The Metaverse and User Wellbeing: A Psychological perspective

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The Metaverse and User Wellbeing: A Psychological perspective

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ABSTRACT

Purpose: The aim of this study was to explore the influence of extended reality technologies and the Metaverse in user psychology, using Pancheva et al. (2021) theory of wellbeing. Alongside the increased implementation of these technologies, the current downfall in global mental health means such research is imperative. As such, the objectives of this study include a critical review of extant literature, the exploration of stakeholder opinions, and the extension of wellbeing theory within the context of XR and the Metaverse.

Methodology: To uncover the underlying mechanisms that affect user wellbeing, a critical realist paradigm was adhered to that involved the exploration of wellbeing and Metaverse literature. Followed by qualitative analysis of ten in-depth semi-structured interviews with key stakeholders (Healthcare professionals, Academics, Developers, and Users).

Adhering to a critical realist thematic analysis, interviews were analysed with the objective of identifying effects on wellbeing and their respective causal underlying mechanisms. By identifying themes, the researcher was able to enhance knowledge about the Metaverse's effect on user wellbeing, including how best to achieve positive wellbeing during technology use. This concluded in a context-specific framework, followed by future research agendas that incorporate notions of positive psychology.

Findings: Analysis revealed that the Metaverse influences all constructs within hedonic and eudaimonic wellbeing, excluding *purpose in life*. However, also revealed were nuanced effects associated with the unique technological features of the Metaverse and the individual differences of users. To demonstrate these effects, findings are articulated in thematic relationships that illustrate underlying mechanisms and their associated effects.

Contribution: The current study expands knowledge of an otherwise limited research domain and sets the groundwork for future research and policy regarding the long-term wellbeing effects of Metaverse and XR technology use.

Keywords: Metaverse, XR, Wellbeing, Positive psychology, Eudaimonic wellbeing, Hedonic wellbeing

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Chapter 1 Introduction

1.1 Opening paragraph

In response to the expansion and fast development of what is now being termed the Metaverse, this research takes it upon itself to explore how the Metaverse and its associated technologies interact with user wellbeing. Adopting a human-computer interaction perspective, it invites a user-centred discussion that unveils the potential effect of the Metaverse on user wellbeing. Already known is the positive and negative effects of more traditional technologies and social medias on users' behaviour as well as their psychological and physical wellbeing. But currently there is limited understanding of how similar effects will manifest in the Metaverse era. As such, the current research takes a qualitative approach that will uncover the underlying mechanisms causing empirical effects reported within stakeholder interviews. Below presents information regarding background knowledge and societal implications regarding technology use.

1.2 Background

The initial conceptualisation of the Metaverse is often associated with Neal Stephenson's 1992 novel *Snow Crash.* In keeping with science fiction, the Metaverse is described as a 3D virtual space where avatars and agents come together in a life-like virtual replica of the real world (Smart et al., 2007; Floridi, 2022). Within this, the Metaverse becomes a place that expands on existing reality and therefore is reflective of its compound words *Meta,* meaning transcendence and virtuality, and *Universe* (Kye et al., 2021).

The actualisation of the Metaverse has since found its place in society among an array of contexts; resulting in a myriad of conceptualisations that reflect the context in which it has been implemented. Additionally, many authors (i.e. Smart et al., 2007; Flavian et al., 2019; Rauschnabel et al., 2022; Cho et al., 2023) have attempted to define the Metaverse and in

doing so have provided nuanced proposals of what they believe the Metaverse involves. Subsequently, these have led to public confusion of what the Metaverse is and what it involves. Despite this, the general essence of such technology remains the same. This being that the Metaverse is a post-reality, multi-user digital world that employs extended reality (XR) technology to merge physical and virtual realities (Mystakidis, 2022). Although not limited to XR use, these technologies include Virtual reality (VR), Augmented reality (AR), and Mixed reality (MR) (Cho et al., 2023).

Virtual forms of reality can be traced back to Milgram and Kishino (1994) in their Reality-virtuality Continuum. Within which they spoke of virtual 2D environments where users can simultaneously interact with one another and their surroundings. On this continuum, they differentiated between technologies. Firstly, they defined MR as environments constructed from both virtual and physical objects (Milgram and Kishino, 1994; Skarbez et al., 2021). While they described environments that are mostly virtualised but still incorporate elements of real objects as Augmented Virtuality (AV) (Milgram and Kishino, 1994; Skarbez et al., 2021). Finally, later followed were discussions of AR, in contrast with AV, this entails the augmentation of the physical world through an interlay of virtual contents (Milgram et al., 1994; Skarbez, et al., 2021). Although both papers have seminal importance, they are not without their limitations. Firstly, Skarbez et al. (2021) argue that Milgram et al. (1994) reduced technology to visual displays that relied on virtual hardware. Thereby ignoring the overall experience of its users and how senses, other than visual, have a role in this (Skarbez et al., 2021). Additionally, Rauschnabel et al. (2022) criticised the Reality-Virtuality continuum, stating that it fails to adapt to emerging terms such as XR and VR, and that due to a limited technical criterion, it is difficult to distinguish between technologies. This becomes more of an issue given the complexities associated with the conceptualisation of the Metaverse and the public's current confusion surrounding its actuality. Meaning efforts that work towards a standardised, easy to digest definition are needed.

