a certain commercial influence of this word so synonyms with a non-commercial tone were sort. This process will be described in more detail within chapter three as it relates to the planning stage of the investigation.

In the context of the digital arena, the term 'older consumers' was initially thought of as a simple phrase about adult users of digital devices. However, as the investigation began, it was clear that this phrase was a far more nuanced first thought. The word 'older' is not so clearly defined when reviewing the literature as it can have a different meaning to different people. This lack of a standardised definition has resulted in a broad age range for the one term so much so that it was problematic to rely solely on searches using that term alone. For example, Lam & Lee (2006) use the term 'older' to describe digital users over the age of 50 and even go on to describe subjects in the sample of age 55+ as "disadvantaged" because they happen to be 'old'.

'Digital Behaviour'

The term *Digital Behaviour* refers to the use of internet-enabled devices and the interaction of the individual with the browsers or apps. While this term seems self-explanatory on the surface, there is a certain amount of grey area with the combination of two concepts that can each stand alone. With discussion regarding the previously mentioned term 'consumption', 'digital behaviour' may not always refer to just the use of a device. Digital consumption can take many forms as the growth in the use of internet-enabled devices continues to grow (Pew Research Center, 2021). For this report, digital behaviour refers to how people use or interact with browser and/or app-enabled devices. This is to separate digital interactions with devices that are not of a first-person nature such as touchscreen kiosks, digital billboards, smart TVs, iPods, and the like. The rationale for this is to do with the proliferation of personal devices since the inception of the browser-ready smartphone (iPhone) in 2007 (Bartels et al., 2019). This 'water-shed' moment has coincided with a societal rise in smartphone use so much so that these devices are the most used item for digital interactions (Vogels, 2019).

'Digital Consumption'

Leading on from 'Digital Behaviour', *Digital Consumption* adopts a similar rationale for its need for clarification as digital content can be consumed in many more ways than just hand-held or personal devices (Vogels, 2019). The key distinction between 'consumption' and 'behaviour' is the consumption of certain digital content, for this report is the output of the interactions an individual has with their smartphones or tablets in asynchronous or synchronous form. The consumption is relatively benign as it is the behavioural aspect of those interactions that is of more interest rather than the resulting data or outcomes themselves.

'Young old'

From the pilot/preliminary searches, the term 'young old' was found to be used to refer to the older consumer. From the initial review of the populations that the term refers to from the pilot search,

the ‘young-old’ consumer is between 65 – 75 years old (Nunan & di Domenico, 2019). That is, ‘old’ because they are over the oft-cited retirement age of 65, and ‘young’ because they are under the stereotypical old age of 80 years (Friemel, 2014). Clarifying this term under the auspices of a literature review was important as the broad nature of the term presents a problem when trying to focus on the age group of 45 – 65. For example, Further discourse regarding this term continues in Chapter Three where an explanation into the investigation into appropriate search terms involved the inclusion or exclusion of phrases based on the iterative nature of the list compilation.

‘Digital Divide’

The *Digital Divide* is a topic where some conjecture exists regarding its definition and its continued relevance. The original definition refers to the divide between the haves and the have nots in terms of digital or technology and it was often regarding the gap between the young digital natives and the digital immigrant. The term has evolved somewhat to encapsulate many divides that may differ between groups/cultures/countries as it seems to predominately refer to an income gap as the defining divide (Vassilakopoulou & Hustad, 2021). Discussing this term for the current research was to highlight the hypothesised paradigm shift where digital immigrants is a redundant term. This redundancy affects the original meaning of ‘digital divide’ in academic research circles as it refers to, or *did* refer to, the older consumer and their adoption/acceptance of digital technologies and is now referred to as a plural of the digital divide where more aspects to that division are apparent (Vassilakopoulou & Hustad, 2021). For this current document, it is posited that the 45 to 65-year-old digital consumer is no longer considered a *digital immigrant* so offering some clarity around this term was needed for this research as the term was thought to refer to the divide between old and young which is now not so much the case.

2.2 Clarifications

Everyday digital users/behaviours

Everyday use, for the purposes of this research, refers to the behaviour of users and the consumption of digital content on a device regularly. The everyday use of devices is posited to now encompass the middle-aged user due to the combination of work and personal digital consumption often being on the same device and occurring more frequently than in previous years (Statista, 2021).

‘Pilot’ Search

Defining the search of articles to determine research validity is referred to as a ‘Pilot Search’ which depicts the initial search conducted for this paper. The term is referred to as a ‘preliminary’ or an ‘initial’ search to provide clarification to the nature and reasons for performing a search for a paper that is using a literature search as its main action to collect data for analysis (Dekkers et al., 2019).

Digital Adoption

Adoption rates within the scope of this research relate to the propensity for users to embrace technology both from a physical and virtual standpoint. Physical refers to tangible technology such as tablets, laptops, and hand-held smartphones that are all commonplace in modern society today. Virtual refers to the apps with which the users engage regularly. The apps present the decision-making facilitators that the devices house and are included in the adoption rates to which this review refers.

2.3 Scope of the Research

To conduct the literature search based on the relatively broad topic of digital behaviour, the definition of the scope was to focus the investigation on certain parameters such as publication date, language, article type, and a select number of databases. The articles researched for this report were limited to the past 10 years (2012 – 2021) as the number of articles in initial searches, coupled with the pace of change within the digital industry over the past 10 – 15 years (Verhoef et al., 2021), contributed to the year limit being applied. Of interest, the initial search string applied to the period between 2012 and 2021, performed in the Scopus database, resulting in 4089 results. The same search string was applied to the previous 10-year period of 2002 – 2011 as a comparison and the results returned 620 results. The comparison was to determine the validity of performing a systematic literature review for this period, so this restriction was an important parameter to apply.

The search for articles was further limited to English as the language in that the studies were published and written. This was to ensure no misunderstanding when foreign language research is translated to English. English is the predominant language that papers are written in, certainly in the business/marketing discipline (Snyder, 2019). The prevailing reason for the English-dominant mega-trend assumes that research conducted in the US and the UK is submitted in English. Most peer-reviewed papers originate from those two countries so restricting the scope of this research to English-only didn’t negatively impact the number of papers available for review consideration (Fig. 6.3.1, Appendix 6.3).

The number of databases to search was restricted to three based on a finite resource of time available for review completion and the thorough nature of the results provided by the pre-selected databases. Scopus, Web of Science, and EBSCO were the three databases and the results of the initial search helped determine that the inclusion of other databases was an unnecessary step (Paperpile, n.d.). The three selected databases include a myriad of publications, and journals, and are multidisciplinary so they were deemed appropriate to use for a digital behaviour literature search for a specific age cohort.

More detail on the parameters of this literature review is discussed in Chapter Three via the inclusion/exclusion criteria which were defined as part of the method for systematically reviewing the literature.

Chapter 3 – Methodology

Chapter Three describes the methodology utilised to select the articles for review, which followed planning, conducting, and reporting procedures for the steps in the process of this literature review. As part of the conducting step, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was adopted as the theoretical procedure that this research adhered to for the discovery of suitable articles for analysis. The details of each major phase within the process (Planning, Conducting, and Reporting) are discussed to explain how the process was used to arrive at the results in Chapter Four. Chapter Three is designed to provide clarity to the article search and selection process. It also describes how the keywords were compiled for the search strings to be used in the article search. Of note, the inclusion and exclusion criteria are outlined as they provide the rationale behind article selection. Finally, data synthesis, the review of selected articles to ascertain the overriding themes present in the subject area, is discussed to help clarify the rationale behind the process.

The justification of a systematic literature review for this research is based on the reproducibility of the method and its unambiguous nature which helps lessen possible bias (Nguyen et al., 2016). In reviewing the literature on the topic of consumer digital behaviour of a specific age group, the systematic approach was chosen over the other types of review methods (thematic, narrative, integrative, or meta-analysis). Recent research alludes to a growing trend in the use of the systematic method for the business and marketing disciplines (Snyder, 2019). The goals of the systematic literature review method are to identify articles that fit certain criteria and to provide findings to draw conclusions from that relate to the current research goal of extending knowledge in digital consumer behaviour (Paré et al., 2015).

3.1 Methodology Outline

The research method for this systematic review follows the plan, conduct, and report of the flow of events as adapted from Gandomani et al. (2020), which was identified as a benchmark literature review for this report. In addition, the categorisation of the steps involved in the process was discussed by Devlin (2017) and it was designed to aid critical analysis about studying behavioural science. The group of procedures suited the process used in this review where each step was grouped based on the categories of planning, conducting, and reporting beginning with the formulation of a suitable question for the research issue outlined in chapter one. This process is depicted in Figure 1 which has been modified from the steps outlined in Gandomani et al. (2020) to

better fit the current research document. Each section of the process is discussed further to clarify the procedure taken to review the literature.

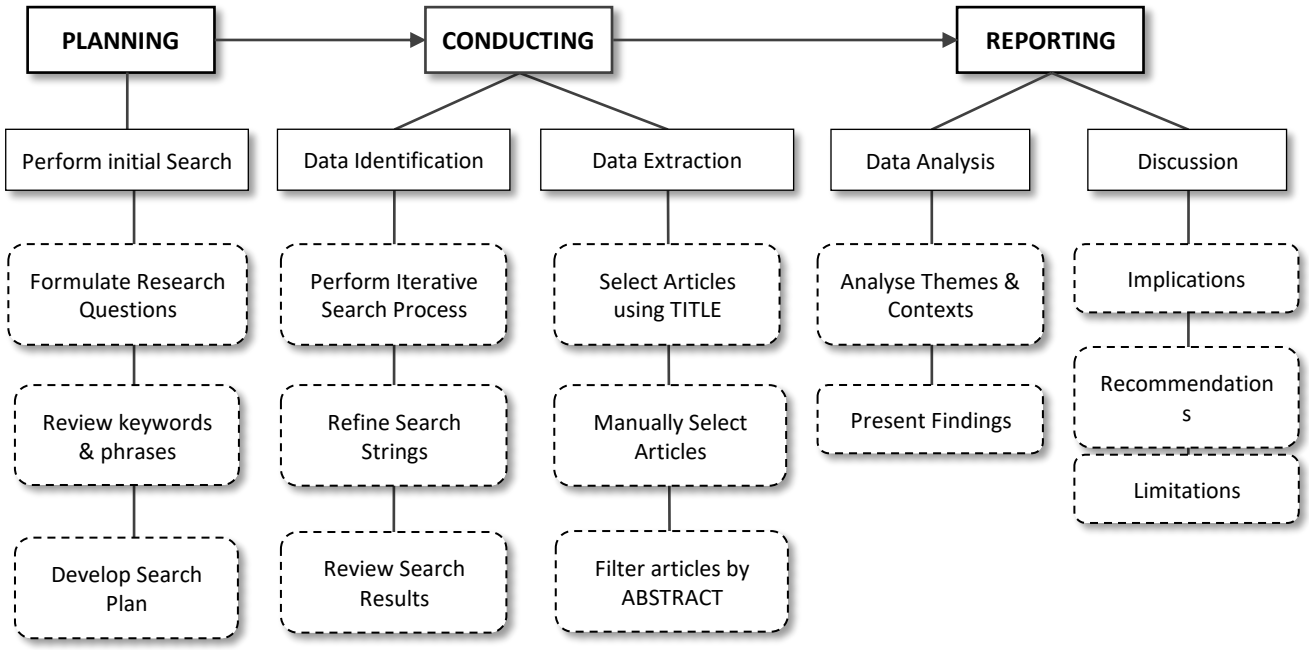

Figure 3.1: Adapted Systematic Review Process

3.2 Planning

The Planning stage in the process involved several parts whereby the goal was to design the search strings to be used in the article searches and to help formulate research questions that drive the investigation. This process involved performing an initial literature search, the formulation of research questions, looking at past literature reviews, and developing the search plan for the report. The initial search string was compiled through research into synonyms derived from the topic of 'older consumers' digital behaviour' (Table 3.1). The resulting list of words was added to a search string as part of this first step in the planning phase (Table 3.2).

Perform initial Literature Search

The initial investigation into the topic of 'older consumers' digital behaviour' was conducted to provide clarity around the suitability of performing a literature review. This was an important first step in the process as the viability of the research and the method proposed needed testing before other stages could commence (Tawfik et al., 2019). The suitability of conducting a systematic review was, in part, determined by the number of results that this initial search phase returned. The volume of results suggested there was ample research to include in a review and that the initial search

phrase was of a broad enough nature that the results were across multiple disciplines. Paré et al. (2015) discuss this stage as a 'pilot' search to test the viability of the preliminary search phrases. Of note, the authors used this approach to refine the keywords they planned to include.

Furthermore, another function of the initial search was to gain a wider understanding of the possible search terms relating to the research topic. Once viability was established, the common and suitable keywords prevalent in this search were recorded to act as a barometer for the formulation of the search strings that were to be used for the literature investigation. This approach was broad in nature to collate common search phrases over and above the terms garnered from the research topic of 'older consumers' digital behaviour'. The pilot search was conducted in the Scopus database as it is considered one of the most often utilised databases for research from a multidisciplinary perspective (The Best Academic Research Databases, 2019). Several systematic literature reviews read for this paper cited Scopus as a valuable resource to use (e.g., Plotnikova et al., 2020; Vassilakopoulou & Hustad, 2021). Plotnikova et al. (2020) cite the sheer number of articles indexed as one of the major reasons for its inclusion in their research. Scopus also provided a comprehensive search facility on their website that made the process of finding suitable articles straightforward as searches could be saved and edited later. Furthermore, the analytics feature provided a snapshot of the search results providing insight into the proposed research viability and the suitability of conducting a literature review.

Based on the initial search analysis, the keyword list included items that were not previously considered. For example, the keyword online concerning the digital category appeared frequently and it was often used instead of digital when discussing device use and browsing practices. The term online was not initially considered as it was deemed too broad a term as it was thought to be redundant as digital devices were 'online' anyway and the term was also considered a relic from the past. The initial search showed that the term online is indeed still relevant when discussing digital behaviour and is often used to refer to device use e.g., 'Online behaviour' (Nunan & Di Domenico, 2019). This example highlighted the need for this initial search to validate the preliminary ideas on the topic and to provide additional search words backed by concrete search results.

Formulate Research Questions

The formulation of research questions was a step in the planning process that was deemed to benefit from the above initial search phase. This aligns with best practice as defined in other literature reviews where the research questions were formed after an initial investigation (Nguyen et al., 2018; Paré et al., 2015). However, in contrast to the process of an initial search, it was found that various literature reviews chose to formulate the question without a stated initial search. For

example, Xiao & Watson (2017) discuss the review process beginning with the formulation of the 'problem' and step two consists of developing the protocol which ends their two-step planning phase.

The rationale for formulating the research questions based on the initial search results was two-fold whereby a) the validity of the research needed to be ascertained first, otherwise there is no point in continuing if the research was invalid and b) the questions for the research be based on a certain amount of evidence and not any preconceived ideas which may add bias to the question formulation. This format of planning was based on some benchmark systematic literature reviews that were used as an informative guide to the process adopted for this research.

Keywords & Phrases

Reviewing keywords and phrases that the initial search produced was a procedure to validate the keywords used for the literature review. It was important to establish which keywords would yield enough results to add validity. The iterative process of reviewing search terms enabled flexibility to arrive at a set of keywords that adequately described the search for a body of knowledge. The Population/Problem, Intervention, Comparison, Outcome (PICO) framework is used in systematic reviews to organise the keyword groups thematically (Methley et al., 2014). A modified version of this common framework was used for this paper as it better suited the research question regarding the main themes of the literature search. The PICo framework (Population, Interest; Context) was utilised as the 'Comparison' part of the original PICO framework was not found to be applicable as it is more suited to the research of a quantitative nature where a control group is needed for comparison purposes e.g., Placebo, Intervention (Murdoch University, 2021).

