THE ROLE OF AGENCY IN EXPERIENCES WITH RETRO-TECHNOLOGY AND THE IMPLICATIONS FOR PSYCHOLOGICAL WELLBEING

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Abstract

Humans have a long history of utilising technology to enhance our capabilities and agency. However, although the role of technology has traditionally been that of a tool to expand human action, dependent on a human agent, it has increasingly taken on the role of an active agent. As technology becomes more able to alleviate the seemingly mundane elements of the human experience, it is possible that it may simultaneously become less able to satisfy our core emotional and psychological requirements. In parallel, the increasing popularity of retro-technology in modern markets, analogous to models of technological evolution, may indicate a desire for greater agency in human experiences with technology. Through three papers, this thesis aims to understand how the relationship between technology, agency, and human involvement in experiences with technology influences the satisfaction of basic psychological needs and contributes to wellbeing outcomes.

Paper 1 involved the analysis of interview data collected from 20 individuals who currently use retro-technologies. This study highlighted four key themes that describe the value derived from the retro-technology experience, and further identified a number of ways in which these themes relate to the satisfaction of the basic psychological needs of autonomy, competence, and relatedness.

Building on the results of Paper 1, Paper 2 sought to provide a theoretical model to describe the variables that can predict user need satisfaction and wellbeing in experiences with technology. Through a review and synthesis of literature on material agency, the increasing negative psychological impacts of digital technologies, and guided by self-determination theory, this paper suggests that the progression of modern technology toward better serving human needs is paradoxical in that deeper

psychological needs may be simultaneously thwarted. It therefore reasons that the satisfaction of basic psychological needs is influenced by the opportunities a technology affords its user to exercise human agency in the experience.

Finally, Paper 3 involved a scenario-based experiment that aimed to understand to what extent human involvement in experiences with technology contributes to need satisfaction and wellbeing outcomes. Data were collected from 273 participants spread evenly across the three involvement conditions and the model was tested via a doubly multivariate repeated measures analysis of covariance with the repeated measure being the quality of the output (i.e., the resulting photograph). The results of this study demonstrate that greater human involvement does contribute positively to psychological need satisfaction in experiences with technology, regardless of the quality of the feedback (image output).

Overall, this research contributes to theory by providing an understanding of how the increasing material agency built into modern (i.e., digital) technologies can limit or inhibit the exercise of human agency and lead to negative wellbeing outcomes. It provides empirical evidence that users of retro-technology experience greater agency through more active, involved experiences with older technologies, and thus derive intrinsic psychological value beyond the output of the technology. It also contributes practically by providing insight into the experiential elements of technologies that contribute positively to user wellbeing and simultaneously, how technology can inhibit this.

Table of Contents

List of Figures

List of Tables

List of publications

Chapter 3

Adams, J., Dedehayir, O., & O'Connor, P. (Manuscript under review). Beyond Nostalgia: Exploring the Multifaceted Appeal of Retro-Technologies. *Technological Forecasting and Social Change*.

Chapter 4

Adams, J., Dedehayir, O., & O'Connor, P. (2022). A Theoretical Model of Technology, Agency, and Wellbeing. *The International Society for Professional Innovation Management (ISPIM)*, 1-15.

Chapter 5

Adams, J., O'Connor, P., & Dedehayir, O. (Manuscript under review). Does Modern Technology Rob Us of Our Agency? Exploring the Psychological Consequences of Technologies That Require Less Input From Humans. *Media Psychology*.

List of General Abbreviations

BPNT: Basic psychological needs theory
CET: Cognitive evaluation theory
COT: Causality orientations theory
DoI: Diffusion of innovations theory
EVT: Expectancy value theory
FFM: Five Factor Model
OIT: Organismic integration theory
PLOC: Perceived locus of causality
SCT: Social cognitive theory
SDT: Self-determination theory
SET: Self-efficacy theory

List of Statistical Abbreviations

The descriptions that follow apply to this thesis only and may therefore represent a more restricted definition than what may otherwise be found in the literature.

ANOVA: Analysis of variance, which is a statistical method for testing differences between more than two groups.

MANOVA: Multivariate analysis of variance, which is a statistical method for testing differences between more than two groups.

MANCOVA: Multivariate analysis of covariance, which is a statistical method for testing differences between more than two groups.

df: Degrees of freedom.

F: A statistic based on the *F*-distribution and is used to calculate a *p*-value.

M: Mean.

n: Number of participants in a sample.

η_p^2: Partial Eta Squared, which measures the proportion of variance explained.

p: *p*-value, which measures the probability that an estimate of the underlying population parameter estimate has occurred by chance. If used in the calculation of an omega reliability coefficient, it refers to the number of items in a latent variable.

r: An effect-size measure of a bivariate correlation statistic.

SD: Standard deviation.

SE: Standard error of the mean.

t: *t*-statistic, which is based on the *t*-distribution and is used to calculate a *p*-value.

ω: Omega, which is a measure of a latent variable's measurement reliability that does not require unidimensionality.

Z-score: The position of a data point on a normal distribution where all data points have been converted such that the mean response = 0.

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Editorial Note

This thesis by publication began with a focus on retro-technologies and building an understanding of the experiences individuals have with such technologies. Through taking a grounded theory perspective in Chapter 3 (paper one), the role of agency exercised by both human and material (i.e., the technology) agents in retro-technology experiences was highlighted as a critical element to be further explored. This led the research program to question the role of agency in experiences with technology more broadly than retro-technology, and to develop a theoretical framework to better understand the relationship between human and material agency in experiences with *technology* and the associated psychological outcomes from Chapter 4 (paper two). As such, the literature review and theoretical framework synthesised in Chapter 2 include theorisation that only became relevant after the findings of paper one were established. Notably, the use of self-determination theory (SDT) as a theoretical framework to understand and define agency and wellbeing outcomes associated with technology use did not influence the inductive analysis described in Chapter 3 (paper one).

Chapter 1: Introduction

The phenomenon that inspired this research is the unprecedented growth in the number of obsolete technologies that have been reintroduced to contemporary markets as 'retro-technologies' over the past two decades. At first glance this development appears to be counterintuitive to our general understanding of how technological innovations should diffuse in markets. After all, the contemporary consumer has access to the convenience of modern technologies such as digital music, digital cameras, and gaming consoles with incredible computing power. Such technology provides seemingly infinite catalogues of music, perfectly composed images with a single button press, and near-realistic game-worlds that seem to extend forever. Yet, many consumers are looking back in time to adopt obsolete technologies including vinyl records, film cameras and decades-old gaming consoles.

The innovation literature describes the increasing efficiencies and conveniences provided by technology as being of great importance for successful diffusion (Rogers, 2003). The resurgence of long-obsolete technologies, therefore, contradicts existing linear models of technological progress (e.g., Rogers, 2003; Tushman & Anderson, 1986), whereby technology that is dominant in its market is eventually superseded by innovation with improved functionalities, efficiencies and convenience. The dethroned technology is thus expected to disappear entirely or survive in a niche application as it receives limited attention from the marketplace and industry. The resurrection of retro-technologies thus presents an anomalous phenomenon (Kuhn, 1961).

Vinyl records, older gaming consoles and film cameras in particular have been experiencing growth in modern markets. In 2019, almost 19 million vinyl records were sold, providing double digit sales growth on the previous year; an upward trend beginning around 2006 (Richter, 2020). Just one year later, vinyl records had outsold CDs in the US for the first time in over 30 years (Beaumont-Thomas, 2020), an increase of over 192% on the previous year (Connoly, 2019). The use of film cameras has also been on the rise which has led to huge growth in new film sales; over 21% for Kodak in 2018 (Keats, 2020). Although the phenomenon largely originated in second-hand sales, there are an increasing number of new in-production film cameras in the market from brands including Leica and Linhof (Lawton, 2020; Petersen, 2020).

Meanwhile, modern personal technologies (e.g., smartphones) have increasingly taken on more of the human "burden" by reducing human action and by thinking and acting for us and are now indispensable for many people. This dependence on modern technologies has nevertheless been accompanied by negative wellbeing outcomes. Watson (2020) estimates individuals in the US spent more than half of their day perusing media in 2020, including television, radio and all digital formats, and this is expected to increase in coming years. With so much information coming in, many individuals attempt (unsuccessfully) to multi-task with only 2% of the population estimated to be capable of productive multi-tasking (Quast, 2017). Such connectivity is negatively associated with wellbeing and can negatively affect our natural thought processes, creativity and innovativeness (Goyeneche, 2020) and individuals who spend much of their time connected to the digital world often feel lonely, fatigued, and anxious (Pearson & Hussain, 2017; Rosen et al., 2016). The present research contends that a component of this negative association may be explained by a decrease in agency exercised by the human user in the human-material

relationship. That is, modern technology is increasingly acting on the behalf of the user and providing increasingly passive human experiences. Thus, the present growth of retro-technology, which, by nature of its design, provides for, and requires, a greater level of engagement from its users, may help to explain the negative wellbeing outcomes associated with modern (digital) technologies.

This leads to the overarching question this research seeks to answer: "To what extent does the decline in human agency brought about by modern technology impact human experiences and psychological outcomes when engaging with technology?". Building on prior research outlined in the review of literature, further research questions are identified which guide the publications. The structure of the thesis is illustrated in Figure 1 and encompasses five key themes.

First, Chapter 2 begins with a review of the retro-technology literature that has emerged over the past two decades. It then reviews the literature on technology (material) agency and considers the negative consequences associated with the use of modern (digital) technologies. The theoretical framework that guided the research (after its emergence as a key theme in paper one), self-determination theory (SDT), is then described. Chapter 3 begins with a study designed to better understand the retro-technology experience. This is an important starting point for the research as it establishes the role of agency in experiences with technology which guides the proceeding chapters. Such an understanding of the user experience with retro-technologies has not been established in the literature, although elements of the experience provided deeper context to published findings, for example, on nostalgia (Gilal et al., 2021), non-conformism (Adams et al., 2019), maintenance (Nokelainen & Dedehayir, 2015), and fashion (Hemetsberger et al., 2012).

Figure 1

Thesis Structure

	Theoretical and empirical foundation	Chapter 2: Literature Review	Review and synthesis of literature and theoretical framework
	Individual experiences with retro-technology	Chapter 3: Paper 1	Analyses data from 21 interviews to understand the value derived from experiences with retro-technology and the role of agency
Experiences with retro-technology	Theoretical model	Chapter 4: Paper 2	Develops a theory of technology, agency and wellbeing through a synthesis of self-determination theory, material agency and affordance theory
	Role of involvement	Chapter 5: Paper 3	Through an experimental design, tests the causal role of involvement on psychological outcomes in experiences with technology (with film cameras)
	Implications and future research	Chapter 6: Discussion	Summarises findings with implications for theory, practice and future research

Chapter 4 addresses the relationship between human and material agency in experiences with technology more broadly, and how this relationship influences wellbeing outcomes. Through a synthesis of theory across domains of material agency and self-determination theory, a model is produced to explain how technology can afford experiences that provide for more complete satisfaction of the basic psychological needs, and therefore agency, leading to more positive wellbeing outcomes. The model therefore also speaks to potential negative consequences relating to experiences with digital technologies wherein agency is stifled, and the basic psychological needs are unmet or frustrated, contributing to illbeing. This approach to understanding the 'balance' of agency between human and material agents provides a novel and important understanding of psychological outcomes associated with technology use in a world characterised by rapid digital innovation.

Chapter 5 then provides empirical evidence for the relationship between user involvement and psychological outcomes via a scenario-based experiment. Utilising film cameras to provide for varying levels of human involvement via higher vs lower material agency (automatic, semi-automatic, manual cameras), the study provides evidence for the ways in which autonomy and competence (via SDT) can be satisfied in experiences with technology. Finally, Chapter 6 summarises the overall findings, contributions and limitations of the thesis and discusses opportunities for future research.

Chapter 2: Literature Review

2.1   RETRO-TECHNOLOGY: REVIVAL

The retro-technology phenomenon can be defined as the re-emergence and growth of products which held market dominance decades ago and have since been replaced by better performing technology. Brown, Kozinets, et al. (2003a) suggests six key characteristics of successful brand revival:

1. Dormancy: The product remains in the collective memory of a population, undisturbed by current marketing attention.

2. Iconicity: It must have been dominant in its market through the development stage (e.g., schooling years) of a particular generation or cohort.

3. Evocativeness: It must be able to evoke a vivid experience from the collective memory and encourage consumers to add their own relevance to it.

4. Utopianism: It must stimulate a longing for a romanticised past which can be realised through consumption.

5. Solidarity: It must inspire a sense of belonging to a community

6. Perfectibility: it must have continuous potential for technological and ideological advancement to ensure ongoing relevance to consumers who are constantly revising their own identities.

Thus, it is suggested that a retro-technology can be successfully revived where iconic elements from a prior historical period are harmonised with contemporary standards of performance (Castellano et al., 2013; Cattaneo & Guerini, 2012; Errajaa et al., 2013). The iconicity element, however, does not limit adoption to the cohort for which the product was salient. There is evidence that retro-technology adoption is not reliant upon auto-biographical connections (Hemetsberger et al., 2012), and individuals can experience an historical sense of nostalgia through thoughts and

emotions related to a time in history that an individual did not experience directly, or even a time before they were born (Brown, Kozinets, et al., 2003b; Marchegiani & Phau, 2011) (discussed further below).

It has been suggested that retro technology is less appealing to consumers if it is simply remade and resold. The technology capabilities must be updated to meet contemporary standards of performance while retaining clear elements of the past; they preserve the fun elements and remove the negative (Brown, 2015; Brown, Kozinets, et al., 2003a; Brown, Kozinets, et al., 2003b; Cattaneo & Guerini, 2012). Typically, this means new technology (internal) within an old design (external) (Dyck, 2014; Errajaa et al., 2013; Fort-Rioche et al., 2013). Fort-Rioche et al. (2013) outline three categories of retro founded on different levels of creativity. First, *creation* refers to a new-to-the-world product with design cues founded on retro forms. In their study, it was found that consumers perceived higher levels of newness from *creation* styled headphones (with visual cues from the 1930s) than those with typical modern designs and comparable technical specifications. Similar results were found in the context of wooden furniture and packaging where consumers perceived newness from designs derived from an earlier era; these examples were also found to elicit perceptions of higher quality, authenticity and eco-friendliness (Celhay et al., 2020; Franzen & Moriarty, 2015; Holotová et al., 2020; Loučanová & Olšiaková, 2020).

Second, *reinterpretation* involves revamping an old product with up-to-date features. For example, the retro styled Fiat500's shape evokes ideas from past designs, yet, in 2007 it also became the first model in the minicar segment to earn EuroNCAP's top score for occupant protection (Wingett, 2007, September 17). Finally, *repetition*, whereby a products exterior design is precisely replicated with up-to-date technology inside. Up-to-date technology does not always imply modern standards of performance

(relative to similar offerings available). Products like Nintendo's SNES, for example, come with a series of games built-in (alleviating the need for cartridge changes), a HDMI port and a modern processor, however, the gaming experience (i.e. graphics and sounds) are exactly as they were originally. Similarly, although modern records are made from different materials, the output quality and sound are comparable to original iterations.

The revival of retro products also represents an opportunity for businesses. Products that are recognisable and hold meaning to the market can command a strong loyalty or following and often represent a cheap and reliable source of income for businesses. Reviving products allows an organisation to capitalise on existing resources, including knowledge, rather than taking on the risk and expense associated with new product launches (Brown, 2015; Fort-Rioche et al., 2013; Kral, 2012). However, this avenue is not always low-risk, particularly where brands may have underlying negative associations in a modern market (Shetty et al., 2014). As such, care needs to be provided to ensure that the products, although adapted with modern technology, retain the characteristics that make them iconic and evocative, so as to produce an authentic and meaningful experience. The iconicity is often associated with memories or perceptions of a development-stage of a particular cohort (Brown, 2015; Brown, Kozinets, et al., 2003a; LaTour et al., 2010; Wilson, 2005). With the advent of social media, resurrection movements for even highly obscure products have gained traction online. Research has found that value co-creation between business and consumers is critical to the success of relaunches as companies must understand what consumers expect from these products, including particular functionalities, experiences, nostalgic cues and so on (Davari et al., 2017; Errajaa et al., 2013; Shields & Johnson, 2016). Current literature largely seeks an understanding of adoption

motivations, however what constitutes a meaningful and valuable experience across different technology-types is not well established in the literature. That is, why do consumers use retro-technology and how can their experiences inform new relaunch ventures.

Research has also begun to look at the role that retro and nostalgia play in events (e.g., concerts) and travel experiences. Findings indicate that experiences which elicit nostalgia are more favourable to customers and increase purchase/attendance intentions (Chung, 2019; Hallegatte et al., 2018). Interestingly, similar to research in product-based retro consumption, old style (e.g., song choice) with new technology (e.g., lighting and sound technology) provide for greater overall satisfaction (Hallegatte et al., 2018).

2.2 MARKETING OF RETRO

2.2.1 Retro-Technology Motivations

Authenticity has been found to be a key motivation for retro-technology adoption as consumers are seeking authenticity in an increasingly inauthentic world (Brown, Kozinets, et al., 2003a; Brown, Kozinets, et al., 2003b; Schiermer, 2014), however there is evidence that this may vary between consumers based on other motivations (Adams et al., 2019). Authenticity is characterised in the literature as relating to genuine items that have not been significantly altered from their original design or functionality and thus embody the values of their time. Authenticity is therefore critical for perceptions of quality, for example, as authentic products stand out in our increasingly consumption-driven society by representing and embodying moral values of craftsmanship and lasting value (Adams et al., 2019; Brown, Kozinets, et al., 2003b). Whereas those motivated by fashion pay less attention to authenticity (Adams et al., 2019; Nokelainen & Dedehayir, 2015).

A desire to maintain, modify or rebuild authentic retro-technologies has also been observed as a motivation but is not well understood. Largely, although such endeavours can be expensive, this does not appear to present a barrier (Nokelainen & Dedehayir, 2015). This type of maintenance reflects an exercise of agency that has not been addressed in the literature, i.e., for a number of consumers, retro-technology affords an opportunity to actively repair and maintain their technology. This is likely influenced by less integrated technology designs which are more easily understood and operated on.

The inherent tangibility of retro products, not just in relation to maintenance, has also been cited as a motivation for adoption (Adams et al., 2019; Brown, Kozinets, et al., 2003a; Hemetsberger, 2012; Nokelainen & Dedehayir, 2015). Retro-technology involves physical media, whereby consumers are required to wind film, set a record and needle, insert a game cartridge and so on, and in many cases are provided with artistic packaging and information to enhance the experience. A lack of physical presence has also been associated with a perceived lack of appreciation. Research has found that consumers prefer owning physical copies of media to demonstrate and display their appreciation of the artists. In the Philippines, this is also associated with displays that accessorise homes and demonstrate an implied wealth and exclusivity (Schoop, 2018). In many cases, this provides a sense of belonging to particular groups.

Consumers may also be motivated to use retro-technology in response to modern technology's social influence. Castellano et al. (2013) suggest that as social awareness increases, and the environmental consequences of purchase-choices become clearer, that some adoption-choices may be motivated by a desire to revive more traditional practices. However, it is not just the health of the environment that is being threatened. Modern technology has demonstrated a potential threat to our humanity; the way we

interact with the world, with each other, how we think, what we consume, and what we are interested in. While some consumers are making the choice to go retro for the sake of the environment, others may choose retro in light of negative social and personal wellbeing outcomes resulting from modern technology. Where a product has the required iconicity and evocativeness for success, it may provide a clear juxtaposition of a perceived nefariousness of modern technology and the values of a retro era (Hemetsberger, 2012). Retro products often blend together opposing values of modern and classic/traditional in this way. Consumers who are more able to integrate those values are understood to have more preferable perceptions of retro-technology (Dogerlioglu-Demir et al., 2017). Indeed, evoking feelings of moral conflict and providing resolutions through these products has been found to motivate purchases (Brown, Kozinets, et al., 2003b). Some consumers, further still, may simply utilise retro-technology as an exercise of cynicism towards such modern developments rather than any inherent favourability towards retro (Adams et al., 2019).

Research has also suggested that retro-technology adoption is motivated by a desire to realise and emulate a utopian sense of past worlds and community (Brown, Kozinets, et al., 2003b; Errajaa et al., 2013). Nokelainen and Dedehayir (2015) identified a strong social component to online LP communities. Such interactions are not purely transactive, e.g., seeking advice, buying and selling, but rather many individuals shared stories, memories and images of their collections. When interacting socially online, individuals are more likely to reveal personal stories to others, largely due to a lack of physical and verbal cues present in face-to-face interactions that might otherwise deter such openness. This in turn enhances the quality of relationships and, in turn, higher quality relationships promote wellbeing. Throughout its evolution, the internet has played an increasingly vital role in the development of individual identity

as it allows individuals to easily assess their values and beliefs against a range of different social contexts from the comfort of their own home (Code, 2013). This is a further element to the overall experience retro-technology provides, and one that is likely shared by some users but not all. It is not well established in the literature whether consumer motivation influences their need for relatedness in these experiences. Such relatedness may be derived from pseudo connections to a culture of people from the past (i.e., by using these products they feel related to the values and individuals of a prior time), or through relationships in the current time formed through shared memories, understandings and interests derived from the use of retro-technology.

Those consumers who utilise retro for fashion also appear to be socially motivated. Fashion-motivated users have been found to utilise retro-technology to forge their own individual and unique styles, distinct of the mainstream. This is often realised through a unique mix of modern and retro elements. Younger consumers, in particular, are likely to adopt retro products as an expression of fashion and non-conformism; to shape their identity and find belongingness and social acceptance. In such cases, a product's utility is largely irrelevant, and the quality or brand is important only insofar as its value as an accessory (Adams et al., 2019; Hemetsberger et al., 2012; Schiermer, 2014).

2.2.2 Nostalgia as A Motivator of Retro-Technology Adoption

Individuals who exhibit the symptoms of what we now call nostalgia were considered to be suffering from a medical disease during the seventeenth and eighteenth centuries. More recently, in the twentieth century, this assessment was altered to be regarded as a psychiatric disorder. Fast-forward to the twenty-first century and nostalgia is now recognised as serving positive psychological functions (Sedikides

et al., 2004). Nostalgia is a well-documented and seemingly intuitive motivation for retro-technology adoption. Sociological evolution has seen customer preferences diverge from purely utilitarian towards more subjective dimensions including sensations, immersion in sensory environments, and the sharing of emotions and experiences. Consumers have been found to experience hedonic benefits from the use of nostalgic products and in some cases, the emotional dimension of a product can outweigh the price/quality ratio as well as any utilitarian shortcomings of the product (Errajaa et al., 2013; Kessous & Roux, 2008). However, this is only when it is done subtly and in line with consumer expectations. As such, it is critical to understand the elements of products and experiences consumers give value to and this can only be achieved by understanding their stories, expectations and experiences (Errajaa et al., 2013).

Nostalgic experiences can be triggered by a range of senses including taste, smell, sight sound and touch which allow consumers to relive past times and experience feelings grounded in nostalgia (Ju et al., 2016). This is exemplified by retro-technologies. Vinyl records, for example, have a particular feeling to the touch, a smell, tactile feedback through moving the tonearm and so on. Nostalgia, however, is rarely in the foreground; it is an important element in retro-technology experiences but is not necessarily the focus (Hemetsberger et al., 2012). While it can generate feelings of fondness and encourage preferences for particular products or experiences (Sierra & McQuitty, 2007), it has been found that nostalgia alone is not enough for a product to be successful in the marketplace (Cattaneo & Guerini, 2012; Davari et al., 2017).

Socioeconomic turmoil has also been suggested as a trigger for retro consumption; or, more specifically, a trigger for nostalgic compulsion (Brown, 2015;

Cattaneo & Guerini, 2012). Nostalgia is seen as a key element of the retro movement where older generations have an innate propensity to look backwards to their youth and remember happier times. Times where things maybe seemed easier, healthier, and more carefree, particularly when compared to fast-moving modern life. In particular, it is suggested that consumers are seeking to "bring the past into the present" (Brown, 2003; Brown, Kozinets, et al., 2003a; Castellano et al., 2013). Nostalgic consumption has also been observed as resulting from a perceived crisis in civilisation due to the proliferation of a mass consumption culture, a loss of individual freedom and autonomy and authenticity (Hemetsberger, 2012; Turner, 1987; Zhou et al., 2013). For some, the past represents a time where marketing was less aggressive, and more authentic before mass production and pervasive commercialisation altered the way technology was designed and sold (Brown, 2003). Older brands possess a heritage that engenders trustworthiness through positive perceptions associated with their history, longevity, and consumer experiences. This brand heritage is shared throughout groups and cultures and increases nostalgic associations as well as perceptions of authenticity and quality (Castellano et al., 2013; Pecot & De Barnier, 2017; Sierra & McQuitty, 2007; Strauss, 2008).

Nostalgic associations have been found to amplify relatedness, as introduced above and can bring people together within communities of shared memories and experiences and create a feeling of belonging - further strengthening identification with the product. The members of these communities often share these feelings only with each other – i.e., people whom they believe experienced the same memories/feelings/nostalgic elements as them (Errajaa et al., 2013). As such, nostalgia can be utilised as a cultural commodity based on the experiences of a particular age-

cohort and even leveraged by those who may not have direct experience (Wilson, 2005).

As such, while auto-biographical experiences are a key component of nostalgia (Barrett et al., 2010), historic nostalgia can simulate similar experiences. Personal (auto-biographical) nostalgia reflects feelings towards object-related experiences that have been lost whereas historical (or communal) nostalgia occurs at a societal level and reflects elements of communal memory and culture. So, for young consumers, retro products may elicit personal nostalgia through memories from childhood, however they may also experience historical nostalgia through an understanding of objects owned by their parents or grandparents and conveyed through stories, images, and objects.

Thus, historical nostalgia encompasses thoughts and emotions related to a time in history that an individual did not experience directly, or even a time before they were born (Marchegiani & Phau, 2007). It is influenced by commodities and media products utilising notions of tradition and ideas of the past (Grainge, 2000) as well as nostalgic feelings derived from involvement/association with items owned by parents or grandparents (Hemetsberger, 2012). Further, their interpretation of the products (and the time period) is believed to be heavily romanticised. They do not wish to bring back "the good old days", but rather to relate to them in parallel with unfavourable modern societal developments; to grant stability and shape an authentic self-concept based on values and attitudes symbolic of deep relationships and standing for one's own opinion and taste (Hemetsberger, 2012; Turner, 1987). Thus, historical nostalgia can be evoked through staged associations between products and experiences to give new life to objects which seem to transport past values and authenticity to the present (Brembeck & Sörum, 2017; Hemetsberger, 2012; Kessous & Roux, 2008).

The inherent history of retro-technology also includes the knowledge required for its use and some individuals exhibit a desire to inherit and preserve such knowledge. This is not only related to operating retro technologies but also to developing and preserving skills and techniques from the past, sometimes in conjunction with modern technologies. In the case of retro sewing, for example, individuals felt a need to continue the legacy of particular techniques and patterns or styles (Armstead & McKinney, 2019). Balmer and Burghausen (2019) also suggest that the past can serve different purposes depending on consumer motivation including explained history, continuation of tradition, a yearning for the past, reminiscence, romanticised ideals, an accrued legacy and inheritance of the past.

Nostalgia is often perceived to possess an element of negative affect. It has been suggested that nostalgia stems from negative perceptions of our time and culture; a sense of loss of individual freedom and autonomy, a loss of simplicity, authenticity and emotional spontaneity (Turner, 1987). Indeed, this resonates also with a loss of agency. Nostalgia has been found to correlate positively with negative emotionality and extraversion, and individuals in a negative mood state experience greater levels of nostalgia (Barrett et al., 2010; Stephan et al., 2014). Similarly, Seehusen et al. (2013) found negative emotionality correlated with the trait nostalgia proneness, however this relationship lost significance when moderated by the need to belong; the need for frequent, non-aversive interactions within ongoing relational bonds (Baumeister & Leary, 1995, p. 296). Negative mood-states have been found to trigger a desire for nostalgic experiences, and thus those who more commonly experience negative moods (i.e., those scoring highly on negative emotionality) have a greater tendency to seek out nostalgic experiences (Barrett et al., 2010).

Although negative emotions may be a trigger for nostalgic consumption, positive nostalgic experiences have been found to be a key motivation for some consumers to adopt retro-technology (Barrett et al., 2010). Adams et al. (2019) found these consumers valued the experience, felt positive emotions related to memories and overall reported more emotionally enriching experiences. Indeed, some users make conscious decisions to purchase brands they know will trigger nostalgia and in turn, have a positive effect on their mood (Orth & Gal, 2012) and counteract sadness and loneliness (Barrett et al., 2010). Further, individuals scoring highly in conscientiousness and openness have been found to be more prone to nostalgic experiences, likely due to intrigue relating to the interconnectedness of life and time (Barrett et al., 2010). This represents a somewhat antagonistic separation in the literature that the present research seeks to address through a better understanding of consumers' technology preferences, motivations and the types of experiences they seek from such technologies.

A key element of nostalgic consumption is a desire or need for self-continuity. Nostalgia can foster a deep reflection of one's past-self, it allows for comparisons to the present and if necessary, to realign with particular values that are perceived to be lost (Ju et al., 2016; Sedikides et al., 2015; Sierra & McQuitty, 2007). It can create a sense of authenticity to a chosen way of life, however, it can also influence behaviour where an individual seeks to rectify discontinuity (Sierra & McQuitty, 2007). Threats to self-perceived authenticity can also be combatted by retro consumption (an exercise of self-continuity) but these are most effective where the object is deemed to be of personal importance and connected to childhood memories (Lasaleta & Loveland, 2019). Namely, it solidifies and augments identity, regenerates and sustains a sense of meaning and supports and invigorates social connectedness (Cartwright et al., 2013;

Sedikides et al., 2008). This can produce a positive psychological effect (Wildschut et al., 2006). When nostalgia is triggered, perceptions of self-continuity are understood to be stronger (Ju et al., 2016). As such, advertising that elicits this type of response, for example, can increase purchase intentions (but not necessarily actual purchases) and the connection consumers experience between their past-identities and the brands can strengthen loyalty (Ju et al., 2016; Sierra & McQuitty, 2007).