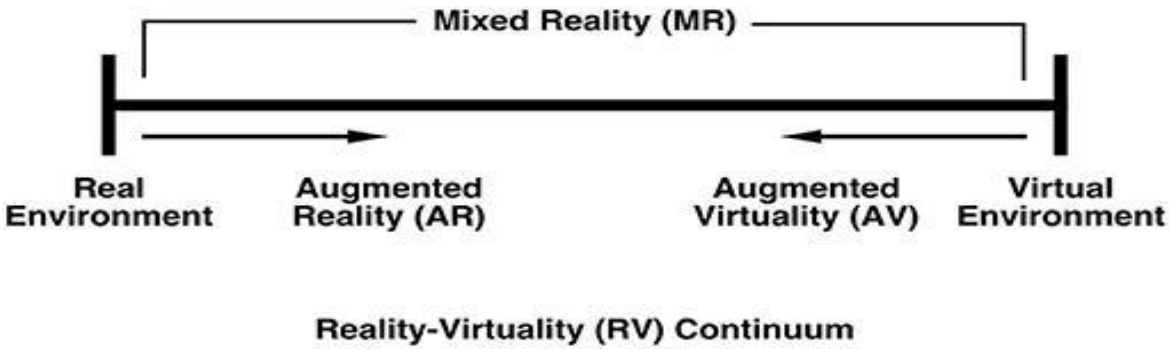
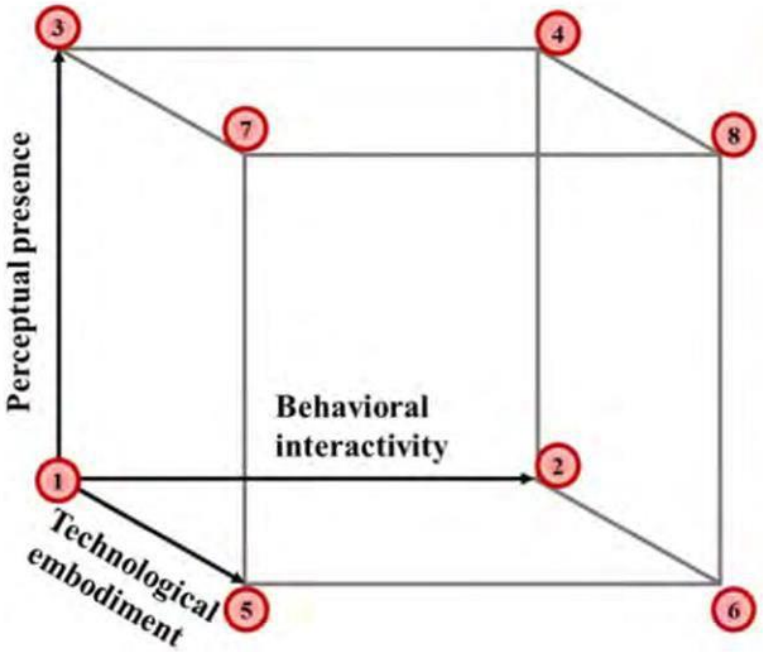


Figure 1.1. The Reality-Virtuality Continuum (Milgram and Kishino, 1994)

As the domain has progressed, VR was introduced and defined as an interactive artificial, virtually immersive environment where users can navigate a 3D computer-generated space with added levels of immersion and a sense of presence (Flavian et al., 2019; Rauschnabel et al., 2022). And although less extensively discussed due to its novelty within the domain (Cipresso et al., 2018), AR is thought of as a hybrid experience that uses overlays of virtual content into a physical environment (Raushcnabel et al., 2022). Both technologies are similar in the way they provide interactive immersive experiences.

Although a seminal starting point, it is apparent that the definitions made by Milrgam et al. (1994) and Milgram and Kishino (1994) are antiquated. With the aim of rectifying the lack of consistency that followed, Flavian et al. (2019) developed the EPI cube, with the hopes of facilitating the classification of reality-virtuality technologies. Classification involves judging technologies by the level of embodiment, perceptual presence, and behavioural interactivity that they conjure (Flavian et al., 2019). From this, we can decipher how VR, AR, and MR affect presence, interactivity, and behaviour.



Vertex	Radical examples of technologies
1	Computer Web 1.0.
2	Website online simulators
3	Video Wall
4	Virtual Worlds (Second Life)
5	Augmented reality glasses
6	Mixed reality glasses (Holographic devices)
7	360-degree video HMD (fixed position)
8	Virtual reality HMD with haptic devices

Figure 1.2 The EPI cube (Flavian et al., 2019)

So how do these technologies relate to the Metaverse?

As stated, the origins of the Metaverse can be identified in Neal Stephenson's snow crash. Smart et al. (2007) developed on this and have since termed the Metaverse as a unification of A) a virtually enhanced version of reality and B) a continuous virtual space that can be accessed physically. This includes the presence of physical objects, actors, and interfaces, all converged within a virtual world (Smart et al., 2007). Virtual worlds being computer-generated virtual environments in which users continually interact in real-time (Flavian et al., 2019). The Metaverse roadmap (Smart et al., 2007) places the Metaverse on two axis – the technologies present, and the applications in which they provision. From this Smart et al. (2007) propose four scenarios, each determined by the primary technology employed i.e., AR, Lifelogging, Mirror worlds or Virtual worlds. The first scenario, *Augmentation,* refers to technologies that enhance the real world, whether using new control systems or information that are overlayed onto the real (Smart et al., 2007). *Simulation,* however, involve technologies that present entirely new environments, or simulations, of interactive worlds (Smart et al., 2007). Following this, it then becomes a question of *Intimate* and *External.* The former incorporates technologies that focus on the identity and behaviours

of its users, and that promote agency through avatars and digital profiles. The latter refers to technology that provides users with information regarding the real world through digital tracking.