In alignment with this modified PICo framework, the search query particulars were divided into the three sections (Older Consumers; Behaviour; Digital) to aid in realising appropriate phrases to use in the literature search (Fig. 3.2). Synonyms were placed under each related category providing a holistic view of the search words to form the basis for creating search strings.

Table 3.1: Initial Keyword List

Older	Consumers	Digital	Behaviour
old	consumer	digital	behaviour
aged	consumers	online	behavior
older	user	internet	behaviours
mature	end user	device	behaviors
adult	end-user	digital device	uses
adults	end users	digital technology	practices
older adults	end-users	consumer technologies	decision making
middle-aged	browser		
baby boomers	browsers		
young-old	customers		
generational cohorts	customer		
aging			
aged 45 - 65			
45-65 years old			

Table 3.2: Refined Keyword List

Older	Consumers	Digital	Behaviour
older	consumer*	digital	behaviour*
adult	user*	online	behavior*
middle aged		digital device	use
mature			practices
			decision making

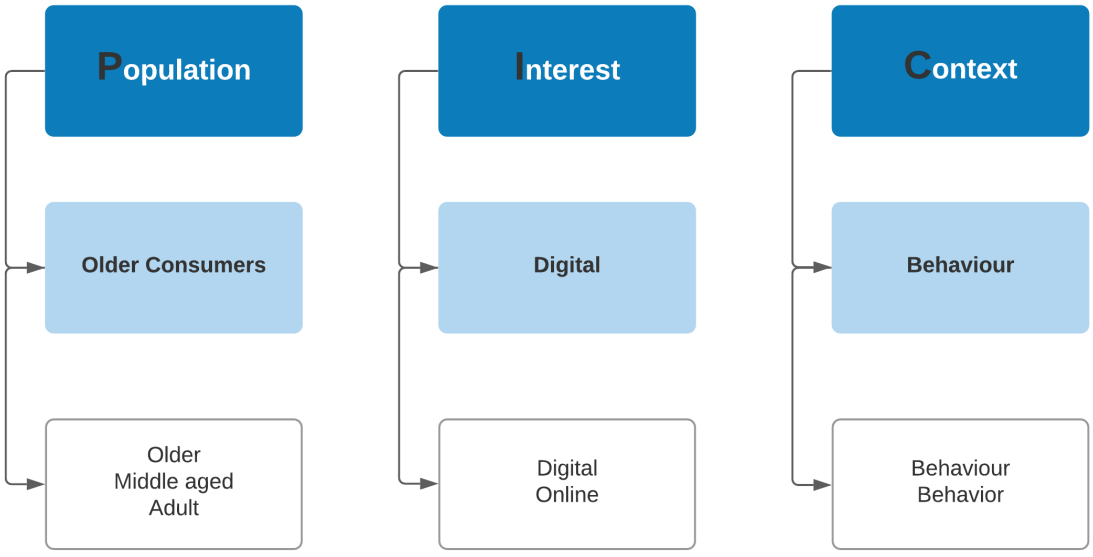

Figure 3.2: PICo Model

Develop Search Plan

The search plan for this research followed from the benchmarking of relevant systematic reviews where the past techniques were adopted. Of note, the plan revolved around the ten-year timeframe for article inclusion (2012-2021) as it is posited that digital behaviour for middle-aged consumers has infiltrated the age group so much so that new research would help tease out the differences within the age cohort.

The development of the search plan involved designing a process for the Conducting phase where the data was collected. Based on the results of the preliminary search, an iterative format was preferred in the article search as the broad nature of the research involved multiple disciplines and/or industries that highlighted certain subjects that weren't related to the research issue. For example, the subjects of Veterinary, Dentistry, Pharmacology, Toxicology and Pharmaceutics (Table 6.2.1, Appendix 6.2) were deemed not digital or behavioural related. Excluding these subjects from the search was to be able to further refine the results to better reflect the research questions. This procedure also provided information for the Inclusion/Exclusion criterion to be used in the Data Extraction stage in the Conducting phase.

In particular, the search plan was designed to include peer-reviewed articles published between 2012 and 2021. Planning the protocol for the review follows the approach taken by Vassilakopoulou & Hustad (2021) where the 'digital divide' was researched regarding digital transformation. While their research excluded certain publications, this report planned to exclude certain subjects that weren't deemed worthy enough for selection. The selection process is a system derived from the initial search whereby a framework is borne out of the results. This framework is discussed in the Reporting phase of this process as it relates to findings that appear in the data.

Article Selection Criteria Formulation

The process for the development of the eligibility criterion for this study were derived from benchmark systematic reviews in which literature was reviewed to identify the extant knowledge in their respective areas of research (e.g., Nguyen et al., 2018; Kahiya, 2018). The inclusion/exclusion criteria to ascertain the eligibility of articles for this review were also influenced by Xiao and Watson (2017) 'Planning Research' article that provided guidelines for systematic review writing. These articles provided a blueprint of sorts for this research to follow regarding the selection criteria. Of note, the selection criteria table format that Nguyen et al. (2018) employed was adopted for this study as it aligned with the process of TITLE then ABSTRACT screening. This example method was adopted because the separation process was fit-for-purpose for this research. The 'fit' is relating to

the delineation of each category as this grouping of processes matched the logical and actual practice employed for this research.

Study Inclusion Rationale

The inclusion criteria were adapted from the exemplar reviews reported in Chapter One and used peer-reviewed journal articles from 2021 to 2021. This time frame was derived from the ever-changing tech industry as well as the popularisation of the smartphone in 2011 (Friemel, 2014). Selecting peer-reviewed articles only was to utilise the vetting process involved in peer-reviewing. This was to ensure a certain quality of the resource is provided as opposed to other sources that are not afforded this rigour. The language that articles were produced in was limited to English so as not to include any language and/or translation issues that may dilute the intended meaning or agenda of the research. The selection tried to include studies from a broad range of disciplines to gain insights from more than just marketing or a more commercial perspective. To this point, empirical and conceptual studies were selected to review insights from both a qualitative and quantitative lens. The Eligibility Criteria are briefly summarised in the below table to aid reader understanding.

Eligibility Criteria

Table 3.3: Article Inclusion/Exclusion Criteria

	Inclusion	**Exclusion**
Screening	Publication date between 2012-2021. Source type is Journal Article Peer-reviewed	Non-journal article Title irrelevant to topic Title implies an inappropriate topic
Abstract Screening	Content relates to digital behaviour Content relates to ages >45 & <65*	Content/theme of inappropriate Explanation/outline not matching Title

The post-screened article lists from each database were combined into a single list that was exported to EndNote. This process aimed to be able to identify and remove duplicates promptly and EndNote provides a quick and simple way to achieve this. Bartels et al. (2019) also utilised the deduplication function in EndNote in their literature review on digital self-monitoring interventions for middle-aged and older adults. The removal of duplicate articles was performed after the title screening process as this cut down the time needed to arrive at a more succinct list to review.

3.3 Conducting

The *Conducting* stage involves performing the searches outlined in the planning stage to first help compile the key terms that will be included in the search strings and to perform the iterative process of conducting the searches. The Scopus database was used for the initial investigation as it utilises many sources of information and has a comprehensive search function in which to identify data.

Data Identification

The identification of the articles to be included for the review was done so in a waterfall-type way where screening of the TITLE was conducted first, then the articles were filtered using their ABSTRACT. The final stage is the actual reviewing of the full article content of the eligible articles.

Once the search was conducted, the articles were then selected based on their title. The reviewing of the title is based on the notion that academic articles contain their main keywords in the title of the paper as a standard practice (Dekkers et al., 2019). The process was manual as the decision to select the article was on an ad-hoc basis which was deemed the most prudent method to review the validity of the article based on its title.

Subject categories that returned five search results or less were excluded from the search (Table 6.2.2, Appendix 6.2). For example, *Dentistry Oral Surgery Medicine* returned 4 results when searching in Web of Science and those articles were specific to that subject area based on a cursory review. This was determined to yield a more accurate picture of the state of the research topic as the articles in this exclusion list were found to be of lesser relevance. This was consistent through the three databases that were used in the literature search and so were employed in the results filtering where possible.

Of note, literature reviews of varying formats tend to have multiple reviewers available to aid in the article screening process (Pringle et al., 2016). While this technique can enhance the viability of each article selection and remove potential bias by seeking the opinion of more than one reviewer, the limited human resources available for this research negated the possibility for more than one reviewer. This limitation, along with some other noteworthy barriers, is expanded on further in Chapter Five.

Perform Iterative Search Process

From this initial investigation regarding keywords to search for, a search string was used to conduct an article search in Scopus. The purpose of this was to investigate keywords that were apparent in the results to be able to research the prominence of the initially selected keywords (Tawfik et al.,

2019). This also allowed for other keywords not included in the initial set to be added iteratively. Keywords that were on the periphery could then be assessed for their suitability for inclusion in the article search.

Scopus was utilised for the initial search as it is a familiar database that has been used by the author along with the user-friendly nature of the website's search function which incorporates advanced filtering capabilities such as the ability to exclude certain subject areas. The use of advanced filters was poignant as the research question has some broad terms that cross many disciplines. In particular, the keyword 'behaviour' is across multiple search areas with most of the search results from the initial investigation belonging to medical-based topics (Fig. 6, Appendix 5)

Refine Search Strings

During this pilot investigation, it was apparent that there were many source titles, subject categories, and certain publications that were not going to be suitable to include in the literature search. Excluding the unsuitable subject categories before commencing the literature search was a key step in the process as it allowed for pseudo-vetting to take place (Dekkers et al., 2019). For example, source titles such as 'Drug and substance abuse' were excluded before the title review stage as the content description from the source information provided by the results was not related specifically to digital behaviours of the general population. Furthermore, as these subjects were deemed important enough to be picked up by the database search engines, it was assumed that the topic of the article centred around these explicitly defined subjects, therefore, negating the need for inclusion.

Verhoef et al. (2021) discuss the benefit of utilising a pre-search investigation to identify suitable keywords to include in literature searches. Their article used a preliminary search to aid in the compilation of a keyword set to be able to conduct a broad search within their identified research topic. It also enabled the funnelling of concepts based on the broad searches performed. This broad nature of initial searches gave a holistic view of the topic which is like the technique that this research adopted for the literature search planning (Verhoef et al., 2021).

Review Search Results

The iterative process of reviewing each search was implemented to test the suitability of the keywords and to exclude subject areas that were either of an inappropriate nature or not relevant to the research topic. The search was rerun iteratively until the subjects identified by the search engine were deemed of an appropriate nature. While presenting results of searches is more akin to the *Reporting* phase, it was deemed to be an important step to filter out undesirable subjects to

improve efficiency with article selection. For example, specific subjects relating to 'drug addiction' and studies geared towards the topic of 'sexual behaviour' were excluded from the search. Subjects that are about specialised medical topics such as 'Cardiovascular System Cardiology' and the like were excluded as the relevance of the articles related to those topics was too low to be considered for selection (Table 6.2.2, Appendix 6.2).

Reviewing these preliminary results highlighted that some search terms, which were deemed important prior to conducting the searches, were yielding irrelevant or inconsistent results. For example, the search term 'customers' was initially included in the preliminary list of selected synonyms before the commencement of pilot testing. While it was identified as a synonym of 'consumer' from the research questions developed in Chapter One, it was excluded because digital content can be consumed without an explicit commercial factor (Verhoef et al., 2021). The rationale to exclude the term 'customers' was to avoid pigeon-holed results that focussed solely on the commercial aspect of digital behaviour. In other words, using the 'customers' keyword in the search strings had only a small effect on the outcome with 2,380 results using 'customers' compared to a search excluding it achieving 2,327 results (Table 3.4).

Table 3.4. Results of Reviewed Search Strings

Condition	Search String	Results
Including 'consumers' and 'customers'	(TITLE-ABS (adult OR older OR middle-aged OR "middle aged") AND TITLE-ABS (consumer* OR user* OR customer*) AND TITLE-ABS (digital OR online OR device) AND TITLE-ABS (behaviour* OR behavior* OR "decision making" OR decision-making))	2,380
Excluding 'consumers' and 'customers'	(TITLE-ABS (adult OR older OR middle-aged OR "middle aged") AND TITLE-ABS (consumer* OR user*) AND TITLE-ABS (digital OR online OR device) AND TITLE-ABS (behaviour* OR behavior* OR "decision making" OR decision-making))	2,327

As outlined in Chapter Two, the term 'young-old' was identified in the initial search during the planning stage to aid in the compilation of the keywords regarding the age of the subjects within research. However, the addition of the term provided no benefit in the results as the search string resulted in the same number of hits. The search in Scopus showed the same number of results (n = 4089) as the search that contained the term 'young old' (young-old; young old).

The keyword search process as it relates to the compilation of the search strings follows an iterative process to allow for the review of the resulting keywords (Fig. 3.3). Each search iteration and subsequent review resulted in different subjects that needed exclusion as the intended goal of the iteration was to eliminate these inappropriate or irrelevant subjects.

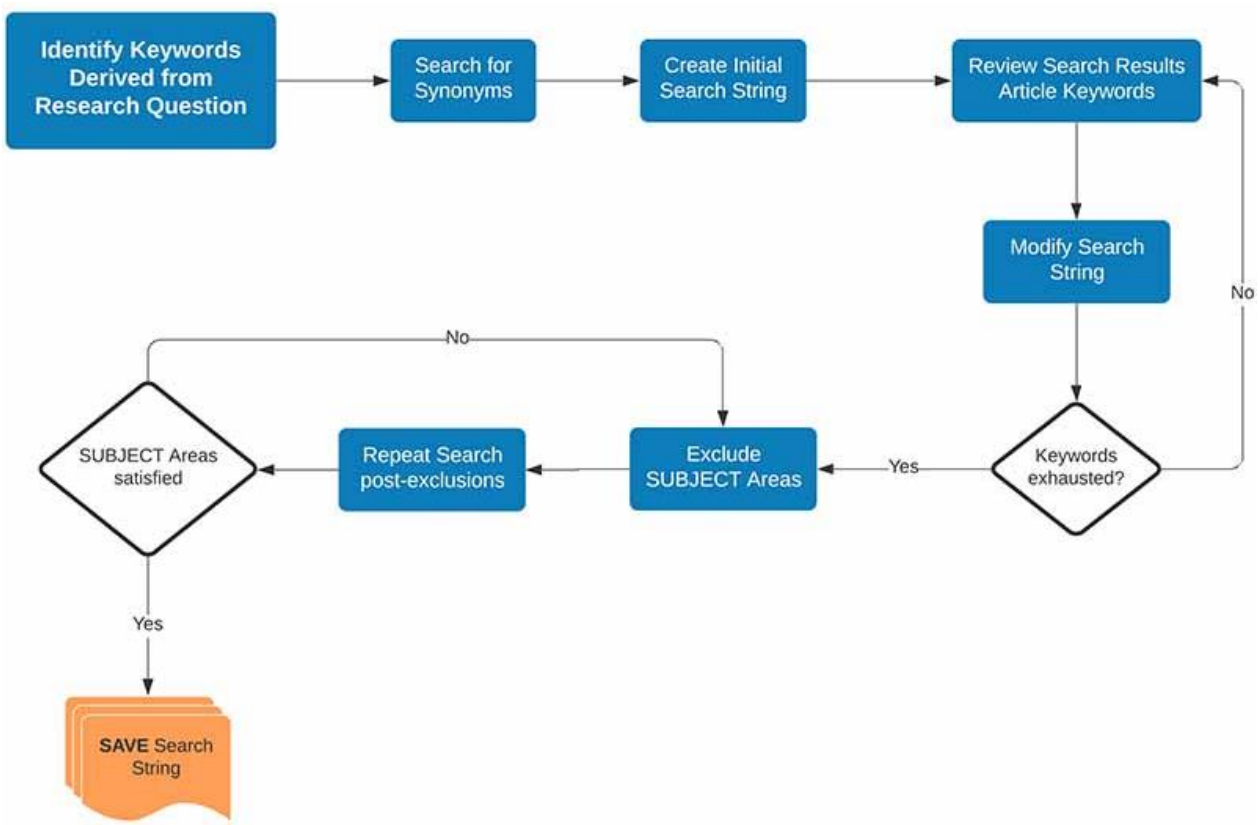

Figure 3.3: Search String Process

Data Extraction

The extraction of data for this structured literature review is done so by screening articles once the search phase has completed. While this process is iterative, there is a completion mark where the review of the search results reached exhaustion. The completion need is borne from a limit in the amount of time available to perform the research and the need to logically progress to the literature review. The exhaustion point was to be when no more new themes are deemed to be of importance and this point was based on the initial findings from the pilot search process. The iterative process of compiling the search string also enabled an overview of the broad topics in the search results (Nguyen et al., 2018). This resulted in a guide for the search to yield hits in the range of 1000 – 1200. The list of records for each database searched was arranged into pages of 50 records and screening process started from page one where the results were organised by their relevance to the search string.