2.2.3 Research problem 1

Motivations for retro-technology adoption and use have largely been generalised in the literature without regard for the differences between different technology types. For example, the role that a romanticised concept of quality has in motivating users across different retro-technology types (e.g., vinyl and film cameras) is not well understood and yet is necessary for a thorough understanding of what users seek in their experiences. Such motivations mostly explain why consumers might adopt retro-technology but there is an opportunity to contribute an understanding of consumer experiences and resulting motivations to continue to use retro-technology. That is, understanding how users interact with these technologies and what elements of these experiences provide value. There is also an opportunity to better understand the differences between consumer preferences within product categories. For example, understanding the differences between the individual who uses a point-and-shoot film camera to take photos of friends at a party compared to the individual who takes their time to understand the settings and unique characteristics of their camera and film and create images iteratively. These differences are critical to understanding the ways consumers interact with these products, the needs they are satisfying and thus the ability for an organisation to create (or reintroduce) a product that meets consumers' needs.

Prior research has indicated that a desire to exercise greater agency may motivate retro-technology use (Adams et al., 2019), however this relationship remains largely unexplored. Consumers who utilise retro-technologies appear to seek agency in a number of ways including being more active in their use of technology (Adams et al., 2019), the maintenance of technology (Nokelainen & Dedehayir, 2015), perusing/purchasing media prior to use (Orth & Gal, 2012), social interactions (Cartwright et al., 2013). The experiences of users are expected to differ between and within technology preferences and such differences are not well addressed in the current literature.

Retro-technology may provide an avenue for experiencing an important element of the human experience that is shrinking in our use of increasingly connected and convenient technologies. The benefits to wellbeing and affect derived from retro-technology experiences may provide opportunities to better design future product innovations to cater for this, and/or guide organisations in efforts to reintroduce obsolete technologies. Such an understanding would also be valuable for individuals who seek healthier relationships with technology and may provide evidence that retro-technology experiences can facilitate or support these efforts. Thus, the first research question seeks to understand:

RQ1: What do users value in their experiences with retro technology?

2.3 AGENCY

Human agency can be defined as "the capability for individuals to consciously choose, influence and structure their actions in order to achieve a desired outcome" (Code, 2013, p. 39). It is argued that agency is a capacity human actors possess with which they form goals and take intentional action to realise those goals through controlling human and non-human resources in different environments and social

contexts (Nevo et al., 2016; Sewell, 1992). It is something that individuals have been found to develop as an ability, through social interaction and experience (Code, 2013). Our sense of agency comes from a clear feeling that we are in control of our own action and through this action we can produce effects in the external environment – to achieve our goals. Berberian et al. (2012) suggests this sense of control can be greater or lesser across different situations, particularly through the use of technology where a user can easily compare their input with the output of the technology.

2.4   HUMAN-TECHNOLOGY RELATIONSHIP

The relationship between technology and humans has long been discussed by philosophers including Heidegger, Mumford and Ellul. They discuss 'technics', that is, the organised process through which humans achieve specific goals through a relationship with technology (Parfitt, 2016; Winner, 1977). Some have argued that this human-material relationship is increasingly moving away from human control to the point where technology may act in its own interest, contrary to human interests (Winner, 1977). As technology continues to increase efficiencies and serve human convenience, we may begin to experience a loss of something 'human'. Heidegger suggested that humans typically fail to understand the significance of Being, and that many will lead inauthentic lives following fashions and norms observed socially as this is the easier path (Heidegger, 1993).

Indeed, modern technology is having a profound effect on the human condition and is modifying how we interact with the world as well as our identity, behaviour and social relationships (Hoffman et al., 2017). The benefits of this evolution are many. Technology in the digital era can enhance our physical capacities, our social standing and our ability to influence the world over time and space. These technologies can thus enhance or take away from our power or capacity to act (Ahlborg et al., 2019; Clowes,

2018). However, as technologies increase or replace our physical capacities, knowledge and competencies may also become lost. The literature provides a number of examples. Tree-climbing robots can reduce management costs, improve practices and reduce personnel injuries however it has been found that the professional and ecological knowledge possessed by arborists gradually erodes leading to a loss of intuition and agency in modern arborists (Bardekjian, 2016). In aviation, automation leads some pilots to wonder who is truly in control and to feel more distant from the task, decreasing their feeling of control (Berberian et al., 2012). In some aged care facilities, the human agency and relationships associated with care are being transferred to the material agency of smart technology (Bhattacharya et al., 2017). In medicine, technology can be imbued with such agency that it can take over natural processes of the human body (e.g., pacemaker technology). In such cases, people are not always comfortable knowing that a technician can remotely control their heartbeat (Oudshoorn, 2015). Many patients express a preference to exert greater autonomy and implement self-care where possible, e.g. self-testing at home and diagnosis via online resources (Kearns et al., 2010).

More broadly, at work, technology and data play an increasingly deciding role in deciding how work gets done (e.g. automation) and how work is assigned (e.g. Uber) (Lingel, 2016). In our everyday lives, technology-assisted remembering and recognition are rampant such that matters of fact are often settled by a Google search rather than personal recall or debate (Clowes, 2018; Hoffman et al., 2017; Rammert, 2008). Many of our activities are mediated by digitally connected devices and cognitive activity largely requires an interweaving of online and offline worlds both at work and in personal life (Clowes, 2018). As a result, there is evidence that the internet is changing how human memory works - we are storing far less information in personal

memory through a reliance on connected technology recalling information for us (Ward, 2013).

We have reached a point in technological development where we have empowered machines to manage us (Ashby et al., 2018; Coker, 2018). Digital services have a profound effect on human agency as they link, combine, and compute data to create new knowledge for and about us (Wessels, 2013). Such practices may also result in unsolicited action from programs (which see the user as an object) prompting advertisements, recommendations and so on (Rammert, 2008). Devices like fit bits can enhance but also threaten human agency. Nudges to 'get moving' may enhance agency for some individuals and increase their likelihood of achieving fitness-related goals. However, many such digital technologies are vehicles for increased efficiency and users often feel compelled to plan out every minute of their day (Clowes, 2018). Some may feel controlled by these extrinsic nudges and experience reluctance to engage in activities they may have been intrinsically motivated to achieve. Algorithms in particular are developing to understand us, our motivations and needs, and threaten to automate many of our decisions we may deem important (Ashby et al., 2018; Coker, 2018). To combat these influences, some technology is designed to prompt us to *disconnect* from it, and thus for some people, technology itself can provide an imperative force for controlling or regulating their technology usage behaviour.

In many cases, at work, at home, and in our leisure time, technologies are designed to increase efficiencies, and to many this appears to be a transaction without a trade-off. This loss or deferral of agency may lead to a loss of competency and autonomy, and negatively impact wellbeing. This research contends that some individuals may utilise retro-technology to exercise agency, and it seeks to understand these individuals, their motivations, and experiences.

2.4.1 Material agency

Throughout human history we have utilised tools to enhance our intentions and decisions and these tools become a powerful extension of our action over which we maintain control. Indeed, human beings are understood to exercise greater agency than any other animal due to the tools and technologies we create and use. As technology continues to advance, it increasingly utilises its own agency, removed from the human actor's intention (Coker, 2018; Nolin & Olson, 2014). Leonardi (2011, p. 148) defines material agency as "the capacity for nonhuman entities to act on their own, apart from human intervention". This describes a technology's ability to do things that the human user is unable to completely or directly control. Agency should be understood separately to a human *sense* of agency. A sense of agency relates to a human actor believing that they are in control of their actions and resulting outcomes (Malafouris, 2007). An agent is "any element which bends space around itself, makes other elements dependent upon itself and translates their will into a language of its own" (Wertsch, 1998, p. 286). Thus, this can be satisfied by either human or material actors. Malafouris (2007) stresses the point of causality in his rationale for material agency - 'who' or 'what' is causing the act. He utilises the example of a potter creating a pot from wet clay in that the shaping of the pot represents collaboration between the potter and the clay. As the human acts to shape the clay, the clay also exhibits dynamic tension. The wheel that spins the clay and resulting centrifugal force also represents action that contributes to the experience.

A number of authors view the human-material agency relationship as unidirectional. As human agents we set goals and have the capacity to reach them; we utilise technology to perform specific tasks towards an end which we do not exert full control over. As such, the technology's affordance may represent barriers to the human

agent's goal and in a unidirectional relationship, the user must be flexible (such that they can adjust their goals to suit the technology's affordance) as the technology is static and must therefore be rejected or utilised in ways which were not intended. Thus, human agency is believed to be exercised via the technology's capabilities as well as by resisting limitations imposed by the technology (Leonardi, 2011).

A number of theories refute material 'agency' in attempts to explain the human-material relationship. Structuration theory views human agency and structure as the key forces in networks and the role of non-human (material) agents is not accommodated (Olohan, 2017). Giddens (1984) defines structure and human agency as a duality wherein both are mutually dependent and recursively related aspects of greater social systems. Structure both constrains and enables agency and as such structure is a key factor when considering agency. Meanwhile, technological determinism views the role of humans in their relationship with technology to be largely passive. Technology is viewed as affecting change at individual, organisational and societal levels (Smith & Marx, 1994b).

Actor network theory (ANT) is an approach that recognises material agency and does not try to explain *why* something happens, but rather *how* relations between actors within a network (both human and material) assemble or don't (Latour, 2005; Law, 2009). It proposes a *symmetrical* agency network whereby both humans and technology have constructing roles and as such technology is both constructed and constructing (Verbeek & Vermaas, 2009). For example, actors in a network contributing to a human catching a fish in an indoor fish-farm might include the people involved, the animals, tools (e.g., nets), architecture (e.g., the floors/walls/roof, the pool housing the fish), electronic technologies including filters which are in turn

powered by electricity supplied by wiring through to the plant that produces the power and so on.

Although ANT recognises the agency potential of material artefacts, a major criticism comes from its assumption that human and material agents contribute equally or symmetrically in their networks. Social shaping, however, is an approach that views technology as a consequence of social factors including economic conditions, gender and broader cultural dynamics (Leonardi, 2011; MacKenzie & Wajcman, 1999; Wessels, 2013). MacKenzie and Wajcman (1999) suggest, through social shaping theory, "the material world is no simple reflection of human will…one cannot make sense of the history of technology if the material world is seen as infinitely plastic and tractable." A major criticism of such theories relates to the phenomenological difference of intention between human and material with respect to action (Leonardi, 2011; Olohan, 2017). Humans possess a will, and their actions have inherent intention. As such, it is argued that material *performativity* is more appropriate as technology performs as it was intended rather than acting through intention (Orlikowski, 2005). Even algorithms, which seem capable of understanding us better than we could ourselves are suggested to lack agency under such models as they are heavily dependent on human actors, namely during the design phase, and although the calculations and outcomes are not reliant on human actors, algorithms themselves do not possess the necessary intentions or reflexive and evaluative elements required to exercise agency (Klinger & Svensson, 2018).

Rammert (2008) however, suggests that we cannot limit our understanding of action with the requirement of human intention (also Law, 2019). Modern technology increasingly has functions of intention, desire and belief provided to them through algorithms. Although different to humans, these qualities are not shared by classical

machines and media and these differences must be recognised. Action is not a human phenomenon, but it involves the interactivities of both human and material agents. He puts forward a scale of agency for technical objects (Figure 2). This scale demonstrates the temporal progress of technology as it has increasingly taken on greater levels of agency. Passive technologies, like a hammer, are tools that extend our capacity for physical action and such tools have been used by humans for centuries. However, as we move forward in time, technology is increasingly demonstrating co-operative agency. That is, it is able to predict action, communicate and cooperate with other technological agents and communicate the result of this network of action to the human user. A streaming service's 'recommended' playlist, for example, is the result of a network of programs making decisions independent of human input. It represents a level of relative autonomy, reactivity to the environment, proactiveness and sociability; all of which are functions of an intelligent agent (Rammert, 2008).

Figure 2

Level of technology agency (Rammert, 2008).

LEVEL OF AGENCY	Description	Examples
Passive:	Instruments completely moved from outside	Hammer; Punching card
Semi-active:	Apparatus with one aspect of self-acting	Machine tool; Record-Player
Re-active:	Systems with feed back loops	Adaptive heating system
Pro-active:	Systems with self-activating programs	Car stabilization; Help agent
Co-operative:	Distributed and self-coordinating systems	Mobile robots; Smart Home

In a similar way, we can consider the level of agency of a human user in relation to technologies across this model. As an agent, the user of a hammer is required to

assess the task that is to be done, utilise physical, mental, and biological resources to generate the precise execution of directed force required to embed a nail. The hammer is utilised as an instrument to extend human action; it has fixed and repetitious action. On the other end of the scale, taking the example of a smart home, a human user is required only to think and verbalise desired action (e.g., "turn the lights on") and the technology will coordinate a sequence of action to achieve the desired outcome. The important element of this example is that depending on the type of technology utilised, and its affordances, the human agent may be required to take more or less action and therefore express more or less agency. To further the earlier example of a streaming service as a co-operative agent, Figure 2 highlights that a record-player exhibits a semi-active level of agency. Depending on its use, a streaming service may exercise a pro-active agency, via its algorithm, where the user may make decisions relating to the music to be played and it requires instruction (i.e., a mouse-click) to begin (sequences of) action. Conversely, a record requires a great deal of action from the user including, selection of a physical record, removing the record from its cover, removing the plastic sheet, cleaning the record, placing it down on the player, setting the speed, moving the tonearm over the record, setting the needle into the groove and so on. In this experience, the user is exhibiting a greater level of agency. Their causal role in the network contributes more meaningfully to the outcome (experience) and thus requires greater agency than if they were to interact with a proactive or co-operative technology like a streaming service algorithm. In this way, our relationship with technology is changing and the retro phenomenon demonstrates the potential that (some) users may prefer to be more active agents within such experiences. To experience greater autonomy in particular environments.

This dissonance of action, when the input of a human actor is out of proportion to the return feedback affecting the actor, represents a partial escape from the human condition. When a human travels at extraordinary speeds in a motor vehicle they may be sitting in comfort, exerting gentle pressure on a pedal which represents action disproportionate to the output (great acceleration), as the technology is taking that input and augmenting it to create a greater level of action. However, even in this case, we are limited in other ways in the greater network; our freedom to move is restricted by road networks, other drivers and costs associated with operating the vehicle (Ahlborg et al., 2019; Feenberg, 2005).

2.4.2 Affordance

To better understand material agency, an understanding of affordances is valuable. The theory of affordances comes from the field of ecological psychology and relates to the action possibilities afforded in the relationship between individuals and their environment. It suggests that the values and meanings of things in the environment can be directly perceived via what they afford an individual. For example, the environment can afford shelter, water, tools, food and so on. At some point in history, humans began to make alterations to their environment; building more and more elaborate shelters, utilising tools to hunt and create things. Gibson (1979) suggests these objects also possess affordances and although they are artificial in their inception, the affordances are no different to those provided by the natural environment.

Affordance can be defined as the possibilities, including behaviours, for goal-oriented action created through the relationship between an artifact and an actor or actors (Markus & Silver, 2008; Strong et al., 2014). However, constraints are also an important element of affordance theory. The theory has been applied in a number of

fields including sociology, to explain the constraining influences of technology on human action; in IS research on a societal-level; in organisation science, to understand relationships with IT on an organisational level; and on an individual-user level (Anderson & Robey, 2017; Thapa & Zheng, 2019). Affordances provide a useful tool with which to understand the relationship between human and material agency as the material properties of technology may afford different action possibilities depending on their context of use. Although the physical properties are the same for all users, the affordances are not.

Capabilities and affordances share many similarities including their signification of action possibilities, their relational nature, and their contingency on conversion factors including personal, social, and environmental factors. Identical objects can provide different affordances for people affected by different conversion factors. Although capabilities and affordances share these similarities they are not the same. The opportunities that capabilities present relate to an individual's capacity, agency, and relative position in the social environment. Capacities can incorporate, but do not rely upon, technologies or material artefacts. Affordances, however, represent opportunities deriving from an individual's perception and interaction with artefacts and are affected by the functional properties of the object, the individual's capacity, and position in the social environment. For example, a digital camera provides a number of affordances via a multitude of add-on features and settings, however, to realise these benefits, the user must have an appropriate capacity, attitude, and social condition. The user may not perceive, understand, or seek the affordance, or it may not be connected to their goal (Anderson & Robey, 2017; Robey et al., 2013; Thapa & Zheng, 2019). Similarly, particular effects and experiences are afforded to those with

the capacity, attitude, and social condition to effectively utilise those same film cameras.

Leonardi (2011) has examined the role of affordances with respect to the imbrication of human and material agencies. Imbrication describes the recursive interdependence of human and material agencies built on past imbrications which provide perceptions of affordances and constraints. Technology is designed to provide obvious affordances to users yet is capable of evolution and is never wholly adopted or rejected by users (Leonardi, 2011; Nevo et al., 2016). Where a technology presents constraints, human agents are able to exert agency to change the effect of the technology and alter the way they utilise it (Leonardi, 2011; Nevo et al., 2016; Yeo & Marquardt, 2015). As a user's goals are formulated via human perception of what a technology can or cannot do, these perceptions are also shaped by goals. Perception is key here as a user may not correctly interpret or recognise affordances (Leonardi, 2011) – as introduced earlier. Importantly, as human needs and goals evolve, material artefacts are naturally reinvented and new artifacts, discoveries, ideas and inventions are introduced to satisfy these changes (Rogers, 2003). Thus, although retro-technologies can be physically identical to the artifacts individuals utilised decades ago, the affordances of the technology are perceivably different (generally speaking) when comparing the modern user's context with that of their predecessor.

2.4.3 Consequences of technology

Convenience is often treated as something unquestionably beneficial. If a technology can reduce human action and increase efficiency it is often sought without question (Nolin & Olson, 2014). Indeed, technological advancements have made many aspects of the human experience simpler, however, all personal (human) development requires human action comprising effort, friction and overcoming difficulties (Nolin

& Olson, 2014). Technology has provided us with computational power and sensors that easily outperform human capabilities and are therefore unquestionably valuable enhancements. However, the very nature of agency is a humanist ideal that we are active individuals who have freedom of choice and, in many cases, technology is so built into our environment that non-usage is not an option (Nolin & Olson, 2014).

Personal technology, e.g., mobile phones, computers, apps, in particular can provide a number of positive and prosocial benefits (Fisch & Truglio, 2001), however, there is an increasing body of research uncovering a range of negative wellbeing outcomes as well. These include attention and comprehension difficulties, poor academic achievement, sleep impairments (Aljomaa et al., 2016; Pearson & Hussain, 2017), depression, anxiety (Morris & Cravens, 2017), and anti-social behaviour (Gergen, 2002; Kuss et al., 2018; McDaniel & Coyne, 2014; Roberts & David, 2016). Stress has also been found to increase smartphone use as a coping mechanism (Kuss et al., 2018; Levy, 2016), thus compounding the effects. Social media, in particular, has been linked to addictive behaviours (Bharucha, 2017; Gerhart, 2017). Through such technology, the number of things vying for our attention has increased dramatically and yet, since our fundamental attentional capacity remains unchanged (if not lessened), it becomes increasingly challenging to decide what to give our attention to at any given moment (Levy, 2016).

Nolin and Olson (2014) suggest that technology has increasingly become a mediator of ordinary life rather than a tool by which we extend our own capacities as human actors. Consumers have been found to use the internet and its connected functions for the underlying instrumental value rather than hedonic qualities and as such, the importance of the internet to a 'normally' functioning lifestyle is the driving factor behind use, more so than a sense of enjoyment (Ojo et al., 2019). Young people,

for example, are believed to accept that internet resources (e.g. messaging apps) make it easier to connect with other people than trying to find and plan time to meet in-person (Viberg & Andersson, 2019).

Many efficiencies of modern technology are such that we are unable to reasonably deny ourselves the benefits. We are quickly moving toward an era of ubiquitous computing whereby technology is miniaturised and integrated with other artefacts to the point of disappearance. This may also present as "mental disappearance" whereby users cease to recognise a technology's presence (Ferneley & Light, 2008). We can choose to restrict ourselves from particular technologies or to disconnect for periods of time, but in many cases digital technology is unavoidable if we want to be competitive value-adding humans in society, at least when it comes to work (Nolin & Olson, 2014). Thus, the element of choice could be a strong motivator for the use of retro-technology.

Morris and Cravens (2017) have subsequently explored "unplugging" or "disconnection", whereby individuals make a conscious effort to keep off digital devices (e.g., smartphones and computers) for varying periods of time (relative to the individual's perception of necessity). This disconnection from technology produced reported improvements in interpersonal relationships, physical health and psychological and emotional wellbeing; echoing results from further studies which suggest that even short periods of disconnection can achieve positive results (Cheever et al., 2014; Thomee et al., 2011). Greater insight is required into the effectiveness of different types and/or degrees of intervention and individual differences between those who are more or less receptive to such interventions.

Decisions to disconnect are acts of agency led by an individual's goal to break out from constant connectivity and to repurpose the time otherwise spent on mobile or

other digital devices (Russo et al., 2019). Such activities are often planned in advance, for example, the decision that particular time-windows of the day are assigned to disconnecting. However, disconnection decisions can also occur from moment to moment, e.g., a decision not to answer an incoming call and remain focused on a task. People are most likely to regulate their connectivity when seeking to achieve some gain in their life, e.g. work, or personal goals, so as to avoid losses in these pursuits or in an attempt to establish a personal digital philosophy (Russo et al., 2019). Self-reflection is a key element of this process and allows individuals to understand the repercussions of their behaviour and divergence from their perceived identity and related values. Such expressions of agency are believed to be born of a trade-off between the benefits and costs associated with technology use (Kolb et al., 2012; Matusik & Mickel, 2011; Russo et al., 2019). Research into how and when people regulate their use of technology is underdeveloped, particularly when considering the amount of research focused on the negative outcomes of modern technology overuse (Kolb et al., 2012; Russo et al., 2019). Retro-technology may serve as to mediate and even enhance such experiences.

2.5 RESEARCH PROBLEM 2 AND 3

As technology rapidly evolves, its ability to exercise its own agency also increases. Often, this increase in material agency translates to a decrease in the human users' agency, and therefore their control and influence over such technology-derived experiences. The effect of greater material agency in experiences with technology on the wellbeing of increasingly disempowered human users has not been addressed in the literature. This thesis contends that a key difference between analogue retro-technologies and their digital successors (e.g., film to digital cameras, vinyl records to music streaming services), is the difference in action and agency attributed to human

and material actors in these experiences. That is, in an experience with retro-technology, the human user is required to do more, control more, be more choiceful and take more responsibility for the outcome when compared to an experience with digital technologies wherein many functions are automated (e.g., automatically generated playlists or automatically selected camera settings).

In the following section, SDT is introduced as a guiding theoretical framework that will be used to contextualise the human agentic experience and better understand the psychological outcomes derived from experiences characterised by varying levels of human and material agency. Through understanding how SDT's basic psychological needs of autonomy, competence and relatedness are satisfied or frustrated in experiences with technologies of varying agentic influence, and thus how the need for human agency can be inhibited or realised, this thesis suggests that positive wellbeing outcomes can be similarly inhibited or realised. Therefore, paper two aims to answer a further inquiry centred on whether attempts to experience agency through the use of technology leads users to satisfy their basic psychological needs and enhance their wellbeing, and if so, of what nature, and to what degree. Thus, two research questions are addressed:

RQ2a: What variables mediate the relationship between technology use and wellbeing?

RQ2b: What variables moderate the relationship between technology use and wellbeing?

Based on this theorisation, a further line of inquiry relates to the extent to which human involvement in such experiences contributes to psychological outcomes, i.e., the satisfaction of the basic psychological needs and wellbeing. SDT has been deployed to understand wellbeing outcomes across a wide range of fields, for example

overcoming health-related threats including use of tobacco, weight gain, medication adherence, as well as social issues including education, videogame addiction, aggression and other negative outcomes (Deci & Ryan, 2012). In studies seeking to understand the (intrinsic) motivation underlying videogame use, it is found that events which diminish a sense of choice, control or freedom have negative consequences on feelings of autonomy and that, overall, wellbeing related outcomes associated with an activity are a function of the satisfaction of psychological needs. That is, enhancements to wellbeing should be realised where an experience provides a sense of volition, effectiveness and social connection (Ryan, 1995b; Ryan et al., 2006).

Other than video-gaming, the SDT framework has been utilised to understand wellbeing outcomes associated with the use of a range of digital technologies, for example, it has been used to understand user intentions towards internet banking (Rahi & Abd. Ghani, 2019), gamification (van Roy & Zaman, 2019), fitness trackers (Attig & Franke, 2019), social media interactions (De Vries et al., 2017; James et al., 2019; Throuvala et al., 2019; Wakefield & Wakefield, 2016), digital learning tools for students (Jeno et al., 2019; Khan et al., 2018; Nikou & Economides, 2017; Roca & Gagné, 2008; Zhou, 2016), supporting tools for teachers (Hew & Kadir, 2016), gamification in education (Hew et al., 2016), self-service technologies (Leung & Matanda, 2013), and organisational IT systems (Mitchell et al., 2012).

However, it has not been used in the context of analogue technologies nor to understand or compare the psychological and wellbeing outcomes associated with the use of technologies of varying levels of material agency (and that provide for varying levels of human agency). As such, there is currently no research seeking to understand whether the greater agency built into modern (digital) technologies negatively influences its human user's psychological outcomes, and similarly, whether the

comparatively low level of agency built into analogue retro-technologies positively influences psychological outcomes. That is, to what extent do technology-derived experiences that require or provide for a higher or lower exercise of human agency influence psychological outcomes? Therefore, through a scenario-based experiment, paper three seeks to answer the third and final research question for this research program:

RQ3: How does the level of human involvement in experiences with technology influence psychological outcomes?

2.6 THEORETICAL FRAMEWORK: SELF-DETERMINATION THEORY

The social psychology literature has a breadth of theories explaining the effects of social environments on people's attitudes, values, motivations, and behaviours. The standard social science model views humans as inherently passive and influenced to think, value, need, and do, by external factors including teaching and socialising. In fields of social psychology, social cognition and cultural relativism, models describe how social contexts, social norms, and cognitive processes influence individual actions and decision-making (Lange et al., 2012). SDT, however, describes humans as innately active, intrinsically motivated and adapted to evolve through integrative processes. It describes the need for psychological nutriments analogously to biological nutriments, and the absence of these nutriments as contributing to suboptimal experiences, development, and behaviours (Deci & Ryan, 2012). Further, SDT differentiates between the quantity and quality of motivation, suggesting that a higher amount of motivation does not positively influence outcomes where its nature is controlled rather than autonomous (Ryan & Deci, 2000; Vansteenkiste et al., 2009; Vansteenkiste et al., 2005). This is an important difference of SDT to other motivation theories that this thesis also borrows from, including self-efficacy theory (SET) (from social cognitive theory [SCT]) which views motivation as a singular quantitative construct whereby intrinsic and extrinsic motivations compound toward total motivation (Bandura, 1989; Deci & Ryan, 2008). As such, related theories, such as SCT, are leveraged to describe the applicability of SDT for the present research and the mechanisms of agentic action, whereas SDT provides guidance as to how agency can be increased and how it is experienced (Petrich, 2020).

SDT was born from research on motivation that sought to understand the effects of extrinsic rewards on intrinsic motivation. This foundation has been built

upon over the last few decades with extensive validation across a diverse range of domains and purposes (Ryan & Deci, 2022). A core element of SDT is the attribution of perceived locus of causality (PLOC) (DeCharms, 1968) which refers to an individual's perception of the origin or source of their actions and behaviours. It refers to the self as a phenomenal centre of personal experience and agency, distinct from the individual and their physical being (Ryan & Connell, 1989). Understanding the type of motivation an individual is experiencing requires observing the intrapersonal forces (i.e., do they perceive their actions to be autonomous) or interpersonal (i.e., the social-environmental context), that is, is it intrinsic and driven from self-determination, or it is external. External events, e.g., rewards, feedback, competition or threats of punishments (Deci et al., 1999), that exert pressure on an individual provide for perceptions of external PLOC which thwart feelings of autonomy and thus undermine intrinsic motivation (Deci & Ryan, 2012). If, however, an event supported the satisfaction of the basic needs (e.g., positive feedback and choice), it would support an internal PLOC and serve to enhance intrinsic motivation (Deci et al., 1999). As such, PLOC is a critical elements of self-determination theory that led to its use as a guiding framework for this research. In experiences with highly agentic technology that controls the experience and makes decisions on behalf of the human user, the user is likely to experience an external PLOC. Where the technology functions as a tool that extends the human user's capabilities, however, and the user experiences control and decision-making, and is likely to perceive an internal PLOC. As such, whether the human user perceives an experience to be driven by an external agent (the technology) or whether they perceive themselves to be in control, will influence the satisfaction of their basic psychological needs, and influence wellbeing outcomes.