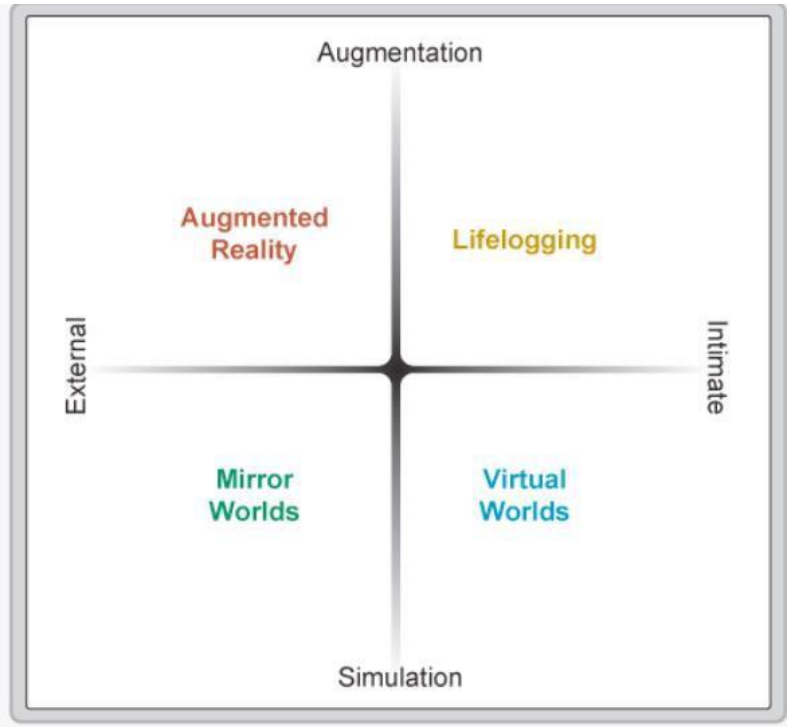


Figure 1.3. The Metaverse Roadmap (Smart et al., 2007)

All scenarios are enabled by new and emerging technologies inclusive of XR, the use of which provision multi-sensory, interactive environments that allow online communities space for social interaction (Mystakidis, 2022; Cho et al., 2023). Therefore, this paper argues that XR is a representation of all that the Metaverse entails.

Such integration of emerging technologies has catalysed changes seen in user behaviour and experience (Flavian et al., 2019; Montagud et al., 2020). More specifically, traditional passive technology engagement has now transformed into rich and immersive experiences that forefronts user autonomy (Flavian et al., 2019; Montagud et al., 2020). One example of a Metaverse is Mark Zuckerberg's *Meta,* where Metaverse technologies are used to facilitate connections between people, communities, and businesses (Meta, 2021). Additionally, Metaverses are streamlined in virtual worlds that foster socialisation, such as Roblox, Secondlife and Minecraft applications (Flavian et al., 2019).

The exponential uptake of the Metaverse and XR technologies can be attributed to COVID-19 lockdowns. This occurred as people required new ways to interact with family and friends, whilst adhering to the strict rules of isolation (Petringa and Musumeci, 2022). Additionally, during this time, industries demanded innovative methods of service and product provision that were accessible online. The expansion of use is also related to the ever growing digitally native generation (Petringa and Musumeci, 2022). Subsequently there is an expectation that by the year 2026, 25% of the world's population will spend a minimum of one hour per day on the Metaverse (Henz, 2022). The use of which will challenge traditional *modus operandi* of an array of sectors including education, tourism, and health and social care (Ud Din and Almogren, 2023). As exciting as these developments in technology are, there are still uncertainties when considering how they will emerge within contexts (Smart et al., 2007) and how this will affect users. However, due to the novelty of the Metaverse, academics are yet to predict the long-term user effects, especially those relating to wellbeing (Jung et al., 2023). Coupled with the increasing prevalence of XR technology and the Metaverse, it is essential to identify and understand these effects on user psychological and mental wellbeing (Ud Din and Alomogren, 2023).

The uprise in 'positive technology' is the perfect indicator of how technology interacts to influence a user's experience and perceived functioning (Gaggioli et al., 2019). Positive technology is an amalgamated outcome of the increased interest in positive psychology and the pedagogical development of Human-computer interaction. As such it is considered the scientific study of individual happiness and wellbeing, that aims to uncover necessary conditions that bring about positivity (Gaggioli et al., 2019). Targeting wellbeing with purpose-designed technology has already proved useful in improving the overall wellbeing of dementia patients by promoting self-actualisation (Talbot and Briggs, 2022). This is just one example of how positive technology can be used to understand the benefits of technology use. However, the opposite can also be true for the negative use of technology, especially when considering mental health and addiction (Hoehe, 2020). The potentiality of adverse effects increases for younger generations (Dienlin and Johannes, 2020), which is concerning due to the increasing numbers of digitally native generations. How these effects manifest is assumably down to the individual themselves and their

experiences (Hoehe, 2020), still, it is unclear what drives differences. Moreso, considerably less is understood and established in the context of emerging XR technologies and the Metaverse. There are however presumptions that the Metaverse will have great social effects, but that these will be challenged by the potential *darkside of the Metaverse* (Dwivedi et al., 2023). Therefore, to combat such a likelihood and ensure that notions of positive technology extend to Metaverse technology, it is essential to promote investigation of user wellbeing (Dwivedi et al., 2023).

Issues arise when deciding what is meant by wellbeing. Over the years, there have been many attempts to understand and pinpoint how best to achieve wellbeing. For instance, utilitarianism theories suggest that engaging in moral actions will inevitably foster happiness and wellbeing for the collective (Guha and Carson, 2014; Savulescu et al., 2020). More traditionally wellbeing and happiness can be traced back to hedonic (positive emotions over negative ones) (Diener, 1984; Sun et al., 2023) and eudaimonic (reaching one's full potential) (Ryan and Deci, 2001; Lima and Mariano, 2022) philosophies. There also exists desire theories that suggest it is the gratification of desires and preferences that benefits one's wellbeing (Mariqueo-Russell, 2023). This being similar to the effects of meeting one's psychological needs as seen in Maslow's Hierarchy of Needs (Maslow, 1943). This should serve as a precis of wellbeing theories to illustrate the extensiveness of the domain.