Select Articles

The selection process used the **P**referred **R**eporting **I**tems for **S**ystematic **R**eviews and **M**eta-**A**nalyses (PRISMA) framework to identify, screen and select the articles to review. The framework is utilised as a guideline for the review process. The three sections within the PRISMA framework used

for this review are organised into 1. Identification; 2. Screening; and 3. Inclusion. The particulars of each section are presented in Fig. 3.4 and integrate the inclusion/exclusion criteria derived in the planning stage and based on the results of the pilot search.

In the identification stage, selection was limited to articles published in journals as this was considered the source that provides the most scrutiny compared to the other forms of publication (Paul et al., 2021). Using journal articles was to also take advantage of the vetting surrounding the publication process. To have work published in the journals featured in the databases searched is of a certain quality that other resources, such as conference transcriptions or grey papers, aren't afforded (Paul et al., 2021).

Each set of results, which are displayed as a paginated set of records within the database website, is reviewed by their TITLE to ascertain their suitability for review consideration. This is a manual process whereby each page of results is scanned to select articles deemed suitable for the literature review. The selection of the articles is saved into a list on each of the databases to be filtered based on their abstracts. In this paper, there was a total of 1710 articles found through the searches spread over the three databases. From those results, 115 were selected applying the eligibility criterion to each record.

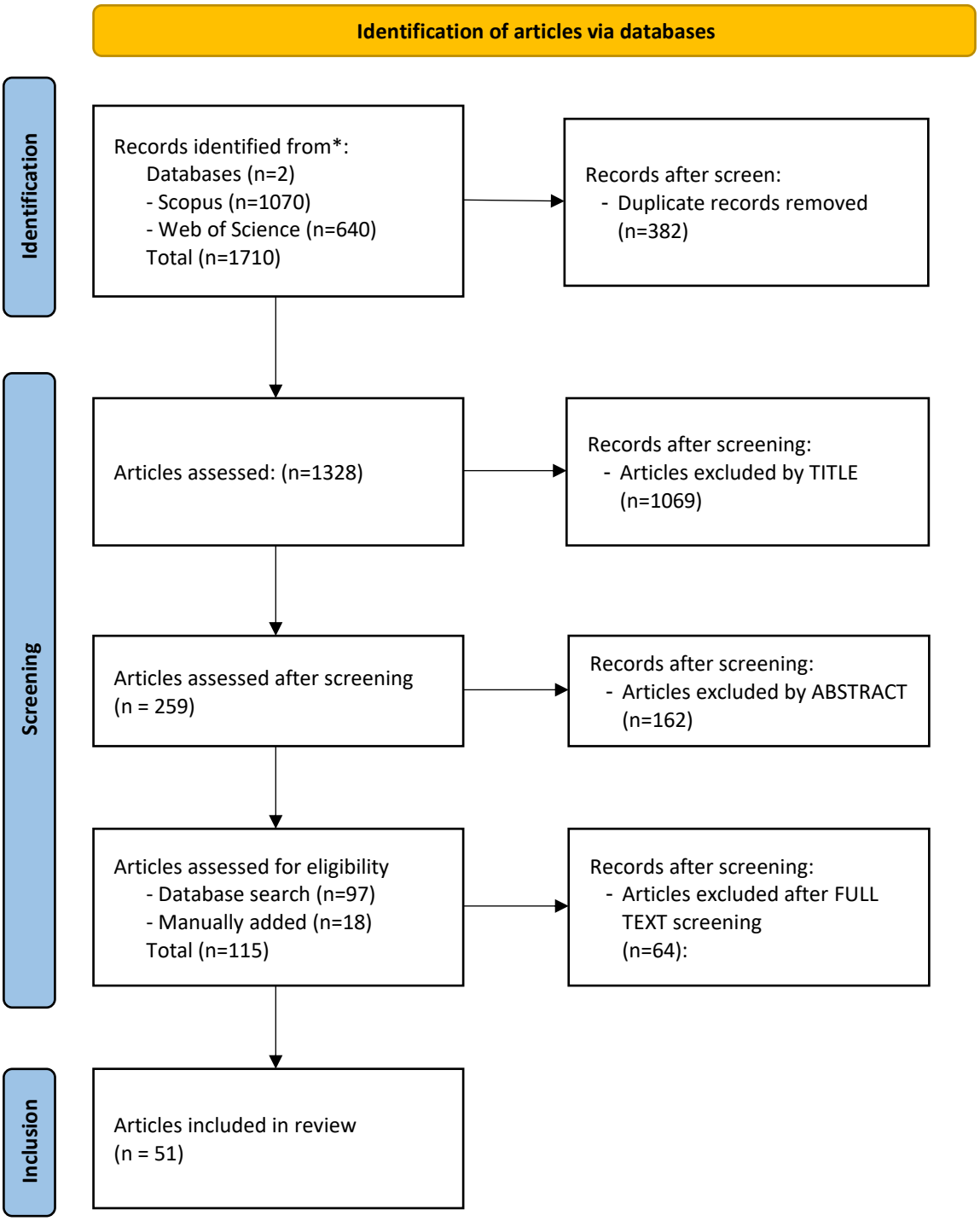

Figure 3.4: PRISMA Flow Chart

Manually Add Articles of Interest

To further investigate current knowledge on the topic of adult consumer's digital behaviour, a manual search was also utilised in addition to the database search. To achieve this manual search, a review of selected articles reference list provides an informative resource to the current 'state-of-play'. This last stage of the process is to provide additional articles to those gleaned from the database searches. This step is to aid in the removal of bias by exhausting the search to include items that may not have been picked up by the searches. This method was a 'hand-search' of sorts, as depicted in Tawfik et al. (2019), to enable further refining of the selected article. Ecar et al., (2020) refer to the term as 'Snowballing' to describe the process of identifying other relevant papers. This addition to the process used poignant articles as a source for further investigation whereby the reference lists were reviewed to include resources of interest and did not appear in the database searches.

Filter Articles via Their ABSTRACT

Following the selection of articles based on their titles, the article's abstracts are reviewed to further filter the selection for the literature review. This process uses the article summary to efficiently determine article suitability as adopted from Gandomani et al. (2020). Each database provided a function to show all abstracts on a results page so multiple articles can be screened before selection. The review of the abstracts uses the TCM-s framework to ascertain their fit within the research topic. The use of the TCM-s framework at this stage of the process is utilised to act as a guide to the screening. Using the framework at the abstract filtering stage is designed to have consistency with how articles are assessed. However, this use of the TCM-s framework regarding the article abstracts is only a guide for which to review each summary. The framework is used to review the article's full text so further detail on the framework is discussed in the following Reporting section of the procedure where the framework is used to review each selected article's full text from an in-depth perspective.

Review Full Text of Articles

The final stage of the selection process involves reviewing the full text of each article post-abstract selection. This is to ensure each selected article provides value to the review over and above the given abstract and that this abstraction aligns with what is reported in the article. The reviewing of the full text was also a quality check whereby each article was assessed for its relevance to the specific topic that this report adheres to. Once each article's suitability for review is ascertained, a framework can then be applied which is elaborated on in the following section regarding thematic reviewing of the literature.

3.5 Reporting

The *Reporting* stage is where the findings are outlined based on the article synthesis and contains the discussion of those findings in terms of recommendations and contributions. Below is a synopsis of the methodology for the reporting phase and concentrates on how each part is to be conducted and some rationale as to why the parts were conducted in the outlined manner.

Data Analysis

The analysis phase is to provide findings garnered from the data that was extracted in the Conducting stage of the process. The article review process is to collate common themes into a table that records the author(s), journal, the salient theme(s) of the research, the context for which the research applies, the methods the article employs, and the approximate age of the subjects.

The extraction of the salient or interesting points from the article are arranged in a table to gain an overarching and holistic view of the themes. This analysis utilises an adopted TCM-s framework as briefly described in the abstract filtering method discussion and is adapted from other systematic reviews (e.g., Paré et al., 2015; Paul et al., 2017).

Apply Framework to Data

Systematic reviews benefit from a framework to organise and present the data. Paré et al. (2015) describe frameworks for systematic reviews as a tool for organising the investigation. The 'TCM' framework is utilised for this review as it provides a recognised structure for which to apply to the review process. The benefits provided are through the recognition of the high-level perspective (**T**heory) of each selected article, an overview of the various **C**ontext that exists in the reviewed body of literature, and to gain insight regarding the common approaches (**M**ethod) used to arrive at the overriding themes of the literature.

In addition, based on the central premise of researching a target age group, it was deemed prudent to add a fourth element to the framework. The age for which the article refers to was considered of relevance, so recognition of the studied **S**ample age for each selected article was included to give a holistic view of the ages/age groups.

The 'T' in the TCM-s framework adopts a thematic approach combined with the analysis of theories that have been used in the literature (Fig. 3.5). The thematic lens refers to the salient themes that emerge from a review of the extant literature on the topic of older consumers' digital behaviour. This framework has the goal of finding out what has been investigated before and what potential study areas still need some research attention. The coding process to extract the salient themes

from the literature utilises an iterative process of distillation. This process involves identifying themes from each article in notation form which is further distilled down into a summarised theme to enable grouping of similar agendas.

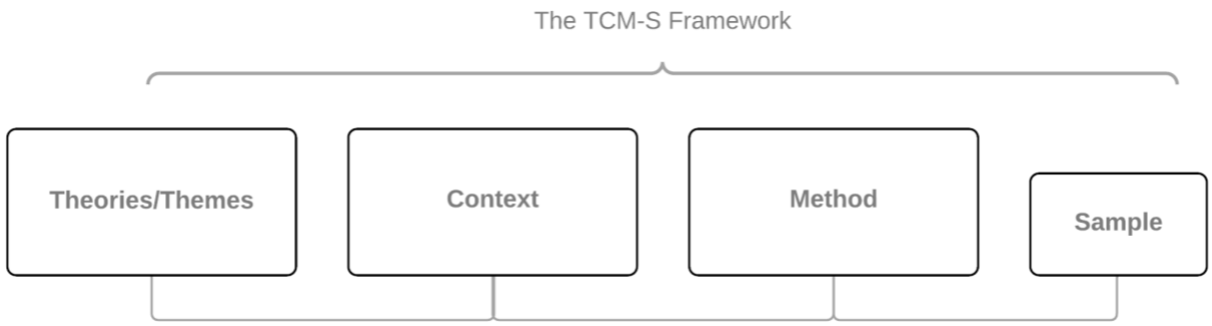

Figure 3.5: Adapted TCM-s Framework

Present Findings

The presentation of the findings follows the TCM-s framework whereby the selected articles are described via each element. The analysis follows a thematic approach as this allows the overarching message to be summarised which provides a holistic view of the data. Once the data has been coded, the findings are organised into each salient theme that was garnered from the literature. These findings are presented via descriptive titles of the distilled themes from the notes made about each article. While the themes go through the three-stage process of distillation, the headings for the findings chapter (Chapter Four) will be more descriptive than the one-to-three-word categories. This is used to help summarise the body of literature to provide a more informative title for the reader to follow.

Discussion

The discussion phase of the process relates to the findings reported in Chapter Four and will be expanded on within the Chapter Five discussion. This is done with a nod to future areas of study as the goal of the research is to ascertain the current 'state of play' regarding consumer digital behaviour. The discussion focuses on the implications and the contributions of the research by analysing the salient themes of the literature using a thematic approach. The discussion is to provide the reader with a summary of the interesting themes to contribute to an overall picture of the research topic.

In providing a summary, the discussion section is presented to address the research questions as the main goal of the review. The discussion is presented in three sections: 1. Implications & Contributions; 2. Recommendations; and 3. Limitations. The rationale for presenting the discussion

in three sections is to first discuss the current knowledge of the research topic. Secondly, the gaps in the research are outlined which leads to recommendations regarding future research areas and some limitations are highlighted to provide some context around the methodology and results.

The recommendations will be based on the identified gaps within the reviewed research and will highlight gaps that may warrant further investigation and discussion. The nature of investigating a topic such as digital behaviour has meant that there is an absence of any concrete conclusion as the topic is in an evolving state. Considering this, instead of a conclusion section, this paper offers recommendations for future research.

The limitations that were identified within this review are outlined in Chapter Five to give some context to potential bias and to highlight some barriers with conducting the review. Outlining limitations was done to also provide a rationale for the selected method employed.

Chapter 4 – Analysis & Findings

The goal of Chapter Four is to report the articles' themes and present what was found as it relates to consumer behaviour of middle-aged adults. Literature findings are summarised by discussing points of interest from the thematic analysis of the selected articles. The themes consisted of behavioural aspects of digital use that were largely centred on adoption rates. These adoption rates refer to both the physical devices with which a user is interacting and the intangible apps that the devices contain. The research that this review investigated did not present any findings relating to post-adoption use, nor did the research offer many insights into nuanced behaviours that exist between users within an age-based cohort. It is these main findings that will be discussed in this chapter to aid the discussion later in Chapter Five where future research recommendations are presented.

4.1 Description of Reviewed Studies

The search strategy resulted in 1710 records identified that related to the study objectives. The removal of duplicates (382) resulted in 1328 eligible records for further consideration. Following the article TITLE screening phase, 259 records were identified for further review. The screening of the selected articles, concerning the article ABSTRACT exclusion criteria, resulted in 114 articles considered for the full-text screening phase. Of these, 97 articles were selected for the review, with an additional 17 articles garnered from the citations within the filtered article list. The inclusion of manually added articles resulted in a total of 51 articles that were reviewed for this research following the full-text screening process (Fig 3.4, Chapter 3).

The research spanned a period from 2012 – 2021 (specifically August 2012 to August 2021) to synthesise articles across a broad range of years and to capture emergent themes that appear relating to the digital space. Of note, the year that most articles were published was 2020 with 10 selected articles followed by 2016 and 2017 (7 featured studies for each year). Reviewing the literature over ten years was designed to gain an understanding of trends relating to the emergence of the personal digital device and their subsequent assimilation into modern society (Fauscette, 2020). The digital device trend, as outlined in Chapter One, is significant to this research because the objectives showing that device use is across all age groups now that smartphone use has reached maturity. It is this ubiquity of use as a mega-trend that has driven the need for this literature review as digital behaviour has moved from studying technology adoption to identifying more nuanced behaviour of vastly different user groups. The themes extracted from this research are discussed in the following sections which summarise interesting points from the past decade of research.