2.6.1 Cognitive Evaluation Theory

Cognitive evaluation theory (CET) is a sub-theory of SDT that was originally formulated to understand why intrinsic motivation was less affected by performance-contingent rewards than task-contingent rewards. It focuses largely on the satisfaction of just two of the basic psychological needs, autonomy and competence, and their relationship with PLOC. As such, CET suggests that where social-environmental events lead to an external PLOC, autonomy will be thwarted and intrinsic motivation will be undermined, whereas events that provide an internal PLOC and support the autonomy need, increase intrinsic motivation. Events that serve to enhance feelings of competence (e.g., positive feedback) will further bolster intrinsic motivation, whereas events that lead to feelings of incompetence (e.g., negative feedback) will further undermine intrinsic motivation (Deci & Ryan, 2012). However, in order for the positive feedback to meaningfully contribute to intrinsic motivation, it must relate to an autonomously motivated activity, or within an autonomy-supportive context (Hodgins et al., 2006; Ryan, 1982). Feedback is thus better received, whether positive or negative, in an autonomy-supportive context which further serves to enhance competence and intrinsic motivation (Deci & Ryan, 1995; Deci et al., 1981; Grolnick et al., 1991).

Events can either be controlling or informational in nature. Controlling events that pressure people into thinking, feeling, or behaving in specific ways (e.g., those relying on deadlines, monetary rewards, threats), just like controlling motivations, relate to an external PLOC, and negatively influence autonomy and intrinsic motivation. Informational events (e.g., positive feedback, choice), contrastingly, convey competence information (positive or negative) within the context of autonomy-support. When positive competence cues are present as related to an autonomous activity, both competence and autonomy are further satisfied. Contrastingly, where

prompts negatively influence feelings of competence, autonomy is also reduced. In an autonomy-supportive task, negative feedback that is informational is more likely to be viewed as an opportunity for development and growth. Where competence information is sufficiently negative, particularly in a controlling environment, both intrinsic and extrinsic motivation can be hindered, leading to amotivation (Deci & Ryan, 2012). Thus, the realisation of these two needs can both influence and be influenced by the individuals PLOC.

2.6.2 Causality Orientations Theory

With causality orientations theory (COT), Deci and Ryan (1985a) further differentiated between individuals' inherent orientation towards causality and suggested these to be predictive of attitudes and behaviours. These orientations mirror the aforementioned interpersonal contexts and state-like motivations and include autonomous, controlled, and impersonal orientations. Autonomously oriented individuals are more likely to perceive both internal and external cues as autonomy-supportive or informational and these individuals are characterised by autonomous motivation, greater self-actualisation, self-esteem, more choiceful self-disclosure and have more autonomy-supportive attitudes towards others. Controlling oriented individuals are likely to interpret cues as controls and demands, and are characterised by controlled motivation, public self-consciousness, type-a coronary prone behaviour patterns (e.g., ambitious, restless, aggressive), inconsistency with attitudes and behaviour, and greater defensiveness (resulting in avoidant coping and self-enhancement) (Hodgins et al., 2006; Neighbors et al., 2002). Impersonal oriented individuals are most likely to perceive cues as indicators of incompetence and are characterised by amotivation, a sense of inefficacy, self-derogation, poorer self-regulation and depression (Deci & Ryan, 1985a).

Research by Hodgins et al. (2006) found that these orientations can be primed or activated either intentionally (via cues) or triggered by naturally-occurring motivation priming. They found that where control-orientation is applied, individuals exhibit decreased openness to experience, feelings of competence, activity engagement, and performance. Where an environment provides for autonomoy-orientation, however, individuals experience increased mindfulness, competence, enthusiasm, and continued performance. Further, autonomy-primed individuals demonstrate fewer threat responses, exhibit more authentic behaviour and act more in line with their internal states (Hodgins et al., 2010). As such, the social-environmental context of experiences plays a crucial role in determining the quality of outcomes. Where the environment is autonomy-supportive, individuals are more likely to confront challenges, approach tasks more confidently, have more favourable pre- and post-performance assessments, and experience greater realised performance. Hodgins et al. (2010) further theorise that activities which increase an individual's ability to experience the current moment may increase autonomy-orientation. To better explore the influence of the social-environmental context, an understanding of the process underlying regulation is required.

2.6.3 Organismic Integration Theory

Organismic integration theory (OIT) represents another core concept that provides further context as to the mechanisms underlying the exercise of human agency, motivation, regulation and the satisfaction of basic psychological needs. OIT, like other organismic theories in psychology, views humans as inherently active beings that regulate behaviour through internal structures that evolve constantly as individuals internalise experiences from their internal and external environments. Through this internalisation process, humans integrate new knowledge, values and behaviours as

they constantly develop their sense of self through increasingly complex and interrelated internal structures (Deci & Ryan, 1985c). Through conscious interaction with the world, individuals are exposed to a myriad of perceptual, cognitive, emotional, and social information via both intrapersonal and interpersonal experiences. When this information clashes with our developed self-structures, we seek to assimilate this novel information into our evolving sense of self through integration. Importantly, OIT differs from the internalisation theories that preceded it in that where prior theorising suggested the regulation of values and behaviours occurs either internal or external to the individual, OIT considers this a spectrum wherein varying degrees of internalisation can translate to varying types of regulation (Deci & Ryan, 2012).

Along this spectrum are four distinct types of internalisations. First, the least autonomous form of internalisation, external regulation, describes behaviours enacted entirely due to external pressures (e.g., rewards, threats). These behaviours are therefore internalised and maintained via self-control in line with expected (learned) outcomes of external controls. Over time, the internalisation of these behaviours develop such that an individual is able to self-regulate through an internal continuation (i.e., now representative of internal demands) of the previously external contingencies (Deci & Ryan, 1985c). This is called introjection and self-regulation of this internalisation is driven by a desire to maintain self-approval or avoid guilt (Ryan, 1995b). Introjection thus results in similar negative consequences as external control as it does not possess the necessary autonomous qualities (i.e., volition and sense of choice) required for healthy regulation and is therefore controlling in nature (albeit internally). This is exemplified by ego-involvement, which describes an individual's regulation of behaviour in line with expected reductions or enhancements to their self-

perceived abilities. Controlled motivation can thus be driven from both internal and external pressures and tension. For example, students can pressure themselves into action to avoid shame, guilt, anxiety, or to enhance their ego and pride (Vansteenkiste et al., 2009). Introjection is therefore associated with an external PLOC, as although the reliance on environmental regulation is minimised, the pressures do not align, or indeed are in conflict, with the individual's intrinsic self (Ryan & Connell, 1989; Ryan & Deci, 2000). This misalignment results in a dependence on outcomes to maintain self-esteem, and as such, even small successes and failures can generate significant fluctuations in self-esteem. Satisfaction derived from success associated with introjection is therefore expected to be short-lived as it is quickly replaced with the next threat (Assor et al., 2004). Many externally motivating factors may also prompt individuals to seek life goals that may not have value when fulfilled. Commercial media, for example, may prompt excessive materialism which may only provide fleeting satisfaction and detract from basic need fulfillment and wellbeing (Richins, 1987; Ryan & Deci, 2000).

Identification is the next evolution of internalisation and describes how an individual comes to identify with the behavioural outcomes and their corresponding regulations. In this way, rather than regulating because they "should", they see value the outcome and therefore perceive importance in engaging in behaviours that produce the outcome (Deci & Ryan, 2012). The individual accepts the regulation as their own and therefore experiences more autonomous, flexible, and volitional self-regulation. Identified regulation is associated with the experience of choice rather than pressure, and is also positively related to proactive coping and wellbeing (Grolnick & Ryan, 1989). As such, identification may also derive from introjections where the necessary social context (i.e., autonomy-supportive) is present (Grolnick et al., 1997).

Finally, integration refers to an individual's successful integration of identifications with other aspects of their core values and practices. The internal structure is thus transformed, rather than added to, and self-regulation becomes self-determined (Deci & Ryan, 1985c). This is the most effective form of internalised regulation. These more autonomous regulations relate to positive outcomes including wellness, engagement, perceived competence, and deeper conceptual learning. Along with intrinsic motivation, these integrations represent five motivations or reasons for action.

Both intrinsic motivation and well-internalised extrinsic motivation are considered autonomous (Ryan & Deci, 2000) and are associated with higher psychological wellbeing and greater use of adaptive meta-cognitive strategies (e.g., planning, time management). Autonomous motivation is associated with more self-determination and a stronger will, greater effort-expenditure (Ryan & Connell, 1989), perseverance, cognitive processing, deeper-level learning, and less procrastination (Grolnick et al., 1997; Noels et al., 2003; Vansteenkiste et al., 2009).

2.6.4 Social contexts

Social contexts play a critical role in determining whether an individual would introject a regulation rather than integrating it more fully. These contexts can either be controlling or autonomy-supportive. Autonomy-supportive contexts allow for more complete forms of internalisation and are characterised by minimising pressures, providing choice, encouraging initiation and exploration, and considering the feelings and perspectives of individuals. Autonomy-supportive contexts are expected to result in identification and integration, providing a more secure identity, a greater sense of choice as well as endorsement and ownership of behaviour (Hodgins & Knee, 2002). Controlling contexts, however, are more likely to result in introjection and are

characterised by pressures that influence an individual how to think, feel or behave (e.g., reward contingencies, threats, or deadlines) (Grolnick et al., 1997; Ryan, 1995a). Further, Vansteenkiste et al. (2009) found that applying controlled motivation to students with no motivation led to poorer outcomes than providing no motivation at all. As such, the satisfaction of the basic psychological needs is crucial for optimal internalisation that results in an authentic self (Ryan, 1995b).

Hodgins and Knee (2002) frame integrated internalisation with the construct 'openness to experience' from the five factor model (FFM) of personality (McCrae & Costa, 1997). They suggest that openness to experience derives from an individual's intrinsic desire to realise their needs and potentials. This provides for a self-worth that remains unthreatened by novel experiences and which engenders an opportunistic mindset geared toward integration. Their high tolerance of novel experiences results from low-defensiveness and high perception of reality unfettered and undiluted by avoidant behaviours typical of more controlled orientations. That is, they perceive information to their consciousness for what it is rather than framed by their conceptualisation of the information's influence on their ego. Thus, autonomous functioning results in a greater ability to experience the current moment and results in fewer behaviours emblematic of escaping awareness of the present moment, e.g., distracting activities, compulsive behaviours or mood-altering substances (Hodgins & Knee, 2002). Individuals influenced by control motivations thus feel a need to defend against experiences, to bolster self-esteem and self-protect. However, effective integration requires low defensiveness to experience in order for it to be effectively integrated (Hodgins et al., 2006).

Importantly, regarding choice, SDT provides that vitality is "energy associated with people's integrated sense of self, which thus invigorates the processes of choice,

volition, and effective coping with challenges" (Deci & Ryan, 2012, p. 11). As such, although self-control depletes energy and vitality, and therefore choice by its very nature should be depleting, where choice is autonomous rather than controlled (and the basic psychological needs are thus satisfied), choice is vitalising (Moller et al., 2006a; Ryan & Frederick, 1997).

Openness also connects with mindfulness, which SDT describes as the purposeful awareness of the present moment that allows for the conscious experience of what is happening to, and within us through successive conscious moments (Brown & Ryan, 2003). Research in the SDT literature has demonstrated that mindful awareness contributes to positive outcomes including greater autonomous regulation of behaviour, need satisfaction and wellness as well as less cognitive and emotional disturbance, and defensiveness (Brown & Ryan, 2003; Deci & Ryan, 2012). Like autonomous-orientations, mindfulness also has strong ties to openness to experience and the embracing of novel experiences. As such, it aides in the meaningful choice of behaviours that align with the intrinsic self and is a further critical element of optimal self-regulation and the satisfaction of the basic psychological needs (Brown & Ryan, 2003; Deci & Ryan, 1980). Mindfulness is obstructed by ruminations of the past and apprehensions about the future, or diluted preoccupation and multitasking thereby limiting the quality of present engagement (Brown & Ryan, 2003). Mindlessness is antithetical to mindfulness and is associated with an escape from the present moment including refusals to acknowledge thoughts, emotions, motives or perceivable object. Mindlessness has links to defensive behaviours and also result from controlling influences. Actions that are not consciously initiated, as described earlier, can result from either autonomous or controlled functioning, however greater mindfulness provides for a decreased vulnerability to being controlled through such primes (Deci

& Ryan, 2012). Attention and awareness are thus critical for human health and wellbeing (Brown & Ryan, 2003). Brown and Ryan (2003) suggest that mindfulness creates a mental gap in time that enables the observation of thoughts and behaviours rather than reactive behaviours driven by the external environment. This interval of time, they suggest, may have consequences for individuals whose behaviours have perceivable negative social and cultural implications including material consumption and addictions.

2.6.5 Basic Psychological Needs Theory

The final relevant piece of the theoretical puzzle is basic psychological needs theory (BPNT). BPNT was formulated primarily to explain the wellbeing outcomes associated with satisfying the three basic needs via the mechanisms described thus far. That is, satisfying the need for autonomy, competence and relatedness results in more self-motivated behaviour and increased feelings of competence (i.e., CET), more effective internalisation of events, providing for integration rather than introjection or identification (i.e., OIT), and a greater likelihood to orient towards autonomous rather than controlled motivation (i.e., COT), all of which provides for increased wellness, vitality and healthier functioning (Ryan & Deci, 2022). They are considered essential nutriments for healthy development, wellbeing, and mature relationships and predict better performance and greater psychological health for individuals consistently across cultures (Chen et al., 2015; Church et al., 2013). Research has demonstrated that individuals experience greater positive affect and less negative affect on a day-to-day basis where these needs are satisfied compared to where these needs are thwarted, resulting in illbeing and defensiveness (Reis et al., 2000; Ryan et al., 2010).

Prior research demonstrates that in the short-term, where these needs are thwarted, individuals actively seek to engage in experiences that will satisfy these

needs and avoid those experience which might further thwart them. However, if the needs continue to be thwarted over time, the drive to satisfy these needs may gradually decline, making it less likely that individuals will satisfy their needs and therefore experience negative consequences as a result (Deci et al., 2013). This section will briefly synthesise and underscore the mechanisms of these needs.

Autonomy relates to a sense of volition or willingness when doing a task. Where an individual perceives a controlling pressure affecting the way they should think, feel or behave, there is a negative effect on autonomy and therefore intrinsic motivation. This can also be thought of in terms of whether the individual perceives the locus of causality to be internally or externally driven (autonomous vs controlling respectively). Autonomy is supported in experiences where the individual has choice and control over their actions. Thus, individuals benefit from experiences where external control is minimised, and the autonomy of the individual is emphasised (Visser, 2010). Frustration of the need for autonomy relates to feeling controlled, either externally or through self-imposed pressures, that may influence behaviour regardless of the individual's values and interests (Chirkov et al., 2003).

Furthermore, individuals who have a high level of autonomy, or self-determination, exhibit more effective self-regulation. An individual who is intrinsically motivated and engaged in a task, is thus more likely to regulate their behaviour towards maintaining focus and performance. This may involve resisting distractions or immediate rewards which could interfere with the pursuit of their goals. Thus, delayed gratification, as a component of self-regulation, also aligns with self-determined action, as individuals who can delay gratification are evidencing autonomy and are thus more likely to experience intrinsic motivation, leading to more effective self-regulation and goal pursuit.

Competence is supported through opportunities to acquire new skills or abilities, to be challenged (though not to the extent that they are unable to succeed) and through receiving positive feedback. Competence is further supported by performing activities with which the user already has competence and where there are clear guidelines, rules and expectations to which the individual can work to (Visser, 2010). The satisfaction of both competence and autonomy are closely linked and as such are often mutually satisfying constructs. Activities or events that threaten an individual's perception of competence provide for decreased intrinsic motivation, whereas, conversely, increased perceptions of competence provide for greater intrinsic motivation (Deci & Ryan, 1985b). Competence satisfaction thus relates to feeling effective and capable to achieve desired outcomes, and as such, frustration of this need involves feelings of failure and feelings of inefficacy and results in decreased intrinsic motivation (Deci & Ryan, 2000; Vansteenkiste & Ryan, 2013). The need for competence manifests in a desire for challenges just slightly beyond the present capacities of an individual and prompts them to take action to improve and meet the challenge. However, it's not the resulting objective competence, but rather the subjective competence that determines positive psychological outcomes.

The perception of competence, has been theorised about within related theories of human motivation, including SCT via self-efficacy. Perceived self-efficacy refers to an individual's belief in their capability to mobilise the motivation, cognitive resources, and courses of action necessary to meet situational demands (Bandura, 1989; Wood & Bandura, 1989). Bandura (1986) suggests that individuals need a robust sense of personal efficacy to sustain the productive attentional focus and persevering effort needed to be successful in any endeavour. Perceived self-efficacy results in similar outcomes to perceived competence and SCT posits that as our social reality

carries failures, adversities, inequities and various frustrations and setbacks which need to be overcome, human attainments and positive wellbeing rely on a strong, optimistic sense of personal efficacy. When an individual perceives self-inefficacy in regard to goals related to their self-worth or life satisfaction, they are more likely to experience depression, particularly when associated to perceptions of social inefficacy (Bandura, 1988; Wood & Bandura, 1989). As such, individuals are able to exert influence over their life to avoid situations that are deemed to be outside of their capabilities but will actively seek challenging activities and social environments they deem to be within their control and level of capability (Wood & Bandura, 1989) – a very similar relationship between challenge and motivation put forward in BPNT.

The key distinguishing factor between the need for competence (via the relationships laid out in SDT) and related concepts such as self-efficacy, is that SDT theorises competence as a fundamental human need required for psychological wellness and actualisation rather than a personal belief or self-evaluation that contributes to wellbeing outcomes (Deci et al., 2013). Such beliefs hinge on perceptions of the control we exercise over threats and the outcomes of our actions. Deci and Ryan (2000) suggest that the human drive to seek and overcome challenges can only be explained via such inherent needs.

Relatedness refers to a need to be close to, trusting of, caring for and cared for by others; similar to the need to belong (Baumeister & Leary, 1995). Relatedness results not only from relationships with significant others, but also members of collectives to which the individual belongs, including leisure groups, political groups, or even cultures (Deci & Ryan, 2000). Satisfaction of this need involves feelings of intimacy and genuine connection with others, whereas frustration relates to feelings of relational exclusion and loneliness. Even individuals who avoid attachment, crave

independence and view close relationships as unimportant and unnecessary have been found to benefit from satisfaction of the relatedness need (Chen et al., 2015). SDT suggests that the development of relatedness as an inherent need is grounded in an evolutionary necessity to internalise behaviours that attribute to working together in groups, and thus, its satisfaction is required for realising human potential (Deci & Ryan, 2000). Further, those who experience relatedness with others and contribute meaningfully to the autonomy of others (i.e., via support etc.) are suggested to better satisfy their overall needs. This suggests humans have developed evolutionarily, to internalise group needs and values that allow us to coherently act within larger social structures and benefit from reciprocal altruism (Deci & Ryan, 2000).

Relatedness is supported through a feeling of connectedness with others. Such feelings are strengthened where others provide acknowledgement, care and genuine support. Retro-technologies are believed to provide a sense of community for users both among current users as well as a pseudo connection to the people and values of the past (Brown, Kozinets, et al., 2003a; Errajaa et al., 2013). Internalisation is facilitated in part via the satisfaction of the need for relatedness. It relates to contexts with which they experience a sense of belonging (Niemiec & Ryan, 2009).

These sub theories culminate in a holistic view of SDT theory and make up the foundation for the working definition of human agency utilised throughout the research in Chapter 4 and 5. That is, human agency is the capacity of individuals to exercise intentional control over their actions and choices aligned with their intrinsic sense of self.

CHAPTER 3: Beyond Nostalgia: Exploring the Multifaceted Appeal of Retro-Technologies

The authors listed below have certified that:

1. they meet the criteria for authorship and that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
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Contributor	Statement of contribution*
Jack Adams	Wrote the manuscript, review and edit of manuscript, method design, conducted interviews, and data analysis
Ozgur Dedehayir	Aided in method design, conceptualization, review and edit of manuscript
Peter O'Connor	Conceptualization, review and edit of manuscript

Abstract

The retro-technology phenomenon has continued to gain popularity in the modern market over the last two decades. Research on retro-technology has largely focused on marketing, branding and specific elements of technologies that provide for success in modern markets. The present study takes a grounded theory approach to understand the value in the user experience with retro-technologies through qualitative interviews with n=20 users of retro-technologies. Through inductive analysis, four key themes are revealed that describe the retro-technology experience; limiting the scope of choice, seizing the moment, expanding the realm of action, and expanding the realm of connection. Together, the model points to a desire for users to engage more meaningfully with technology and to exercise greater human agency. These themes are also demonstrated to align with the satisfaction of the basic psychological needs of autonomy, competence and relatedness and these relationships are explored. The study thus provides future research direction and perspectives on the evolving relationship between humans and technology.

Keywords: retro-technology; self-determination theory; grounded theory; experience; human agency

3.1 INTRODUCTION

Consumers have access to an abundance of innovative technologies that increasingly enhance the conveniences available to them. Yet, several obsolete technologies, including film cameras and vinyl record players, are experiencing rapid growth in modern markets, with the last two decades seeing new, reimagined and returning retro-technologies that demonstrate a backwards step to analogue technologies (Brown, 2013; Errajaa et al., 2013). This trend appears counterintuitive when examined under the lens of the conventional Diffusion of Innovations Theory (Rogers, 2003). As such, the resurrection of retro-technologies is a contradictory phenomenon that is not yet well understood (Kuhn, 1970).

Research on the retro phenomenon has primarily emerged within the field of marketing, with a focus on identifying the sources of potential for retro products or brands in modern markets (Davari et al., 2017; Fort-Rioche et al., 2013). Brown, Kozinets, et al. (2003a), for example, note the characteristics of successful retro-product diffusion to include dormancy, iconicity, evocativeness, utopianism, solidarity and perfectibility. Consumer motivations for adopting retro-technologies, meanwhile, have been proposed to include fashion trends, higher quality, nostalgia, non-conformism and aesthetic principles (Adams et al., 2019). While these motivations go a long way towards explaining why consumers might adopt retro-technology, an understanding of the motivations driving continued use of retro-technology, and the experiential elements that contribute to this, remains limited.

While our understanding of consumer experiences with retro-technologies remains limited, prior research suggests that psychological factors could be a key motivator driving people towards the use of retro technology (Adams et al., 2019). Retro-technology may therefore provide an avenue for realizing important elements of

the human experience diminished by our increasing reliance on connected and convenient digital technologies. Improving our understanding of how consumers use, and experience retro-technologies can reveal which aspects are most valuable, offering useful insights for developing new products (Contesse et al., 2021; Kummitha, 2020).

Using a grounded theory approach, we aim to understand how consumers derive value in their experiences with retro-technology and how this contributes to continued use after adoption. While prior research looks at the motivations for adoption, the user experience requires greater, in-depth understanding, particularly in light of findings that suggest users may be driven by a desire to exercise agency. Thus, the research question that guides this paper is: *What do users value in their experiences with retro-technology?*

3.2 LITERATURE

The retro-technology phenomenon can be defined as the re-emergence and growth of products which held market dominance in prior decades and have since been replaced by better performing technology. Research suggests that retro-technology adoption is motivated by a desire to realize and emulate a utopian sense of past worlds and community (Brown, Kozinets, et al., 2003b; Errajaa et al., 2013).

Nostalgia is well-documented in the literature as an important and intuitive motivation in the adoption of retro-technology (Brown, 2013; Errajaa et al., 2013). Barrett et al. (2010) identify two types of nostalgia. While personal (auto-biographical) nostalgia reflects feelings towards object-related experiences that have been lost, historical (or communal) nostalgia occurs at a societal level and reflects elements of communal memory and culture. So, consumers may elicit personal nostalgia of retro products through memories from childhood, or may alternatively experience historical nostalgia through an understanding of objects owned by their parents or grandparents

and conveyed through stories, images, and objects (Grainge, 2000; Marchegiani & Phau, 2007). Nostalgic associations have also been found to bring people together within communities through shared memories and experiences which can foster a sense of belonging - further strengthening an identification with the product. Members of these communities are believed to share these feelings largely exclusively with those whom they believe have experienced the same memories or feelings (Errajaa et al., 2013). Nostalgia can thus be utilized to create value through the lived experiences of a generation and even leveraged by those who do not have first-hand experience (Wilson, 2005).

The authenticity of retro products is a further motivation for adoption as consumers seek authenticity in a world increasingly marked by inauthenticity (Brown, Kozinets, et al., 2003a; Brown, Kozinets, et al., 2003b; Schiermer, 2014). Authenticity plays a critical role in perceptions of quality, for example, as authentic products stand out in our increasingly consumption-driven society by representing and embodying moral values of craftsmanship and lasting value (Adams et al., 2019; Brown, Kozinets, et al., 2003b).

Fashion is an additional driver of retro product adoption. Fashion-motivated users have been found to utilize retro-technology to forge their own individual and unique styles, distinct of the mainstream (Adams et al., 2019; Hemetsberger et al., 2012). This is often realized through a unique mix of modern and retro elements. Younger consumers, in particular, are likely to adopt retro products as an expression of fashion and non-conformism, thereby shaping their identity and finding belongingness and social acceptance. In such cases, a product's utility is largely irrelevant, and the quality or brand is important only insofar as its value as an accessory (Adams et al., 2019; Hemetsberger et al., 2012; Schiermer, 2014).

The adoption of retro-technology by consumers can also be seen as a reaction to the pervasive social and environmental impacts of modern technology. Castellano et al. (2013) suggest that as social awareness increases and the environmental consequences of purchase-choices become clearer, product adoption may be motivated by a desire to revive more traditional practices. In addition to environmental concern, some consumers may adopt retro products in response to negative social and personal wellbeing outcomes resulting from modern technology; how we engage with the world and each other, how we think, what we consume, and what we are interested in. Where a product has the required iconicity and evocativeness for success, it highlights and contrasts the perceived negative influence of modern technology and the values of a retro era (Hemetsberger et al., 2012). Retro products often blend together opposing values of modern and classic/traditional in this way. Consumers who are more able to integrate those values are understood to have more positive perceptions of retro-technology (Dogerlioglu-Demir et al., 2017). Indeed, evoking feelings of moral conflict and providing resolutions through these products has been found to motivate purchases (Brown, Kozinets, et al., 2003b). Some consumers, further still, may simply utilize retro-technology as an exercise of cynicism towards such modern developments rather than any inherent favorability towards retro (Adams et al., 2019).

Overall, the resurgence of retro-technology is a multifaceted phenomenon driven by diverse motivations such as nostalgia, authenticity, fashion, and a reaction to the social and environmental impacts of modern technology. These motivations highlight a shift in consumer preferences from utilitarian aspects to more subjective dimensions like emotional resonance and sensory experiences (Errajaa et al., 2013; Kessous & Roux, 2008). The literature underscores the importance of understanding not just why consumers adopt retro-technologies, but also how they experience and interact with

these products (Brown, 2015). This understanding is crucial for developing products that resonate with consumers on a deeper, more emotional level. As we move forward, it becomes increasingly important to delve into the stories, expectations, and experiences of consumers to truly grasp the value they find in retro-technologies. This insight will not only enrich our theoretical understanding but also guide practical applications in product development and marketing strategies.

3.3 METHOD

The collection and analysis of data were guided by a grounded theory perspective (Charmaz, 2014). Through this lens, data collection was approached with as few predetermined ideas as possible, relying instead on the experiences of the research participants to build theory. Although bias cannot be entirely removed, it should be limited as much as possible by seeking to record events and happenings without the lens of pre-determined hypotheses (Glaser, 1978). Interviews were utilized to gather data which were then coded through an interpretive procedure so that the theory emerged from the data.

To explore the motivations and experiences underlying the continued retro-technology consumption, qualitative interviews were conducted with users of (a range of) retro-technologies. Due to the nascence of this research, the nature of the interviews were semi-structured and exploratory (Rabionet, 2011).

3.3.1 Sample

Participants were recruited predominantly via convenience sampling (Tracy, 2019). As this study seeks to understand the users of these technologies and their experiences from a 'not knowing' perspective, no demographic parameters were set except that they should be at least 18 years old. To better understand the scope of the phenomenon, we sought users of different retro-technologies. Examples of

technologies were provided in the recruitment material (described below), including record players and film cameras. However, as the research aimed to understand the motivations and experiences from a starting point of 'not knowing', users' interpretations of retro-technology and their related experiences were explored without limit (Charmaz, 2014). To recruit participants, we distributed flyers to retail outlets where users of different retro-technologies may be informed of the study and agree to participate. These included record stores, a film studio, a retro-arcade, a 'vintage' store, and a used bookstore. Snowball sampling was also utilized to recruit participants (Tracy, 2019); at the conclusion of each interview, the respondent was requested to forward the details of the study and researcher to retro-technology users in their social network who may be interested in participating. This recruitment strategy resulted in only one additional respondent.

In line with grounded theory principles, interviews were conducted until theoretical saturation was reached, at which point data collection yielded no additional insights or concepts (Bryant & Charmaz, 2007). A total of 20 interviews were consequently conducted with an average duration of 65 minutes. The interviews were conducted both in-person and online using Zoom and were audio recorded and transcribed in full. Participant information including demographics, recruitment site, and technology type is presented in Table 1.

Table 1

Participant information

Participant ID	Gender	Age	Recruitment Site	Retro-tech
Interviewee_1	Male	19	Used bookstore	Vinyl, Film
Interviewee_2	Male	31	Film studio	Vinyl, Film
Interviewee_3	Male	24	Retro arcade	Vinyl
Interviewee_4	Male	43	Used bookstore	Vinyl
Interviewee_5	Male	45	Retro arcade	Film

Interviewee_6	Male	57	Vinyl store	Vinyl, Film
Interviewee_7	Female	45	Vinyl store	Vinyl
Interviewee_8	Male	33	Antiques store	Vinyl, Film
Interviewee_9	Female	28	Antiques store	Vinyl, Film
Interviewee_10	Male	26	Film studio	Vinyl, Film
Interviewee_11	Male	35	Snowball	Film
Interviewee_12	Female	24	Antiques store	Film
Interviewee_13	Female	32	Vinyl store	Vinyl
Interviewee_14	Female	22	Vinyl store	Vinyl
Interviewee_15	Male	33	Antiques store	Vinyl, Film
Interviewee_16	Female	30	Antiques store	Vinyl, Film
Interviewee_17	Male	75	Antiques store	Vinyl, Film
Interviewee_18	Male	21	Film studio	Vinyl
Interviewee_19	Male	58	Film studio	Film
Interviewee_20	Male	32	Used bookstore	Vinyl, Film

The ages of the 20 respondents range from 19-75 with a mean age of 36. Six identified as females (30%) and 14 as males (70%). The most common technologies discussed were LP records and film cameras, however the respondents also discussed their use of technologies including typewriters, games, cassettes, and crafting-tools. Of the two main retro-technology categories, the cohort comprised 10 users of LP records, five users of film cameras, and five users of both film cameras and LP records.