To complicate matters more, wellbeing has been further compartmentalised into different contexts. This includes social (Salehi et al., 2017), emotional (Langeland, 2022), physical (Mahindru et al., 2023), cognitive (Luhman et al., 2021), and spiritual (Ryff, 2021) wellbeing. Further division has subsequently led to notions such as workplace wellbeing (Litchfield, 2020). Although these dissections are vital in understanding context-specific wellbeing, they take a reductionist view in comparison to a theory that holistically explores wellbeing. Given the flexibility of technology use, this being technology can be used in an array of contexts, we must evaluate how the Metaverse can affect overall wellbeing. Therefore, to establish the effect of the Metaverse on user wellbeing, we must primarily identify a theory of wellbeing that incorporates the whole person.

1.3 Problem statement:

As a society we have already acknowledged and understood that online experiences can impact a person's daily life (Kozinets, 2015). However, the emergence of new technologies brings with it new concerns regarding people's wellbeing (Dienlin and Johannes, 2020). This becomes an issue for Metaverse users as little is known about the daily impact technology will have (Dwivedi et al., 2022).

Moreover, the need to investigate concepts of wellbeing for the sake of promoting positive health and psychology has previously been argued in the context of flourishing – the experience of life going well (Huppert and So, 2013; Sharma-Brymer and Brymer, 2019). Arguing that by understanding the characteristics and causes of flourishing and investigating the populations which experience elevated levels of flourishing; research can provide the essential groundwork necessary for positive health policy (Huppert and So, 2013). Extending this to the current study, it is therefore important to explore how the Metaverse can exacerbate human wellbeing, regarding the characteristics depicted by Pancheva et al. (2020). In this way, we can promote Metaverse use in a manner that aligns with positive technology whilst also setting the groundwork for future policy.

On a broader note, the necessity to recognise the role of wellbeing is imperative in counteracting changes in demographics and subsequent increases in mental health conditions. Globally, the prevalence of mental health conditions and substance use disorders have increased by 13% in the last decade alone (WHO, 2023). Effects have been felt in all generations across the globe, with 20% of adults suffering from a mental health condition (WHO, 2023). Moreover, suicide has become the second leading cause of death for ages of 15-29 (WHO, 2023). This becomes even more concerning when remembering that adverse effects of technology are more likely to occur in younger generations (Dienlin and Johannes, 2020). This data highlights the devastating effect poor mental health is having on the world's population and the urgent need to respond. Despite there being effective treatment delivered at relatively low costs, there still lies a gap between those who require care and those with access (WHO, 2023). Accordingly, the WHO continues to collaborate with Member States and partners to improve individual and collective mental health. Alongside the prevention of mental health conditions and attempts to increase

access to care, this includes efforts that promote the mental wellbeing of people (WHO, 2023). Highlighting the causality and significance of wellbeing in determining and facilitating positive mental health, which is pertinent in achieving global development goals beneficial for individuals and society (Huppert and So, 2013; WHO, 2023).

1.4 Research Aim and Objectives

Based on the discussion above, this study has the following aim and objectives:

Aim

To explore the influence of XR and the Metaverse in user psychology using the theory of wellbeing.

Objectives

- To critically review the research areas including XR, the Metaverse, the theory of wellbeing and user psychology.
- To explore stakeholder opinions to identify constructs of the theory of wellbeing in relation to user psychology.
- To propose the extended theory of wellbeing in the context of XR and the Metaverse.

1.5 Structure of thesis

The remainder of this research project is categorised by chapters. Firstly, in fulfilling the first research objective, a review of literature takes place. In providing an overview of related research, the researcher can identify gaps in literature. Gaps in literature will then be used to support the justification of the current project and determine where it will fit within the research domain. Following this, a detailed breakdown of the research design is provided. Including justification for the chosen methodology and research paradigm. As well as transparency, this chapter will delve into the nuances of this research and how this affects impact and originality of its contributions.

The final chapters will present analysis, succeeded by a discussion of findings in relation to previous research and theory. The project will be summarised with proposed research agendas and conclusive remarks.

1.6 Summary

To summarise, by assessing XR technology within the context of the Metaverse we can begin to establish the Metaverse's role in user psychology, specifically wellbeing. As already noted in research surrounding more traditional technologies, we know that frequent use of technology in general can instigate both positive and negative effects on user psychology. This is motivation enough to promote comprehension of effects when considering the increasingly frequent and ubiquitous use of the Metaverse. Subsequent knowledge can be advantageous in counteracting the potential adverse side of Metaverse use. Whilst additionally promoting positive mental health through modern technologies.

Chapter 2 – Literature review

The purpose of this chapter is to pinpoint to readers where this thesis will fit alongside current literature, and evidence its interdisciplinary nature. To begin with, this section explores and evaluates literature enabling the researcher to define wellbeing and illustrate its constructs (Booth et al., 2022; Kraus et al., 2022). Secondly, a review of XR and Metaverse literature in relation to psychology was conducted to scope the current state of the domain and to identify gaps in research (Booth et al., 2022; Kraus et al., 2022). The review of wellbeing literature occurred in a non-systematic way, thereby relying on the researcher's own expertise and background founded in psychology and wellbeing theory (Kraus et al., 2022). The point of which is to challenge assumptions of wellbeing and build on previous theory and research (Kraus et al., 2022).