The eligibility criterion highlighted that, geographically, most of the articles selected came from the US followed by the UK and Australia. This is attributed to the English language criteria for articles to be reviewed but, interestingly, the other top-performing countries were European and China which would suggest English as the predominant language for which research is written and published. Furthermore, the United States was the leading country from which research was produced, which also mirrors the trend from years before the research period (2012 – 2021) (Fig 6.3.2, Appendix 6.3).

4.2 Findings Analysis

The analysis of the articles is based on the TCM-s framework outlined in Chapter Three, where the research is summarised by emergent themes, the context that the research is referring to, the methods used to conduct the research, and a summary of the samples used. The analysis of the reviewed themes was important to gain a holistic view of the literature regarding the digital behaviours of middle-aged users.

There were 13 **THEME** (T) categories extracted within the 51 selected articles. These theme categories were condensed from the *raw* themes that existed. For example, there was a reoccurring theme relating to *Adoption* which was an adjective to describe themes that relate to the concept of digital adoption by users of technology. Identified themes such as "Internet adoption process of mature consumers" were categorised into 'Adoption' to enable thematic comparisons and to offer a holistic theme view of the body of literature. The themes of interest for this research are based on these category groups and highlight Adoption, Cognitive Age, Engagement, Influence on Behaviour, Post-adoption, and Seeking Information (Fig. 4.1).

The **CONTEXT** (C) part of the applied framework allowed a holistic view of the narrative for each selected study. The significance of synthesising the contextual aspects of the body of research is to provide background to findings garnered from the review. However, the contextual summary of the literature showed such a diverse range of contexts (e.g., technology adoption, health information seeking, online shopping, supermarket shopping, etc) that it tempered the overview of the themes to a certain degree (Fig 4.1). In other words, to gain an understanding of the broad themes relating to the digital behaviours of the older consumer, perspective is needed to provide relevance to digital behaviour for any derived insights. For example, Harris et al., (2016) suggest that technology adoption varies across different age groups via a survey that was used to capture sentiment regarding the banking sector and its services offered. Hall et al. (2015) discuss health information seeking relating to 'medical decision making and compare offline and online information searches as the context for their research and refer to older consumers as those over 50 years old. The

contextual difficulty with extracted themes from digital-related research was that the insights were quite context-specific to the studies themselves. This made providing a general overview of themes for a holistic view of consumer behaviour difficult as each extracted theme may be quite specific to the context for which it was derived.

The analysis of the article found that most studies (26) used the *Survey* **METHOD** (M) to gather the data which represented 55% of the studies which used surveying as the method of choice. The types of surveys used consisted of face-to-face, telephone, online, or Street-Intercept surveys. Furthermore, only four studies observed participants using tech devices to understand behavioural differences while 38 articles tried concluding participant self-perceptions (Interviews, Surveys, or Questionnaires). This finding suggests a limited analysis of connections between perceived and actual behaviour has been conducted. For example, Magsamen-Conrad et al. (2018) concluded that trust in information drove seeking behaviour in older consumers. However, Barnard et al. (2013) observed user behaviour of participants interacting with a tablet device and surmised that older adults are too diverse a group to be representative. This highlighted a disparity between insights from research using different methods to gather behavioural data.

Investigating the **SAMPLE** (s) for the studies reviewed showed myriad ranges of participants and highlighted a difficulty with a standardised grouping of ages. Some researchers selected participants aged between 50 – 90 to represent 'older adults' (e.g., Vaziri et al., 2020) whereas other research defined 'older consumers' as adults over the age of 40+ inclusive (Chéron & Kohlbacher, 2018). These examples show the variations that exist when investigating older consumer behaviour.

The synthesis of the articles resulted in points of interest relating to the behaviour of the middle-aged/older consumer, some key concepts that warrant further discussion, and some areas where clarity is omitted affecting the conclusions drawn. Moreover, the pandemic has thrown a cat amongst the pigeons in digital behavioural research as the global event has meant previous research findings will need to be rethought due to the pandemic's unprecedented nature. These are discussed in the following section of this chapter to highlight key points that form the basis for future research.

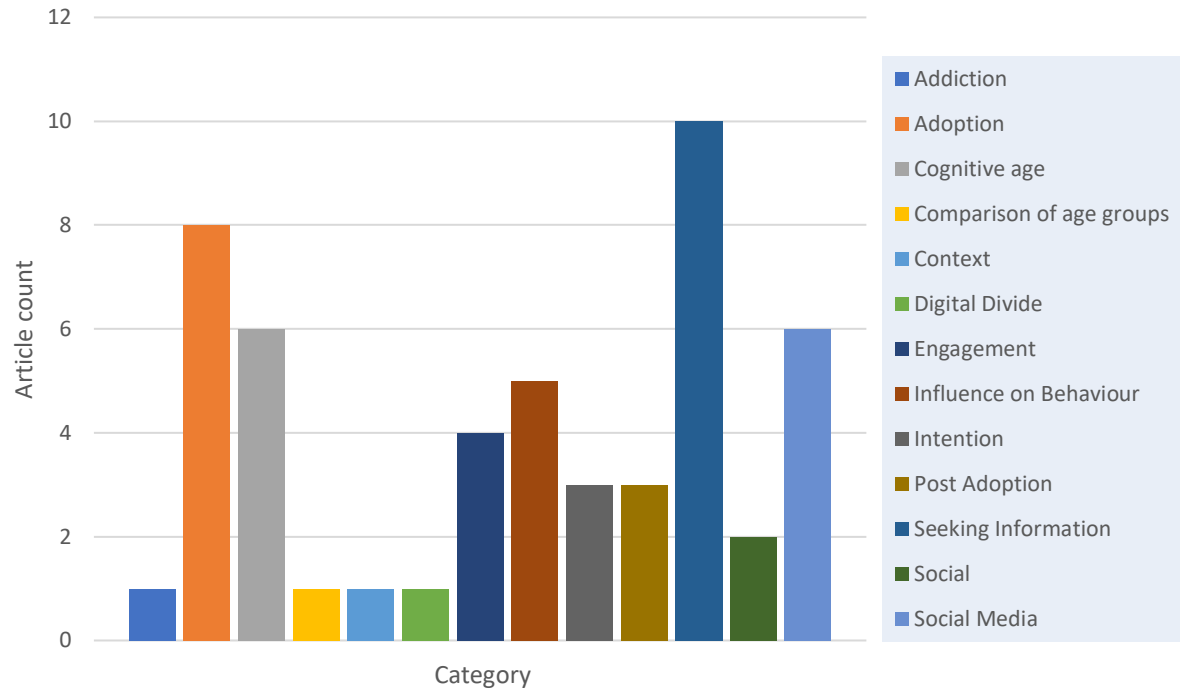

Figure 4.1. Thematic Summary

4.3 Research Findings

Stereotypes/Assumptions of older consumers

An interesting finding from reviewing the literature, that involves multiple themes, relates to age-related stereotypes that are still prevalent in research. The stereotypes/assumptions about older consumers relates to the *Adoption, Comparison of age groups, Digital Divide, and Post-Adoption* themes. These were further encapsulated to highlight the interesting commonality that was present within the thematic categories shown in Figure 4.1.. Furthermore, the findings, and the headings that are referred to, are not an exhaustive list and description of every category that was garnered. The analysis was performed from a holistic lens to aid readability and to avoid certain discussion repetition. Preconceptions existed that grouped older users by their propensity for digital adoption and, of those who have adopted digital technologies, that the internet was primarily used for health-based reasons. Furthermore, the stereotypes about the elderly trickled down to be applied to middle-aged consumers. Stereotypes such as those associated with cognitive decline and a drop in mobility, as well as resistance to new tech and an inability to learn how to use apps or devices, still exist in research.

Stereotypes relating to digital adoption rates persist which influence the research focus within the study of digital consumption. In other words, the investigation of digital adoption rates was based on assumptions that the middle-aged consumer is similarly disadvantaged to the elderly (over 65) in

comparison to the younger user who is thought of as 'tech savvy'. Of note, was that research tended to apply these stereotypes, normally directed at the over 65 age group, to the under 65's. For instance, certain studies (e.g., Bui, 2021; Lee, Han & Chung, 2014) have applied these stereotypes to the 'older adult consumer' which may present bias in the results. The comparison of digital consumption between older and younger consumers is an oft-used theme to show the correlation between age and tech use. These stereotypes presented potential bias with the sample selection (e.g., Bui, 2021) or had influence over the extrapolation of the study conclusions to a wider population (Leysan et al., 2019).

While the negative assumptions may have had gravitas in the past, they are not supported by empirical evidence. In addition, this label of 'tech savvy', concerning the younger user, has influenced the thought that older users are not 'tech savvy'. Kennan, (2018) explored the online learning environment comparing old and young users through reviewing the literature on internet-based learning. The conclusions drawn suggest age was not a predictor of achievement and that more research was needed to investigate the nuanced behaviours that contrast with commonly held assumptions of adult online learners. Much of the research referenced in the Kennan (2018) study was before 2000, which suggests that the assumptions applied to older digital users may now be redundant due to the ubiquity of device use with the older age cohort as alluded to in Chapter One. The research discussed the 'elderly population' regarding their technology adoption noting that digital devices are now much more integrated into the older consumers' lives (e.g., Vassilakopoulou & Hustad, 2021) and the assumptions and stereotypes of old may not apply, particularly to the middle-aged user.

What does 'older consumers' mean?

The lack of a clear, or universally accepted, the definition for terms relating to the older consumer was an observation from the literature that highlighted a difficulty when comparing one research's findings to another. The variation of ages that exist across research is vast so, when selecting articles relevant to the 45 – 65 age group, the inclusion criteria meant that articles relating to ages >=45 and <=65 were included in the review. Selecting articles based on terms relating to the 'older consumer' for the aforementioned age meant that studies on any age within the 45 – 65 age range would appear in the results. The problem with this was that the grouping of subjects into commonly labelled age groups such as 'middle-aged', 'older', or 'young old' was not consistent so a comparison of sample groups was not so straightforward.

Kamin, Beyer & Lang (2019) discuss device use for 'older adults' but the age range is between 60 and 93. This proved problematic when attributing the results to all 'older adults' as the term contains

different ages depending on the preferences of the researcher(s). In comparison, Lee, Han & Chung (2014) define the age range for the term 'mature consumers' (referring to older adults) as subjects aged 40+ and Vassilakopoulou & Hustad (2021) refer to the 'elderly' population but fail to define the ages that the term encompasses. Of note, Lee, Han & Chung (2014) describe the mature consumer as the 'most disadvantaged group' about an assumed cognitive decline for users over 40 and Wu & Song (2020) discuss a disparity between terms used to describe age groups containing older adults when investigating online shopping adoption and continued use. An interesting insight from Wu & Song (2020) about older adults is that the diversity among age cohorts is great and that this diversity can affect how representative the findings are to any given age group. This could highlight that each age group is more diverse in behavioural aspects than the literature has found to date, therefore future academic attention could yield interesting findings.

In terms of the significance for digital behaviour, the broad range of ages in the literature presents difficulties when comparing research findings/conclusions in a like-for-like scenario. For example, attempting to compare the Lee, Han & Chung (2014) conclusion regarding older consumers that 'enjoyment' was the strongest predictor of adoption, and the findings of Barnard et al. (2013) about 'usefulness' being a strong influence on continued engagement (adoption) becomes difficult. Both studies refer to 'older consumers' but the ages which those terms refer to are quite different (40 - 70 and 58 - 78 respectively).

This fragmented view of the 'older consumer' in terms of one's digital behaviour also showed that the predominant comparisons of populations were between the young and the old. There was limited research offering insights specifically for the middle-age group and of those studies that did contain information about the behaviour of users between 45 – 65, as mentioned in the Hettich et al., (2017) literature review of consumer behaviour, the contexts were mainly focussed on health-related topics; as a crossover age to the older demographic; or the sample consisted of adult digital consumers over the age of 18.

Age as a Predictor Variable

The use of age as a moderating variable, particularly in quantitative research, is widely accepted (Nunan & di Domenico, 2019). This was echoed in the literature as the review found that age is used as a predictor element where conclusions state that one's age determines one's behaviour. For example, Shang & Zuo (2020) discuss the influence age has on learning intentions for older adults and van Deursen et al. (2015) suggest age is negatively correlated with addictive smartphone use. However, in terms of age-related digital behaviour, the information is fragmented when research uses demographic variables such as age. Harris et al. (2016) discuss age not adding much value as a

predictor variable and this sentiment is shared by Hettich et al. (2017) when describing the lack of benefit received by using chronological age. It is to this point that cognitive age was found to potentially add more benefit to research in the field of digital behaviour (Yang & Shih, 2020). Cognitive age as a concept was a theme that came through from the literature review. Indeed, a few studies suggest that self-perception of one's age is more informative regarding digital behaviour and has more influence on the use of smart devices (Mariano et al., 2021).

Regarding a predictor variable for digital behaviour, the literature showed diminished benefit in concluding one's behaviour based simply on their age (e.g., Zhitomirsky-Geffet & Blau, 2017). This suggested that the traditional quantitative-style methodology that uses moderating or predictive variables to conclude a sample does not necessarily work for the complexities of digital behaviour. Like the finding of the difficulties in comparing studies based on terms such as 'older consumers', problems occur when trying to extrapolate those predictive conclusions to other populations. The use of chronological age as a demographic moderator was found to be less reliable for digital behaviour insights now that digital use has matured (Hettich et al., 2017).

Cognitive Age

An interesting finding from research compared digital natives (> 34 years old) with digital immigrants (> 34 years old) regarding their cognitive age relating to their smartphone use. Shih, Yang & Yang (2018) highlighted that cognitive age had a moderating effect regarding the behaviour of older smartphone users. Specifically, the users with a cognitive age less than 34 but a chronological age greater than 34 exhibited the same behaviours as those users with a chronological age of 34. In other words, those who perceive themselves as younger tend to behave as younger users.

The use of cognitive age, and its benefit over the use of chronological age, has been drawing more attention concerning the digital realm (Shih & Yang, 2020). Indeed, the use of cognitive age may present more benefits than chronological age when comparing scenarios that entail digital interactions and consumption (Hettich et al., 2017). However, Mochis (2012) provides a contrasting discourse about the merits of cognitive age as a potential research variable. Interestingly, Mochis (2012) argues that the use of cognitive age needs to be coupled with context to be useful when attempting to explain behaviours. The context in which someone's cognitive age is measured can affect the consumer behaviour that is exhibited. For instance, Mochis (2012) bemoans the lack of a contextual element, such as the role of emotions that can be generated at differing times of the day and the physical environment, when using cognitive age in research. In particular, Mochis (2012) discussed a lack of including emotions concerning 'cognitive models', which may have a greater effect on behaviour than previous research suggests.

The replacing of chronological age was an interesting conclusion from the Hettich et al. (2017) article that looked at the literature on consumer behaviour over a 45-year period. Of note, more specific age-based parameters were discussed regarding decision making based on dimensions of the aging process. With relevance to cognitive age, 'phycological aging' is discussed via discourse about behavioural patterns and the idea of individual self-perception influencing decision making. The premise is that aging from a cognitive perspective is not a linear process and that the assumption that an individual has a deficit in cognitive ability purely based on their age is inadequate when extrapolating findings to a wider population.

This concept is built upon when reviewing activities that were traditional physical in customer interactions but now employ a more digital focus towards customer engagement. The banking sector is one industry that has a large adult consumer base and spans the breadth of ages from 18+. Research into the adoption of *m-banking* showed that a cognitive-based age indicator has a direct relationship with the behavioural intentions regarding technology adoption viewed through the Unified Theory of Acceptance and Use of Technology (UTAUT) theoretical lens (Harris et al., 2016). In other words, the younger someone perceives themselves, the more likely they are to use banking technologies.