3.3.2 Protocol and Interview Strategy

Semi-structured interviews were conducted to stimulate a flexible and organic discussion (Tracy, 2019). Participants were also encouraged to follow thoughts that were not obviously connected to a line of questioning; these 'tangents' were frequent and provided rich data. These narrative interviews, an inductive technique that aligns with the grounded theory approach, encouraged participants to tell stories about their experiences and life events (Gubrium & Holstein, 2001; Tracy, 2019). Where

participants described their experiences, they were often prompted for examples, deeper insight and recollection of their behavior. The questions posed were intentionally broad and open-ended and included a number of questions about motive, both in regard to the participant as well as their perception of others. These lines of inquiry typically began with a '*how*' question, e.g., how do you use retro-technology?, to provoke an explanation of scenarios or processes, after which we sought to understand *why* the elements described are important to the experience.

The questions that comprise the semi-structured protocol were used only as a reference point, as they were often answered organically, and out of order, through the natural flow and direction of the conversation and storytelling. The broad topics of the protocol and example questions are provided in Table 2. The main sections of this protocol included, firstly, questions relating to what the participant remembers about when they first started using this technology, including timeline, impetus, memories (particularly of childhood), and feelings. For a select few, these recollections did not run deeper than the past few months, however most participants described a rich history of use, including periods without use, and re-adoption. Participants were then asked to describe the scenarios where they find themselves using retro-technologies. These scenarios included the elements that stand out as important or enjoyable, the steps or processes that contribute value to the experience and important artifacts and their role. Participants were also asked about their feelings before, during and after their experiences with technology, including mood-related factors, reflective exercises, and whether these feelings were sought after purposefully or result only as a consequence of other motivations to engage with these technologies. Further, participants were asked about *how* they use the technologies, including questions behind their choices of media (e.g., choosing records, deciding where/the subject/what

kind of photographs they would take) and whether there are any rules or procedures they follow.

Table 2

Protocol topics and example questions

	Topic	Example questions
1	Retro-technology types	What is a retro-technology to you?
		What kinds of retro-technologies do you use?
2	History	What do you remember about when you first started using this technology?
		When might you find yourself reflecting on the time period the technology comes from?
3	Affective state	What kinds of feelings do you have when you're using retro-technology?
		Are there particular moods or feelings that motivate you to use retro-technology?
4	Using the technology	Describe how you use your retro-technology (i.e., describe the scenario)
		When would you choose to use retro-technology?
5	Purchase behavior	In what circumstances might you buy new versus second hand retro-technology/media?
		Explain the process leading up to the purchase of retro-technology or media
6	Social use	In what situations might you share these experiences with others?
		In what ways do you engage with communities relating to your use of this technology?
7	Important qualities of the tech	What elements of the technology are most important?
		Are there ways it could be improved?

We posed a number of compare-contrast questions in relation to their motivations to use retro versus modern technology, including the situations where they would use one over the other, where they might integrate modern technology versus safeguarding authenticity, and situations where they would not use modern technology (e.g., disconnection practices); this also included discussions of habits and context-specific usage (Charmaz, 2014; Tracy, 2019). Participants were additionally asked to draw comparisons between their motivations to use modern versus retro-technologies and the experiences that are sought (or result) from these choices. We also endeavored to understand how their experiences with retro-technology extend beyond usage

scenarios. As such, participants were asked about the experiences including the purchase of technology and media through physical stores, interaction and collaboration with social circles (including online), attendance to events, and interactions with the people present in these situations.

Participants were, in turn, asked about how they share these experiences, whether with friends, family, online; their preferences for engagement and sharing, participation in groups, clubs and forums and whether these relationships exist separately to their 'real' life. Discussion of modern technology often related to themes of disconnection, motivating us to add prompts to the protocol to understand participants' social media habits and their relationship with retro-technology experiences. We also posed 'ideal' related questions. For example, where a respondent suggested they have owned film cameras but did not presently use them due to the high-cost of film, we would ask whether new-in-production film at a reasonable price would elicit their custom, and from there seek to understand the appeal and experience-related value (Charmaz, 2014). We further asked participants to frame their experiences in relation to how they believe others might use similar technologies. For instance, a user of film cameras who describes a preference to slow down and carefully adjust settings might describe their use of the technology as more authentic and purposeful when compared to a user who uses point-and-shoot variants (Gubrium & Holstein, 2001; Tracy, 2019).

Commensurate with the grounded theory method, changes to the scope of questioning were made through preliminary analysis of the data and theoretical sampling (Charmaz, 2014; Haig, 2010). For example, early in the interview process, we began to understand the importance of themes relating to the expression of human agency. One way in which agency was found to be important is through opportunities

to simply 'do more' and be more active in the experience. Questions were subsequently added to the protocol to better understand the ways in which participants might be more engaged in these experiences and whether they believe *doing more* enhances the experience.

3.3.3 Coding

The coding of data was guided by grounded theory methods (Charmaz, 2014). The interviews, transcription and coding were completed by the research team. This ensured that context associated with each participant and the way they answered questions could be recalled (e.g., body language and other cues). Further, memos were collected throughout the process, including intra- and post-interview, during transcription (particularly to make reference of contextual cues recalled while listening to the recordings), and during initial coding procedures to begin to map potential relationships between codes as well as uncover themes that could benefit from further exploration in subsequent interviews. As such, theoretical sampling was a critical technique utilized in the coding process, whereby, through the analysis of previously acquired data, new avenues for questioning and theory building were taken. All data were subject to constant comparative analysis in this way (Corbin & Strauss, 2008). As new data were coded, differences and similarities across previously coded data were established.

The full transcripts were imported into the qualitative data analysis software NVivo for coding and analysis. The first step in the coding process involved line-by-line open coding whereby the researchers carefully read through each line of each transcript and began creating initial codes that illustrate meaning or action and to uncover early concepts in the raw data (Charmaz, 2014). These initial codes aimed to capture ideas in the way participants described them. The next step was axial coding

whereby the researcher analyzed the relationships between codes, the themes and subthemes, to determine larger thematic codes and consolidate initial codes that describe similar themes to better explain the phenomena. Through the axial coding process, we were able to sort, synthesize, integrate and organize that data into more focused codes. Finally, we utilized selective coding to further sort, integrate and refine codes and memos (Strauss, 1998) in an iterative process until the research team determined that the resulting themes contributed meaningfully to a theoretical model.

3.4   ANALYSIS

The analysis of data revealed four key themes that contribute to the final model (see Figure 3); limit the scope of choice, expand the realm of action, seize the moment, and expand the realm of connection.

Figure 3

A model of the experiential value of retro-technology
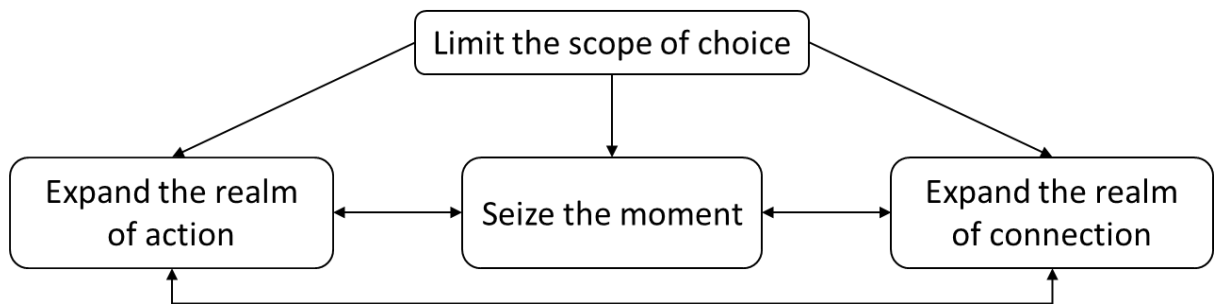
Users do not view their experience with retro-technology as simply pertaining to the actions associated with the technology's purpose. Rather, the perceived value derives from a collection of connected experiences motivated by different needs which are realized in various ways through the inherent limitations of the technology. The analysis, thus, suggests that the technology provides for unique experiences by limiting the scope of choice which creates opportunities for engagement that are increasingly

denied by modern technology. Limiting the scope of choice speaks to a desire for control and disconnection from modern technology. These limitations provide for experiences that enable the user to feel more present and connected in their experiences – to seize the moment. Expanding the realm of action speaks to intentionality, learning, and physical interaction with technology. The limitations and rituals associated with retro-technology experiences expand the user's realm of action driving them to learn and improve their skills, and actively seek out and engage in experiences that reinforce their agency and competence. Finally, these limitations provide opportunities for more active, authentic, and engaging experiences with other individuals - to expand the realm of connection.

3.4.1 Limit the scope of choice

The limitations inherent to retro-technology experiences provide a greater sense of control to many individuals. For instance, not being able to skip songs, fast forward, shuffle, autoplay, and other key value-related elements of digital music, provides objectively far less flexibility in the experience, however the result of this is a greater feeling of ownership over the experience. The predictability of experiences and built-in confirmation is immediate evidence of their own agency. Users select an album, commit to listening to every song, they are attentive and unable to make impulse-based changes and thus, the experience proceeds exactly how they envisioned it – reaffirming their sense of control.

> *"That is what I find so attractive about retro or analogue technology - it's not like looking at an endless fade of scrolling or a menu within a menu and endless possibilities - there are limitations and you can work within those."* – Interviewee_8

There is a sense that by engaging in experiences that are in some way limited by the technology, a boundary is created within which the user may exercise control. A roll of film has a specific number of shots just as a vinyl record's playtime is a specific number of minutes. These qualities are static and provide users greater certainty in their experiences with the technology. When a user commits to listening to a record, the record itself provides for a finite experience; once the needle reaches the edge of the record, the technology's role ends and the user must decide whether to end the experience and put the record away, select another record, replay the same record, or play the opposite side. The physical actions that are required for each of these options provide a non-negotiable level of engagement from the user, which cannot be deferred to the technology.

> *"You have to actually be listening because you have to turn over the record - if you let the record spin you could damage it. You have to actively engage with these things to use them."* – Interviewee_20

Music streaming, by contrast, can continuously play music recommended by an algorithm, absent of listener intervention, thus creating a sense that the listener is at the whim of the program – the experience is not their own but rather that they are a passenger – they do not have control. This is illustrated in the observations of Interviewee_15 who describes this as realizing "I haven't found a new music preference *organically* in a really long time" as his preferences were largely shaped by recommendations from his music streaming service.

> *"It's me trying to take back control of my own personality and interests and self. My core being almost. I'm trying to live independently and more slowly and naturally."* – Interviewee_15

In a similar manner, users of film cameras seek experiences which allow them

to exercise control, namely, through the settings that will contribute to image production. For users of both vinyl records and film cameras, controlling output requires the user to apply knowledge and experience. For instance, record users know when they have cleaned a record properly between uses by its sound (whether there is popping or hissing), or whether they have set the needle in the correct place and set the correct rpm (revolutions per minute). These small confirmations reaffirm their role and also contribute to feelings of competence.

Several respondents additionally underscored disconnection practices, whereby individuals make a conscious effort to keep off digital devices (e.g., smartphones and computers) for varying periods of time depending on the individual's perception of necessity (Pawłowska-Legwand & Matoga, 2020).

> *"So, I'll take my old camera out and I'll put my phone in my bag and I'll just go for a wander throughout the city."* – Interviewee_1

Users who make conscious decisions to disconnect also notice a positive effect.

> *"That's what I love about it - you get bombarded with - especially in my job - with phones and applications and for me it's back-to-back. Analogue technology for me takes me right out of that. I can close my door and use analogue technology. It's kind of like we really have this digital overload and it's so relaxing to disconnect from that stuff."* – Interviewee_20

When these users employ retro-technology as "*a way of escaping modern technology*" (Interviewee_15), they make a choice to gain control over their experiences, even if for a short time.

Driving the desire for disconnection, many respondents discussed their perceptions of pressures born of modern technology's controlling presence. Importantly, the values they describe as antithetical to this control are being present,

being engaged, being with the people around them and being more connected with their environment. They describe making decisions to negate the control typical of modern technology, and this backwards step to retro-technology provides both a physical reminder of this goal as well as an opportunity to exercise their own agency. Realizations born in 'present' moments of introspection provoke evaluations of their decision-making and whether this has occurred organically or at the whim of an algorithm.

> "*Sometimes I find myself thinking about where my preferences in the last couple of years have come from. Have they been algorithmically determined? Some of the software that's out there now, is it driving me towards a particular behavior?...[I'm] trying to figure out and untangle what is algorithmically driven and what is my long-held inherent preference that I might have had since I was younger."* – Interviewee_15

Such comparison to one's previous self is a common element of identity affirming practices and speaks to an intrinsic desire to act independent of perceived external influence. These elements contribute to a desire for greater agency and self-efficacy, to be in control and make meaningful choices (Bandura, 2002). Many users describe their desire to have greater control over their choices, to understand why they are making a decision, and to own their decision, even if it turns out to be less than ideal. This also relates to taking action to regain control from technology with the aim of utilizing technology as a tool rather than something to be dependent on. Interviewee_9 suggests "when I go back to the internet being used as a tool, I enjoy it more".

3.4.2 Seize the moment

Users of retro-technology desire experiences that allow them to feel more present in the moment - a more 'human' experience that provides for greater connection to their own mental state and where they are forced (by their own choice) to pay attention. Such moments seem fleeting and non-replicable to users, and further, that a lapse in attention may cause the loss of that moment. This feeling that the user could lose part of the experience provides a sense of preciousness which in turn demands attention. When streaming music, for example, if the listener is distracted during a song, the song can be easily rewound or skipped back at any time. In a retro-technology experience where music plays on vinyl, however, such freedom is not as easily granted to the user, concurrently increasing the attention of the listener.

> *"I love vinyl...the process is different, instead of just putting on a Spotify playlist and letting it play indefinitely you have to be there in the moment, and typically listen to it from beginning to end, and you have to flip it to make it work"* – Interviewee_10

The tangible nature of the technology also contributes to this attention-derived experience as the user is required to physically operate the technology and must remain attentive. Participants described some of these processes in the context of vinyl records, including the need to raise the needle when one side of a record finishes playing in order to prevent damage. They then need to turn the record over and place the needle again to continue the album. Respondents contrast this with the freedoms granted by modern technology; being able to skip, randomize, shuffle or swap between albums with a single click. Such freedom drives them to do so almost unwillingly and without clear reason. Through using retro-technologies, participants describe being able to avoid the impulses that are typical with digital technology so that they can experience music in the way they deem to be valuable to them; the way it is 'supposed'.

This extends similarly to film photography. When users are limited in the number of photos they can take, capturing the right moments becomes more important. Each shot of film represents an opportunity and each photograph that is not well designed may result in a wasted opportunity. These moments provide pause and allow individuals to experience the world, and their place in it. By contrast, when it comes to taking photos with a digital camera (or smartphone), users report a haphazard approach whereby very little care need be taken as to what should be captured and how. A corollary concern is the large volume of images that are often taken, with very few of these carrying value to the photographer, and any images of value being lost in the vast memory storage systems.

> *"Taking a photo where you've got limited shots, and the work that goes into the process to get that image will force you to be more in the moment. Thinking about the knobs and dials and getting it right; as well as observing whatever your subject is. There's something very beautiful about looking at the world for key moments. It's like literally looking at life…and once you sort of get into that mindset, mundane moments seem quite meditative and calming"* - Interviewee_8

Images taken on film are imbued with meaning for the user (and indeed, those who shared the experience). By contrast there is a sense of loss associated with over-processed digital photographs that have been meticulously selected and edited.

> "*At the end of a [digital camera] shoot I'll spend a day or two days looking at a screen going through editing it all and finding the perfect one and the end result is like commercial quality but that presence and that feeling is what is lost.*" – Interviewee_8

In film photography especially, users feel a connection to the experience through the images they produce by virtue of their uniqueness. These images may have many perceptible defects, which speaks to novel elements of the camera, the film, or the user's whimsy. Moreover, these imperfections provide the user with further validation that they influenced this image, and that they are an invaluable component of this novel experience. It provides a more 'human' feel to users; they realize greater satisfaction when looking at an image that they took, where they can understand the image has imperfections which point to human engagement. As the resulting qualities cannot be replicated exactly, they become expressions of the photographer's individualism and physical evidence of their agency – something lost through many digital experiences.

> *"The feeling that you get when you look at a photo that was taken on 35 mil…it's sort of like a warmth, it seems more human when it comes through. It's more imperfect if it comes through on film than the 4k cameras…it's really crisp, it's almost cold."* – Interviewee_1

Similarly, in the case of vinyl records, there was a preference amongst respondents for records with 'character', that may include imperfections derived from use, age, or the recording itself. One user contended that digitally remastered copies, while they sound objectively better, are less 'human' in that the imperfections of the recording process, including background noises, mixing errors, mistakes from musicians etc., create a more real and tangible experience – one that they feel more connected to while listening to rather than one born of 'perfection' with digital corrections.

"You can hear that the band is off just by a fraction of a second but if you listen to the digital remastering every beat has been quantized to be exactly on the beat." – Interviewee_15

The interconnected nature of digital technologies also provides for a multitude of distractions that do not necessarily belong in the scenario they force their way in to. Interviewee_8 described this as "getting sucked into the vortex" whereby simply having their phone with them can lead them to miss the moment they initially intended to capture. Modern technology, and indeed modern life as a consequence, has become so fast paced that multitasking is taken as common sense. We are frequently bombarded with distractions that fight for our attention and lead us to lose track of what we may have originally deemed to be important – it influences our own power of will.

For record-listeners, the music appears to have more of a presence due to the physical artifact - the device itself seems to demand attention. The characteristics of the music-output is also unique as the device and the media react to each other which further amplifies this sense of presence. Rather than cold, emotionless sound, users feel warmth through the pops and cracks as the needle passes over imperfections in the vinyl which are unique to their copy. This connection has an influence that provides the user an opportunity for reflection – through present being, they are gifted with a uniquely human experience alongside technology rather than being a passive observer at a technology's whim.

"You know there's little warm pops and things that you might get listening to vinyl. It's that thing of - you're present, that's what I'm so so attracted to." – Interviewee_8

Many respondents described the benefits of retro-technologies as being about appreciating the experience rather than seeking an outcome. If they sought an outcome (e.g., listening to music or taking a photograph), they might choose a streaming service or a smart phone to undertake this task. However, when engaged in experiences with retro-technologies, this outcome becomes merely a consequence of the process.

3.4.3 Expand the realm of action

Retro-technologies not only offer more opportunity for the user to be active in the experience, but they also provide a great amount of feedback on their performance. In a number of cases, this feedback is tactile in nature – for example, when a user is winding film there may be cranking vibrations followed by a clear click to indicate the film has been accurately set. Even when errors occur with potentially devastating outcomes, these provide learning experiences that do not detract from the passion for the tech.

> *"My favorite thing is the winding on of the 35-millimetre film, that's very nice. It's also petrifying when you feel the film break or the mechanism break and I'm just like 'oh okay that's ruined, there goes a day's worth of film'."* – Interviewee_9

For record users, they learn how it feels to properly set and weight the arm on a record player, they develop habits around how gentle to be with records when cleaning them and so on. These small tactile affirmations may not only provide the users with a sense that they are connected with the technology and therefore the experience, but it may also provide positive affect.

> *"With vinyl especially, one of the things that's great about it is how tactile it is and there's a ritualistic process involved with it because you've got to pull the album out after you've chosen it, you take it out of the sleeve, you put it on the*

platter, you start the spinning, you lift the needle up, you drop it down, you sort

of step back and then the whole room fills with sound. There's so much more

to that than just hitting play on your phone." – Interviewee_3

Retro-technology use engages other senses as well. For instance, the crank wheel on the camera provides audible feedback, while cracking/popping sounds heard during record playback will alarm the user that the record has not been cleaned properly or that an incorrect rpm has been set. Respondents also described the smells associated with records and their cardboard sleeves, particularly over time, as well as smells associated with processing film.

The actions taken by the user to progress the experience also require mental effort. While some of these processes are simple, others (particularly in the case of fully manual film cameras) require more thought. The scarcity of film introduces an element of risk which engenders a greater level of planning to ensure that every shot is worthwhile. This element of risk challenges users to improve their skills and knowledge through problem solving and trial and error. Further, through the feedback illustrated by the output, they are subsequently rewarded, and their competence affirmed.

"It's more challenging because its riskier so there's a bit of thrill in the

chase…it forces me to be a photographer whereas with digital you get a bit

lazy and let the camera do a lot of the work." – Interviewee_6

This risk also comes through as a sense of experimentation. Particularly considering the cost of film, these lessons are not free and so understanding the outcome is inherently more valuable.

"I think those steps [choosing the camera and film] are also fun, a bit of

experimentation of, you know, choosing those different physical combinations

of the camera and the film and then experiment to see what happens." –

Interviewee_16

Digital technology can make the creative process easier for users also with filters and settings that can be altered with a click. Although some users view this akin to cheating, they also describe it as a trap they very easily fall into. These statements speak to a desire to be challenged in their experience. One respondent described the similarities between using retro-technologies with a desire to prepare more of his food himself (i.e., not buying pre-cut vegetables wherever possible). Throughout this entire process and right up to when the film is developed for the user to analyze the output, there is greater positive affect. Many respondents spoke of the difference between instant and delayed gratification in modern versus retro-technologies, respectively. Users derive far greater satisfaction from not jumping for instant gratification. Moreover, elements of the outcome that are below the standard the user expected (i.e., a disappointing outcome) have far less of a negative impact on the individual on account of their overall satisfaction derived from the experience. For those who engage in film photography, this stems from understanding their role in creating the output image and, the 'disappointing' elements become reminders of their experience and in turn create a positive rather than negative influences.

Respondents touched on the idea of intention – a core principle of agency. Through their use of retro-technology they are able to exercise, and be consciously aware of, their own intention. One way in which this is actualized relates to how users seek out and obtain media. Many users describe this as a 'hunt', illustrated by going to physical stores (including specific record stores, small sellers running shops from their garage and record fairs). They might also buy online, however the process of physically browsing, selecting 'options' and listening to them, engaging with the seller

(exchanging knowledge), assessing the quality, finding rare records, digging through 'bins', and anticipating a great find are far more exhilarating.

> *"I would have to say that the hunt appeals to me. It is great when you find it, but you are always thinking about the next one now. You savor the moment – like 'that is cool' and 'I found this here amongst everyone else who is looking'. Definitely that hunt of finding those originals is always great."* – Interviewee_4

Most users described a routine or ritual associated with retro-technology use. There were common steps taken in each experience, largely representing loose and unspoken rules which might include how long the experience goes for (e.g., one side of a record, one roll of film), describe things to avoid (e.g., not skipping songs), or ways of disconnecting from the digital world. These rituals denote clear boundaries to their experience in time and space.

> *"Picking out four or five [records] and just putting them to the side and just going through and putting them on. Clean them, turn everything on, put down the needle and then sit back. Have a look at the record cover and liner notes, or a book that I might be reading at the time. I listen from start to finish. Occasionally I might play it again - bring back the needle to the start - not very often, but it will be start to finish and I try to do both sides. Rarely will I just put one side on and then put it away. When I finish with the record it has to go back and when the record goes on I've got to put the dust brush over it between 10 and 15 times and if it is still noisy, I'll spray stuff on it and give it another whirl with a different brush."* – Interviewee_4

Respondents spoke of the skills they had to develop, many with a sense of pride, and happily explained the different mechanisms that are required when using retro versus modern. There are many examples provided for the development of skills, from

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the way records are handled, through to the host of settings required to take a picture on a film camera.

> *"I grew disillusioned with digital photography in that it seemed more of an exercise in how to photoshop an image well or who has the best editing skills…[with film] it wasn't so much the camera you had, it's what you did with it and how you go about things."* – Interviewee_10

Most respondents also discussed their knowledge of the technology in some detail. This could be knowledge that they have sought and accumulated about types of film, techniques, and the history of particular technologies (including trivia on bands and celebrities). For example, users of record players enthusiastically explained the differences between certain record labels and where the records were pressed. Comparisons of quality and authenticity were often raised among these stories, backed up by their understanding of the history of the band to which the record belonged.

The users' knowledge was additionally reflected in the way they look after their technology and the symbolism associated with respecting these physical items. Retro products are largely built with technology that is far easier for individuals to understand. The simple, tactile, and intuitive functionality engenders greater respect from its user through their ability to more easily understand how it works, particularly when compared with digital devices that 'hide' features deep in multi-tiered menus. As such, digital technologies may cause users to feel less competence due to the sheer magnitude of features the user is required to understand before they can claim proficiency. Retro-technology presents itself far more like an extension of the human user than a totally separate device that could seemingly act of its own will.

> *"With a lot of modern products and equipment there's so much hidden behind the scenes…everything's really complex and comprehensive because people*

want to pack features into everything…it gives you less confidence when you use it." – Interviewee_2

For first-time users, retro-technology is a novel technology and by nature of its inherent qualities, it requires users to learn lessons on how to properly care for it. Digital technologies are such that many are not able to readily understand how they work, and so certainly repairing them or maintaining them is not a function of ownership as it is with retro-technology. Moreover, interactions with a physical object (e.g., record player or film camera), which the user can learn to understand, generates a drive to properly care for them – and this involves learning the processes, sometimes online, but also through experience. Retro-technology use consequently provides opportunities for continuous learning as well as repairing and maintaining the technology.

3.4.4 Expand the realm of connection

Retro-technologies provide many avenues for users to experience relatedness, and nostalgia – in other words a connection to the past - is one such avenue. The importance of nostalgia and its function in the retro-experience differed greatly among respondents. For many, nostalgia had a greater role in their adoption decision than in their continued use. That is, they may have been drawn in by feelings of nostalgia, however, it soon took a back seat to other elements of the experience.

Nostalgia may be experienced based on an individual's own lived experiences, or through communal nostalgia, experienced through stories and perceptions of past time periods (Marchegiani & Phau, 2011). Often, such values and symbolisms are imbued into the technology through the users' experiences and knowledge. In our study, personal nostalgic connections were largely described through memories from childhood. Such positive memories are sometimes accessed during experiences, but

the key learning from these discussions relates to how their current experiences with retro-technology were influenced by nostalgic associations. Memories with family, in particular, were connected to habits and rituals which live on through them. Users describe remembering how fragile the technology seemed, and the warnings their parents would give about caring for it. They explained how they behaved around the technology and how they connect with feelings that they have reached a point of responsibility – that now they can look after such technology themselves. Such memories also lend themselves to self-reflection allowing individuals to connect with values they believed were important in their past and try to bring them forward or build on themselves in the present (Sierra & McQuitty, 2007).

> *"Youth culture was based around music. You saved up every week, you bought a record, your best friend bought a record, you taped them, you swapped them, so that you got twice the music for the one price."* – Interviewee_7

Feelings of communal nostalgia were more common among the respondents. Individuals described feeling a connection to the people of a past time through the use of the technology, particularly in the case of second-hand technologies. Through their research, users learn about the celebrities who once owned their cameras, about how cameras may have been used in war, about the circumstances leading to a particular album being recorded (e.g., from band members to wider political situations). Through the artwork and liner notes within vinyl sleeves as well as through online research, users feel connected to the band and the times where they were writing the music and the influence it had to their audiences.

> *"I often think about who were the famous people that used these, what did they achieve. Like Ansel Adams and all those guys - the pinnacle that set the standard - they were just using these basic cameras."* – Interviewee_2

These memories are also brought forward into ideals that are sought to be realized in the present.

Some users attempted to reignite such ideals by inviting friends over to listen to records and having parties that revolve around the record player.

Physical relics also serve a strong symbolic purpose for users - for example, inheriting records, or cameras from family, as well as beyond this close social network. Interestingly, one respondent spoke of the rolls of film that are left in purchased second-hand cameras, which depict scenes from a past that have never been seen before. Such relics can engender a profound sense of connection through time with the camera acting as the anchor point. Through these photographs, the user can understand something of the time the camera came from and the people who once owned it.

> *"I have old photos from my grandfather, and I also have an old camera display from the early 90s as well. It's just having a piece of history in my living room."*
> – Interviewee_20

In addition to a connection with the past, respondents underscored connections in the contemporary facilitated by retro-technology use. For instance, some users connected with friends and family, particularly through shared experiences.

> *"With a film camera I can get [friends] to take photos and have them involved and with LPs they can also listen along with me. I guess those are what's different to a lot of the other technologies I use just for myself…I can use them in a community sense."* – Interviewee_9

Their collections and centerpieces proudly displayed at home also provide for social experiences, such as listening parties that represent more 'human' experiences that were popular in the past.

Interviewee_4: *"We have listening parties…you bring a pile of records in, and*

likeminded people would hang out and chill and see what people picked and try new things…sort of like Spotify but more natural intelligence not artificial intelligence."

Connection to the broader retro-technology community was also illustrated in the wealth of online forums devoted to retro-technologies mentioned by the respondents. For some, such groups were the impetus for their now-passion for retro-technology. By accessing these groups by chance, they came to understand the appeal of retro-technologies and took small steps to understand what the 'fuss' was about. The respondents also identified many local communities that engage in events like record fairs, film camera walks, and record exchanges, where users can share their experiences, stories and knowledge with likeminded people as well as buy and sell. The stores associated with retro-products provide an additional social element where users engage with shop owners, fair-goers, or those running a garage sale, to talk about the history of the tech, gain advice and in some cases, learn the mechanics.