The scoping review of Metaverse literature from a psychological perspective followed a systematic approach that utilised the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) (BMJ, 2021) methodology. This intended to enhance the researcher's own understanding of such a novel domain thus ensuring accurate synthesis of literature and proposed research agendas (Kraus et al., 2022). To begin, searches occurred using Scopus and Web of Science during January 2023. These databases were useful in accessing peer-reviewed documents originating from an array of domains (Loureiro et al., 2021). Search terms were curated using the terms "Metaverse" and "Psych*" to allow for topics relating to both psychology and psychiatry to be explored. Although most exclusion occurred post-hoc, documents must be written in the English language, and book and book chapters were excluded following the guidelines to scoping reviews proposed by Adams et al. (2016). Publishing dates however remained flexible so to investigate when discussions of psych*, in relation to the Metaverse, have occurred. In total 101 documents were extracted into excel, including a mélange of journal articles, review articles, conference proceedings and editorials. Documents were screened for relevance and were subsequently extracted if found to be irrelevant. For instance, where mentions of "Metaverse" were used to discuss the "Universe" and not the technology, papers were discarded. An overview of included documents can be found int APPX 1 and are discussed in more detail in the following review. To facilitate understanding of potential outcomes,

the review additionally incorporates literature that discusses the effects of traditional technologies and social media. The literature review process is detailed more thoroughly within sections 2.2 and 3.3 and provides further information regarding post-hoc exclusion. As with a traditional scoping review, papers were synthesised into an overview of methodology, theory and findings.

2.1 Theory of wellbeing

For too long, the study of mental health focused primarily on the presence of disease without considering the potential of wellbeing (Keyes, 2014). Consequently, wellbeing is often considered an after-thought; something that occurs in the absence of pathology (Huppert and So, 2013; Keyes, 2014). More recently, however, society has begun to recognise wellbeing as an important indicator of mental health and psychology. For instance, the World Health Organisation (WHO, 2022: online) have defined mental health as "a state of well- being in which the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community". This agreed upon definition not only emphasises the acceptance of wellbeing as a construct but also its role in determining mental health. Despite this, it still proves difficult to conceptualise and define what is meant by wellbeing. This adds complexity to the already disorganised and polarising interpretations that spread throughout this research domain (Goodman et al., 2018). To characterise what is meant by wellbeing with regards to the present study, this chapter will discuss its previous conceptualisations.

Past considerations of wellbeing tend to incorporate philosophical conceptions known as *hedonia* and *eudaimonia*. *Hedonism,* also referred to as hedonic wellbeing (HWB), assumes that happiness is attained through experiences that promote pleasure and an avoidance of pain (Diener, 1984; Kahneman et al., 1999). This includes a deeper cognitive process, in which a person evaluates their satisfaction with life (Pancheva et al., 2021). Consequently, it is assumed pleasure equates to a higher level of life satisfaction, and that increases in positive emotions such as joy are indicative of a person's wellbeing (Pancheva et al., 2021). Early research was mostly reflective of this mentality, suggesting *hedonia* is solely responsible for subjective wellbeing (Diener et al., 1999; Adler and Seligman, 2016). However, despite the clear importance of pleasure, it is argued attaining happiness is a

much more complex enigma (Burnett, 2018), one that HWB cannot solely explain. This same thought led academics such as Diener et al. (2010), Seligman (2011) and Hupert and So (2013) to petition for the acknowledgement of eudiamonic wellbeing (EWB).

Unlike hedonic wellbeing, *eudaimonism* (EWB) promotes what it means to be human, in terms of human ability and potential (Ryan and Deci, 2001; Ryff, 2014). Originating from an Aristotelian perspective of the *highest human good*, EWB assumes that the highest of human goods is about becoming your best self (Ryff, 2014). This requires self-acceptance and realisation of one's true nature (*daimon)* in a state of achievement and personal growth. EWB thereby moves beyond subjective reports of emotion found in HWB (Ryan and Deci, 2001; Pancheva et al., 2021). Eudaimonic models of wellbeing aim to measure the extent to which someone is fully functioning (Pancheva et al., 2021). For instance, Ryff's model of psychological wellbeing distils human functioning into *autonomy, self-acceptance, purpose in life, environmental mastery, positive relationships,* and *personal growth* (Ryff and Singer, 2008; Ryff, 2014). Fundamentally, these factors affect how a person can navigate challenges of life and thus are highly associated with mental health (Ryff, 2014; WHO, 2022). Similar constructs have additionally been used by Ryan and Deci (2010). These models aim to overcome previous ignorance of human functioning found in hedonic theories, and subsequently enrich the realm of wellbeing literature (Ryff, 2014).

Despite both HWB and EWB having evidentiary significance, wellbeing literature often investigates the two separately (Huppert and So, 2013; Bruni and Portia, 2016; Pancheva et al., 2021). The separation of the two becomes an issue as it fails to provide a complete overview of high-quality living and how best to obtain it (Pancheva et al., 2021). Another issue of severance is that self- reported happiness (associated with HWB) is liable to cognitive error (Bruni and Porta, 2016). Meaning to gain an accurate, objective understanding of one's wellbeing, we must consider eudaimonic measures (Huppert and So, 2013). In recognition of this, the notion of wellbeing has transcended a positive affective state to incorporate the idea of prospering throughout different life domains (Diener et al., 2003; Adler and Seligman, 2016). Therefore, contemporary definitions of wellbeing combine constructs that stem from both HWB and EWB (Adler and Seligman, 2016).