While the Harris et al. (2016) study is predominately focused on a young vs older comparison, their findings are supported in other reviewed literature that states the digital behaviour of middle-aged and older adults is not predicated on chronological age (Mariano et al., 2021; Chéron & Kohlbacher, 2018; Shih & Yang, 2020). This point is magnified when looking at digital engagement and adoption as physical limitations are not as significant barriers when using devices. The interesting aspect of findings on cognition is that one's perceived age can affect one's digital capability and willingness to engage, although there is a consensus that more research is needed in this area.

While cognitive age was discussed regarding its value to research on digital behaviour, the persistence of the age demographic used in digital decision-making affects some of the findings. The inconsistency of some of the reported insights associated with age and the nuanced behaviours of individuals made reviewing the data in a holistic way challenging. As alluded to previously in this chapter, the difficulty with comparing studies where the term 'older consumer' is used is not necessarily a like-for-like comparison when actual age is considered, hence the emergence of the concept of cognitive age.

Post-Adoption

Previous research relating to technology has largely been based on technology adoption i.e., whether a user accepts a new process or not (Hettich et al., 2017). Hettich et al. (2017) referenced the lack of research for the decision-making process of technology adoption over the 45-year period for which they reviewed articles. This suggests that further aspects of consumer decision-making, such as post-adoption, are being overlooked. From a digital perspective, the post-adoption phase may be a more salient area of research as acceptance and continued use of devices and/or apps are key components of behavioural change (Odekerken-Schröder & Oertzen, 2019).

Through a theoretical lens, the UTAUT was oft mentioned in the literature as a guiding framework for many studies that looked at digital behaviour and adoption (e.g., Barnard et al., 2013; Shih & Yang, 2020; Harris et al., 2016; Lian & Yen, 2014). The theory identifies variables that explain digital behaviour, so the use of the concept is understandably widespread among research authors and disciplines. The use of UTAUT was found to be mainly applied to adoption and whether the acceptance and/or use of tech was viewed positively or negatively. Interestingly however, the papers utilising the UTAUT theory to focus on the intentions of users to engage with tech and the long-term behavioural implications are a less reported concept. While the theory can offer some insight into intention, the area of post-adoption in digital use is a topic to be further investigated in terms of its influence on behavioural change (Odekerken-Schröder & Oertzen, 2019).

Under-researched areas relate to the emotional, perceptual, and behavioural aspects of app use from a post-adoption perspective. Cho (2016) investigated gaps related to the aspects while studying Korean health app users as societal adoption rates among adults in Korea are one of the highest rates in the developed world. Interestingly, the study investigated continuance motivation as a precursor to adoption which, in turn, influences the users' behaviour. The more experience an app user has related to their motivation to use the app, which can determine the behaviour utilised. The study concluded that the amount of effort to learn is inversely related to the 'perceived ease-of-use' of health apps (Cho, 2016).

Information Seeking Behaviour

A particular behaviour that stood out within the research was how consumers digitally seek information. The salient goals for these searches, based on the body of literature reviewed, was to find information about one's health or the health of others in their social circle (e.g., Hong & Cho, 2017; Jacobs et al., 2017; Shang & Zuo, 2020; Agree et al., 2015), consumer information gathering (e.g., Knezevic et al., 2020), and seeking social information (e.g., Zhitomirsky-Geffet & Blau, 2017)

Knezevic et al. (2020) discuss a transition of sorts for the older consumer from the habit of using physical stores for their shopping information to using their devices to gain the information they need. However, what was not found was a context for that consumer information-seeking behaviour. Context such as whether the product in question is a high or low involvement product would require different amounts of information needed and, consequently, varying degrees of intention to use a smartphone for this seeking behaviour. The lower the involvement can result in less information needed; therefore, a smart device may now be more suited for this type of information-seeking behaviour for the older consumer that digital technology has permeated all age groups (Bartels et al., 2019).

Zhitomirsky-Geffet & Blau (2017) suggest smartphones are predominately used for seeking 'social information' implying social media services are the main purpose of smartphone use. This social information search was posited to be for emotional gratification, but their research mentioned that this behaviour was performed to a lesser extent in adults. Zhitomirsky-Geffet & Blau (2017) describe the older adult motivation for seeking social information as less about emotional gratification. Furthermore, their research stated that this social searching behaviour was performed by 'extrovert and neurotic adults' referring to specific behavioural traits that their research identified and chose to discuss. While this may apply to some adults, middle-aged users are more nuanced in their behaviours (Law, Kwok & Ng, 2016). In other words, labelling of adults in their research based on extroversion or concluding their neuroses was a too simplistic view of an individual's behaviour and may benefit from more context.

Regarding the research context applied to older consumers, three main areas of focus were prevalent: Healthcare; the Banking industry; and Online Shopping. A prevailing theme from the reviewed literature for the older consumer relates to the health sector and/or medical science where the health-seeking behaviour of older users was investigated (e.g., Jacobs et al., 2017; Hong & Cho, 2017). The discussion revolved around an increase in both the older consumer's health information searches and the health industry's move to more of a digital focus (Agree et al., 2014). Shang & Zuo (2020) echo this increase in health information seeking behaviour but through a social media lens where the older user seeks information through social channels. Healthcare information has traditionally been through face-to-face consultations, but the emergence of digital communication channels has meant more than one approach is now available to patients (Shang & Zuo, 2020).

The literature regarding health information-seeking behaviour was heavily focussed on samples relating to the elderly consumer (e.g., Hall et al., 2015). While there was some discourse on the

younger information seeker (e.g., Magsamen-Conrad et al., 2018), there was a paucity of research on the middle-aged digital user as the research still concentrated on comparing young age groups (< 30) and the elderly (> 60). For example, Hall et al. (2015) suggest that the complexity of health decisions that the information seeker is experiencing has a potential effect on the use of digital devices for health purposes when comparing older and younger users (Hall et al., 2015). In other words, the more complex the health issue for which the information was being sought, the greater the effect on the digital behaviour exhibited when using devices.

Health, Finance, and e-Commerce

In device use within the broader health topic, mHealth (or eHealth) was a topic of interest regarding the older consumer and their digital behaviour (Bujnowska-Fedak & Węgierek, 2020). The findings on mHealth are congruent with generalised app use in that the insights are fragmented when related to the middle-aged consumer. Knapova et al. (2020) discuss the topic of mHealth for older consumers and talk about how the use of personal devices impact health-related behaviour. Interestingly, their study highlights 'eHealth technology' adoption is low and the continued use of the tech decreases over time. While their research discussed digital behaviour, the focus was still on the older consumer mean age 66.14) as opposed to the middle-aged device user. Of note, their findings indicated that 'readiness to adopt' mHealth tech was directly related to device use i.e., the more experience a user has on a smart device, the higher their propensity is for mHealth adoption. This insight could relate to the middle-aged consumer because, as previously mentioned in Chapter One, device use rates are high and increasing.

Nunan & di Domenico (2019) highlighted the focus of research towards the health/medical areas tends to gravitate towards those users trying to address health issues. Furthermore, they surmise that the over 60 age group gets more of a digital research focus due to a preconceived notion that older users predominantly search for information about their health concerns, disregarding everyday-type digital behaviour like online shopping or digital communication (Tyrväinen & Karjaluoto, 2019). In other words, their observations suggest that the older consumer only uses digital health channels because they have age-related health problems, and this also suggests that *older consumers* relate to anyone 'not young' which presents an issue with the definition of the older consumers' term as discussed previously in this chapter.

Bhuyan et al. (2016) discuss the increased use of mHealth apps and the need for further research to be done in this area by looking at the user characteristics and how they influence behaviour. While mHealth research looks at general health and health prevention applications, their research discussed the influence contextual factors have on device/app behaviour. For example, the use of

devices to discuss health information with a particular physician or to seek a second opinion for a proposed procedure showed low rates of usage. Of note, their study mentioned that their findings did not reveal causation but merely correlation which, in part, highlighted their discussed need for more investigation into mHealth app use.

The banking sector was an industry-specific research topic that was found to provide insights on device use in a similar vein to the healthcare industry. The banking and finance sector has utilised technology in a disruptive manner by removing physical aspects such as bank branches and investment brokerage firms and replacing them with tech-based solutions (Frackiewicz, 2021). The disruption is concerning the user's habitual behaviour where a simple trip to the bank has evolved into an online channel (Wu & Song, 2020). Nikou (2015) discusses behaviour as being linked to *habit* where the maintenance of what was previously done is a driver of one's behaviour. In terms of the banking industry, the habit of going to the bank is hard to break for the older consumer.

The financial sector is also an industry going through a digital metamorphosis of sorts into the digital realm. *FinTech* is a relatively new tech sector that is taking previously people-centric business processes, such as share purchasing and personal investing, and digitising them (Oertzen & Odekerken-Schröder, 2019). While FinTech is a relatively new service, it is being adopted by the middle-aged consumer quickly, so habits are being formed from its use. The nature of FinTech, being a financial service technology, is benefiting from the banking industry's relatively mature technology adoption as the banking industry was an early adopter of internet-based innovation (Singh et al., 2020).

Interestingly, both FinTech and m-banking/e-banking services were noted as having the same issues that were identified as poignant to other services (Harris et al., 2016). Issues such as *intention to use, perceived usefulness,* and *social influence* were discussed in the literature for finance and banking services which mirrors the issues for other digital services mentioned in this chapter. However, as m-banking integrated internet-based technology into their processes earlier than many other industries, the adoption rates mentioned in the literature were higher than comparative industries (Singh et al., 2020). Singh et al. (2020) note that this maturity is pushing the industry to innovate at a more granular level with more customer-centric developments to address user needs and wants. However, post-adoption research was in limited supply relating to the FinTech/Banking sector, particularly for the middle-aged consumer, which again mirrors the issue experienced by other industries (Oertzen & Odekerken-Schröder, 2019). This reiterates the need for more research regarding the long-term impact on actual usage, particularly as they relate to usage intentions.

Furthermore, usage intentions of the digital consumer were mentioned as being influenced by word-of-mouth (WoM) and this point relates to the issue of social influence (Farah et al., 2018).

Social Influence was discussed as having a greater impact on post-adoption for financial-based tech as the trust users put in the opinions of others seems to hold more gravitas than company marketing efforts (Oertzen & Odekerken-Schröder, 2019). This finding was interesting and could have implications for marketing practitioners in the financial sector. For instance, WoM's influence on FinTech services was a key factor regarding adoption and the effect on the behavioural intention for technology use (Singh et al., 2020; Belanche et al., 2020). The social influence was described as pressure to act a certain way or to adhere to a set of norms which was noted as particularly salient for disruptive innovations. Predictors of intention, such as social influence, are noted as relevant factors for digital behaviour and can consequently affect predictions when investigating intention against actual usage (Farah et al., 2018). The potential for prediction, in the 'boom' of social media (Bui, 2021), is significant as social influence is arguably more widespread than ever, so this insight raises interesting questions about the effect of social media on the use of FinTech.

In a similar vein as FinTech/m-Banking, online shopping has been an early adopter of digital innovation with websites providing an additional sales channel to the brick-and-mortar store (Rana, 2021). To this point, the e-commerce industry is an oft researched topic area in terms of consumer behaviour and how retailers provide customers with the user experience they want. For the research period for this report (2012 – 2021), the e-commerce industry was considered well established and at a certain maturity level.

Furthermore, the articles reviewed were more nuanced in topic areas than just offering generalised e-commerce discussions which would suggest a certain saturation of the more generalised discussions. For instance, Knezevic et al. (2020) compared two generations for book buying online and Nguyen et al. (2016) investigated the effect of order fulfilment on consumer behaviour. These are examples of the focussed research topics that were typical for the literature reviewed and they highlight a more nuanced approach to researching the *online shopping* topic.

However, the broad topic of adoption was still prevalent regarding online shopping but more from a smartphone context as mobile shopping is now the most-used channel for e-commerce interactions (Cavalinhos et al., 2021). When discussing older consumers, the agenda mirrored previously mentioned literature where the adoption of technology was the research focus. In other words, the focus of adoption in the research, about the older consumer, was to do with whether the age group engaged with online shopping or not. The persistence in studying adoption is significant for middle-aged consumers as the engagement rates are now similar to younger age groups. To this point, it

would suggest that there may be benefits with moving on from adoption and investigating more nuanced research topics.

The dichotomy of utilitarian versus hedonic motivation was an unexpected research topic that gave insight for mobile e-commerce. Mobile shopping is prolific within all age groups and the values consumers attribute to the experience is becoming increasingly more varied (Newman et al., 2017). The motivations and intentions of the middle-aged consumer may not only vary compared to younger age groups but also differ from an intergroup perspective. The study of utilitarian or hedonic motivations provided interesting insights into the older consumers' behaviour (Guido et al., 2014). These insights highlighted the importance of context when comparing behaviour regarding digital use as the contextual motivations had a documented influence on digital engagement (Guido et al., 2014).

This dichotomy is an interesting concept for the middle-aged consumer as it is posited that the use of smartphones/tablets/websites is now so widespread that the hedonic value has diminished. Cavalinhos et al. (2021) discuss the 'strong utilitarian component' that mobile devices/apps provide and that they can contribute to the hedonic value through the customer journey via efficiencies for the customer at certain touchpoints. Further, the use of apps on smart devices now has a short hedonic window before the utilitarian aspect dominates and the use of the app and device become unconscious and habitual. It is through this crossover to habitual use that the behaviour becomes automated, and the 'sparkly new thing' attribution to the task/device functionality is gone (Sheth, 2020).

The significance of this *spectrum* between utility and hedonism is related to the ubiquitous nature of digital use for middle-aged consumers. In other words, due to the widespread use of digital devices, the utilitarian/hedonic value may change depending on the context (e.g., a product category that is being bought, digital experience of the user, the type of device used, the environment in which the task is performed etc) (Park, Kim & Hyun, 2020). For example, the utilitarian aspect of the regular supermarket trip to get groceries has a typical utilitarian function (Wu & Song, 2020). However, during the pandemic-inspired lockdowns, the ability to perform this mundane task was disrupted and the large proportion of over 30-year-old shoppers was forced to change to a digital solution for the grocery shopping task (Wang et al., 2020).

Due to the ongoing pandemic-based restrictions, it is unknown if the switch to online grocery shopping offered a hedonic value for a traditionally utilitarian activity for middle-aged users. Furthermore, an investigation is needed to determine if changes, like the supermarket scenario, have been adopted or rejected (i.e., reverted to the behaviour before the pandemic forced a

change). This investigation relates to the need for longitudinal research on post-adoption and whether continued digital use is more hedonic or utilitarian for the older consumer.

An interesting finding on the motivation spectrum was regarding user experience (UX), which had two salient themes garnered from the literature. First, the lack of discussion on UX was conspicuous in its absence. Second, of the few articles that discussed UX relating topics (e.g., Guido et al., 2014; Park, Kim & Hyun, 2020), was a recognition of the need for app design (including websites) that caters to more than one cohort (Nurgalieva et al., 2019). In other words, a "one design fits all" approach may not be the best way to cater to such diverse design needs within each age group as individual users may have different UX depending on the context. This point highlights that more research is needed to determine how varying contexts can alter an individual's experience.

The Issue of Trust

Trust as a topic for digital use was not as widely discussed as expected in the body of literature when referencing behaviours of the older digital consumer (Law, Kwok & Ng, 2016). It was more specifically discussed regarding online purchase intentions where personal financial information was to be provided. The issue of trust is an area where more research is needed as the effect on digital behaviour has not been studied in detail regarding the middle-aged consumer (Nunan & Dim, 2017).

The type of information related to trust has 'traditionally' been about the provision of payment information for online-based transactions (Lee et al., 2014). However, the literature featured the scant discussion of credit card security with a paucity of research regarding the types of personal information that caused trust issues. In other words, there was no detail on the specifics of the information that may result in privacy issues that could affect the behaviour of the user. Knezevic et al. (2020) discuss generational differences for online purchasing and give some insight on the issues of trust, security, and privacy for purchasing books online but lament the lack of specific differences between generations in previous research. Their research discussed the issue of trust via survey questions about the perception of obstacles of online shopping for which digital security is regarded as a barrier to adoption and/or continued use.