3.5   DISCUSSION

The first key theme, expanding the realm of choice, highlights that retro-technologies grant greater control and ownership, in turn, providing experiences that allow users to seize the moment and expand their realms of action and connection. The requirement to make deliberate decisions and contribute meaningfully to a structured and predictable experience reaffirms the user's control and agency. They feel responsible and are driven to actively engage with the technology and make decisions that steer the experience rather than relying on automated functions. Therefore, the presence of choice and the ability to exercise control over their experiences are key elements that contribute to the value and appeal of retro-technology.

The second emergent theme exhibited retro-technology users' desire for more present, human experiences; to seize the moment. These experiences allow users greater connection to the lived moment and their own mental state juxtaposed with the interconnected, constant, and distracting nature of digital technologies that often lead users to lose track of these moments. This feeling of presence is largely derived from an immersive experience whereby the tangible and attention-driven nature of retro-technology requires (often skillful) physical operation and monitoring from the user. The nature of analogue experiences also provides for more 'real' human experiences, derived of perceptions that the output (whether audio or film) is less processed and 'raw' as compared to the digitally corrected and 'perfect' outputs of modern technologies. That is, the quality of the experience holds greater value than the quality of the outcome.

The third theme, expand the realm of action, describes a desire to actively seek opportunities to engage, learn and interact. The "hunt" for physical media was described as an exciting and rewarding experience that is increasingly rare – connected also to greater engagement with communities and other users. The limitations, risks, tactile feedback, and unique rituals associated with retro-technology experience encourage learning and improvement that builds skills and understanding. For some, understanding the technology leads to a respect that extends to careful maintenance of devices further expanding the realm of action and reflecting a deeper appreciation.

Finally, the theme of expanding the realm of connection describes the role of nostalgia, human interaction, and community. Nostalgia was experienced by users in both personal and communal form - users often felt a sense of connection to the past with some seeking to understand the history of the technology and the people who used it. Meanwhile, personal connections derived from the use of retro-technologies

materialized through displaying collections in homes to spark conversation, engaging in online communities and social events or sharing experiences with friends and family. These experiences provided opportunities for knowledge sharing, support, and social interaction that are less common with digital technology.

Closer inspection reveals these emergent themes to possess links with the basic psychological needs put forward by self-determination theory (SDT): autonomy, competence, and relatedness. The theory describes humans as having evolved to be inherently active, intrinsically motivated, and oriented towards developing naturally through integrative processes (Deci & Ryan, 2012).

3.5.1 Autonomy

Respondents report being capable of 'living in the moment' and providing greater focus to the tasks they wish to take part in. They have identified values which they believe to be important for them as human beings, and through these experiences they are able to move closer to and embody those values. Such experiences demonstrate mindful awareness derived from autonomy-supportive rather than controlling experiences allowing for expressions of self-regulation (autonomous) rather than self-control (controlled) and thus contributing positively to intrinsic motivation, need satisfaction, vitalization and wellness (Deci & Ryan, 2012; Moller et al., 2006b). The freedom described by respondents is also an inherent and valuable element of human agency. Freedom is not concerned with a complete lack of external pressure or constraints but rather an individual's ability to influence themselves. Through reflective and regulated thought, users were able to utilize skills and other tools to make choices and support their own plans of action. Those who regularly exercise such regulative skills will become more capable of doing so in the future and

are thus more motivated and successful than those who have limited means of personal agency (Bandura, 1986).

A key indication of satisfied autonomy can be understood from respondents reporting the perception of their own influence and intention through their retro-experience; their ability to exercise choice and have control (Deci & Ryan, 2000; Visser, 2010). Such feelings of autonomy compound over time, reinforcing their ability to influence their own experiences and outcomes and increasing feelings of self-efficacy (Wood & Bandura, 1989). Importantly, these findings also demonstrate a desire to exercise greater agency defined by Code (2013, p. 39) as "the capability for individuals to consciously choose, influence and structure their actions in order to achieve a desired outcome". These experiences also provide visual and auditory artifacts that confirm the user's role in the experience. Through the limitations imparted by retro-technology, users felt that they understood the technology (and therefore its functions and roles) and were able to exhibit control over their experience. The user is responsible for operating the technology, and responsible for whether music plays or whether a photograph is taken well, as well as any damage the technology may suffer through their lack of care or inattentiveness. Contrastingly, respondents described experiences with digital technology as being designed to remove this responsibility. Consequently, users perceive a loss of self as their behavior is influenced or controlled by external digital entities. Indeed, respondents' concerns regarding such entities denote feelings of heteronomy (the opposite of autonomy), characterized by perceptions of control by forces outside the phenomenal self which may seek to influence one's behavior regardless of their values or interests (Ryan & Deci, 2006). These perceptions lead to decreased feelings of autonomy and therefore negative wellbeing outcomes (Ryan & Deci, 2006).

Respondents also describe their attempts to disconnect from the digital world. Through such practices they actively seek to influence positive change in their lives. Research has explored "unplugging" or "disconnection", whereby individuals make a conscious effort to keep off digital devices (e.g., smartphones and computers) for varying periods of time (Morris & Cravens, 2017). This disconnection from technology produced reported improvements in interpersonal relationships, physical health and psychological and emotional wellbeing; echoing results from further studies which suggest that even short periods of disconnection can achieve positive results (Cheever et al., 2014; Thomee et al., 2011). Such results resonate with the findings of this study. It appears as though users utilize retro-technology to facilitate disconnection practices and through these practices they experience positive affect (evidenced by improved mood, meditativeness, and calming effects). Even users who do not state this as their primary objective admit that disconnection is often a consequence of their experiences. Decisions to disconnect are acts of agency led by an individual's goal to break out from constant connectivity and to repurpose the time otherwise spent on mobile or other digital devices (Russo et al., 2019). Self-reflection is a key element of this process and allows individuals to understand the repercussions of their behavior and divergence from their perceived identity and related values. Such expressions of agency are believed to be born of a trade-off between the benefits and costs associated with technology use (Kolb et al., 2012; Matusik & Mickel, 2011; Russo et al., 2019).

Further, the age of the technology is not an important consideration for many users. For example, listeners of LP records may use new record players, new speakers, new records. Similarly, with film cameras, many will use light meters (often through phone apps) which allow them to better calibrate certain settings better in the photograph. Indeed, it is not uncommon to utilize a blend of modern and retro-

technologies to create unique experiences (Fort-Rioche et al., 2013; Hemetsberger et al., 2012). As such, users are happy to use digital technology as a tool to enhance their own decision making, however, they do not wish for the technology to act on their behalf, i.e., to automatically select the settings.

3.5.2 Competence

It is well established in the literature that the tactile nature of retro-technology is a motivation for adoption (Adams et al., 2019; Hemetsberger et al., 2012). The results of this study provide new perspectives to this phenomenon. That is, we contend that the inherently tactile nature of retro-technology, provided by its mechanical nature, allows for users to perceive their own input and receive feedback that an action has been successful through tactile cues. This reaffirms their competence and may contribute to positive affect across the experience (Deci & Ryan, 2012). Evidence of competence-satisfaction is also demonstrated by users describing their experiences with retro-technology as requiring mental and physical effort, which naturally results from the technology's limitations. Such effects were juxtaposed with perceptions that digital technology is increasingly encroaching on its users' lives; it is doing too much for us. A user is more likely to utilize a technology where they perceive themselves as able to effectively use and take advantage of its capabilities (Kelly, 2014).

Skill development was described positively by respondents characterized by a desire to be challenged, to build skills and capacities and inspire personal growth (Visser, 2010). This observation aligns with Bandura's (1986) assertion that individuals benefit from building confidence in their personal capabilities developed through failures and difficulties. Overcoming these hardships and inequities not only reinforces personal efficacy but also positively influences wellbeing. Our study

similarly shows that respondents demonstrate high perceptions of self-efficacy through their experiences, supporting their increased agency.

Developing an understanding of the technology's mechanical function was also common with most users seeking at least a basic understanding of the technology to appropriately care for and maintain it. Nokelainen and Dedehayir (2015) similarly found that users of retro-technologies may sometimes be more interested in the technology's hardware than its performance. This is likely influenced by less integrated technology designs which are more easily understood and operated on. Further, retro-technologies have inherent feedback systems due to their tactile nature as well as readily perceivable outputs. Users subsequently speak of understanding when they have done something correctly because they feel and hear a 'click', or indeed, when the music 'fills the room', or when the photo demonstrates and rewards their skill. Many of these skills are being lost to time and made obsolete alongside the technology they relate to, providing users with a unique sense that they possess something that others do not. This is commensurate with prior literature that has demonstrated users of retro-technologies to feel a need to continue the legacy of particular techniques and skills (Armstead & McKinney, 2019).

3.5.3 Relatedness

A core means of realizing relatedness in experiences with retro-technology is through both personal and communal nostalgia imbued in the technology. Nostalgia has been cited by earlier contributions as a core motivation for retro-technology adoption (e.g., Brown, Kozinets, et al., 2003a; Errajaa et al., 2013). In our study, users demonstrated a desire to bring back elements of the past that represent values they believe to be critical to positive life function. Such desires are also documented in the literature which suggests nostalgia fosters deep reflection through a juxtaposition of

the past and present self, and may inspire realignment with particular values that are perceived to be lost (Ju et al., 2016; Sedikides et al., 2015; Sierra & McQuitty, 2007).

Such actions are core functions of agency (Bandura, 1988). With social connection as the focus, users additionally sought to engage with like-minded individuals through clubs, online communities, and activities including photo-walks and record listening parties. In these social encounters, retro-technology is utilized as a physical artifact around which people can gather, providing a sense of belonging and further inviting the sharing of preferences, stories and the creation of new memories (Baumeister & Leary, 1995; Brown, Kozinets, et al., 2003a; Schoop, 2018). Indeed, prior research has highlighted the importance of a complex network of social actors for the rediffusion of retro-technology (Sarpong et al., 2016). Such experiences, thus, may satisfy the need for relatedness through genuine connections made with others (Chen et al., 2015)

3.6 CONCLUSION AND CONTRIBUTIONS

Using grounded theory methodology this paper has provided an understanding of user experiences with retro-technology. The findings of the study show that retro-technologies limit the user's scope of control, thus enhancing their ability to assert and perceive control over their experiences and disconnect from the digital world. This provides opportunities to be more present and connected to each moment further heightened by the tangible nature of the technology. Retro-technologies additionally expand the user's realm of action by encouraging intentional engagement both within the experience as well as through learning and competence building. Finally, retro-technologies expand the user's realm of connection, inspiring greater connection both personally and within communities further augmented by personal and communal

nostalgia. This holistic view of the broader retro-technology experience adds new understanding to the literature and provides avenues for further research.

Firstly, our findings show that retro-technology provides users with the opportunity to choose what is really important to them. This contrasts significantly with digital technology use. For instance, ever-increasing data storage allows users to collect and store a seemingly infinite number of files to the point that they may store something simply because there is no reason not to. By comparison, the limitations of retro-technology provide a means for individuals to make clear choices as to the memories that are captured in photographs, or the music they enjoy. Rather than taking hundreds of photos intending to "pick the good ones out later", or creating endless playlists but never being satisfied with what is playing, these obsolete technologies limit the scope of choice and simultaneously expand realms of action, connection and presence. Evidence was provided that users may be experiencing choice overload (Turri & Watson, 2022) or decision paralysis (e.g., Huber et al., 2012) from a deep ocean of digital storage. While digital technology deals with choice overload through algorithms devised to create photo collages and music playlists inspired by user preferences, it is unclear as to the effect that deferring choice and preferences to algorithms have on outcomes relating to autonomy, competence, wellbeing when compared to making intentional, meaningful choices.

Second, our study underlines a perception that humans are losing something critical to their being. Technology takes great strides towards improving our quality of life as we increasingly outsource our daily effort to it; but to what extent is this progress a positive change for our wellbeing? This research provides evidence that individuals have a need for experiencing agency and this need can be satisfied through retro-technology experiences. Such experiences may represent a reprieve from the digital

world even when our reliance on digital technologies is so heightened. For example, respondents spoke of opportunities to blend newer technology with analogue ideals, the way an e-reader replaces physical books whilst maintaining separation from the digital world. Certainly, some users prefer the authenticity of older goods, but the commonality between all users is the enjoyment born of more active engagement in their experiences. The critical component of their experience remains the same even with modern support – that is, the technology's role is that of a tool, not an active presence. This suggests there are opportunities for technology - broadly speaking, beyond the context of retro-technologies - to be designed to support intentional use and deeper engagement; something that could become more important as technology continues to evolve rapidly (Kaplan & Haenlein, 2019).

Third, this research contributes to the literature on SDT by demonstrating the alignment of themes derived from experiences with retro-technology and the basic psychological needs of autonomy, competence and relatedness. The findings suggest that users are able to satisfy these needs in their experiences with retro-technology, which has been associated with positive wellbeing outcomes in the literature (Chen et al., 2015), and, in some cases, to escape perceived negative influences of digital technologies. Such experiences with retro-technologies provide opportunities to exercise agency and satisfy needs in ways that modern technology's increasing 'convenience' may be inhibiting (Petrich, 2020). These novel relationships provide opportunities for future research to seek further understanding of the ways that individuals are able to satisfy their basic psychological needs through their experiences with technology. Moreover, this also represents practical implications, particularly for individuals who are suffering negative outcomes in their relationships with digital technologies. The findings emphasize the important role that retro-technology

experiences can play in personal growth and wellbeing outcomes not only through the satisfaction of basic psychological needs but also in the facilitation of disconnection-styled practices to promote mindfulness and reduce digital overload.

Fourth, the finding that users are turning to retro-technology in search of experiences that require, enable or encourage greater human agency motivates examinations of the empirical phenomenon from different theoretical vantage points. Among others, the inevitable relationship and interplay between human and technological agency resonates with conceptual frameworks offered by Actor Network Theory (Walsham, 1997), the Social Construction of Technology view (Pinch & Bijker, 1984), and Technological Determinists (Smith & Marx, 1994a). Future research employing these conceptual lenses may address issues such as the nature of the 'connection' between actors - including human and technical 'actants' (Latour, 1996) - as well as their 'disconnection' (i.e., the disconnection sought by human actants from modern technological actants). While our explanations of the retro-technology experience possess technological deterministic flavor (e.g., technology limiting the scope of control, and expanding the realm of action and connection), exploration of how social groups define retro-technologies and shape their evolutionary trajectory can enhance our understanding of the retro-technology phenomenon. Furthermore, our findings demonstrate that the level of action or control that technology has in the user's experience, particularly where it limits the user's perceived ability to act, and have choice or control, seems to influence psychological outcomes. From a practical standpoint, they demonstrate opportunities for future technological innovations to cater to these human needs through design elements to ensure active agency in experiences with technology. Affording the user more control, autonomy, and opportunities to make deliberate choices can enhance the appeal of

technologies. Domains of inquiry such as 'user-centered design' (Vredenburg et al., 2002) and its more recent strand of 'experience-centered design' (Blythe et al., 2006) may benefit from our findings in designing modern technology through the evaluation of 'aesthetic interaction' (Wright et al., 2008).

Finally, as the retro phenomenon has steadily gained influence over the past couple of decades, contradictory to scholarly understanding of innovation life cycles (Rogers, 2003), there has been a need to understand this paradoxical development (Nokelainen & Dedehayir, 2015). Building on prior work that highlighted retro-technology adoption to be driven by factors such as a disdain for consumption culture and elements of non-conformism (Adams et al., 2019), this paper presented the value that users exact from their experiences with retro-technology past the point of adoption, and why they remain consumers of retro-technology. The four emergent themes describing how value is derived from retro-technology use enhances our understanding of why obsolete technologies, in a number of contexts, can continue to exist in niche segments and in fact, with growing patronage (Adner & Snow, 2010; Nokelainen & Dedehayir, 2015).

This research has one key methodological limitation that represents opportunities for future research. The data represents the experiences of 20 individuals who opted into the study from key locations where individuals may purchase retro-technologies. Thus, some findings (particularly related to the collection/purchase of media) may be less generalizable to a broader population. Future research should seek to understand the extent to which these findings apply more generally, including individuals with varying levels of experience with retro-technology.

Chapter 4: A Theoretical Model of Technology, Agency, and Wellbeing

The authors listed below have certified that:

1. they meet the criteria for authorship and that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
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In the case of this chapter:

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Contributor	Statement of contribution*
Jack Adams	Wrote the manuscript, review and edit of manuscript, method design, analysis and synthesis
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Abstract

Modern technology's rapid evolution has brought with it an equally rapid change in the relationship humans share with the technologies they use. Digital technologies are increasingly utilising their own agency, often at the cost of human agency. As convenience overtakes humanistic ideals, seemingly at odds with the satisfaction of our basic psychological needs, a dependence on modern technologies has nevertheless been accompanied by negative wellbeing outcomes. This paper puts forward a model for understanding the wellbeing outcomes derived from technology use. It suggests that technology affords its user opportunities to exercise agency, satisfying their basic psychological needs (vis-à-vis Self-Determination Theory), thus influencing wellbeing outcomes. The proposed model provides an explanation as to why some individuals may seek to adopt technology that affords high agency experiences (e.g., 'retro-technologies', including vinyl records and analogue cameras), in lieu of pervasive digital technologies.

4.1 INTRODUCTION

The agentic relationship between humans and technology has been discussed for centuries and as technology rapidly evolves, so too does the nature of this relationship. As such, scholars have sought to understand this changing relationship and how to better work with technology (Leonardi, 2011; Pickering, 2008). As technology continues to advance, it increasingly utilises its own agency, removed from the human actor's intention (Coker, 2018; Nolin & Olson, 2014). While some researchers argue that technology cannot have agency as it lacks human intention (Klinger & Svensson, 2018; Orlikowski, 2005), others argue that modern technology increasingly has functions of intention, desire and belief provided by complex algorithms (Coker, 2018; Rammert, 2008). Rather than human intention, causality has been proposed as a key variable; that is, 'who' or 'what' is causing the act, whether human or not (Malafouris, 2007). In the complex relationship between human and material actors, one may take on a greater load of action than the other in achieving some outcome (Leonardi, 2011; Rammert, 2008).

The extent to which technology limits or facilitates a user's ability to exercise agency, as well as its resulting effect on wellbeing has nevertheless not been well established. Technological advancements have made many aspects of the human experience simpler, paradoxically however, all personal (human) development is believed to require human action comprising effort, friction and overcoming difficulties (Nolin & Olson, 2014). For instance, individuals increasingly use the internet and its connected functions for the underlying instrumental value rather than hedonic qualities. As such, the importance of the internet to a 'normally' functioning lifestyle is the driving factor behind use, more so than enjoyment (Ojo et al., 2019; Viberg & Andersson, 2019). Indeed, many efficiencies of modern technology are such

that we are unable to reasonably deny ourselves the benefits. Personal technologies, such as mobile phones and computers, provide many positive and prosocial benefits, however, there is also an increasing body of research uncovering a range of negative wellbeing outcomes. These include attention and comprehension difficulties, poor academic achievement, sleep impairments, depression, anxiety, and anti-social behaviour (Morris & Cravens, 2017). Yet, the very nature of agency is a humanist ideal that describes us as active individuals who have freedom of choice, and, in many cases, technology is so built into our environment that non-usage is not an option. Technology thus has increasingly become a mediator of ordinary life rather than a tool by which we extend our own capacities as human actors (Nolin & Olson, 2014).

In this theoretical paper, we focus on the human-technology relationship with a specific interest in the extent to which users can exercise agency for their wellbeing, and to what extent technology limits or facilitates this agency. This is an important issue for the contemporary world marked by the pervasiveness of technologies, which has hitherto received limited scholarly attention. The model we develop suggests that a technology's affordances invite users to exercise agency and the level of experienced agency directly relates to wellbeing outcomes. Self-determination theory is utilised to understand the relationship between agency and human behaviour; that is, the extent to which the technology provides for the satisfaction of its user's basic psychological needs of competence, autonomy and relatedness (Ryan & Deci, 2000). Our paper and its proposed model adds to a growing body of literature seeking to understand problematic use of technologies (Durak & Senol-Durak, 2014; Takao, 2014), as well as providing a broad understanding of how consumers cope with such problems – and thus possible avenues for self-regulation (Morris & Cravens, 2017).

The purpose of this paper is to develop a conceptual model that explains how wellbeing outcomes derive from technology-based experiences. To this end, we are motivated by two broad research questions that guide this 'model' paper (Jaakkola, 2020):

What variables mediate the relationship between technology use and wellbeing?

What variables moderate the relationship between technology use and wellbeing?

4.2 THEORETICAL BACKGROUND

4.2.1 Human Agency

Human agency is the intentional exercising of influence over one's functioning and life circumstances (Bandura, 2006). Through personal capabilities including forethought, self-reflection and self-regulation people can foresee future consequences of action, understand current thinking and exercise control through selecting, constructing and influencing their environments (Bandura, 1986, 2006).

A more specific definition of human agency is "the capability for individuals to consciously choose, influence and structure their actions in order to achieve a desired outcome" (Code, 2013, p. 39). It is argued that agency is a capacity human actors possess with which they form goals and take intentional action to realise those goals through controlling human and non-human resources in different environments and social contexts (Nevo et al., 2016; Sewell, 1992). It is something that individuals have been found to develop as an ability, through social interaction and experience (Code, 2013). Our sense of agency comes from a clear feeling that we are in control of our own action and through this action we can produce effects in the external environment – to achieve our goals. Berberian et al. (2012) suggests this sense of control can be

greater or less across different situations, particularly through the use of technology where a user can easily compare their input with the output of the technology.

As such, experiences afforded by different technologies may provide opportunities for agentic expression in different ways and at different levels. That is, some technologies may allow individuals greater choice, control and autonomy. Such experiences may also provide moments of introspection and self-reflection that allow for positive behavioural change and positive wellbeing outcomes.

4.2.2 Consequences of Modern Technology

If a technology can reduce human action and increase efficiency it is often sought without question (Nolin & Olson, 2014). Personal technology, e.g., mobile phones, computers, apps, in particular can provide a number of positive and prosocial benefits (Fisch & Truglio, 2001). Notwithstanding, there is an increasing body of research uncovering a range of negative wellbeing outcomes as well. These include attention and comprehension difficulties, poor academic achievement, sleep impairments (Aljomaa et al., 2016; Pearson & Hussain, 2017), depression, anxiety (Morris & Cravens, 2017), and anti-social behaviour (Gergen, 2002; Kuss et al., 2018; McDaniel & Coyne, 2014; Roberts & David, 2016). Stress has also been found to increase smartphone use as a coping mechanism (Kuss et al., 2018; Levy, 2016), thus compounding the effects. Social media, in particular, has been linked to addictive behaviours (Bharucha, 2017; Gerhart, 2017). Through such technology, the number of things vying for our attention has increased dramatically and yet, since our fundamental attentional capacity remains unchanged (if not lessened), it becomes increasingly challenging to decide what to give our attention to at any given moment (Levy, 2016).

Nolin and Olson (2014) suggest that technology has increasingly become a mediator of ordinary life rather than a tool by which we extend our own capacities as human actors. Consumers have been found to use the internet and its connected functions for the underlying instrumental value rather than hedonic qualities and as such, the importance of the internet to a 'normally' functioning lifestyle is the driving factor behind use, more so than a sense of enjoyment (Ojo et al., 2019). Young people, for example, are believed to accept that internet resources (e.g. messaging apps) make it easier to connect with other people than trying to find and plan time to meet in-person (Viberg & Andersson, 2019).

Many efficiencies of modern technology are such that we are unable to reasonably deny ourselves the benefits. We are quickly moving toward an era of ubiquitous computing whereby technology is miniaturised and integrated with other artefacts to the point of disappearance. This may also present as "mental disappearance" whereby users cease to recognise a technology's presence (Ferneley & Light, 2008). We can choose to restrict ourselves from particular technologies or to disconnect for periods of time, but in many cases digital technology is unavoidable if we want to be competitive value-adding humans in contemporary society, at least when it comes to work (Nolin & Olson, 2014).

4.2.3 Human-Material Agency Relationship

The relationship between technology and humans has long been discussed by philosophers including Heidegger, Mumford and Ellul. They discuss 'technics', that is, the organised process through which humans achieve specific goals through a relationship with technology (Parfitt, 2016; Winner, 1977). Some have argued that this human-material relationship is increasingly moving away from human control to the point where technology may act in its own interest, contrary to human interests

(Winner, 1977). As technology continues to increase efficiencies and serve human convenience, we may begin to experience a loss of something 'human'. Heidegger (1993) suggested that humans typically fail to understand the significance of Being, and that many will lead inauthentic lives following fashions and norms observed socially as this is the easier path.

Indeed, modern technology is having a profound effect on the human condition and is modifying how we interact with the world as well as our identity, behaviour and social relationships (Hoffman et al., 2017). The benefits of this evolution are many. Technology in the digital era can enhance our physical capacities, our social standing and our ability to influence the world over time and space. These technologies can thus enhance or take away from our own power or capacity to act (Ahlborg et al., 2019; Clowes, 2018). However, more than our physical capacities, knowledge and competencies may also become lost.

In the workplace, technology and data play an increasingly indispensable role in deciding how work gets done (e.g. automation) and how work is assigned (e.g. Uber) (Lingel, 2016). In our everyday lives, technology-assisted remembering and recognition are rampant such that matters of fact are often settled by a Google search rather than personal recall or debate (Clowes, 2018; Hoffman et al., 2017; Rammert, 2008). Many of our activities are subsequently mediated by digitally connected devices and cognitive activity largely requiring an interweaving of online and offline worlds both at work and in personal life (Clowes, 2018). Moreover, there is evidence that the internet is changing how human memory works - we are storing far less information in personal memory through a reliance on connected technology recalling information for us (Ward, 2013).

4.2.4 Material Agency

Leonardi (2011, p. 148) defines material agency as "the capacity for nonhuman entities to act on their own, apart from human intervention". This describes a technology's ability to do things that the human user is unable to completely or directly control. An agent is "any element which bends space around itself, makes other elements dependent upon itself and translates their will into a language of its own" (Wertsch, 1998, p. 286). Thus, this can be satisfied by either human or material actors. Malafouris (2007) stresses the point of causality in his rationale for material agency, i.e., 'who' or 'what' is causing the act. He utilises the example of a potter creating a pot from wet clay in that the shaping of the pot represents collaboration between the potter and the clay. As the human acts to shape the clay, the clay also exhibits dynamic tension. The wheel that spins the clay and resulting centrifugal force also represents action which contributes to the experience.

A number of authors view the human-material agency relationship as unidirectional (Leonardi, 2011). As human agents we set goals and have the capacity to reach them; we utilise technology to perform specific tasks towards an end which we do not exert full control over. As such, a technology may represent barriers to the human agent's goal and in a unidirectional relationship, the user must be flexible (such that they can adjust their goals to suit what the technology makes possible) as the technology is static and must therefore be rejected or utilised in ways which were not intended. Thus, human agency is believed to be exercised via the technology's capabilities as well as by resisting limitations imposed by the technology (Leonardi, 2011).

Rammert (2008) by contrast, suggests that we cannot limit our understanding of action with the requirement of human intention (also Law, 2019). Modern technology increasingly has functions of intention, desire and belief provided to them through

algorithms. Although different to humans, these qualities are not shared by classical machines and media and these differences must be recognised. Action is not a purely human phenomenon; it involves the interactivities of both human and material agents. He puts forward a scale of agency for technical objects Table 3. This scale demonstrates the temporal progress of technology as it has increasingly taken on greater levels of agency. Passive technologies, like a hammer, for example, are tools that extend our capacity for physical action and such tools have been used by humans for centuries. However, as we move forward in time, technology is increasingly demonstrating co-operative agency. That is, it is able to predict action, communicate and cooperate with other technological agents and communicate the result of this network of action to the human user. A music streaming service 'recommended' playlist, for instance, is the result of a network of programs making decisions independent of human input. It represents a level of relative autonomy, reactivity to the environment, proactiveness and sociability; all of which are functions of an intelligent agent (Rammert, 2008).

Table 3

Scale of technology agency (Rammert, 2008)

Level of agency	*Description*	*Examples*
Passive	Instruments completely moved from outside	Hammer; Punching card
Semi-active	Apparatus with one aspect of self-acting	Machine tool; Record-Player
Re-active	Systems with feedback loops	Adaptive heating system
Pro-active	Systems with self-activating programs	Car stabilisation; Help agent
Co-operative	Distributed and self-coordinating systems	Mobile robots; Smart Home

In a similar way, we can consider the level of agency of a human user in relation to technologies across this model. As an agent, the user of a hammer is required to

assess the task that is to be done, utilise physical, mental, and biological resources to generate the precise execution of directed force required to embed a nail. The hammer is utilised as an instrument to extend human action; it has fixed and repetitious action. To further the earlier example of a streaming service as a co-operative agent, Table 3 highlights that a record-player exhibits a semi-active level of agency. Depending on its use, a streaming service algorithm may exercise pro-active agency, via its algorithm, where the user may make decisions relating to the music to be played and it requires instruction (i.e., a mouse-click) to begin (sequences of) action. Conversely, an LP record and its player require a great deal of action from the user. These actions include, the selection of a physical record, removing the record from its cover, removing the plastic sheet, cleaning the record, placing it down on the player, setting the speed, moving the tonearm over the record, setting the needle into the groove and so on. In this experience, the user is exhibiting a greater level of agency. Their causal role in the network contributes more meaningfully to the outcome (experience) and thus requires greater agency than if they were to interact with a proactive or co-operative technology, like a streaming service.