Acknowledgement of this has led to theoretical recognition of both. For instance, Keyes

(2002) determines a person as either *flourishing, languishing,* or experiencing what they refer to as *moderate mental health*. This is measured using an array of hedonic and eudaimonic factors that references Ryff's six dimensions discussed above, alongside social wellbeing and life satisfaction (Keyes, 2002). However, Keyes (2002) conceptualisation of mental wellbeing fails to underscore the influence components have on one another or their independent effect on overall scores (Pancheva et al., 2021). Similarly, Seligman (2011) has since introduced The PERMA model of wellbeing, incorporating eudaimonic ideations such as *engagement, relationships, meaning,* and *accomplishment*, whilst also recognising the role of *positive emotion.* Huppert and So's (2016) conceptualisation of flourishing further echo this*.* In which they assume *flourishing* and subsequent elevated levels of mental wellbeing is achieved when one is feeling good and functioning effectively (Huppert and So, 2013). Although only a limited *precis* of wellbeing literature, this illustrates the evolution of the research domain. In that it has moved beyond traditional economic and social scientific stances that assumed life satisfaction and happiness as the sole indicators of wellbeing (Huppert and So, 2013; Ryff, 2014).

Unfortunately, a consistent definition and understanding of wellbeing is yet to be delivered (Ong et al., 2021). In overcoming this and to fortify comprehension of wellbeing, Pancheva et al. (2021) used component planes to qualitatively analyse how wellbeing variables are related to one another. As a result, they found that for many of us the underlying components of hedonic and eudaimonic wellbeing converge to affect overall wellbeing (Pancheva et al., 2021). Meaning at times their constructs can complement or even contradict one another – something previous theories do not consider (Pancheva et al., 2021). Accordingly, Pancheva et al. (2021) propose an integrated view of wellbeing which combines HWB and EWB: *autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, self-acceptance, life satisfaction, positive affect,* and *negative affect*. In their summary, they reveal five clusters of wellbeing. Like previous conceptualisations of HWB and EWB, these components refer to the level that respondents are self-determined (Autonomy); are able to shape and manage their surroundings and meet personal needs (Environmental mastery); develop and utilise their skills and talents (Personal growth); build and maintain positive and trusting social relationships (positive relations with others); find meaning in life (Purpose in life); have an awareness of both their strengths and weakness, whilst maintaining positive self-reflections (self-acceptance);

remain satisfied with their life and surrounding (life satisfaction); feel cheerful, happy and full of life (positive affect); or feel nervous, sad and worthless (negative affect).

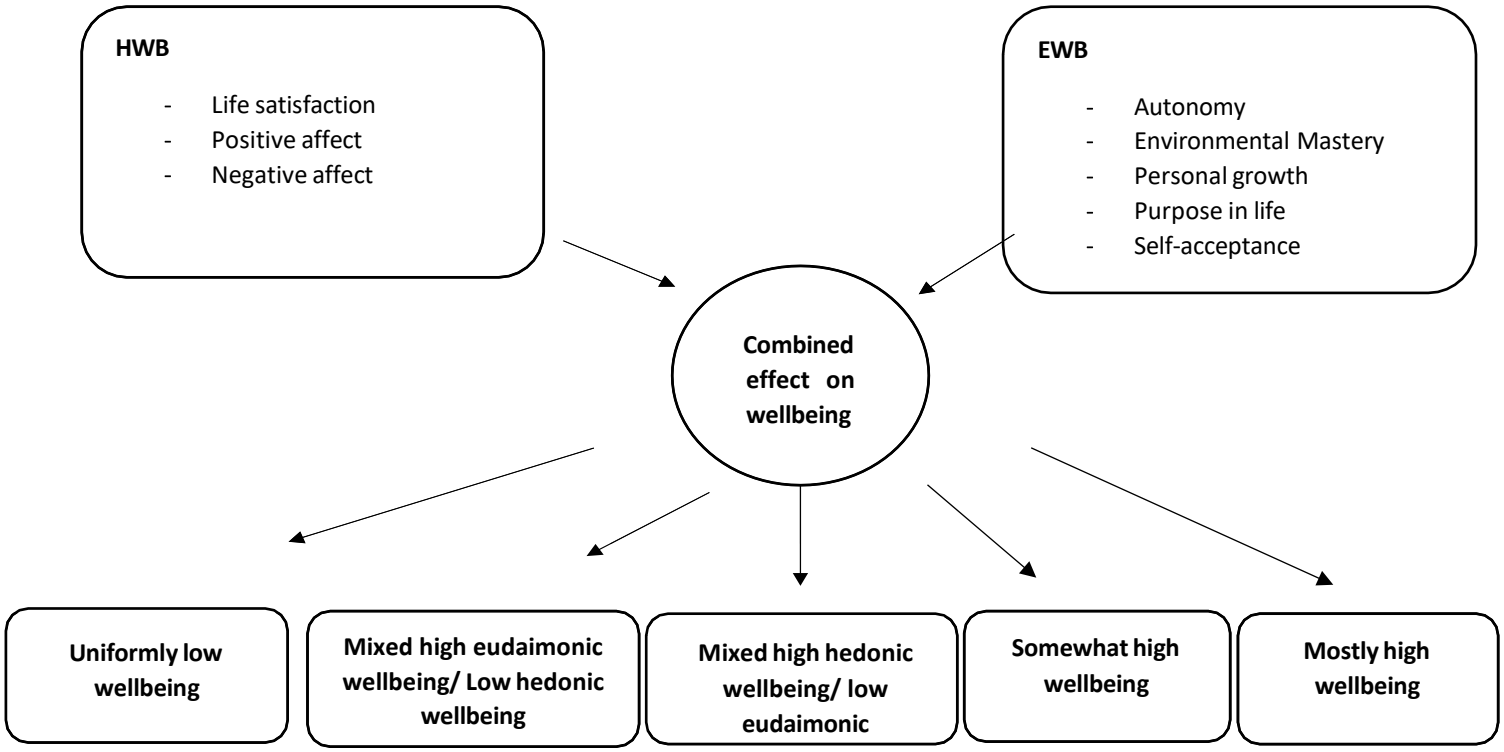
Table 2.1 breaks down these clusters to show how distinct levels of HWB and EWB combine to determine a person's level of wellbeing. Cluster 1, *Uniformly low wellbeing,* is characterised by both low levels of EWB and HWB. Whereas in Cluster 2, *Mixed high EWB/ Low HWB,* ratings remain low for HWB, but begin to increase for all EWB constructs but environmental mastery. In contrast, Cluster 3, *Mixed high HWB/ Low EWB,* sees increases in HWB but not EWB. Both Cluster 4, *Somewhat high wellbeing,* and Cluster 5, *Mostly high wellbeing,* represent those with higher levels in both HWB and EWB. However, in Cluster 5, Autonomy does not measure above the mean sample.