Interestingly, it was the provision of personal information via digital channels that caused anxiety about security, not the fear of fraud-type consequences of providing credit card details, and the trepidation about the digital provision of personal information was similar across all age groups. However, some research (e.g., Singh et al., 2020) noted a correlation between the age of a user and their perception of digital safety. Perceptions of security, trust, and privacy were seen to affect older users more significantly than younger users (Singh et al., 2020). What is not clear is whether this

perception was found to be the same for the 45 – 65 age group because much of the research on trust aspects was based on the elderly consumer (> 65). Lian & Yen (2014) talk to the topic of *risk* from a broad perspective on the barriers to the purchase intention of older consumers. Moreover, they state there is a gap in current research about which particulars of the risk issue are poignant for older consumers. Interestingly, Lian & Yen (2014) mention *social influence* as a major driver for older adults and their online shopping propensity and the emergence of social media (SM) has potentially increased its relevance.

Social Media Research

Regarding the digital behaviours of users, the focus on interactions with social media apps as the basis for research findings was a common theme. Of all the specific classes of digital behaviour mentioned in the literature (online shopping; health information seeking; social media engagement; etc), social media (SM) interactions were a particular topic of interest as they dealt with social factors about a digital device (Singh et al., 2019). Social factors such as personality and identity, self-perception, user intention, and value were interesting topics that related to behavioural attributes using social media (Fietkiewicz et al., 2016).

However, SM research for the older consumer is somewhat limited and has been described as changing the 'landscape' of marketing and device use. This is driven, in part, by the growth of older populations globally (e.g., Hruska & Maresova, 2020) but the research still focussed on the levels of adoption and engagement when discussing SM concerning the older consumer. Hruska & Maresova (2020) found that users over 50 years old were less inclined to use SM daily, compared to younger users who engaged more regularly (daily or more). Of interest, there was limited research on SM relating to the middle-aged adult user as the analysis of the literature showed a propensity to reference comparisons of older vs younger users (Hruska & Maresova, 2020). Furthermore, there is a lack of insight on *how* individuals interact with SM and specifically how various age groups differ in their engagements or 'usage patterns' (Nunan & Di Domenico, 2019).

While it was found that technology has permeated all aspects of society (e.g., Mutsvairo & Ragnedda, 2019; Statista, 2022) with SM having a wide reach (e.g., Bui, 2021), there is still little discussion on the nuanced differences in various age groups. Bui (2021) mentions the 'boom of social media' regarding the continued spread of SM and alludes to stereotypical barriers, such as technological literacy assumptions, potentially preventing researchers from investigating SM behaviours and adoption for users over a certain age. Bui (2021) specifically mentions that SM marketing is still predominately targeted at the younger cohort even faced with the aging populations around the globe that are increasing faster than these younger targeted audiences.

However, the Bui (2021) article references the older consumer as those aged over 55 who are *transitioning* to retirement, going so far as to label participants over 55 as part of the 'grey market'. While the retirement transition may be the case for some SM users over 55, the term 'older consumer' seems to carry a certain preconception about the influence of age on SM engagement. There is an assumption that the older SM user is digitally illiterate which affects their adoption of SM and this preconception spills over to include the middle-aged user (Bui, 2021). Their intention to use is assumed to be less as illiteracy is a barrier to adopting SM although the article also talks to a certain commercial aspect of their research by discussing intention via the concept of *intention to purchase* through SM (Benson et al., 2019).

The notion of Intention (whether an intention to use tech, SM services, or any other device/app) was a point of interest garnered from the literature regarding the previously mentioned adoption and post-adoption rates. Of note, one's *intention to use* is regarded as a key antecedent of adoption, and continued use, of digital services and can differ greatly between individuals (Moschis, 2012). SM and its spread throughout society would suggest that all ages use these SM services to some degree (Mutsvairo & Ragnedda, 2019). The older consumer has been traditionally slow to adopt these services, but this trend is changing with 79% of users aged 45 to 55 now regularly using Facebook (Singh et al., 2019). This suggests that the middle-aged user has demonstrated that regular use is more than a matter of intention and may have moved into the area of habitual and/or subconscious use. Mochis (2012) surmised that decision-making for older adults may involve social influences of one's community which affects one's intention to engage. This was echoed by Fietkiewicz et al. (2016) when discussing motivations to adopt SM services relating to Facebook, Instagram, and Twitter specifically.

Furthermore, Barnard et al. (2013) also discuss the *intention* concept but focus more on the devices as opposed to interactions with apps. Their research also referenced technology adoption via learning intention with a dichotomous decision of acceptance or rejection of any given device. There is an implication that the older consumer is less than 'tech-savvy' which affects their intention to use SM services. However, these studies are all before 2020 and all conclude that more research needs to be conducted regarding the different motivations to use and to investigate the behaviour of users who have 'fully adopted' a digital service such as social media (Fietkiewicz et al., 2016).

The research on SM raised more questions than provided answers as the prevailing theme was that more information is needed to better understand the variations of SM interactions for the older/middle-aged consumer. There is also a prevailing sentiment that more investigation is required to enable the prediction of SM behaviours for a given demographic or user persona. The context for

which SM engagement is measured may indeed shed some light on differences that exist within an age group (Bui, 2021). Contextual factors such as the time of day, personal or professional use, or user personality have been noted as important aspects affecting behaviour for middle-aged SM users (Zhitomirsky-Geffet & Blau, 2017). Furthermore, the Zhitomirsky-Geffet & Blau (2017) study suggests social seeking behaviour was predominately performed on personal devices, such as smartphones, for all age groups. This use of personal devices for social information seeking may be impacted by the context for which they are used, such as the physical environment. For middle-aged consumers, the SM engagement context may be of greater significance for the prediction of behaviour.

A Contextual Issue

"Our identities are malleable depending on whom, or what, we are with"
- Wordsworth (Botton, 2004)

Context, as an interesting theme concerning older digital consumers, was generally viewed as needing more research to provide more significant insights. While some research (e.g., Nikou, 2012; Lee, Han & Chung, 2014) discussed results that suggest the older consumer is less likely to use or adopt technology than their younger counterparts, there is growing discourse regarding the need for context to play a more prominent role in research for digital behaviour (Barnard et al., 2013). Context can provide insight into *how* behaviours are influenced as the impact of this influence may vary greatly when comparing behaviours concerning context for any individual (Mochis, 2012). For an anecdotal example, the differences in the digital behaviour of individuals between work and home may be large and could change daily depending on the environmental, social, or emotional context (Shih & Yang, 2018). Indeed, Mochis (2012) discusses the need for a wider contextual lens to view behaviour that incorporates aspects of a 'day-to-day' nature. For example, an office worker by day might be a devoted gamer by night and may behave differently, from a digital perspective, depending on the given situation.

An interesting find regarding the issue of context was the lack of discourse on cultural or personal identity differences. While there was some talk of societal influences on behaviour relating to a digital user's friends/family etc (e.g., Barnard et al., 2013; Lee, Han & Chung, 2014), there was no specific mention of any effects that culture may have on consumer behaviour. The overarching approach was to extrapolate findings from a studied sample to wider populations. However, this omission of a cultural reference made the findings not a representative reflection of a user group. The previously mentioned article by Wu & Song (2020) discussed the difficulty in applying findings to other populations when discussing the diversity within the middle-aged user group and Leysan et al.

(2019) mentioned the lack of cultural aspects in literature when discussing design guidelines of touch-screen devices. This issue could be apparent as the diverse range of cultures that exist within any age group is vast so the lack of research regarding cultural aspects was an interesting find.

Mochis (2012) discussed the need for more contextual research to determine relevance for one's digital behaviour. Situational, external, or environmental factors were noted as having a significant influence on the behaviour of older digital users (Zhitomirsky-Geffet & Blau, 2017). These extraneous factors can cause stress which research suggests has an influential effect on digital behaviour. The influence of outside events on consumer behaviour was introduced in Chapter One referring to the global financial crisis (Claessens et al., 2010) and the 'millennium bug' (Kratofil & Burbank, 1999). The Covid-19 pandemic is of relevance to digital behaviour as a contextual topic for the older/middle-aged consumer. Aspects of life for many cohorts in society were affected and the lockdowns/restrictions pushed digital solutions forward or necessitated the adoption of existing tech that was not previously utilised by older consumers (Sheth, 2020). The research on pandemic-inspired behavioural change is just beginning as the situation is ongoing as of the date of writing this report.

The Covid Effect

The writing of this report was conducted during the Covid-19 global pandemic and so provided an interesting caveat to the reviewed findings. The results garnered from the research could be affected by the enforced lockdowns as this has placed digital services in front of users of all ages. The government-enforced restrictions meant that 'traditional' behaviours were affected, and digital solutions were wanted/needed, particularly for industries that had a face-to-face component. Of particular interest, the work-age population, of which a large proportion is in the 45 – 65 age group, were arguably affected the most. The work environment and the humble grocery run moved online, retail had to adapt to an online world and students of all denominations were forced indoors.

The literature search for this review began before the advent of any mandated restrictions so findings relating to the effect of Covid-19 on the digital behaviours of all users was not a well-researched topic area yet. It is to this point that there may be far more gaps in the research since the time of writing than this paper highlights. Indeed, Covid-19 was a specific author-defined keyword as of December 2021 whereas pre-August 2021 Covid-19 related topics were not shown in the results. This points to the emergence of the topic as an increasingly researched area and one that could produce insights as to how digital behaviour has been affected (Sheth, 2020). A simple example of a behavioural change was uptake in the use of laptop and desktop use. Jílková & Králová (2021) discussed an interesting statistic that highlighted a possible behaviour change. In a digital industry

where the smartphone was the most used device to access social media, e-commerce and news, the change bought about by Covid-19 based restrictions resulted in a significant increase in the use of laptops and desktops (Jílková & Králová, 2021). While this statistic may be borne from necessity, the pandemic may have resulted in a paradigm shift in behaviour for the digital consumer but the information regarding the behavioural effects is still a work in progress (McClain et al., 2021). The impact on the older consumer needs further investigation to tease out the nuanced differences that have fundamentally changed, either directly or indirectly, because of the crisis.

Chapter 5

The purpose of this systematic literature review was to look at what information exists regarding the digital behaviour of older consumers. Literature was searched from the period 2012 to 2021 and the review included 51 peer-reviewed articles from journals across multiple disciplines. The structure of the report follows a thematic approach where salient themes were garnered from the selected articles and synthesised to provide a holistic view of digital consumer behaviour for middle-aged consumers. A framework based on Theme, Method, Context, and Sample was used to synthesise the article findings systematically. The TCM-s framework was adapted from previous research to organise the findings for reproducibility.

The findings have shown current knowledge on the digital behaviour of middle-aged consumers is fragmented while events have had a large effect on the digital arena. The global pandemic has been a catalyst for change so assessing what information currently exists was an important step in the process as the global effects of this unprecedented event continue to potentially shape digital behaviour for future generations. The report aimed to present a critical analysis of the research to provide impetus for further investigation of digital consumer behaviour. The following chapter presents implications and contributions that this research makes from theoretical, managerial, and methodological perspectives.

5.1 Summary of Findings

The findings in Chapter Four offered insight into the current state of digital behaviour for the adult consumer. These were arranged into thematic categories to encapsulate the salient topics extracted from the body of literature. The poignant areas garnered from the review extend the current knowledge of the topic and enable potential directions for future research endeavours. Some of the findings relate to persistent issues with the research of a digital nature whereas others relate to important areas that were omitted from certain studies. A summary of what was found in the literature review is provided below to help understand the origins of the theoretical, managerial, and methodological implications.

A persistent theme was the existence of *stereotypes* attributed to older consumers, or any consumer not considered ‘young’. Preconceptions regarding cognitive ability, lifestyle-type barriers such as a lack of desire for digital engagement and applying preconceptions about the ‘elderly’ to middle-aged users. A common topic in the literature was research attributed to the health sector. Whether it was *health information seeking*, or general information searches, *information seeking* is a particular

behaviour that was deemed common for the 'older consumer'. This related to research practitioners assuming older consumers were only interested in finding out health information.

Furthermore, these age-based assumptions manifested themselves into an overarching theme of measuring *adoption* rates for either digital devices, a generalised view of apps, online shopping, or social media. Interestingly, the findings showed research still focuses on whether 'older consumers' adopt/accept technology or not. This fails to address the middle-aged user's widespread digital engagement and the nuanced behavioural differences apparent within the age group. Of note, while the topic of *post-adoption* was briefly discussed, there seems to be an opportunity for further research in the post-adoption aspects of digital interactions extending post-adoption research into areas investigating continued and/or habitual use.

The age-based assumptions apparent in the research identified issues with the use of terms to describe the sample representing older consumers. The disparity of labels attempting to define what chronological ages are encapsulated by the descriptive research terms used was large and presented difficulties when comparing article conclusions that used the term 'older consumer', 'adult consumer' and the like. The ages that these terms encompassed ranged from 35-90 depending on the study author's interpretation. The age of digital users were also found to be used as a moderating variable (e.g., age and gender) for quantitative analyses. Again, this presented difficulties with comparing studies as *age* was described as a predictor variable. In other words, the discussion of the results where studies used age as a predictor of behavioural characteristics surmised that this applied to one's chronological age with limited contextual references.

The issue of *context* was found to have limited discourse in the literature so it needs further investigation for digital behaviour. Contextual factors such as the environment that digital engagement is performed potentially influences behaviour. Interestingly with relevance to the adult consumer, was the comparison between the work and home environments. The middle-aged digital user is increasingly required to consume digital content on devices in a professional context coupled with home usage rates are like the rates of the younger consumer. These insights are more poignant when a global pandemic is considered.

Finally, the developing Covid-19 situation has put the 'cat amongst the pigeons' in digital research. Of the few articles that were found to address the pandemic, the consensus was that more research was needed but that the situation is potentially a major behavioural disruptor for all age cohorts. Interestingly, the push of an already fast-moving digital industry was accelerated as a matter of necessity as lockdowns presented the need for digital solutions. For the behaviour of the middle-

aged consumer, the change in the work environment, and other contextual factors, could yield some interesting insights from future research.

5.2 Theoretical Implications

While the area of consumer behaviour has been researched in-depth, the emergence and widespread use of digital devices has potentially changed the landscape for behavioural research. This systematic literature review provides value by identifying the information that is currently available on middle-aged digital behaviour. The literature review improved the understanding of the research topic by showing conceptual fragmentation and highlighting limitations in the approaches used to give insight. The findings showed the repetition of concepts when referring to the characteristics of digital behaviour. The concepts of *adoption* and *intention* were mentioned extensively throughout the literature. These concepts and approach limitations are encapsulated into two main issues that affected the strength of the conclusions that attempted to represent the middle-aged digital consumer.

First, this review provides information on the traditional concepts used in prior research on digital behaviour. Concepts such as *adoption* and *intention* were shown to be anecdotal (relying on the self-perception of the respondent) in nature and not as salient as they once were. Adoption referred to whether users engaged with a given technology or not, and Intention was researched by determining if a research subject had an 'intention-to-use' device or app. This report highlighted that the middle-aged user is more complex than mere adoption or intention can represent. However, there was a paucity of research on post-adoption and/or habitual use to investigate digital behaviour from a longitudinal perspective. This review presents an opportunity to look further into concepts such as *continual use* and *habitual use* as potentially beneficial digital behaviour research approaches.