While Rammert's model describes the agency of technology, we can also consider the agency of the individual along a similar scale. Though it is often the case, technologies characterised by the lower levels of agency (i.e., passive technology) do not exclusively require higher comparative levels of agency from the user.

4.3   AFFORDANCES

The theory of affordances comes from the field of ecological psychology and relates to the action possibilities afforded in the relationship between individuals and their environment. It suggests that the values and meanings of things in the environment can be directly perceived via what they afford an individual (e.g., the

environment can afford shelter, water, tools, food and so on). At some point in history, humans began to make alterations to their environment such as by building more and more elaborate shelters, utilising tools to hunt and create things. Gibson (1979) suggests these objects also possess affordances and although they are artificial in their inception, the affordances are no different to those provided by the natural environment.

Affordance can be defined as the possibilities for goal-oriented action created through the relationship between an artifact and an actor (Markus & Silver, 2008; Strong et al., 2014). However, constraints are also an important element of affordance theory. The theory has been applied in a number of fields including sociology, to explain the constraining influences of technology on human action (e.g., in IS research to explain societal-level problems, in organisation science to understand relationships with IT on an organisational level, as well as on an individual-user level (Anderson & Robey, 2017; Thapa & Zheng, 2019)). Affordances provide a useful tool with which to understand the relationship between human and material agency as the material properties of technology may afford different action possibilities depending on their context of use. Although the physical properties are the same for all users, the affordances are not.

A technology's capabilities and its affordances share many similarities including their signification of action possibilities, their relational nature, and their contingency on conversion factors including personal, social, and environmental factors. Identical objects can provide different affordances for people affected by different conversion factors. However, although capabilities and affordances share these similarities, they are not the same. The opportunities that capabilities present relate to an individual's capacity, agency, and relative position in the social environment. Affordances,

however, represent opportunities deriving from an individual's perception and interaction with artefacts and are affected by the functional properties of the object, the individual's capacity, and position in the social environment. For example, a digital camera provides a number of affordances via a multitude of add-on features and settings. However, to realise these benefits, the user must have an appropriate capacity, attitude, and social condition. At times, the user may not perceive, understand, or seek the affordance, or it may not be connected to their goal (Anderson & Robey, 2017; Robey et al., 2013; Thapa & Zheng, 2019).

4.4   RESEARCH DESIGN

While this theoretical paper follows a research design that departs from those traditionally employed in empirical studies, we have employed a systematic approach to collecting sources of information and combining these according to a set of norms (Jaakkola, 2020). Unlike empirical research that builds on data as the sources of information, a conceptual paper builds on already developed theories and concepts. Starting with the relationship between human and material agency as focal phenomena, this paper identified three different streams of literature that provide conceptualisations with a valuable degree of complementarity.

We firstly incorporate concepts of material agency, in particular, Rammert (2008), who puts forward a scale of agency for technical objects ranging from passive to co-operative. We are able to build on Rammert's work by considering the level of agency of a human user in relation to technologies across this model, whereby, depending on the type of technology utilised, the human agent may be required to exercise more or less agency.

Next, we refer to affordance theory to understand how technology can provide users with unique experiences that allow for the exercising of greater or less human

agency. Affordances provide a useful tool with which to understand the relationship between human and material agency as the material properties of technology may afford different action possibilities depending on their context of use.

We finally utilise self-determination theory (SDT) to understand the relationship between agency and human behaviour to determine its effect on the user's wellbeing. SDT is a theory of human motivation and personality which proposes that wellbeing depends on the fulfilment of three universal (basic) psychological needs, namely, competence, autonomy and relatedness (Baumeister & Leary, 1995; Ryan & Deci, 2000).

- Competence can include opportunities to acquire new skills or abilities, to be challenged and receive positive feedback.

- Autonomy relates to a sense of volition or willingness to undertake activities.

- Relatedness refers to a need to be close to, trusting of, caring for and cared for by others; similar to the need to belong.

SDT differs from similar social psychology theories in its assumption a (Deci & Ryan, 2012). A wide body of research has shown that the satisfaction of these three needs directly affects subjective wellbeing and other health and wellness outcomes, even across culturally diverse samples (Chen et al., 2015; Chirkov et al., 2003; Church et al., 2013), whereas the frustration of these needs has been shown to cause ill-being, including maladjustment and psychopathy (Vansteenkiste & Ryan, 2013). SDT has been utilized to understand wellbeing outcomes in studies across many domains including, organizational behaviour, academic performance, hobbies and music. These three needs are essential to human wellness in an evolutionary sense. That is, humans have been shaped by particular experiences which have led to the development of robust psychological mechanisms that drive individuals to seek out similar

experiences; the realization of which rewards them emotionally (Martela & Sheldon, 2019).

4.5 DISCUSSION

The conceptual model we have developed explains that 'wellbeing' outcomes derive from 'technology use'. This relationship is nevertheless mediated by 'agency', which is reliant on the satisfaction of the basic psychological needs; competence, autonomy, or relatedness. Hence, our model proposes that the technology used by the individual determines the agency accrued by that individual - manifest in feelings of competence, autonomy and relatedness - which in turn determine the wellbeing of the individual. Furthermore, the model proposes that the relationship between technology use and agency is moderated by the technology's affordances. In other words, the degree to which the technology affords experiences that satisfy an individual's basic psychological needs governs how the use of that technology influences agency – and ultimately wellbeing.

The proposed conceptual model is pictured in Figure 4 and leads us to make three propositions.

Figure 4

Conceptual model
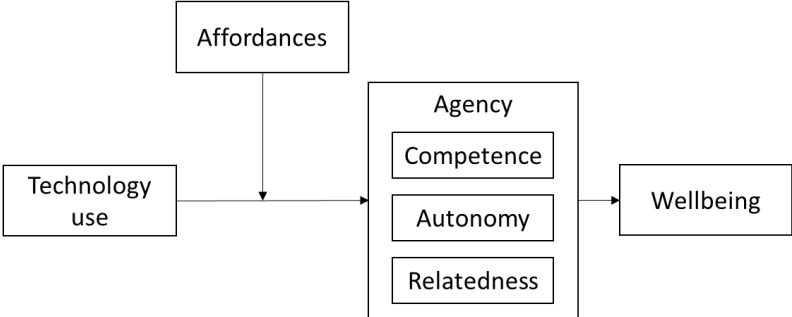
Competence satisfaction relates to feeling effective and capable to achieve desired outcomes and can include opportunities to acquire new skills or abilities, and to be challenged and receive positive feedback. Frustration of this need involves feelings of failure and feelings of inefficacy (Vansteenkiste & Ryan, 2013). Where an activity threatens the individual's perception of competence it has negative consequences on intrinsic motivation (Deci & Ryan, 2000).

We have reached a point in technological development where we have empowered machines to manage us (Ashby et al., 2018; Coker, 2018). Digital services have a profound effect on human agency as they link, combine, and compute data to create new knowledge for and about us (Wessels, 2013). Such practices may also result in unsolicited action from programs (which see the user as an object) prompting advertisements, recommendations and so on (Rammert, 2008). Algorithms in particular have developed to understand us, our motivations and needs, and threaten to automate many of our decisions we may deem important (Ashby et al., 2018; Coker, 2018). Indeed, such technological advancements have made many aspects of the human experience simpler, however, all personal (human) development requires human action comprising effort, friction and overcoming difficulties (Nolin & Olson, 2014; Rambe & Nel, 2015).

Personal agency – the belief in one's ability to exercise control over their actions and events in their life – relies heavily on self-efficacy beliefs. Perceived self-efficacy refers to an individual's belief in their capability to mobilise the motivation, cognitive resources, and courses of action necessary to meet situational demands (Wood & Bandura, 1989). Thus, self-perceived cognitive ability may relate to the individual's skill or knowledge enabling effective utilisation of technologies. This motivation represents their willingness, drive and desire to use this technology in a particular way,

i.e., take greater ownership over the outcome. People need a robust sense of personal efficacy to sustain the productive attentional focus and perseverance effort needed to be successful in any endeavour. In particular, as our social reality carries failures, adversities, inequities and various frustrations and setbacks which need to be overcome, human attainments and positive wellbeing rely on a strong, optimistic sense of personal efficacy (Bandura, 1986).

Self-efficacy is also important in the acceptance of technologies that are new to the user. If a user believes they are capable of successfully utilising the technology and reaping the perceived benefits they will have greater self-efficacy and therefore are more likely to adopt the technology (Kelly, 2014). For younger individuals who adopt and use retro-technology (that is, outdated and obsolete technology), for example, this could represent an important element that leads to adoption. In modern settings, analogue technologies may represent a steep learning curve to build the competencies and ability required for self-efficacy. The understanding that the mastery of such technology requires skills and knowledge outside of those held by the average person may positively influence feelings of self-efficacy.

Competence satisfaction is further supported by performing activities with which the user already has competence. Such feelings are evident in experiences that have clear structure, rules and expectations and provide opportunities for personal growth via attainable challenges that build skills and capacities (Visser, 2010). The acquisition of such knowledge and skills is expected to be an important element of the experience afforded by the use of such technologies. Thus,

Proposition 1: Technologies that afford high human agency foster feelings of competence

Autonomy satisfaction relates to a sense of volition or willingness. Where an individual perceives a controlling pressure affecting the way they should think, feel or behave, there is a negative effect on autonomy and therefore intrinsic motivation. This can also be thought of in terms of whether the individual perceives the locus of causality to be internally or externally driven. Frustration relates to feeling controlled, either externally or through self-imposed pressures that may influence behaviour regardless of the individuals values and interests (Chirkov et al., 2003). A greater sense of autonomy can provide greater self-actualisation, self-esteem, and more choiceful self-disclosure. Feelings of being controlled, however, can lead to public self-consciousness, inconsistency in attitudes and behaviours and greater defensiveness.

Individuals who are intrinsically motivated have been found to experience greater self-actualisation and vitality, whereas extrinsically motivated individuals, are more likely to experience depression, anxiety and narcissism (Deci & Ryan, 2012; Ryan & Frederick, 1997). Many externally motivating factors may prompt individuals to seek life goals that may not have value when fulfilled. Commercial media, for example, may prompt excessive materialism which may only provide fleeting satisfaction and detract from basic need fulfillment and wellbeing (Richins, 1987; Ryan & Deci, 2000). Such influences, supported by technology, are increasing in both number and pervasiveness (Ashby et al., 2018; Coker, 2018).. Mindful awareness stemming from feelings of autonomous rather than controlled choice, and self-regulation rather than self-control contribute positively to greater intrinsic motivation, need satisfaction, vitalisation and wellness (Deci & Ryan, 2012; Moller et al., 2006b).

Autonomy is supported in experiences where the individual has choice over what they want and have control over the situation. Thus, individuals benefit from experiences where external control is minimised, and the autonomy of the individual

is clear (Visser, 2010). Analogue experiences inherently facilitate greater autonomy through greater control over the experience. For example, in the case of an LP record player, the user chooses an album, they are not presented with recommendations and auto-play options but rather make their own choices. Where they have a finite number of records, for example, they are able to consider the collection and make a choice. A music streaming service, however, has a seemingly infinite catalogue and puts forward a shortlist of options based on an algorithm and through this, may impose (or create the perception of) control over the user's choice. In some circumstances, this may also extend to the boundary of the experience (i.e., when it begins and when it ends); rather than having control over when to end the experience, the user chooses the conditions are thus in control. For example, when a record ends, the user must make a choice to continue the experience by putting on a new record or flipping it to the next side, whereas a streaming service may continuously decide what music to play, with the user being external to these decisions – a passenger to the experience. Thus,

Proposition 2: Technologies that afford high human agency facilitate a sense of autonomy

Relatedness refers to a need to be close to, trusting of, caring for, and cared for by others; similar to the need to belong (Baumeister & Leary, 1995). Satisfaction of this need involves feelings of intimacy and genuine connection with others whereas frustration relates to feelings of relational exclusion and loneliness. Even individuals who avoid attachment, crave independence and view close relationships as unimportant and unnecessary have been found to benefit from the satisfaction of the relatedness need (Chen et al., 2015).

Relatedness is supported through a feeling of connectedness with others. Such feelings are strengthened where others provide acknowledgement, care and genuine

support. The use of niche, and potentially outdated or 'obsolete' technology has been found to provide a sense of community for users both among current users as well as a pseudo connection to the people and values of the past (Brown, Kozinets, et al., 2003a; Errajaa et al., 2013). In modern times, users may come together via social media (e.g., forums, image boards) as well as through local events (e.g., fairs, meetups and so on) and share their unique experiences. Technologies that afford the user opportunities to grow personally may effect identity and create relatedness with other individuals with shared interests, motivations, competencies and so on. Thus,

Proposition 3: Technologies that afford high human agency provide relatedness with others

4.6 CONCLUSIONS

As technology increasingly takes over the 'human burden' by reducing human input requirement and by thinking and acting for us, experiences that provide for higher human agency and effectively satisfy autonomy, competence and relatedness needs are reducing. The motivations behind, for example, retro-technology use, as well as the non-utility affordances it provides, certainly indicate a desire in some consumers to be more active agents. With a focus on efficiency and convenience, technology has provided increasing digital connectedness while decreasing the necessity for individuals to act of their own will, engage with others, solve problems and acquire or retain knowledge related to their work (as per earlier examples including arborists, pilots, plumbers). Experiences that provide for increased autonomy, competence and relatedness may engage users more meaningfully and provide temporary separation from such modern influences.

The proposed model provides an explanation as to why some individuals may seek to adopt technology that affords high agency experiences (e.g., 'retro-technologies', including vinyl records and analogue cameras), in lieu of pervasive digital technologies. This is likely because the increasing level of material agency built into modern technology has led to a decrease in exercised agency from the human user of such technologies. As such, alternative technologies may provide an avenue for enhanced human experience that is shrinking in our increasingly connected and convenient technological world.

The conceptual model developed in this paper has valuable theoretical contributions to the innovation management field by providing insight into the role of agency in the decision to adopt technological innovations. The model additionally contributes to the burgeoning research efforts on the problematic use of technologies, where researchers underscore the importance of understanding how individuals differ across technology types and level of dependence/problematic use. Our research adds to this body of literature by offering a broad understanding of how consumers cope with such problems – and possible avenues for self-regulation (Morris & Cravens, 2017). The model provides one possible avenue for understanding consumption of modern (digital) innovation and whether separation from the digital world is a requisite in an agency-motivated adoption decision.

Two key practical implications arise from this paper for managers and consumers. Firstly, the benefits to wellbeing derived from experiences with technology that afford high agency can motivate better designed future product innovations catering to this agency requirement, including strategies for reintroducing/updating obsolete technologies. Secondly, this research may also benefit

those who struggle with technology addiction/problematic use by providing new

avenues for imparting positive affect on psychological wellbeing.

Chapter 5: Does Modern Technology Rob Us of Our Agency? Exploring the Psychological Consequences of Technologies That Require Less Input From Humans

The authors listed below have certified that:

1. they meet the criteria for authorship and that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
5. they agree to the use of the publication in the student's thesis and its publication on the QUT's ePrints site consistent with any limitations set by publisher requirements.

In the case of this chapter:

Adams, J., O'Connor, P., & Dedehayir, O. (Manuscript under review). Does Modern Technology Rob Us of Our Agency? Exploring the Psychological Consequences of Technologies That Require Less Input From Humans. *Media Psychology*.

Contributor	Statement of contribution*
Jack Adams	Wrote the manuscript, reviewed and edited manuscript, method design, data collection, cleaning and analysis
Peter O'Connor	Aided in experimental design, conceptualization, review and editing of manuscript
Ozgur Dedehayir	Conceptualization, review and editing of manuscript

Abstract

In an age where increasingly capable technology demands less of us while promising better outcomes, a critical question is raised: does this convenience come at the cost of our fulfillment? The aim of the current research is to understand the psychological and wellbeing outcomes associated with reduced human involvement in experiences with technology. In a scenario-based pre-registered experiment, participants (n=273) were tasked with taking photographs in one of three technology involvement conditions (fully manual camera, semi-automatic camera, fully automatic camera) and were provided both high- and low-quality image outputs across two attempts. Results were analysed through a doubly multivariate repeated measures analysis of covariance and revealed that, compared to low technology involvement conditions, higher required human involvement provides for greater satisfaction of basic psychological needs, regardless of the quality of the output. These results suggest that the increasing reliance users place on digital technologies to think and act for them impacts the sense of autonomy, competence and overall fulfillment users derive from interacting with technology.

Keywords: Self-Determination Theory; Human Agency; Material Agency; Wellbeing; Scenario-based Experiment

5.1 INTRODUCTION

Humans have a long history of utilising technology to enhance our capabilities and agency. However, as technology rapidly evolves, so too does our relationship with it. Where the role of technology was once that of a tool to expand human action, dependent on human agency, it has increasingly taken on the role of an active agent. There are, of course, many benefits to these developments including increased efficiencies and conveniences associated with devices that can think, act, organise and recommend, taking on mental and physical processes that we often consider menial. However, as technology becomes more able to alleviate the seemingly mundane elements of the human experience, it is possible that it may simultaneously become less able to satisfy our core emotional and psychological requirements (Adams et al., 2022).

Alongside the rapid evolution of modern technology is the seemingly paradoxical resurgence of obsolete technologies, including vinyl records, film cameras (Asmelash, 2022) and more recently 'dumb phones', which have seen enormous sales increases (Fares, 2023). Given that obsolete technologies cannot compete with the functionality of more modern products, the last two decades have seen increasing attention in the literature seeking to understand this revival, and what attributes contribute to a successful product (Brown, 2015). These older technologies do less for their users, and thus require more from them whether through physical interaction or problem solving and decision making, the user is a more active agent in experiences with analogue technologies (Adams et al., under review).

As we increasingly empower technology, it increasingly disempowers us and limits our exercise of agency (Ahlborg et al., 2019; Ashby et al., 2018). In parallel, a growing body of literature points to a range of negative wellbeing outcomes associated

with digital technology use (and overuse), including attention and comprehension difficulties, academic struggles, sleep disturbances, depression, addictive behaviours, anxiety, and anti-social behaviour (Aljomaa et al., 2016; Morris & Cravens, 2017; Tandon et al., 2020). Presently, there is no research that seeks to understand the psychological and wellbeing outcomes associated with varied levels of required human involvement (RHI) in experiences with technology. Thus, the research question guiding this study is: *How does the level of human involvement in experiences with technology influence psychological outcomes?*

Adopting self-determination theory (SDT) as a guiding framework, we aim to understand how the level of RHI in experiences with retro-technology, specifically film cameras, influences feelings of autonomy, competence and wellbeing. Through a pre-registered, scenario-based experiment, we manipulated the level of RHI (low, medium, high) in the process of taking a photograph to explore whether the loss of agency incurred by modern, automated technology can cause a reduction in users' perceptions of autonomy, competence, and affect in the short-term after engaging with that technology.

5.2 THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

Material agency refers to the capacity of nonhuman entities to act independently, without human intervention (Leonardi, 2011). Indeed, modern technology is increasingly equipped with functions of intention, desire, and belief through algorithms. Agency is thus not limited to humans; technology is able to influence its environment, expressing its own will, and performing tasks beyond the complete or direct control of the human user (Wertsch, 1998). This blurs the line between human

and material agency, as experiences with technology increasingly involve dynamic relationships between human and technological agents (Rammert, 2008).

Rammert (2008) proposes a scale of agency for technical objects, showing how technology has progressed from passive tools to exhibiting co-operative agency, able to predict actions and communicate with other technological agents. With respect to this scale, humans can be required to be more or less active in an experience with technology, depending on the level of agency exercised by the technology. The effects of this relationship are evident in comparisons between modern technologies and those it superseded. For example, in the present study we look at film cameras which require humans to take an active role in the photograph production experience, relying on the user's knowledge, skill, and judgement to select appropriate settings and frame scenes in a desirable way. By contrast, a modern digital camera can make up for these human actions by automatically selecting the appropriate settings and even performing edits or selecting the best image out of a number of shots autonomously, concurrently limiting the level of human agency.

The balance of human and material agency in experiences with technology is rapidly shifting, favouring more active technology and less active human involvement. Where technology was once a tool that supported human action, it has increasingly become an active agent that replaces human action and even controls it (Nolin, 2014; Ojo et al., 2019). Technology's influence extends to various domains, from work and education to personal life and leisure. Smart devices, automation, and algorithms shape our daily experiences, influencing our behaviour, choices, and even our memory (Clowes, 2018). As technology takes over tasks and responsibilities traditionally handled by humans, there is a risk of losing essential competencies, knowledge, and the ability to make meaningful decisions independently. Further, research is

increasingly pointing to a range of negative consequences associated with digital technology, including compulsive use, fatigue, anxiety and depression, and in many cases this overuse is motivated by external social pressures (e.g., a fear of missing out [Dhir et al., 2018]). The extent to which this relates to a decrease in human agency in experiences with modern vs retro-technologies has not been well established.

Technology's increasing integration and data-driven practices raises questions about privacy, autonomy, and the potential loss of human identity in a world increasingly shaped by digital services (Adams et al., under review). As we embrace the benefits of increasingly capable technologies, we must also consider its negative consequences, finding balance between the satisfaction of our basic psychological needs and the utility of highly involved technologies. This calls for a deeper examination of human experiences with technology, its influence on wellbeing and the ways we can foster more mindful and intentional relationships with the technologies we rely on. In the following section we review self-determination theory which we suggest can provide insight into why modern technology has negative implications for human wellbeing.

5.2.1 Self-Determination Theory

SDT has emerged as a prominent psychological framework that describes human functioning in terms of three innate psychological needs that are critical for human development and wellbeing: autonomy, competence, and relatedness (DeHaan & Ryan, 2014). The theory suggests that as human beings progress through life, they integrate aspects of their internal and external environments into an intrinsic sense of self (Deci & Ryan, 1985c). This integration is thought to be a motivated process derived from a need to be autonomous, competent and related, and the sense of self

reflecting an individual's identity, values and beliefs (Deci & Ryan, 1995). The importance of these three needs for human wellness consequently derives from the evolutionary development of robust psychological mechanisms that lead humans to be fundamentally active, self-motivated, and inclined towards self-development through integrative processes (Deci & Ryan, 2012). As such, environments that promote the satisfaction of these needs are expected to facilitate a stronger sense of self, and greater feelings of self-worth and wellbeing. Contrastingly, environments that stifle or inhibit the satisfaction of these needs are expected to impede the development of self and perceptions of self-worth resulting in illbeing (Deci & Ryan, 1995; Ryan & Frederick, 1997).

When an individual behaves in line with their integrated self, they are acting autonomously or self-determinedly, stemming from a perceived internal locus of causality resulting in a sense of agency. SDT thus suggests that self-determined action is agentic action, derived from acting autonomously and making choices based on personal values, desires and beliefs rather than influenced by external factors (Deci & Ryan, 1995).

Autonomy satisfaction is grounded in feelings of volition, choice, and control. It relates to mindfulness and a sense of intentional rather than controlled choice, and thus self-regulation rather than self-control. Autonomy satisfaction, and acting in line with the integrated self, contributes positively to intrinsic motivation, vitalisation and wellness (Deci & Ryan, 2012; Moller et al., 2006a). Autonomy is frustrated, however, when an individual does not act in line with their integrated self and believes their thoughts, feelings or behaviours result from external forces, thus inhibiting intrinsic motivation and feelings of agency (Chirkov et al., 2003; Deci & Ryan, 1995; Visser,

2010). Where autonomy is frustrated, individuals tend towards depression, anxiety, and narcissism (Deci & Ryan, 2012; Ryan & Frederick, 1997).

Satisfying the need for competence results from feeling effective and capable. Feelings of competence are enhanced where an individual engages in activities that provide for challenge, the development of skills or abilities, and receiving positive feedback (Burgers et al., 2015; Deci et al., 1999). Competence is further supported through activities which the individual feels competent in and where there are clear guidelines and expectations (Visser, 2010). Importantly, feelings of competence also contribute to a greater sense of agency and intrinsic motivation but only where it aligns with an individual's integrated self, derived through autonomous decision-making; they need to perceive their success as truly their own. As such, competence satisfaction requires environments that support an individual's ability to act autonomously to facilitate and enhance feelings of competence derived from optimal challenge and positive feedback (Deci & Ryan, 1995). Frustration of this need results from feelings of ineffectiveness and failure and contributes negatively to wellbeing and intrinsic motivation (Deci & Ryan, 2000; Vansteenkiste & Ryan, 2013).

5.2.2 Current Study and Hypotheses

In the current study, we explore whether the benefits afforded by capable modern technology come at a cost in terms of psychological outcomes. Specifically, we investigate whether reduced human involvement in experiences with technology characterised by greater material agency causes – at least in part – negative psychological outcomes. For the purpose of this research, we define required human involvement as the extent to which the user is required to actively make choices and perceive control over the experience and responsibility for the outcome. Thus, low

involvement is characterised by a passive experience where the action required from the user is low, and the actions required from the technology is high. Higher involvement requires the user to be more active, engaged, and contribute meaningfully and thoughtfully to the process.

To investigate the consequences of reduced human involvement in experiences with technology, we conduct an experiment whereby we manipulate RHI in a scenario involving film photography using film-cameras with different levels of material agency. We randomly allocate participants to one of three conditions defined by: (i) low involvement (i.e., a scenario featuring a highly automated film camera that requires little input from users); (ii) moderate involvement (i.e., a scenario featuring a semi-automated film camera requiring some input from users); and (iii) high involvement (i.e., a scenario featuring a traditional film camera requiring high input from users). We then provide participants with either a high-quality image or a low-quality image that participants are told is the photo produced based on their specifications. Participants then respond to several questions designed to measure their current levels of competence, autonomy, and affect.

Our primary objective in this experimental task is to test whether higher levels of RHI in experiences with technology of low material agency enhance positive psychological outcomes, and vice versa for lower levels of RHI. Although our primary focus extends beyond cameras, we have opted to employ this context because it allows RHI to be easily manipulated.

Drawing from SDT, we argue that higher levels of RHI will allow users greater opportunities to exert and perceive their influence and affect the output (i.e., image quality) through greater choice and decision making (and hence actively controlling camera settings), and therefore will experience greater levels of autonomy (Deci &

Ryan, 2000). By contrast, more passive use characterised by less control and fewer opportunities to make decisions, as well as a greater sense of external influence (i.e., the influence of the camera controlling/contributing to the outcome), will result in lower feelings of autonomy. Thus,

H1: Higher required human involvement will positively influence experienced autonomy.

Second, commensurate with Self-Determination Theory (Ryan & Deci, 2000), higher RHI is anticipated to enhance perceptions of competence. Greater involvement allows individuals to exercise their skills, receive immediate feedback, and develop a sense of mastery, ultimately leading to increased perceptions of competence compared to more passive treatment conditions (Deci & Ryan, 1985b). Thus,

H2: Higher required human involvement will positively influence experienced competence.

Third, SDT posits that through the satisfaction of the autonomy and competence needs, individuals experience positive wellbeing outcomes, including heightened positive affect and reduced negative affect (e.g., Reis et al., 2000; Ryan et al., 2010). As hypothesised in H1 and H2 above, higher RHI is expected to positively influence both autonomy and competence in participants, thus, we expect that participants in our experimental conditions with greater levels of RHI will tend to report higher positive affect and lower negative affect. Thus,

H3: Higher required human involvement will positively influence affect. That is, as required human involvement increases, positive affect increases and negative affect decreases.

Fourth, the SDT literature suggests that positive feedback more meaningfully contributes to competence where the environment is autonomy-supportive (e.g., greater sense of choice and volition) (Hodgins et al., 2006; Ryan, 1982). As such, higher RHI is expected to positively augment the individual's perception of their skills and capabilities. More positive feedback (i.e., a higher quality image) is expected to provide greater feelings of competence. Thus,

> *H4: There will be a positive interaction between image quality and required human involvement. That is, higher involvement will increase the positive effect of image quality, leading to higher competence.*

Finally, based on the logic of H3, it is expected that greater feelings of competence resulting from higher RHI and high-quality output (i.e., image quality), will subsequently result in greater positive affect scores and lower negative affect scores.

> *H5: There will be a positive interaction between image quality and affect. That is;*

> *H5a: Higher required human involvement will increase the positive effect of image quality, leading to higher positive affect.*

> *H5b: Higher required human involvement will increase the positive effect of image quality, leading to lower negative affect.*

A scenario-based experiment was selected so as to reduce the possibility of confounding variables. By standardising the conditions and presenting participants with the same images and written scenarios, we aimed to isolate – and test – the specific impact of RHI with technology on perceptions of autonomy and competence. This high level of experimental control allowed us to draw conclusions that would be impossible without this control. For example, if users were asked to take the images

with their own (different) cameras, the resulting images may be influenced by their creativity or ability to take a better image, the sensory experience may provide greater feelings of competence for some users, familiarity with the selected artifact(s) may influence perceptions of competence, and so on.

5.3 MATERIAL AND METHOD

5.3.1 Participants

Participants were recruited using Amazon Mechanical Turk (MTurk) and were paid 2USD to complete the 10–15-minute survey. All individuals regardless of their experience with film cameras were encouraged to participate in the study. While MTurk generally produces sufficient quality data for experiments (see Buchanan & Scofield, 2018), we only allowed participants with MTurk's 'masters qualification' to participate in the study to further increase the likelihood of good data quality. This research was preregistered on the Open Science Framework, including desired sample size, variables, hypotheses and planned analysis before any data were collected (osf.io/gnrv7).

A total of n=287 responses were collected. The data were analysed to identify low effort and automated responses. Responses were removed from the dataset where participants completed the survey too quickly, straightlined (particularly across reverse-coded items), or failed one of two attention checks (Buchanan & Scofield, 2018). After data cleaning, the sample included n=273 participants with 54% Males. The majority of participants were 35-44 years of age (39.2%), followed by 45-54 (22%), 25-34 (17.6%), 55-64 (16.8%), 65+ (3.7%) and 18-24 (0.7%).