Table 2.1. Pancheva et al. (2021) wellbeing clusters.

Cluster	Title	EWB	HWB
Cluster 1	Uniformly low wellbeing (ULWB)	90-95% of population sample scored below sample mean in purpose in life, environmental mastery, and self-acceptance.	75% of population sample fall below sample mean in all HWB constructs.
Cluster 2	Mixed high EWB/ Low HWB (EWB>HWB)	Average score of all EWB, but environmental mastery, were above mean sample (75% of population sample)	Opposite is said for HWB. All HWB indicators fall below sample mean.
Cluster 3	Mixed high HWB/ low EWB (HWB> EWB)	All 6 EWB indicators fall behind sample means. Mostly regarding Autonomy, Personal growth, and Purpose in life. This was true for 75% of observations.	Average score for all HWB scales were above sample mean. 75% for Life satisfaction and Negative affect. Over 50% for Positive affect.

Cluster 4	Somewhat high wellbeing (SHWB)	For all EWB factors 75% population sample measured above sample mean.	For all HWB factors 75% population sample measured above sample mean.
Cluster 5	Mostly high wellbeing (MHWB)	All EWB factors, but Autonomy, were above sample mean. This was true for 90% of population	All HWB factors were above sample mean. This was true for 90% of population.

This theory of wellbeing, like the rest, push to move away from previous reductions of mental health and instead contribute to the stances made in positive psychology. Moreover, their combination of constructs further evidence that separation of HWB and EWB is insufficient in assessing human wellbeing (Pancheva et al., 2021). Thus, promoting the need for future research to integrate EWB and HWB. Although offering insightful conclusions, their study fails to investigate the influence of health, demographic and economic statuses on integrated wellbeing. Thereby ignoring the causal influence of these factors on wellbeing. Still, they evidence the need for a combination of HWB and EWB, which poses the question, to what extent can the design of newer technologies, such as the Metaverse, also interact with an integrated view of wellbeing?



Note. Source: Adapted from Pancheva et al. (2021)

Figure 2.1. A framework to show the relationship between EWB, HWB, and wellbeing clusters (Pancheva et al., 2021).

2.2 Metaverse and psychology

RQ: What is the prevalence and role of psychological theory in current Metaverse related research?

At first the scope of the review question may be criticised for being too broad, as psychology is a vast discipline. However, it is paramount to acknowledge the nascent disposition of the Metaverse within academic research. Thereby the researcher did not expect to unveil an unmanageable weight of data. As a result, a scoping review was applied following the proposed methodological framework from Arksey and O'Malley (2005). This method was deemed most appropriate as it can capture the current state of psychological discussions taking place within Metaverse research (Booth et al., 2016; Pollock et al., 2021). Thus,

suggesting this method to be the most accurate in answering the current research question positioned above. Searches for literature took place using Scopus and Web of Science (WOS) due to their offer of peer-reviewed journal articles and grey literature (Loureiro et al., 2020; Donthu et al., 2021). Furthermore, the choice was made to include grey literature given the limited availability of peer-reviewed data associated with newly emerging research topics like the Metaverse (Adams et al., 2016).

2.2.1 Findings

Following the PRISMA method to structured literature reviews (SLRs), documents went through a series of screenings to judge their relevance in answering the RQ. A detailed description of this process is discussed further in the Methodology chapter (Chapter 3), including the application of an inclusion/ exclusion criteria. Subsequently a collection of 28 journal articles and 5 conference proceedings published between 2016 and 2023 were included in the current review. The majority of these (n=25) were published during 2022 suggesting the Metaverse to be a topical research domain; consistent with the growing interest following Mark Zuckerberg's announcement of Meta (Cho et al., 2023). The subsequent discussion of data is broken down into methods, contexts (both Metaverse and psychology related), technology, theory, and themes. Doing so illustrates how psychology has previously been applied during investigation of the Metaverse and XR technology.

Methods applied in previous studies.

A brief investigation into the methodology of research revealed a tendency to use quantitative approaches (n=14) and literature reviews (n=10) (Appendix 1). Lesser applied methods included qualitative (n=4) and mixed–methods (n=3) approaches. Implying a need for researchers to adopt these lesser explored methods to ensure a comprehensive psychological perspective of the Metaverse is obtained. Out of the two remaining papers, De Graaf (2016) discussed the findings of a previous study of theirs, whilst Han and Oh (2021) focused on stage-based planning of a Metaverse space suitable for older generations. Thus, neither of these studies fit into the traditional methodologies we often see in academic research.

Metaverse contexts and applications

Table 2.2 A list of Metaverse contexts used in research.