Secondly, this report contributes to the consumer behaviour field by showing that there are difficulties when comparing studies that used descriptive terms to represent a sample of the population within a given age group. Terms such as: 'older'; 'adult consumer'; middle-aged' etc was used referring to the age of a studied cohort and these terms were utilised in the discussion/conclusion areas of research to describe insights derived from findings. While this process is nothing new in the research community, there was difficulty when trying to compare studies on digital behaviour as the conclusions often failed to specify the specific ages for which the statements referred to. For example, when comparing derived insights from one study to another, a conclusion from two studies using common terms may present congruence ("older consumers don't use social

media as much as younger users"). However, the term "older consumers" is not a like-for-like comparison and the actual ages from each study may be vastly different. "Older consumers" in one study measuring over 50's could also be used in another study where the age group of 'older consumers' is 65+. The difference between these two groups could be vast, particular with digital behaviour where any assumed physical decline associated with aging is somewhat negated.

The assumptions, as reported in the findings (Chapter Four), are still being applied to the older consumer and that the middle-aged users are the unfortunate recipients of these long-held stereotypes. These assumptions have manifested themselves into bias when defining terms to use in research, which has subsequently affected the conclusion validity of some of the studies on older or middle-aged consumers of digital content. This raises some questions around the future directions research could head in when investigating digital behaviour now that it is across all age groups. These directions are summarised below to highlight burgeoning areas of interest.

5.3 Managerial Implications

The long-term effects of a change in behaviour for the digital arena, instigated by Covid-19, has meant a ramping up of technologies that offered contact-less solutions for both provider and user. Solutions that were in the beta phase of completion were forced to move into production as the need for digital solutions during the pandemic were increased. For example, the supermarket industry was moving globally to more digital-driven business models before the advent of the pandemic. As digital offers more and more possible efficiency gains within the business sector, more knowledge regarding the behaviour of consumers can offer benefits for any future digital endeavours in this new post-pandemic world.

The research of the middle-aged digital user has permutations for the next crop of 'older adults' in the post-retirement age of 65 years old. The increased digital knowledge and behavioural traits that the current middle-aged users possess has the potential to greatly influence how they integrate tech into their daily lives past the age of 65. While the findings from this research show a large focus is placed on e-health, e-commerce, and tech adoption rates, there is potential for more nuanced topics of research for the older adult user group. The maturation of device/tech use for the burgeoning older consumer (current middle-aged users) will have ramifications for many aspects of digital behaviour for marketing, business, and policymakers alike.

This literature review contributes to the marketing and management disciplines by highlighting the middle-aged user as an oft-forgotten market. Traditional targets for disruptive technology were the younger digital consumer but the middle-aged digital user shows similar consumption rates. The

significance of this is two-fold being a) the current state of behavioural knowledge of this age cohort is lacking and can provide benefits for both internal and external customers and b) the middle-aged consumer group is the next elderly generation, of which is now the majority age group and growing, but more possessing tech skills than the previous elderly group.

Further research regarding the effect of Covid-19 on the digital behaviour of 45–65-year olds is a particular area that would benefit from more research. As findings from the review indicate, the short and long-term effects of change take time to be realised. This, coupled with the traditional fast pace of change in the digital industry, point to the pandemic having a disruptive effect on the behaviour of digital users. The significance of the pandemic on the middle-aged consumer will be an interesting area of research as changes begin to materialise and reach maturity. For example, changes in how middle-aged workers are affected may be vast as employers, workers, and the digital industry itself, adjust to a new era. The potential Covid-inspired shift away from traditional offices so a need to better understand the impact on the office working digital consumer, of which the 45-65 age group is the largest, and potentially most affected, cohort.

5.4 Methodology Implications

There is a difficulty with the measurement of behaviours for an age group spanning 20 years (45-65). Add in the regular, fast pace of change within the digital industry it then becomes more problematic for research findings to be applied to such a diverse group. The problem with using ones' age as a moderator for digital behaviours is that there exist many nuanced characteristics in behavioural differences within an age group regarding digital use and consumption. Of note, chronological age is far from a reliable moderator for studies of a digital nature as the attribution of a characteristic based solely on a time-based variable is not representative. Traditional research techniques have used common demographics like *age* as a comparison barometer often pitting one age group against another. This fails to recognise the vast differences in digital behaviours that exist between people aged similar to each other, let alone the differences between generations. This 45-65 age group, and arguably any age group, is much more dynamic regarding digital behaviour than current and past research suggests so understanding the behavioural nuances that exist in any cohort would benefit marketers, academics, business owners, and policymakers for decades to come.

The methods utilised in the review body of literature are over-represented by quantitative data collection processes. Much of the literature reviewed used survey-type data collection methods (Online surveys, Questionnaires, Street-Intercept surveys, etc) of a quantitative nature which provided plenty of information on perceptions of users but raised questions of the value derived

from anecdotal data. How accurate is the relationship between what an individual says and what they actually do? There seems to be a certain face-value trust that is needed to extrapolate the data to make the research conclusion representative to a wider population.

In other words, the researchers have taken the survey participants' responses at face value and the validity or truth of statements is not tested to provide a level of certainty to a study's findings. This issue may point to a greater need for a mixed-methods approach to investigate digital behaviour so anecdotal responses can be compared to observed behaviours to validate what was said to what is done. There are obvious increases in complexity and time to undertake such mixed-method studies which could impact the number of submissions to reputable journals for the academic fraternity. However, the gains made in rigour could have a positive impact on the quality of the research thus benefiting the intended recipients of the research outcomes such as the middle-aged consumer.

In terms of future recommendations, the advancement of technology to augmented reality (AR) and virtual reality (VR) offers research opportunities for behavioural research. Therefore, methodological innovation and creativity could (and should) keep pace with the fast-moving and innovative digital industry. The global pandemic has pushed forward many technological advances to a point where digital solutions are being implemented, and the ubiquity of device/app use has moved beyond a mere utilitarian function. This saturation of use may have fundamentally changed behaviours for all ages where conscious use has now become an unconscious habit. Eye-tracking systems, emotional measurements to stimuli, etc all offer an observational methodology to enable analysis that can offer objective and unbiased approaches to behavioural research. These can overcome the analytical challenges of cognitive biases, such as confirmation bias etc, that are attributed to survey-based responses. These advanced techniques can also complement survey data to expand on the knowledge and data previously collected.

5.5 Future Directions

The overall theme of these contributions alludes to a greater need for more research of a longitudinal nature to better describe digital behaviour.

1. There is a need to further investigate behavioural nuances of the middle-aged user
2. There is a reliance on certain concepts to describe digital behaviour
3. Future research could use cognitive age coupled with context to try and understand behavioural differences

First, the differences in behaviour between ages within the adult consumer age group were found to be underreported. The 45-65 age group is a complex cohort and the research offered little in explaining this complexity when describing digital behaviour. For instance, there was a paucity of discourse on the relationship between app type and app use, a comparison of the varying devices that are used within the age group, or the varying types of content consumed. Furthermore, there is a tendency for authors to attribute the stereotyped cognitive deficiencies of the elderly to the adult consumer. What was evident from the findings was that not enough information was presented for post-adoption and painted the adult user as not important enough to be researched in-depth. Information regarding long-term post-adoption was lacking for the middle-aged user so it is posited that more longitudinal research is needed to identify salient behaviours. Interestingly, the previous experience of the user was found to contribute greatly to the behaviour patterns of that user, but little investigation was done on the middle-aged user.

Secondly, concepts such as *adoption*, *intention-to-use,* and *digital divide* were used throughout research on digital behaviour that concerned users outside of the 'young'. The wider research trend of comparing younger and older consumers regarding tech adoption to explain digital acceptance fails to address the middle-aged consumer's nuanced behavioural differences. The concept of *adoption* is commonly discussed when referring to the adult consumer but whether or not a device/app is adopted fails to explain behavioural nuances. The concept of *intention* was also found to be an oft-used term that is related to the adoption concept i.e., whether a user has the intention to use technology. However, the intention of a user and the actual behaviour can differ greatly so more research into the intention-action gap would be beneficial to the understanding of digital use.

A further contribution of this study is to enhance understanding of the potential for further research on the 45 - 65 age group regarding their digital behaviour. It is posited that the *traditional* meaning of the concept 'digital divide' (referring to the lack of technology adoption for older consumers compared with younger users) is less to do with adoption between age groups. The digital divide has been a much-researched topic, but the term may indeed be redundant as an age group comparison as digital use has reached a certain saturation point for all age groups. The significance of the ubiquity in digital consumption within age groups sheds light on the growing need for a shift in focus for digital consumer behaviour research. In particular, the recent influence of the global pandemic has arguably drawn a line-in-the-sand from a broad adoption perspective as digital behaviours may have been affected long term for all ages. Moreover, the global pandemic meant that more digital interaction for all age groups was conducted as the pandemic-inspired lockdowns restricted non-digital activities. This means that explaining the digital behaviour of adult consumers goes far

beyond mere adoption rates as the use of digital devices in the middle-age group is so widespread that it renders adoption a moot point.

Lastly, there is potential for an investigation into the possible redundancy of using chronological age as a predictor variable for certain research areas such as digital behaviour. It is to this point that the report delves into the behaviours of a particular age group (45 – 65) as the differences in the digital engagements from one individual to another within the age group can vary greatly. For example, comparing one digital user to another may present very different results even if those users are the same age. Focus on device and app development has traditionally been centred on the younger population segments while device use of those over 45 years old has been increasing as described in Chapter Four. This increase comes with caveats as the increase in use is a) not accurately attributed to the chronological age itself and b) not uniform for all users over the age of 45.

Cognitive age is an interesting concept, and it has relevance to the digital arena as age-based physical and environmental barriers can be decreased. Cognitive age was a concept that was used to demonstrate a gap in the theoretical approach to assessing digital behaviour. The findings from Chapter Four show that there is an increase in the discussion about the potential benefit that using cognitive age could bring. When using cognitive age as a predictive variable for research, context may play an important role in digital behavioural research. As a yet-to-be-studied theory, the concept of a 'digi-age' is a hypothesis derived from differences in perceived cognitive age when using devices for varying purposes and in a multitude of environments. In other words, a device user's perceived age may differ depending on what they are doing on that device or what environment they happen to be in.

This future direction discussion shows the salient or interesting areas within the topic of digital consumer behaviour for the middle-age group. More research questions are proposed, based on the aspects of the TCM-s framework, to offer other potential areas that may be of interest to the research community which have been summarised in table form below.

Table 5.5.1 Proposed Future Directions

Research Issue (TCM-s)	**Proposed Questions**
THEME	
Adoption of digital	- What are the characteristics of digital behaviour/use that determine whether a technology is adopted? - What are the adoption rates for various app categories (social media, fun/games, productive, etc) for middle-aged digital consumers? What elements of apps (security, personalisation, search functions, ease-of-use, etc) are considered important to contribute to the term 'adopted'?

	- What is the gap between individual perception of adoption and actual adoption for digital engagements of middle-aged consumers? What characteristics/aspects determine *adoption* for digital tech?
Post-adoption and habitual use	- What aspects of digital behaviour/use for an adopted tech contribute to the determination of *post-adoption* for the middle-aged consumer? How do these aspects compare to other age groups? - What are the individual perceptions of device/app usage patterns compared to actual usage? What characteristic of digital use determine the classification of *habitual*? Is habitual/utilitarian use more/less prevalent in middle-age compared to younger digital users? - Does *hedonic* or *utilitarian* attribution effect the classification of habitual use for adult consumers aged 45 - 65? Is utilitarian-perceived digital tech more/less likely to be determined habitual for tech-savvy middle-aged users? - When does tech move from one needs category to another (*e.g., hedonic* $\rightarrow$ *utilitarian, utilitarian* $\rightarrow$ *hedonic)* for the middle-aged user? Can utilitarian tech provide a hedonic aspect?
Intention-to-use	- What is the gap between the intention-to-use and actual, engaged use for digital devices/apps of middle-aged consumers? An investigation into digital cognitive dissonance - Does the psychological state (e.g., mood, emotion, etc) of an individual affect the intention-to-use for digital tech? Does one's negative/positive emotion affect the perception of the intention-to-use?
CONTEXT	
Environmental influence on behaviour (e.g., Work vs Home)	- How do Covid-pandemic lockdowns affect productivity for adult consumers aged 45 - 65 working at home? - What affect has pandemic-influenced restrictions (i.e., work from home) had on digital behaviour for the middle-aged user? - How did the work-from-home situation affect digital behaviour for middle-aged business users? - What physical environments do digital users aged between 45 - 65 consume content the most? Where do users spend the most time on their devices outside of the home environment?
Contextual differences	- What are the drivers/barriers for digital behaviour of individuals of the same or similar age with the middle-aged user group? Can Time-of-day (TOD) explain digital usage patterns? What value does TOD provide in predicting usage patterns for the middle-aged digital user? - Does the perception of one's digital Cognitive Age affect the behavioural aspects (types of apps most engaged with, continuous time on one app, social; fun; productive style app categories) of digital users?
The role of emotion-based context	- What role does emotion play in determining characteristics of digital behaviour for adopted tech? How do emotions relate to digital usage patterns of the middle-aged consumer group compared to their younger counterparts?
Social Media	- How do the social media engagements differ when comparing various age groups? - What effect does *social influence* have on the social media behaviour of middle-aged users? - Is there correlation between the perception of one's own personality and the perception of how others see that individual based on social media interactions?

	- How does personality type (e.g., Introvert/Extrovert) predict behaviour for digital social media users aged 45 - 65?
METHOD	
The use of survey-based methods	- Are survey-based methods valuable in determining user behaviour of the middle-aged user? What does the literature say about the practical use surveys provide for digital behaviour insights over the past decade?
The lack of observational analysis	- What does using a mixed-methods approach reveal about the gap between one's perception of use compared to one's externally observed usage patterns?
Using chronological age as a predictor variable	- How much value does using chronological age to predict behaviour provide compared to other demographic moderators?
sample	
Fragmented 'middle-age' sample representation	- What ages are encapsulated by 'middle-aged' in digital research? Since 2000, what does the literature say about the different age ranges within each defined age group? What are the various age groups in research?
Middle-aged	- What ages are used in the literature for the 'middle-age' term over the past 15 years?
Digi-age	- Would a digital specific age, based on one's cognitive age + context, offer value to research? Is a digi-age a valid way to define a research sample population?

5.6 Limitations

TITLE Selection

Initial selection was based on TITLE only which, although a valid form of article selection, may have led to the exclusion of articles with titles that were not directly related to the content of the article. While bias was monitored on a keyword basis, reviewing titles for possible inclusion prior to the review of abstracts, some titles were a colloquial expression of the article contents. For example, the article titled 'A large-scale analysis of task switching practice effects across the lifespan' is absent of the identified keywords. However, the article is relevant when the abstract is reviewed. This example shows that there is some limitation with title selection alone.

Sources of Data

A limitation was highlighted when performing the article searches in one of the databases earmarked for research consideration. EBSCO was seen a third database for this review. However, upon using the database, it was apparent that the functions available for searching and selecting articles to save were problematic. First, the searches did not have the sophistication of Scopus or Web of Science so filtering unsuitable subjects from the results was more time consuming and not as intuitive. Secondly, the saving function to enable articles to be saved was inferior to that of both Scopus and WOF. The inefficiency of the search/save process impacted the time dedicated to

performing the article searches and as mentioned in previous chapters, time was a limited resource for this review. Finally, the article titles were present in either Scopus or WOF searches anyway, so the use of EBSCO failed to add much value regarding the articles available for inclusion into this research.

The omission of one database from the original list of three may be seen as a limitation by others as the *more the merrier* ethos to literature reviews was (or could be perceived as) not applied in this research. However, based on the results apparent in Scopus and Web of Science that also showed in EBSCO, its inclusion as a third database to use was deemed unnecessary. The searches for this literature review showed significant repetition when performed in EBSCO, therefore it was deemed to provide no additional value to the search of literature. This may be viewed as a limitation as it could be construed as a lack of variation in the selection of data sources.