5.3.2 Experimental Design and Procedure

In this study, a scenario-based experiment was conducted to assess the hypothesised causal role of RHI (as derived from a photography experience) in enhancing a range of psychological and behavioural outcomes in the short term. Each participant completed the experiment within a single session.

The experiment constituted a 3 (RHI) x 2 (image quality) mixed factorial design (n = 273) where RHI was the between-subjects factor and image quality was the within-subjects factor. The experiment was conducted in 3 stages (see Figure 5 for the design). In stage 1, all participants completed a short survey consisting of basic demographic questions, as well as measures for state-affect, experience with photography and how recently they used a film camera. In stage 2, participants were randomly allocated into one of three experimental groups (see Table 4) and required to read one of three scenarios describing an environment in which they would be required to take a photo with a film camera. During the hypothetical task, participants were presented with an image of the camera described in the scenario (see Appendix 2A).

Figure 5
Experimental design
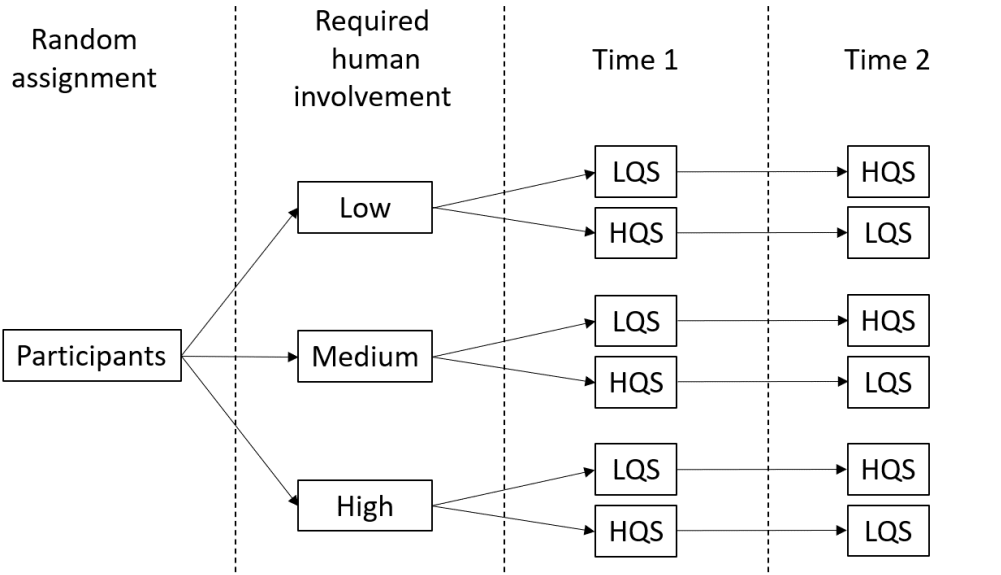
The three scenarios represent three RHI conditions and provide the participant with options for composing a photograph (e.g., selecting shutter speed, ISO, focal length) with varying degrees of RHI depending on their prescribed RHI condition. The low RHI (fully automatic camera) condition provided very few options and described a scenario where the camera adjusted key settings automatically to take the picture, the medium RHI (semi-automatic camera) condition required more input from the user whereas high RHI (fully manual camera) condition required the user to take full control over the photography process and resulting image. The only difference among conditions was the number of options presented, each necessitating thoughtful decision making to participants prior to taking the hypothetical photo.

Within each RHI condition, participants were required to complete the scenario twice. Having executed the task as described above in their first scenario, the participants were guided to repeat the exercise a second time, where they were told the weather conditions had changed and they would have to make different selections. All participants received a high-quality image in one scenario and a low-quality image in one scenario. Image quality included a counterbalance whereby half of the respondents in each RHI condition were presented with a high-quality scenario (HQS) first (i.e., the image output was a clear image) and a low-quality scenario (LQS) second (i.e., the image output was out of focus and badly lit) and the other half of participants in each RHI condition were presented with the LQS first and the HQS second (see appendix 2B and 2C respectively for the images used). The same two images (high-quality and low-quality) were used across each RHI group.

Finally, in stage 3, after producing each image, all participants completed questionnaires including manipulation checks for RHI and image quality, and measures for the outcome variables; competence, autonomy, and state affect.

Table 4

Experimental Group Frequencies

RHI	*n=*
Low	92
Medium	92
High	89
Total	273

5.3.3 Measures

A number of scales and demographic items were measured for analysis. A summary of descriptive statistics including correlations, means, standard deviations and omega total reliabilities (ω) are included in Table 5.

Independent Variables

Required Human Involvement

We manipulated RHI by randomly allocating participants to one of the three RHI conditions as described previously. After each scenario, participants were asked to what degree they felt the technology required their involvement in the experience, which served as the manipulation check for the RHI manipulation (see section 5.1 for details of manipulation check).

Quality

We manipulated image quality by sourcing a copyright free image of a landscape taken with a film camera. The original image was used as the high-quality image and a low-quality version was generated by editing the photo to increase exposure and blur (see Appendix B for the images used). After each scenario, participants were asked to rate the quality of the resulting image, which served as the manipulation check for the quality manipulation.

Dependent Variables

State affect

State affect was measured with the 20-item Positive and Negative Affect Schedule (PANAS) measuring the extent to which respondents feel particular emotions (e.g., attentive, interested, upset) "right now" (Watson et al., 1988). This questionnaire provides a measure for both positive and negative affect with 10-items each measured on a 5-point Likert scale from very slightly to extremely/very much. Good internal reliability was observed for both high- and low-quality scenarios for positive (HQS ω=.942, LQS ω=.959) and negative (HQS ω=.920, LQS ω=.929) affect.

SDT: Autonomy

Autonomy was measured on a 6-item scale adapted from a questionnaire designed to measure autonomy in video game experiences (Azadvar & Canossa, 2020; Azadvar & Dalqvist, 2020; Chen et al., 2015) with questions including "I could approach the task in my own way", measured on a 7-point Likert scale from 1-7 (1 being Strongly Disagree and 7 being Strongly Agree). The autonomy measure had good internal reliability in both the HQS (ω=.950), and LQS (ω=.953).

SDT: Competence

Competence was also measured on a 6-item scale adapted from a questionnaire designed to measure competence and autonomy in video game experiences (Azadvar & Canossa, 2020; Azadvar & Dalqvist, 2020; Chen et al., 2015) with questions including "Through this task I became better at taking photos", measured on a 7-point Likert scale from 1-7 (1 being Strongly Disagree and 7 being Strongly Agree). The competence measure had good internal reliability (LQS ω=.894, HQS ω=.886).

Covariates

Measured covariates include, the image quality counterbalance variable, age, gender, education, income, experience with film cameras, and their current use of film cameras. Experience with film cameras measured how much experience participants had with film cameras on a 5-point Likert scale (1 – 'none at all' to 5 – 'A lot'). Participants were also asked about their use of film cameras (I have never used a film camera, I have previously used film cameras, I currently use film cameras). These measures were included as covariates to control for the effect of experience with film cameras on the outcome variables, particularly as related to feelings of competence. Image quality was counterbalanced to control for the confounding effect on the order of image quality conditions.

5.4   RESULTS

Means, correlations, standard deviations, and reliability estimates are shown in Table 5.

5.4.1 Manipulation Checks

Required Human Involvement

A one-way MANOVA was performed which revealed a significant multivariate effect of RHI: $F(4,534)=29.14$, $p<.001$, $\eta_p^2= .180$, power=1.0 on the manipulation checks. Tests of between-subject effects confirmed that RHI explains significant variance in the manipulation check post-LQS: $F(2,273)=186.91$, $p<.001$, $\eta_p^2= .280$, power=1.0, and post-HQS $F(2,273)=264.62$, $p<.001$, $\eta_p^2= .274$, power=1.0.

Quality

A repeated measures MANOVA was performed which revealed a significant multivariate effect of the manipulation: $F(1,270)=3269.8$, $p<.001$, $\eta_p^2= .924$,

power=1.0. Pairwise comparisons revealed a significant difference between the quality score post-LQS ($M = 1.64$, $SD = .070$) and post-HQS ($M = 8.69$, $SD = .086$, at $p<.001$).

5.4.2 Model

A 2x3 (quality x RHI) doubly multivariate repeated-measures analysis of covariance was conducted with image quality (good or bad) as the within-subjects factor and RHI (low, medium or high) as the between-subjects factor. A doubly multivariate repeated measures analysis of covariance allows for multiple factors to be observed across multiple time points with more than one outcome variable and covariates (Cleophas & Zwinderman, 2020). The outcome variables included in the analysis are competence, autonomy and state affect and covariates included gender, age, education, experience with film cameras, use (current) of film cameras, and the counterbalance variable, image order (i.e., whether the participant received the high- or low-quality image first).

Table 5

Scale Properties, Descriptive Outcomes, And Correlations Among Study Variables

#	Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Age	4.480	1.098	-															
2	Female	0.460	0.499	.221†	-														
3	Education	5.150	1.319	.074	-.041	-													
4	Income	2.940	1.478	-.013	-.001	.280†	-												
5	Current use	2.060	0.373	-.010	.003	.122*	-.026	-											
6	Experience	3.030	0.887	.171†	.185†	.109	.032	.383†	-										
7	RHI	1.989	0.816	.129*	-.069	-.135*	-.071	-.034	.011	-									
8	Image Quality	1.498	0.501	.042	.003	.045	.082	.010	-.033	.022	-								
9	Autonomy HQS	3.839	1.004	.151*	.056	-.105	-.029	.055	.068	.615†	.026	*.950*							
10	Autonomy LQS	3.646	1.095	.191†	.045	-.096	-.034	.027	.063	.592†	.090	.872†	*.953*						
11	Competence HQS	3.494	0.844	.074	.093	-.031	.015	.044	.127*	.267†	.254†	.568†	.523†	*.894*					
12	Competence LQS	2.126	0.821	.090	-.094	-.068	-.024	.062	.149*	.270†	.118	.314†	.323†	.338†	*.886*				
13	Pos Affect HQS	3.539	0.935	.053	.071	.039	.140*	.088	.267†	.034	.158†	.246†	.243†	.480†	.145*	*.942*			
14	Neg Affect HQS	1.168	0.456	.096	-.082	-.002	.079	.089	.267†	.031	.187†	.157†	.190†	.252†	.314†	.628†	*.920*		
15	Pos Affect LQS	2.819	0.882	-.095	-.047	-.078	-.143*	.040	-.039	-.004	-.137*	-.073	-.092	-.141*	.026	-.199†	-.153*	*.959*	
16	Neg Affect LQS	1.492	0.643	-.150*	.001	-.026	-.157†	.062	-.065	.031	-.160†	-.010	-.080	.059	-.143*	.065	.586†	-.326†	*.929*

Note: n = 273. Female is coded as 0 = male, 1 = female. SD = standard deviation. Omega total reliabilities are shown on the diagonal. * $p < .05$, † $p < .01$, § $p < .001$.

Required Human Involvement

The between-subjects multivariate assessment indicated a highly significant effect for RHI: $F(8,520)=23.50$, $p<.001$, $\eta_p^2= .266$ across all DV's collectively, power=1.0. Tests of between-subject effects revealed that RHI explains significant variance in competence: $F(2,273)=17.46$, $p<.001$, $\eta_p^2=.117$, power=1.0, and autonomy: $F(2,273)=99.57$, $p<.001$, $\eta_p^2=.431$, power=.1.0. However, these was no significant effect on positive affect: $F(2,273)=.524$, $p=.593$, $\eta_p^2=.004$, power=.136, or negative affect: $F(2,273)=.092$, $p=.818$, $\eta_p^2=.002$, power=.081.

Pairwise comparisons indicated significant differences in autonomy scores between individuals in the low ($M = 2.83$, $SD = .80$) and medium ($M = 4.07$, $SD = .80$) RHI groups ($p<.001$), as well between low and high ($M = 4.342$, $SD = .80$) RHI groups ($p<.001$). In these comparisons, autonomy was greater in the higher RHI conditions, consistent with H1. No significant difference was observed between the medium and high RHI groups ($p=.063$) (see **Figure 6**).

Similarly, competence scores showed significant differences between individuals in the low ($M = 2.50$, $SD = .65$) and medium ($M = 2.93$, $SD = .65$) RHI groups ($p<.001$), and between the low and high ($M = 3.01$, $SD = .67$) RHI groups ($p<.001$). Similar to autonomy, competence was higher in the higher RHI groups as per H2. No significant difference was observed between the medium and high RHI groups ($p=1.00$) (see Figure 7).

Figure 6

Estimated Marginal Means of Autonomy Across Levels of RHI.

RHI
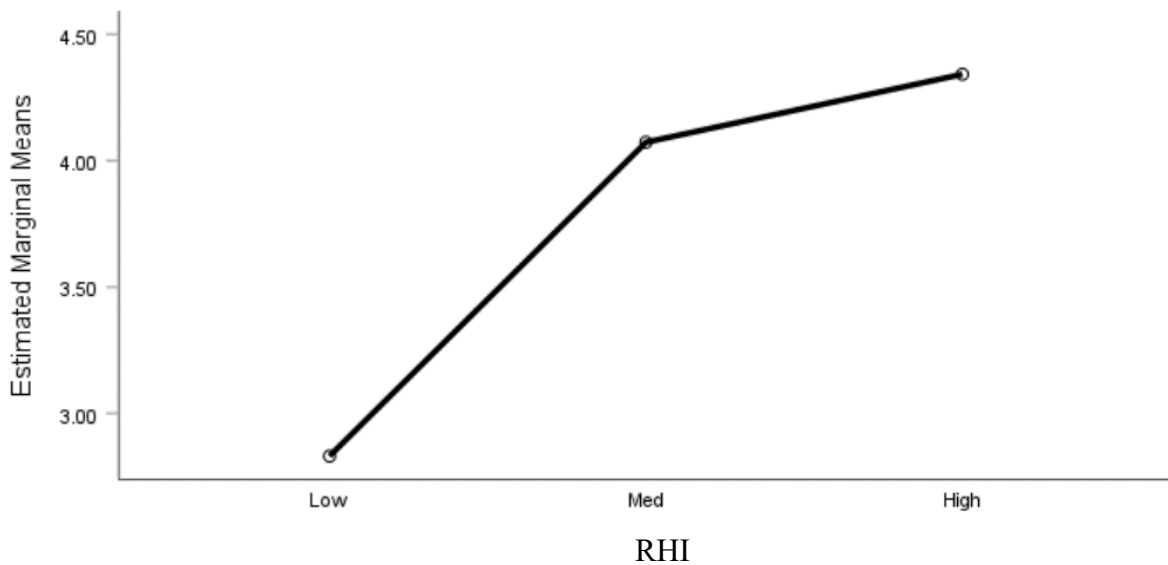
Figure 7

Estimated Marginal Means of Competence Across Levels of RHI.

RHI
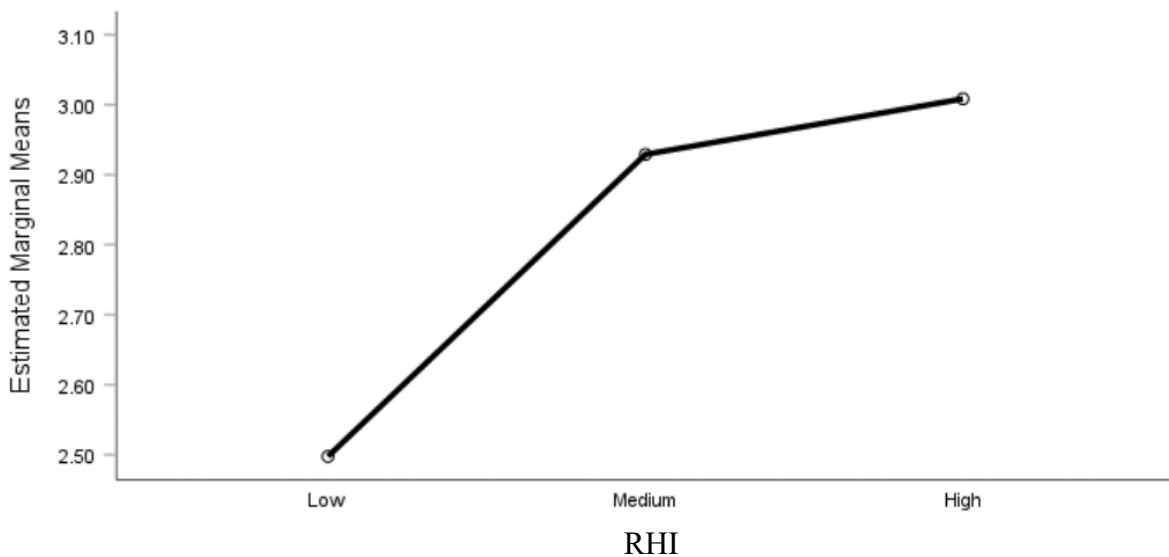
Image Quality

The within-subjects multivariate assessment did not indicate a significant effect for image quality: $F(4,260)=2.25$, $p=.064$, $\eta_p^2=.033$ power=.654. However, follow-up univariate analysis revealed significant effects for both competence: $F(1,273)=5.13$, $p=.024$, $\eta_p^2=.019$ power=.617, and negative affect: $F(1,273)=4.19$, $p=.042$, $\eta_p^2=.016$

power=.532, but not autonomy: $F(1,273)=2.89$, $p=.091$, $\eta_p^2=.011$ power=.395, or positive affect: $F(1,273)=3.25$, $p=.073$, $\eta_p^2=.012$ power=.435.

Pairwise comparisons revealed significantly ($p<.001$) lower competence scores post-LQS ($M = 2.13$, $SD = .47$) compared to post-HQS ($M = 3.50$, $SD = .47$). Similarly, negative affect scores were significantly ($p<.001$) higher post-LQS ($M = 1.49$, $SD = .27$) compared to post-HQS ($M = 1.17$, $SD = .38$).

Image Quality* Required Human Involvement

There was also no significant interaction between image quality and RHI: $F(8,520)=.802$, $p=.601$, $\eta_p^2= .012$, power=.376, indicating that differences observed in the outcome variables across the two levels of image quality are not dependent on the level of RHI. The univariate results also indicated no significant results.

Explaining why this interaction was not significant, the pairwise comparisons indicated that in both the low- and high-quality scenarios competence scores were significantly different (p<.001) between individuals in the low [LQS (M = 1.83, SD = .082), HQS (M = 3.16, SD = .082)] and medium [LQS (M = 2.24, SD = .082), HQS (M = 3.62, SD = .082)] RHI groups, as well between low and high [LQS (M = 2.31, SD = .084), HQS (M = 3.71, SD = .085)] RHI groups. No significant difference was observed between medium and high RHI groups for competence in either the HQS or LQS (p=1.00). Nor were any significant relationships observed in the pairwise comparisons for positive and negative affect.

Autonomy indicated similar results to competence in the pairwise comparisons. In both the low- and high-quality scenarios autonomy scores were significantly different (p<.001) between individuals in the low [LQS ($M = 2.75$, $SD = .090$), HQS ($M = 2.92$, $SD = .079$)] and medium [LQS ($M = 3.93$, $SD = .090$), HQS ($M = 4.22$, SD

= .079))] RHI groups, as well between low and high [LQS ($M = 4.28$, $SD = .093$), HQS ($M = 4.40$, $SD = .081$)] RHI groups. No significant difference was observed between medium and high RHI groups for competence in either the HQS or LQS (p=1.00). However, while in the LQS there was no significant difference between medium and high RHI groups ($p=.319$), in the HQS there was a significant difference ($p=.023$). This suggests that the increase in RHI from medium to high, where the image quality is higher, leads to greater perceptions of autonomy for individuals in more involved experiences.

Covariates

In the multivariate assessment, significant main effects were revealed for the counterbalance variable: $F(4,260)=6.98$, $p<.001$, $\eta_p^2= .097$, power=.994. Significant main effects were also revealed for experience with film cameras: $F(4,260)=6.78$, $p<.001$, $\eta_p^2= .094$, power=.993. Image quality also had significant interactions with two covariates; image quality x gender: $F(4,260)=3.69$, $p=.006$, $\eta_p^2=.054$, power=.879 and; image quality x image order: $F(4,260)=3.121$, $p=.016$, $\eta_p^2= .046$, power=.812.

5.5   DISCUSSION

We conducted a scenario-based experiment with a 3 (RHI) x 2 (image quality) mixed factorial design to understand the impact of reduced RHI in experiences with technology on user's wellbeing outcomes and satisfaction of basic psychological needs. The results highlight a number of important relationships.

Firstly, consistent with H1 and H2, results indicated that higher RHI in experiences with film cameras results in greater feelings of autonomy and competence. Further, there was a greater increase in both autonomy and competence between low and high RHI conditions as compared to low and medium RHI conditions indicating close links between the satisfaction of these two basic psychological needs and the

level of RHI in an experience. Notably, there was no significant difference between the medium and high involvement groups for either competence or autonomy, which suggests that the level of involvement does not require fully manual interaction to improve the satisfaction of these needs. This indicates there may be a minimum threshold of RHI that reaps a majority of psychological benefits associated with higher involvement. This provides for an interesting opportunity for future research. Where user experiences have become increasingly passive with many having no desire to give up conveniences completely, the value of moderate levels of RHI (i.e., greater than passive) may provide for sufficient satisfaction of these basic psychological needs. Striking a balance between embracing technology for its benefits while ensuring human connections and personal growth remains in focus – i.e., to ensure we retain meaning (Brown & Ryan, 2003). As such, this highlights the benefits of designing user experiences to promote overall wellbeing.

Importantly, increases in need satisfaction were most notable for autonomy which was also less influenced by other factors in the model as compared to competence. As such, regardless of other factors, including the quality of the output, user perceptions of autonomy are greater where RHI is greater. This provides an interesting duality between the forward progress of modern technology and the fulfillment of basic psychological needs. On one hand, the rate of innovation is ever-increasing, aiming to enhance effectiveness, efficiency and convenience for users by automating various physical and mental tasks that were once solely performed by humans (Rogers, 2003). However, this accelerating innovation seems to lead to a paradoxical outcome: as technology evolves to cater to our every need, it ceases to cater for our most important needs of autonomy and competence. Our increasing

reliance on technology to meet our utilitarian needs may actually provide a shallower sense of satisfaction and a disconnection from our authentic selves.

The study thus contributes to the human-computer interaction literature by highlighting the role of RHI in achieving positive psychological outcomes in experiences with technology, regardless of the quality of the output. HCI models often prioritise efficiency and automation in technology design, to be more user-friendly (Norman, 2013; Norman & Kirakowski, 2018). However, these results underscore the importance of balancing human-material agency in the fulfilment of our basic psychological needs. Even limited opportunities for user action and choice can significantly influence the satisfaction of the user's basic psychological needs. Rather than viewing the technology as a means to an end (i.e., something that should be made more efficient and automated), users may benefit from experiences that allow them to interact with technology as a tool that supports or enhances the user's agency rather than replacing it. These insights provide avenues for designers of technology to not only provide functional benefits to users, but also positively influence their lives in an increasingly digital world.

Neither H4 nor H5 were supported. Notably, however, these results indicate that individuals had higher perceived competence in the high RHI group even when the output quality was low. Certainly, the literature suggests that where autonomy is high, individuals are more likely to perceive any feedback as informational and thus representative of opportunities to improve resulting in increased competence (Deci & Ryan, 2012; Grolnick et al., 1991). Interestingly, the only significant relationship assessed between medium and high RHI conditions was for autonomy where both involvement and image quality were high. Therefore, in line with prior research, positive feedback most meaningfully contributes to competence and intrinsic

motivation contexts of higher autonomy-support, and as such, individuals who are provided with a greater range of choice and control in experiences with technology are more likely to experience greater need satisfaction (Hodgins et al., 2006; Ryan, 1982).

Surprisingly, neither RHI nor the RHI*quality interaction had significant relationships with affect, and therefore no evidence was found to support H3 or H5. Quality did, however, have a direct relationship with both positive and negative affect. These results suggest that where the quality of the output in the experience was high (i.e., high image quality), individuals experienced greater positive affect and less negative affect regardless of their level of involvement in the task. The literature on SDT has provided extensive evidence that the satisfaction of basic psychological needs translates to more positive wellbeing outcomes (e.g., Chen et al., 2015; Church et al., 2013; Ryan et al., 2010). Thus, while greater RHI was shown to improve need satisfaction in this experiment, it did not significantly affect short-term affect when controlling for quality. This is perhaps due to a limitation in the research design in that affect was measured with only one tool and only immediately following the activity. Thus, it may not capture the lasting nature or quality of the wellbeing outcomes adequately.

The literature does suggest, however, that where positive feedback derives from an activity characterised by an external locus of causality (i.e., a controlled rather than autonomy-supportive experiences), it is expected to be short-lived (Assor et al., 2004). That is, where the high RHI condition was autonomy-supportive and provided opportunities for volition and choice, the low RHI condition was driven by an external agent (the technology) and as such, while success improved affect in the short term, it may not have provided meaningful changes in wellbeing. The satisfaction of basic

psychological needs however, as evidenced by this research, is expected to provide for a more resilient improvement in wellbeing attained through self-determined action and higher perceived competence (Hodgins & Knee, 2002; Moller et al., 2006a).

This study, thus, contributes to the SDT literature by providing empirical evidence of the short-term psychological outcomes associated with passive versus active experiences with technology. The results demonstrate that need satisfaction is higher in experiences with technology that provides users with more opportunities to exercise agency and suggests that where digital technologies reduce the action required from human users, they may also limit the user's ability to satisfy their basic psychological needs. This also highlights the applicability of SDT to consumer experiences with obsolete technology, contributing new insights to the literature on retro-technology adoption and use by addressing calls to better understand the role of agency in motivating engagement with obsolete technologies (Adams et al., 2022). It provides empirical evidence that users of retro-technology experience greater agency through more active, involved experiences with older technologies and thus derive value beyond the output of the technology. It also explains how less capable technologies can provide more rewarding experiences for consumers, contrary to accepted models of innovation diffusion (Rogers, 2003).

5.6   PRACTICAL IMPLICATIONS

This research also provides several practical implications. Firstly, this research adds to an understanding of the motivations and consumer profile of retro-technology users. Organisations looking to reintroduce or redesign retro products can leverage the knowledge that users are seeking active, agentic experiences that provide for the satisfaction of basic psychological needs. Secondly, knowledge gains were also realised as to the qualities of retro-technology which can provide agency and how this

can be applied to future innovation (Adams et al., 2019). Marketers can emphasize the experiential qualities of retro-technology that allow users to take control, produce meaningful outcomes and realise psychological benefits. In particular, the finding that moderate RHI provides for a substantial increase in need satisfaction demonstrates the possible benefits associated with a blend of old and new technologies. Benefits of digital technologies may be integrated but these should function as tools to enhance the users experience rather than becoming active agents in experiences. These findings may also provide general users of technology with avenues for realising greater agency and opportunities for satisfying their basic psychological needs. In particular, where individuals are experiencing negative consequences relating to their experiences with technology, they may identify opportunities to better satisfy their needs and positively influence their wellbeing through more involved experiences with retro-technologies.

5.7 LIMITATIONS AND FUTURE RESEARCH

A number of limitations and opportunities for future research are noted. First, the study included a limited sample and although it was sufficient for analysis and interpretation, greater diversity would provide greater confidence in the generalizability of results. Second, this research measured only one type of technology. While this provides valuable insights into retro-technology and user experiences, it may not fully capture the complexity of experiences with a wide range of modern technologies. Future research could explore other technological contexts to provide a more comprehensive understanding of how experiences with different types of technology influence psychological outcomes. Third, the type and speed of feedback are not as diverse as real experiences might be. Due to the inherent limitations of a scenario-based design, the quality of photographs was manipulated only twice (high

and low), and the feedback was instant rather than delayed (as it often is in film-photography experiences) (Adams et al., under review). Future studies could consider a broader scope of image quality to better understand its influence on user outcomes. Finally, the study examines psychological and behavioural outcomes in the short term after the photography experiences. However, the long-term effects of these experiences on users' attitudes and behaviours remain unexplored. Investigating the variations in psychological outcomes over time (and over multiple experiences) could offer additional insights into the lasting impact of technology experiences.

5.8 CONCLUSION

In summary, this paper extends previous research by demonstrating how higher levels of RHI through the use of technology with low material agency can enhance positive psychological outcomes. This was achieved through a scenario-based experiment manipulating the RHI with film cameras and the output (image) quality. It was found that higher RHI leads to greater experienced autonomy and competence regardless of output quality. These results also suggested that the threshold for the greatest benefits to psychological outcomes is quite low, requiring only a moderate increase in user-involvement. Overall, the findings highlight the importance of considering the balance of human-material agency in user experiences with technology. As users interact with increasingly agentic technology throughout their everyday lives, the satisfaction of their basic psychological needs may be increasingly frustrated. This study thus underscores the importance of these needs in the design of new technologies and provides insight towards understanding motivations behind the use of obsolete retro-technologies.

Chapter 6: Discussion and Conclusions

6.1 INTRODUCTION

The primary aim of this research program was to understand how the relationship between technology, agency and human involvement impact user experiences and psychological outcomes. To answer this question, three research questions were proposed. First, paper one sought to understand the experiences individuals have with retro-technology and how they derive value from these experiences (RQ1). Second, paper two built on findings from paper one to propose a theoretical model describing the variables that mediate and moderate the relationship between technology use and wellbeing (RQ2). Finally, paper three sought to understand how human involvement influenced psychological outcomes (RQ3).

> *RQ1: What do users value in their experiences with retro technology?*
>
> *RQ2a: What variables mediate the relationship between technology use and wellbeing?*
>
> *RQ2b: What variables moderate the relationship between technology use and wellbeing?*
>
> *RQ3: How does the level of human involvement in experiences with technology influence psychological outcomes?*

Chapters 3 to 5 presented the three publications that each address their respective RQs. The present chapter, Chapter 6, discusses the overall findings from the research program including an overview of the papers, a summary of key findings relating to each research question, and an overview of the overall theoretical contributions and practical implications. Finally, the limitations and opportunities for future research of the overall program are discussed, followed by a conclusion and final comments.

6.2   OVERVIEW OF RESEARCH PAPERS

To answer the research questions outlined above, this research program utilised a qualitative approach in paper one, a theoretical approach in paper two, and a quantitative approach in paper three.

Paper 1 (see Chapter 3) took a grounded theory approach and involved the qualitative analysis of data from 20 interviews. This study provided a theoretical model of the retro-technology experience and revealed relationships between elements of this model that contribute to the satisfaction of basic psychological needs (via SDT) and the enhancement of experienced agency in the user experience with technology.

Paper 2 (see Chapter 4), informed by the findings of Paper 1, sought to provide a theoretical model to explain how technology affords the user opportunities to exercise agency through satisfying the basic psychological needs of autonomy, competence, and relatedness, which, in turn, provides positive wellbeing outcomes. To arrive at this model, this paper synthesised literature on material agency, self-determination theory and affordances.

Finally, paper three utilised a scenario-based experimental design (n=273) to provide empirical evidence for the role of human involvement in the realisation of psychological outcomes in experiences with technology. The results of this study suggest that greater human involvement does in fact provide for greater satisfaction of the basic psychological needs.

6.3   SUMMARY OF KEY FINDINGS IN RELATION TO RESEARCH QUESTIONS

6.3.1 RQ1: What do consumers value in their experiences with retro technology?

Paper 1 involved the analysis of interview data collected from 20 individuals who currently use retro-technologies. The purpose of this paper was to understand the

user experience from a perspective of 'not knowing' and encouraged participants to tell stories about their experiences across a range of events that contribute to their overall experience with retro-technologies. This research provided a model comprising four key themes that describe the value derived from the retro-technology experience, and further identified a number of ways in which these themes relate to the satisfaction of the basic psychological needs of autonomy, competence and relatedness (Deci & Ryan, 2012).

The first theme identified describes how retro-technology limits the scope of choice in the user's experience. These inherent limitations provide the user more opportunities for more choiceful action and control, and in many ways, to disconnect from the digital world. As such, the user is able to focus more on the experience and feel a greater sense of presence and connectedness to their own actions and the meaning associated with their involvement and the media; to seize the moment. This provides for, and is provided for, by opportunities to expand the realm of action – to do more. Individuals describe greater intentionality in their experiences, they actively seek opportunities to care for, interact with, and learn about the technology and media. These experiences also expand the user's realm of connection. This connection relates not only to other individuals engaged in similar experiences, but also with the past, brought forward by both personal and communal nostalgia.

This study also demonstrated the relationship between these themes and the satisfaction of the basic psychological needs of autonomy, competence, and relatedness, as described by SDT. Firstly, users describe their ability to exercise control and make deliberate, volitional decisions throughout the network of events that make up the retro-technology experience. Through this, they describe the satisfaction

of the need for autonomy. Secondly, the experiences provide several opportunities to build skills, engage in a range of tasks, build and test knowledge, and receive feedback both tangible and intangible. Thus, individuals are able to build, reinforce, and perceive greater competence. Finally, the technology also provides several opportunities for users to engage socially and feel a sense of belonging and relatedness with like-minded individuals, values, and ideas both past and present. Through these connections with SDT, the findings demonstrate the ways in which retro-technology experiences contribute to greater need satisfaction, and thus, provide for more positive wellbeing outcomes (Patrick et al., 2007).

Thus, the findings of Paper 1 answer RQ1 and demonstrate that individuals find value across a range of events that encompass the retro-technology experience while simultaneously providing for the satisfaction of their basic psychological needs and contributing positively to their wellbeing. This research also extends our understanding of the relationship between human agency and technological engagement, highlighting critical psychological drivers of the experience beyond what is currently described in the literature. It also provides evidence for the role technology plays in user wellbeing, for example, it indicates that retro-technology may facilitate or enhance 'disconnection' efforts and the associated outcomes (Morris & Cravens, 2017). The literature would benefit from further understanding these relationships.

6.3.2 RQ2a: What variables mediate the relationship between technology use and wellbeing?; RQ2b: What variables moderate the relationship between technology use and wellbeing?

Paper 2 (see Chapter 4) builds on the findings of Paper 1 and sought to provide theory that describes the variables explaining user need satisfaction and wellbeing in experiences with technology. It synthesises literature on material agency, the increasing negative psychological impacts of digital technologies, and self-

determination theory to describe the evolving relationship of human and material agency in experiences with technology. This synthesis of literature suggests that as the capabilities of digital technologies increase, technology is more able to exercise its own agency, removed from the intention and control of the human user. This is not an unusual concept in the context of accepted frameworks of innovation progress that describe ideals of increased efficiencies and convenience for human users (Rogers, 2003). However, SDT posits that humans have evolved to be inherently active, intrinsically motivated, and oriented toward developing naturally through integrative processes (Deci & Ryan, 2012). As such, the progression of modern technology toward better serving human needs is paradoxical in that the deeper psychological needs are simultaneously thwarted.

This research thus contends that satisfaction of the basic psychological needs is influenced by the opportunities a technology affords its user to exercise human agency in the experience. The model proposes that agency is realised through the satisfaction of these needs and thus contributes to wellbeing outcomes. Therefore, the relationship between technology use and wellbeing is mediated by agency and the relationship between technology use and agency is moderated by the technology's affordances.

Thus, in answering RQ2a and RQ2b, the paper provides three propositions. First, technologies that afford high human agency foster feelings of competence. Where modern technology removes the friction and action that was typically required from humans in experiences with its predecessors, it also inhibits the user's ability to build and perceive competence. Through developing mastery of technology in experiences that provide opportunities for personal growth and feedback, users are able to develop a sense of competence. Second, technologies that afford high human agency facilitate

a sense of autonomy. In experiences with technology that are controlled by technology, the human user often takes a more passive role. As such, they are more likely to experience an external perceived locus of causality and therefore lower autonomy. Autonomy-supportive experiences, wherein the user has a sense of volition and control, and is able to make decisions and perceive their influence, provide for greater autonomy. The satisfaction of autonomy will also, in turn, promote greater competence through the user's perceived contribution to the outcome via the natural feedback of the experience. Finally, it suggests that technologies affording high human agency provide relatedness with others. Technologies that provide the user with a sense of belonging will positively contribute to relatedness satisfaction. Experiences with retro-technologies provide several avenues for connectedness with likeminded individuals as well as with past ideals and values. Although we can more readily connect across greater distance with digital technologies, the satisfaction of the need for relatedness may be better realised through the values instilled in older technologies, e.g., sharing experiences, knowledge and ideas (Brown, Kozinets, et al., 2003a).

Therefore, in answering RQ2a and RQ2b, this paper provides a theoretical model describing the wellbeing outcomes associated with experiences characterised by increasingly agentic technology. It therefore suggests that individuals may experience need frustration through experiences with digital technology and may realise psychological benefits from the use of less agentic technologies that extend the human user's agency and capabilities rather than replacing it (i.e., where the technology takes the role of a tool rather than an active agent). This research does not suggest that need satisfaction can only occur in the absence of digital technology, but rather that there are less opportunities to exercise agency in a digital technology-driven modern society

and as such, individuals may reap benefits from experiences that provide more opportunities to exercise human agency.

6.3.3 RQ3: How does the level of human involvement in experiences with technology influence psychological outcomes?

Paper 3 (see Chapter 5) involved a scenario-based experiment that manipulated the level of human involvement in an experience with film cameras where the user's involvement was either low, medium, or high and therefore the technology's operation was either fully automatic, semi-automatic or fully manual respectively. In this way, the study aims to understand whether individuals experience greater need satisfaction and positive wellbeing outcomes where the agency of the technology in an experience allows for greater user involvement (i.e., low vs high material agency). Data were collected from 273 participants spread evenly across the three involvement conditions and the model was tested via a doubly multivariate repeated measures analysis of covariance, with the repeated measure being the quality of the output (i.e., the resulting photograph).

The results of this study demonstrate that greater human involvement does contribute positively to psychological need satisfaction. It further highlighted that the benefits of greater involvement are similarly achieved between low to medium and low to high involvement experiences and thus, meaningful need satisfaction does not require fully manual use. This suggests that there is a minimum threshold of involvement beyond passive use, that provides the user with a majority of benefits to wellbeing. This suggests that even a moderate increase in volition, decision making, and control, provides an autonomy-supportive context that results in greater feelings of competence. To measure wellbeing, state affect was also measured, and was not found to be significant for any hypothesized relationships. Although there were

differences in state affect between involvement groups in line with expected relationships, these were not significant. Although the literature on SDT widely describes the positive wellbeing outcomes derived from the satisfaction of the basic psychological needs (Deci & Ryan, 2012), the manipulation of image quality may have accounted for enough variance in the model to reduce the effect of involvement on affect in the short-term. This is one of several limitations identified in this study that speak to opportunities for future research.

Therefore, in answering RQ3, Paper 3 makes several theoretical and practical contributions. It demonstrated that greater involvement in experience with technology does meaningfully contribute to the satisfaction of competence and autonomy, and that the level of involvement that most meaningfully contributes to need satisfaction may allow for some influence from material agents. That is, where the user experiences some opportunities for choiceful and volitional action, need satisfaction is not thwarted by a low influence of technological control. This has implications for marketing and design, as well as consumer wellbeing.

6.4 THEORETICAL CONTRIBUTIONS

Overall, this research program makes several theoretical contributions to fields of innovation management and human computer interaction.

6.4.1 Framework for understanding the value of retro-technology experiences

Firstly, this research contributes a theoretical model to describe the factors that provide value in experiences with retro-technology, and thus contribute to continued use beyond initial adoption. The literature on retro-technology encompasses a number of fields from innovation management (e.g., Errajaa et al., 2013), to marketing (e.g., Brown, Kozinets, & Sherry, 2003), and consumer behaviour (e.g., Hemetsberger et al., 2012) and psychology (e.g., Adams et al., 2019). Prior research largely describes

purchase intentions and decisions (e.g., Castellano et al., 2013), market opportunities (e.g., Brown, Kozinets, et al., 2003b; Errajaa et al., 2013), and some experiential elements including the maintenance of technology (Nokelainen & Dedehayir, 2015), perusing/purchasing media prior to use (e.g., Orth & Gal, 2012), social interactions (Cartwright et al., 2013) and, most frequently, nostalgia (e.g., Hallegatte & Marticotte, 2016; Kessous, 2015; Koetz & Tankersley, 2016). However, this thesis is the first to provide a holistic framework for understanding the user experience, providing further context to many of these elements and describing the mechanisms through which value can be realised. It found that the inherent limitations of retro-technologies (as compared to their digital successors), provide users with more opportunities for choiceful and intentional action, mindfulness, and connection. Through these limitations, the user experience encompasses a range of activities that provide meaning and value beyond the utility of the technology and its related functions. Thus, the findings provide new opportunities for understanding the retro-technology phenomenon, particularly with respect to a need to exercise human agency and the associated wellbeing outcomes.

6.4.2 Conceptualisation of material agency's effect on the expression of human agency in experiences with technology

This research also contributes an understanding of the ways in which the increasing material agency built into modern (digital) technologies can influence the human user's ability to exercise their own agency. Many theorisations of material agency exist in the literature, as discussed in Chapter 2. While some theories suggest that technology does not have the ability to exercise agency (e.g., Olohan, 2017), others suggest it can exercise agency, but only in equal proportion to the human agent (e.g., Verbeek & Vermaas, 2009), and others still, suggest that technology can exercise

agency on a number of incremental levels, from passive (i.e., operating as a tool) to co-operative (i.e., self-coordinating systems) (Rammert, 2008). The present research, particularly through the model illustrated in Paper 2, extends these theorisations to demonstrate that the level of agency a technology exercises in an experience with a human agent influences the human users' potential (i.e., inhibits or supports) to exercise agency. It further suggests that the increasing digitisation and ubiquity of technology is such that humans are not reasonably able to deny its influence. Humans are thus increasingly self-limiting their ability, or opportunities, to exercise human agency through the use of digital technologies, and in many cases, this leads to a desire or need to engage in more agency-supporting experiences. Paper 1 also provides evidence for this in the context of retro-technologies. It found that the inherent limitations built into analogue technologies are an important element of value that provide for a range of connected experiences with technology that relate, stem from, and contribute to a greater exercise of human agency. It suggests that individuals are intentionally engaging with less capable technologies for the opportunities afforded by lower levels of material agency. Further, the authenticity of the technology was found to be less important than its role in the experience. That is, individuals are accepting of new technology playing a part in the retro-technology experience where it is less active - providing information or analysis but not taking action. This understanding has important implications for theory as it suggests that accepted innovation theories which describe a need to improve the efficiencies and conveniences provided by technology (e.g., Rogers, 2003), may provide for a less human experience, inhibiting the exercise of agency, and therefore failing to meet or inhibit the satisfaction of consumers' more inherent (and critical) psychological needs.

6.4.3 Extension of SDT to explain how the level of human agency provided by technology can provide for the satisfaction of basic psychological needs and lead to wellbeing outcomes

This research further contributes theory to understand the wellbeing outcomes associated with the use of technology and the level of perceived material agency exercised in such experiences. Through SDT, Paper 2 proposes a theoretical model that describes how material agency moderates the exercise of human agency and the satisfaction of basic psychological needs to influence wellbeing. While SDT has been used to understand wellbeing outcomes and need satisfaction resulting from the use of a range of digital technologies (e.g., James et al., 2019; Jeno et al., 2019; Rahi & Abd. Ghani, 2019), it has not been used in the context of analogue technologies, or to explain how human agency is inhibited or provided for in experiences with technology. The theoretical model formulated in Paper 2 thus extends SDT and utilises this framework as a means for understanding this relationship. It demonstrates that technologies may afford human users opportunities to exercise human agency to varying degrees and thus influence their ability to satisfy their basic psychological needs of autonomy, competence, and relatedness. The satisfaction of these needs therefore mediates the relationship between technology use and wellbeing outcomes, which have been extensively evidenced in the SDT literature (e.g., Chen et al., 2015; Church et al., 2013; Ryan et al., 2010). The findings of Paper 1 also contribute to this theorisation by demonstrating the relevance of SDT and the basic psychological needs for explaining the value derived from user experiences with less agentic retro-technologies. It demonstrated that individuals seek experiences that require more active use, decision making, and control while building competencies and realising greater relatedness. Paper 3 further provided empirical evidence for this relationship as the level of involvement in experiences with technology lead to greater perceived competence and

autonomy. These findings represent important contributions to the field of human and computer interaction and provide direction for further deepening an understanding of how the agency built into modern technologies can influence the realisation of psychological and wellbeing outcomes.

6.5 PRACTICAL IMPLICATIONS

This research program also provides several practical implications for organisations, marketers, and consumers.

6.5.1 Marketers should emphasise the experiential elements of retro-technologies

The literature on the retro-technology phenomenon largely seeks to better understand how to successfully revive retro-technologies (e.g., Brown, Kozinets, et al., 2003a) and much of this research focuses on nostalgic marketing and emphasising emotional connection to the past (e.g., Cattaneo & Guerini, 2012). However, the results of this research program suggests that many individuals are turning to retro-technologies in an effort to 'disconnect' (Morris & Cravens, 2017) from the digital world, and to be more mindful and active. This provides opportunities for marketers to position retro-technology in a way that highlights these differences with digital technologies. The theoretical model illustrated in Paper 1 provides a deeper understanding of the many elements that contribute value to the overall experience. For example, to take control of their preferences, to have more mindful experiences, and to create more meaningful social experiences.

6.5.2 Consider the design elements of technologies that provide for the user to experience agency and satisfy their basic psychological needs

These findings also provide implications for technology design. The findings suggest that greater involvement in experiences with technology, where the user is able to take more choiceful action, contributes to greater satisfaction of the basic

psychological needs. The results of Paper 3 highlight that many of the benefits associated with greater involvement are achievable with semi-automatic functionality. That is, users do not need to have full control of the technology in the experience, but rather require only some opportunities to exercise agency and to reinforce or build competencies. This may involve, for example, a blend of old and new technologies. In Paper 1, it was found that users were accepting of modern technology's role in the experience (e.g., light meters in photography), however it was important that use or application of the assistance was something the human agent was responsible for. As such, the role of the technology should be (or at least be perceived as) that of a tool to extend the human user's capabilities in the experience, rather than replacing them.

6.5.3 Individuals experiencing negative consequences in relationship with technology can consider engaging in experiences with technologies that provide for greater need satisfaction

These results also have important implications for consumers of technology more broadly. The findings suggest that the use of digital, highly agentic technologies may contribute to negative psychological outcomes. Firstly, Paper 1 provided accounts from individuals who were making conscious decisions to engage in experiences with retro-technology in an effort to better understand themselves and to break away from the digital world. They described the psychological benefits of such experiences, including greater mindfulness and appreciation of their environment, mood improvements, self-regulation practices, reflection and identity confirming practices. Secondly, Paper 2 demonstrated that technology can inhibit the exercise of human agency and thus frustrate the basic psychological needs leading to negative wellbeing outcomes. Conversely, by engaging with less active technology that supports human agency, users are better able to perceive autonomy, build and/or affirm competencies, and experience relatedness (i.e., a sense of belonging), contributing positively to

wellbeing outcomes. Paper 3 further demonstrated that where individuals are more involved in their experiences with technology, they are better able to satisfy their basic psychological needs. As such, these findings provide users with avenues for improving their wellbeing through meaningful experiences with technology.

6.6 LIMITATIONS AND FUTURE RESEARCH

There are several limitations and opportunities for future research derived from the studies but also across the research program as a whole.

The first limitation relates to the qualitative approach in Paper 1 and the generalisability of results. Although the exploratory grounded theory approach is a strength of the research design that provided rich and insightful data for theory building, the data comprises the experiences of 20 users of retro-technologies. As such, the field would benefit from further quantitative studies seeking to verify these findings across a larger and more diverse sample of individuals.

The second limitation is the use of a single psychological framework (SDT) to describe and test the relationships of the resulting theoretical model. SDT was utilised for several reasons (described in Chapter 2.6) including its ability to describe agency through the measurable satisfaction of basic psychological needs, for its depth of theoretical foundation and applicability across cultures and countries, and its characterisation of PLOC as necessary for the meaningful satisfaction of these needs (and thus the direct applicability of this to perceptions of human versus material agency in experiences). However, future research could consider utilising other psychological and behavioural frameworks to measure and test these relationships. For example, whether users' individual differences, e.g., FFM (McCrae & Costa, 1995), predict a greater need for agentic experiences with technology.

A third limitation relates to the measurement of affect in Paper 3. Although involvement demonstrated a greater satisfaction of competence and autonomy, it did not significantly contribute to changes in positive or negative affect. This is suggested to be a limitation in the research design in that affect was measured with only one tool and only immediately following the activity. Thus, a more comprehensive and nuanced measurement of wellbeing (e.g., both eudemonic and hedonic measures, triangulation of self-report data and physiological measures), as well as understanding the long-term effects of these experiences on users' attitudes and behaviours, presents an interesting direction for future research.

The fourth limitation is the that the study design of Paper 3 was limited by funding and practical considerations. As such, although the scenario-based design provided meaningful results, future research should seek to further verify these relationships within more diverse experiences, for example, including a greater range of output quality, feedback timing (i.e., delayed versus instant gratification with respect to the findings in Study 1), a greater number and variance in the levels of user involvement, multiple experiences across different time points and technologies, and testing the relationships in a real (rather than scenario-based) context.

A final limitation is the focus on western cultures and countries in the data collection of Paper 1 and Paper 3. Although the validity of SDT has been demonstrated across countries and cultures (Chen et al., 2015), the ways in which these needs are realised through technology use may be influenced by cultural and other contextual factors. Therefore, future research should seek to test these relationships across a more diverse range of countries and cultures.

6.7   CONCLUSION

This PhD thesis has achieved its overall aim to understand how the relationship between human and technological agency impacts human experiences and psychological outcomes in experiences with technology. Across three publications, evidence was presented that demonstrates the increasing level of material agency built into modern technology can have a limiting effect on the exercise of human agency, leading to negative wellbeing outcomes. As technology increasingly manages its human users in the name of improved efficiency and convenience, it simultaneously impedes its user's ability to satisfy their deeper and more basic psychological needs.

The results of this research thus suggest both caution and opportunity. The findings underscore the importance of intentional and choiceful action, mindfulness, and personal connection in experiences with technology. Several practical implications were provided throughout the papers that suggest opportunities for organisations to blend these elements into future technology design as well as highlighting where their current product offerings do this well (e.g., retro-technologies). For consumers, the results illustrate the importance of seeking opportunities to exercise agency in experiences with technology. Where the technology does not provide for this, the benefits of short-term engagements in autonomy-supportive experiences with technology (e.g., with analogue technology) that provide for greater human involvement were demonstrated to provide greater satisfaction of autonomy and competence needs. While the findings of this research do not suggest rejecting modern technology, they do propose further opportunities to understand the complex relationship between human and material agency towards fostering a more thoughtful and balanced approach to technology interactions that satisfy both utilitarian and deeper psychological needs.

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Appendices

Appendix A: Study one materials

Appendix A1: Recruitment flyer

Appendix A2: Participant information and consent form

<table>
<tr><td>**QUT**</td><td>**PARTICIPANT INFORMATION FOR QUT RESEARCH PROJECT**
– Interview –</td></tr>
<tr><td></td><td>**What is driving the retro phenomenon?**

QUT Ethics Approval Number 2000000693</td></tr>
</table>

Research team

Principal Researcher:	Jack Adams	PhD student
Associate Researcher(s):	Dr. Ozgur Dedehayir	Supervisor
	Prof. Peter O'Connor	Supervisor
	Business School, School of Management	
	Queensland University of Technology (QUT)	

Why is the study being conducted?

This research project is being undertaken as part of PhD study for Jack Adams.

The last two decades have seen an unprecedented growth in the number of obsolete technologies that have been reintroduced to contemporary markets as 'retro-technologies'. The present research sets out to better understand how users interact with this technology. We seek to determine the motivations, behavior, preferences and social influences relating to the purchase and use of retro technologies.

The research team is inviting individuals over the age of 18 and who use retro-technology, including but not limited to LP records/player, gaming consoles, e.g. NES, Atari, cassette players, Polaroid/instant camera(s), 35mm film camera(s).

You are invited to participate in this research project because you are a user of retro products and will be able to provide valuable insight into the experiences and motivation behind the use of retro technology.

What does participation involve?

Your participation will involve an audio recorded interview virtually (via Zoom) or in person in Brisbane (e.g., a café, depending on your preference) that will take approximately 45-60 of your time.

Questions will include:

Under what circumstances are you most likely to use your retro-technology?

When did you first start using your retro-technology?

How did you come to begin using it? I.e., what sparked the initial interest and what kept it going?

Your participation in this research project is entirely voluntary. If you do agree to

participate you can withdraw from the research project without comment or penalty. You can withdraw anytime during the interview. If you withdraw within four weeks after your interview, on request, any information already obtained that can be linked to you will be destroyed. Your decision to participate or not participate will in no way impact upon your current or future relationship with QUT.

What are the possible benefits for me if I take part?

It is expected that this research project will not benefit you directly. Benefits will be realized by future researchers seeking to look deeper into this phenomenon. Further, contributions to domains such as strategy, marketing and entrepreneurship could result in indirect benefits to consumers due to knowledge gains leading to better/more suitable product offerings in this domain. You can request a brief summary of the outcomes of the study by providing an email address to the principal researcher (Jack Adams). This will be available in July of 2021.

What are the possible risks for me if I take part?

There are no risks beyond normal day-to-day living associated with your participation in this research project.

What about privacy and confidentiality?

All comments and responses are coded, i.e. it will be possible to re-identify you. A re-identifying code stored separately to personal information (e.g. name, address), will only be accessible to the research team, and the code plus identifying information will be destroyed 5-years after data collection date.

Any personal information that could potentially identify you will be removed or changed before files are shared with other named researchers or where results are made public.

Any data collected as part of this research project will be stored securely as per QUT's Management of research data policy. Data will be stored for a minimum of 5 years, and can be disclosed if it is to protect you or others from harm, if specifically required by law, or if a regulatory or monitoring body such as the ethics committee requests it.

As the research project involves an audio recording:
- The recording will be retained for the minimum retention period of 5 years after the last research activity.
- The recording will not be used for any other purpose.
- Only the named researchers will have access to the recording.
- You will not have the opportunity to verify your comments and responses prior to final inclusion.
- It is not possible to participate in the research project without being recorded.

Every effort will be made to ensure that the data you provide cannot be traced back to you in reports, publications and other forms of presentation. For example, we will only include the relevant part of a quote, we will not use any names, or names will be

changed, and/or details such as dates and specific circumstances will be excluded. Nevertheless, while unlikely, it is possible that if you are quoted directly your identity may become known.

How do I give my consent to participate?

We would like to ask you to write to the research team by email to provide written consent to confirm your agreement to participate. Please also review the consent form before providing written consent.

What if I have questions about the research project?

If you have any questions or require further information, please contact one of the listed researchers:

Principal Researcher: Jack Adams
Supervisors: Dr. Ozgur Dedehayir
                             Prof. Peter O'Connor

If you would like to request feedback on the results of this study, this will be available from July 2021. You may request feedback by emailing the request to the principal researcher, Jack Adams, at j29.adams@qut.edu.au.

What if I have a concern or complaint regarding the conduct of the research project?

QUT is committed to research integrity and the ethical conduct of research projects. If you wish to discuss the study with someone not directly involved, particularly in relation to matters concerning policies, information or complaints about the conduct of the study or your rights as a participant, you may contact the QUT Research Ethics Advisory Team on +61 7 3138 5123 or email humanethics@qut.edu.au.

Thank you for helping with this research project. Please keep this sheet for your information.

Appendix B: Study 3 materials

Appendix B1: Participant information and consent form

<table>
<tr>
<td rowspan="2">**QUT**</td>
<td>**PARTICIPANT INFORMATION FOR QUT RESEARCH PROJECT**
– Interview –</td>
</tr>
<tr>
<td>
Understanding the retro-tech experience: The case of film photography

QUT Ethics Approval Number - 6231
</td>
</tr>
</table>

Research team

Principal Researcher:	Jack Adams	PhD student
Associate Researcher(s):	Dr. Ozgur Dedehayir	Supervisor
	Prof. Peter O'Connor	Supervisor
	Business School, School of Management	
	Queensland University of Technology (QUT)	

Why is the study being conducted?

This research project is being undertaken as part of a PhD study for Jack Adams.

The last two decades have seen an unprecedented growth in the number of obsolete technologies reintroduced to contemporary markets as 'retro-technologies'. The present research sets out to better understand how users interact with this technology. We seek to determine the motivations, behavior, preferences and outcomes relating to the use of retro technologies.

The research team is inviting individuals over the age of 18 to engage with a scenario in which you use a film camera to take a photograph.

We are seeking any individual regardless of their history or experience with film cameras – i.e., you do not need to have any experience or knowledge of film cameras to participate. Your perspective will help us to understand what makes these experiences unique.

What does participation involve?

Participation will involve completing a 12-item anonymous survey with Likert scale answers (e.g., strongly agree – strongly disagree) and short-response questions, which is expected to take less than 10 minutes of your time. To participate you must be at least 18 years old.

Questions will include:
  Rating the degree to which you agree or disagree with statements including:
  • Whether you have felt interested, alert, active etc.

- Whether an exercise turned out the way you expected

Your participation in this research project is entirely voluntary. If you do agree to participate you can withdraw from the research project without comment or penalty. However, as the survey is anonymous, once it has been submitted it will not be possible to withdraw. Partially completed surveys will not be included in the data analysis.

To receive compensation for this survey you must correctly follow all instructions and progress to the end of the survey where you will be provided with a unique validation code to input in the Mechanical Turk window before submitting the task.

What are the possible benefits for me if I take part?
It is expected that this research project will not benefit you directly. Benefits will be realized by future researchers seeking to look deeper into this phenomenon. Further, contributions to domains such as strategy, marketing and entrepreneurship could result in indirect benefits to consumers due to knowledge gains leading to better/more suitable product offerings in this domain. You can request a brief summary of the outcomes of the study by providing an email address to the principal researcher (Jack Adams). This will be available in September of 2022.

What are the possible risks for me if I take part?
There are minimal risks associated with your participation in this research project. These include the potential for emotional discomfort or distress.

What about privacy and confidentiality?
All comments and responses are anonymous i.e. it will not be possible to identify you at any stage of the research, because personal identifying information is not sought in any of the responses and no traceable information is collected via the server or survey tool.

Any data collected as part of this research project will be stored securely as per QUT's Management of Research Data Policy. Data will be stored for a minimum of 5 years.

Please note that non-identifiable data from this research project may be used as comparative data in future projects or stored in an open access database for secondary analysis.

How do I give my consent to participate?
Submitting the completed online survey is accepted as an indication of your consent to participate in this research project.

What if I have questions about the research project?
If you have any questions or require further information, please contact one of the listed researchers:

Principal Researcher: Jack Adams

Supervisors: Dr. Ozgur Dedehayir

                                Prof. Peter O'Connor

If you would like to request feedback on the results of this study, this will be available from July 2023. You may request feedback by emailing the request to the principal researcher, Jack Adams, at j29.adams@qut.edu.au.

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Thank you for helping with this research project. Please keep this sheet for your information.

Appendix 2B: Image of camera utilised in the scenario

Appendix 2C: Image output in the high-quality image scenario

Appendix 2D: Image output in the low-quality scenario