Additional Authors/Researchers Unavailable

There was limited human resource available for this report so comparisons of search results from different implementations of search strings could not be conducted and utilised. This could impact the viability of the results as the filtering of records was performed by only one author. To reduce the effect of the lack of co-authors the searches were performed on two databases that combined many journals in a wide array of disciplines. The searches were also performed on multiple occasions at different times of day and different days to ensure a comparison of results could be done.

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Appendix

6.1 Search Strings

Table 6.1.1: Pilot Search

ITEM	OUTPUT
Parameters:	Title, Abstract
Search String:	(TITLE-ABS-KEY (old OR aged OR older OR mature OR "adult*" OR "older adults" OR "middle-aged" OR "middle aged" OR "baby boomers" OR young-old OR "generational cohorts" OR aging OR "aged 45-65" OR "45-65 years old") AND TITLE-ABS-KEY ("consumer*" OR "user*" OR "end user" OR "end-user" OR "end user*" OR "browser*" OR "customer*") AND TITLE-ABS-KEY (digital OR online OR internet OR device OR "digital device" OR "digital technology" OR "consumer technologies") AND TITLE-ABS-KEY (behaviour* OR behavior* OR use OR practices OR "decision making")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012)) AND (LIMIT-TO (LANGUAGE , "English"))
Results:	n = 4,089

Table 6.1.2: Pilot Search (Post Refined Keywords)

ITEM	OUTPUT
Parameters:	Title, Abstract
Search String:	(TITLE-ABS (mature OR adult OR older OR middle-aged OR "middle aged") AND TITLE-ABS (user* OR consumer*) AND TITLE-ABS (digital OR online OR device OR "digital device") AND TITLE-ABS (behaviour* OR behavior* OR use OR practices OR "decision making")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012)) AND (LIMIT-TO (LANGUAGE , "English"))
Results:	n = 4,089

Table 6.1.3: Pilot Search (Subject Filtered)

ITEM	OUTPUT
Parameters:	Title & Abstract
Search String:	(TITLE-ABS (mature OR adult OR older OR middle-aged OR "middle aged") AND TITLE-ABS (user* OR consumer*) AND TITLE-ABS (digital OR online OR device OR "digital device") AND TITLE-ABS (behaviour* OR behavior* OR use OR practices OR "decision making")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (

	PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012)) AND (LIMIT-TO (LANGUAGE , "English")) AND (EXCLUDE (SUBJAREA , "BIOC") OR EXCLUDE (SUBJAREA , "PHAR") OR EXCLUDE (SUBJAREA , "PHYS") OR EXCLUDE (SUBJAREA , "CENG") OR EXCLUDE (SUBJAREA , "CHEM") OR EXCLUDE (SUBJAREA , "IMMU") OR EXCLUDE (SUBJAREA , "EART") OR EXCLUDE (SUBJAREA , "DENT") OR EXCLUDE (SUBJAREA , "VETE")) AND (EXCLUDE (SUBJAREA , "AGRI"))
Results:	n = 3,595

Table 6.1.4: Pilot Search (Keyword Filtered)

ITEM	**OUTPUT**
Parameters:	Title & Abstract
Search String:	(TITLE-ABS (mature OR adult OR older OR middle-aged OR "middle aged") AND TITLE-ABS (user* OR consumer*) AND TITLE-ABS (digital OR online OR device OR "digital device") AND TITLE-ABS (behaviour* OR behavior* OR use OR practices OR "decision making")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (EXCLUDE (SUBJAREA , "BIOC") OR EXCLUDE (SUBJAREA , "PHAR") OR EXCLUDE (SUBJAREA , "PHYS") OR EXCLUDE (SUBJAREA , "CENG") OR EXCLUDE (SUBJAREA , "CHEM") OR EXCLUDE (SUBJAREA , "IMMU") OR EXCLUDE (SUBJAREA , "EART") OR EXCLUDE (SUBJAREA , "DENT") OR EXCLUDE (SUBJAREA , "VETE") OR EXCLUDE (SUBJAREA , "AGRI")) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012)) AND (LIMIT-TO (LANGUAGE , "English")) AND (EXCLUDE (EXACTKEYWORD , "Young Adult") OR EXCLUDE (EXACTKEYWORD , "Adolescent") OR EXCLUDE (EXACTKEYWORD , "Aged, 80 And Over") OR EXCLUDE (EXACTKEYWORD , "Very Elderly") OR EXCLUDE (EXACTKEYWORD , "Smoking") OR EXCLUDE (EXACTKEYWORD , "Child") OR EXCLUDE (EXACTKEYWORD , "Electronic Cigarette") OR EXCLUDE (EXACTKEYWORD , "Epidemiology") OR EXCLUDE (EXACTKEYWORD , "Smoking Cessation") OR EXCLUDE (EXACTKEYWORD , "Tobacco") OR EXCLUDE (EXACTKEYWORD , "Electronic Nicotine Delivery Systems") OR EXCLUDE (EXACTKEYWORD , "Vaping") OR EXCLUDE (EXACTKEYWORD , "Anxiety") OR EXCLUDE (EXACTKEYWORD , "Sex Difference") OR EXCLUDE (EXACTKEYWORD , "Nicotine") OR EXCLUDE (EXACTKEYWORD , "Hearing Aids") OR EXCLUDE (EXACTKEYWORD , "Hearing Impairment") OR EXCLUDE (EXACTKEYWORD , "Tobacco Products") OR EXCLUDE (EXACTKEYWORD , "Cannabis") OR EXCLUDE (EXACTKEYWORD , "Pathophysiology") OR EXCLUDE (EXACTKEYWORD , "Adolescents") OR EXCLUDE (EXACTKEYWORD , "Cochlear Implants") OR EXCLUDE (EXACTKEYWORD , "Addiction") OR EXCLUDE (EXACTKEYWORD , "Tobacco Use") OR EXCLUDE (EXACTKEYWORD , "Electronic Cigarettes") OR EXCLUDE (EXACTKEYWORD , "Preschool Child") OR EXCLUDE (EXACTKEYWORD , "Hearing Loss") OR EXCLUDE (EXACTKEYWORD , "Speech Perception") OR EXCLUDE (EXACTKEYWORD , "Patient Attitude")) AND (EXCLUDE (EXACTKEYWORD , "Young Adults") OR EXCLUDE (EXACTKEYWORD , "Exercise") OR EXCLUDE (EXACTKEYWORD , "Depression") OR EXCLUDE (EXACTKEYWORD , "Rehabilitation") OR EXCLUDE (EXACTKEYWORD , "Chronic Disease") OR EXCLUDE (EXACTKEYWORD , "Diabetes Mellitus") OR EXCLUDE (EXACTKEYWORD , "Obesity") OR EXCLUDE (EXACTKEYWORD , "Disease Severity") OR EXCLUDE (EXACTKEYWORD , "Disabled Persons") OR EXCLUDE (EXACTKEYWORD , "Independent Living") OR EXCLUDE (EXACTKEYWORD , "Children")) AND (EXCLUDE (EXACTKEYWORD , "Dementia"))
Results:	n = 1,973

Table 6.1.5: Web of Science Search String

ITEM	OUTPUT
Parameters:	Title, Abstract & Keywords
Search String:	(TI=(adult OR "middle aged" OR middle-aged OR older) AND TI=(consumer OR user) AND TI=(digital OR online) AND TI=(behavior OR behaviour OR "decision making")) OR (AB=(adult OR "middle aged" OR middle-aged OR older) AND AB=(consumer OR user) AND AB=(digital OR online) AND AB=(behavior OR behaviour OR "decision making")) OR (AK=(adult OR "middle aged" OR middle-aged OR older) AND AK=(consumer OR user) AND AK=(digital OR online) AND AK=(behavior OR behaviour OR "decision making"))
Results:	n = 1070

6.2: Excluded Subjects

Table 6.2.1: SCOPUS Excluded Subject Areas

Subject Areas
Agriculture and Biological Sciences
Biochemistry, Genetics and Molecular Biology
Pharmacology, Toxicology and Pharmaceutics
Veterinary
Immunology and Microbiology
Energy
Earth and Planetary Sciences
Dentistry
Physics and Astronomy
Chemical Engineering
Chemistry

Table 6.2.2: Web of Science Excluded Subject Areas

Subject Areas		
Nutrition Dietetics	Anthropology	History Philosophy Of Science
Substance Abuse	Astronomy Astrophysics	International Relations
Environmental Sciences Ecology	Biochemistry Molecular Biology	Legal Medicine
General Internal Medicine	Biodiversity Conservation	Mathematical Computational Biology
Paediatrics	Haematology	Pathology

Rehabilitation	Allergy	Philosophy
Transportation	Reproductive Biology	Radiology Nuclear Medicine Medical Imaging
Criminology Penology	Anaesthesiology	Robotics
Endocrinology Metabolism	Gastroenterology Hepatology	Urban Studies
Infectious Diseases	Rheumatology	Virology
Nursing	Chemistry	Water Resources
Veterinary Sciences	Energy Fuels	Architecture
Sport Sciences	Literature	Developmental Biology
Obstetrics Gynaecology	Microbiology	History
Immunology	Toxicology	Imaging Science Photographic Technology
Agriculture	Anatomy Morphology	Medical Ethics
Audiology Speech Language Pathology	Evolutionary Biology	Mineralogy
Food Science Technology	Instruments Instrumentation	Palaeontology
Surgery	Marine Freshwater Biology	Plant Sciences
Urology Nephrology	Mechanics	Remote Sensing
Zoology	Meteorology Atmospheric Sciences	Transplantation
Dermatology	Music	Geochemistry Geophysics
Cardiovascular System Cardiology	Parasitology	Emergency Medicine
Otorhinolaryngology	Tropical Medicine	Public Administration
Dentistry Oral Surgery Medicine	Art	Life Sciences Biomedicine Other Topics
Mathematics	Automation Control Systems	Oncology
Ophthalmology	Cell Biology	Pharmacology Pharmacy
Orthopaedics	Demography	Biomedical Social Sciences
Biotechnology Applied Microbiology	Entomology	Family Studies
Religion	Forestry	

6.3: Search Analysis

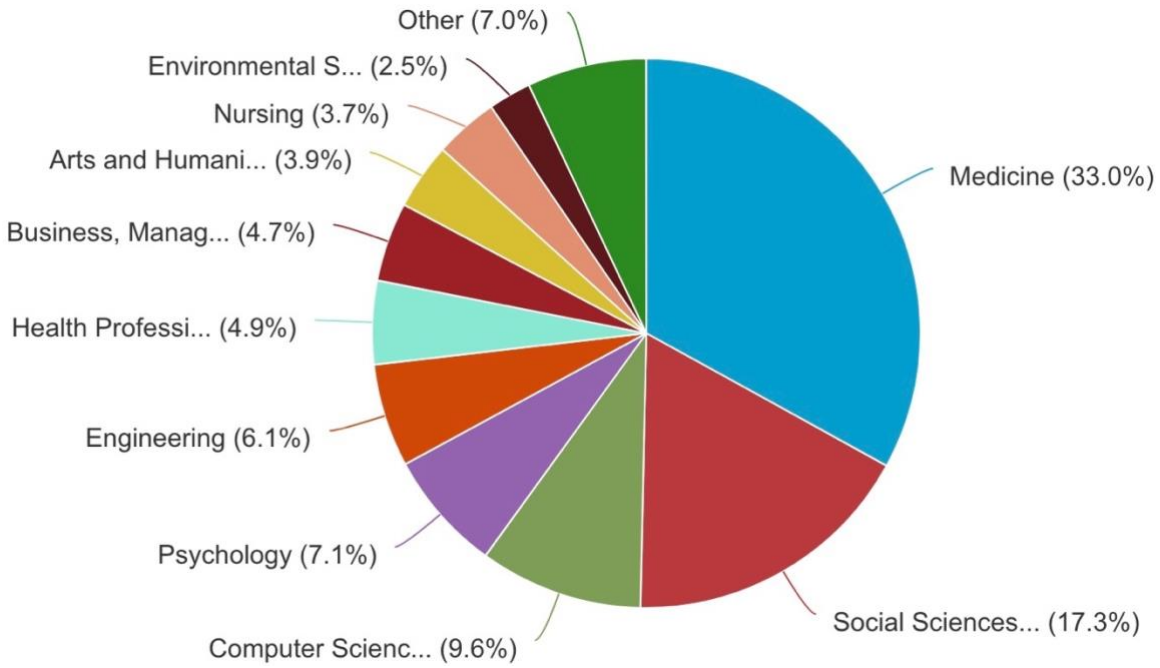

Figure 6.3.1: Subject Analysis (Pre Keyword Exclusion)

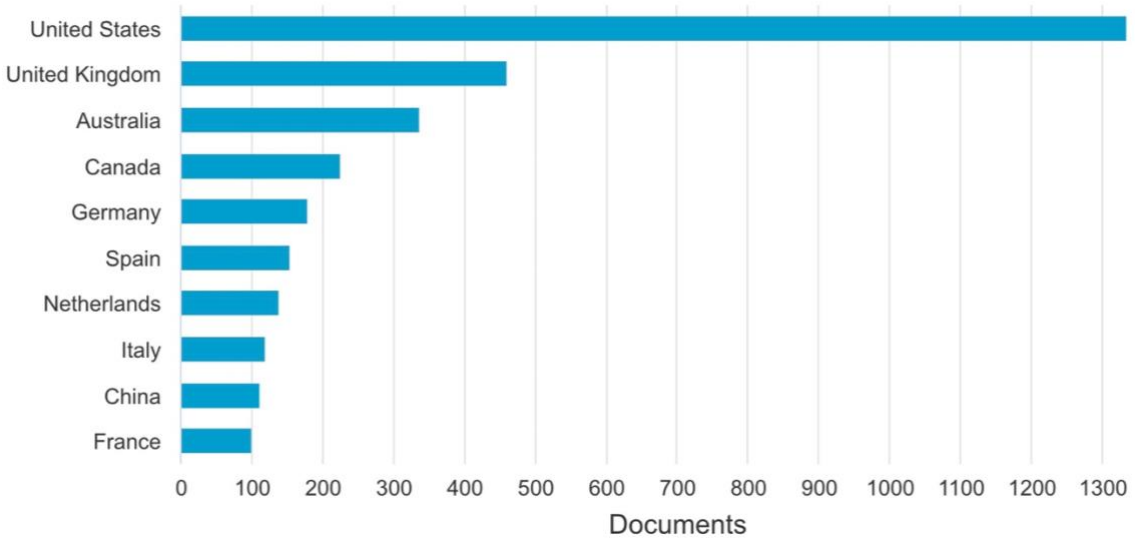

Figure 6.3.2: Region Analysis (Pre Keyword Exclusion)

6.4: Theme Summary

Table 6.4.1: Table of Identified Article Themes

Theme	Count
Addiction	1
Adoption	7
Cognitive age	6
Comparison of age groups	1
Context	1
Digital Divide	1
Engagement	4
Influence on Behaviour	5
Intention	3
Post Adoption	3
Seeking Information	10
Social	2
Social Media	5

6.5: Reviewed Articles

Agree, E. M., King, A. C., Castro, C. M., Wiley, A., & Borzekowski, D. L. G. (2015). "It's Got To Be On This Page": Age And Cognitive Style In A Study Of Online Health Information Seeking [Article]. *Journal Of Medical Internet Research, 17*(3), e79, Article e79. https://doi.org/10.2196/jmir.3352

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Cho, J. (2016). The Impact Of Post-Adoption Beliefs On The Continued Use Of Health Apps [Article]. *International Journal of Medical Information, 87*, 75-83. https://doi.org/10.1016/j.ijmedinf.2015.12.016

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