Metaverse context	No. of citations.	References
Healthcare and Psychiatry	9	Cerasa et al., 2022; Yin et al., 2022; Calabro et al., 2022; Usmani et al., 2022; Liu et al,, 2021; Eckhoff et al., 2022; Han and Oh, 2023; Dwivedi et al., 2022; Plechata et al., 2022;
Education	7	Arpaci and Bahari, 2023; Bale et al., 2022; Dwivedi et al., 2021; Zhang et al., 2022b; Guo and Gao, 2022; Ren et al., 2022; Yang and Kang., 2022
Marketing	5	Tsai, 2022; Chen and Yao., 2021; Petit et al., 2022; Branca et al., 2022; Bale et al., 2022
VR gaming	3	De Graaf, 2016; Bojic, 2022; Dwivedi et al., 2022
Tourism and virtual escapes	3	Danny-Han et al., 2022; Bale et al., 2022; Dwivedi et al., 2022
Not specified	3	Scattolin et al., 2022; Kriklenko et al., 2022; Puspitasari and Lee, 2022
Virtual environments	2	Han et al., 2023; Mandolfo et al., 2022
Ecommerce	2	Bale et al., 2022; Dwivedi et al., 2022;
Social applications	2	Bojic, 2022; Zhang et al., 2022a
Health, Beauty, and cosmetics	2	Lee and Kwon, 2022; Dwivedi et al., 2022
Sports	1	Huang et al., 2022
Esport	1	Cai et al., 2023
Financial services	1	Dwivedi et al., 2022
Avatar Orchestra Metaverse	1	Martin, 2017
Digital humans	1	Loveys et al., 2022

Manufacturing, Operations and Supply chain	1	Dwivedi et al., 2022
Retail	1	Dwivedi et al., 2022
Trading	1	Bale et al., 2022
Conferencing	1	Bale et al., 2022

The most common of contexts noted were reflective of the decision to include psychiatry within the search string. As such, it is apparent that the Metaverse has potential in healthcare and psychiatry; indicative of its ability to influence health and wellness (Tang et al., 2019). Discussions of the Metaverse in Education also occurred. Arguing for its ability to provide educational sustainability through the gratification of student and educator psychological needs, resulting in improved learning efficiency of students (Guo and Gao, 2022; Apraci and Bahari, 2023). From a marketing perspective, the Metaverse has been investigated alongside consumer behaviour (Chen and Yao, 2021; Tsai, 2022). Table 2.2 presents an array of contexts, useful in identifying what and what has yet to be explored. Surprisingly, VR gaming was lesser explored despite the Metaverse's origin within gaming (Cho et al., 2023).

Metaverse related technology

Noting the technological foundations of the Metaverse, as it was defined within psychological research, highlighted an incoherent conceptualisation of the Metaverse within the domain. Overall, a staggering 47 technologies and applications were mentioned over 33 documents. Consequently, it becomes difficult to establish what technological design aspects of the Metaverse interact with user psychology.

Out of those mentioned, VR recurrently appeared throughout literature (n= 27) showing that most academics consider VR as a standard component of the Metaverse. Following this, augmented reality was mentioned a total 14 times. While remaining a significant application of the Metaverse, its difference in popularity compared to VR may be due to AR's more recent development and application within research (Cipresso et al. 2018). Also emerging often throughout the literature was the use of 3D applications (n=8) and artificial

intelligence technology (n=8). Subsequently followed by Secondlife (n=7) – perhaps emulating from the Metaverse's ties to online gaming and virtual worlds as discussed in the introduction. Blockchain (n=6), Digital avatars (n=5) and Digital twins (n=5) were also noted.

Psychological approaches

During synthesis, a combination of semantic and latent analysis techniques was used to determine psychological approaches. These were informed by mentions of psychological constructs alongside the researcher's own academic background in psychology. Interestingly, five papers forsook the use of a psychological approach.

Out of those that did, the most common approach taken was that of a social psychological nature (n= 5). Where the Metaverse's ability to provide social spaces, enhance involvement (Martin, 2017), combat loneliness (De Graaf, 2016), transform social interactions (Han et al., 2023), and influence social behaviours (Loveys et al., 2022) have all been explored. Controversially, Bojic (2022) warned of disruptions to social powers, within a Metaverse, and how this will inevitably harm user wellbeing. Previously in discussions of older technologies, Clark et al. (2017) have suggested that consequential outcomes are the result of a mismatch between online behaviours and behaviours that meet the needs of acceptance and belonging. This bi-directional relationship has previously been discussed regarding forms of social media (Song et al., 2014). Here it is theorised that users already vulnerable to loneliness are more likely to engage in mediated forms of social communication (Morahan-Martin and Schumacher, 2003). This idea that individual differences have a role in outcome, is summarised in the Interpersonal- connection-behaviours framework (Clark et al., 2017). Which highlights how the mediating role of individual differences, such as self-esteem and social anxiety, can affect social technology use.

Cognitive psychology approaches (the study of thought and behaviour) also appeared to play a key role in human-computer interaction. For instance, Cai et al. (2023) trialed the Metaverse with the aim of supporting eSport performance. In doing so, they targeted the mental health of users, as a mediating variable, and found that technology affected their participant's cognitive and behavioural psychology. The cognitive perspective has been used mostly within a health and psychiatric context, especially when reviewing the

potential of a health Metaverse, or *MedVerse*, as it has often been termed (e.g., Han and Oh, 2021; Ceresa et al., 2022; Calabro et al., 2022). Behavioural psychology was employed once more by Scattolin et al. (2022) who investigated social behaviours in a technological context.

Furthermore, the ability of the Metaverse and XR to satisfy the psychological needs of its users was evident. As previously hinted, the psychological needs of students can be gratified by technology and facilitating educational sustainability (Arpaci and Bahari, 2023). This is also the case in palliative care settings, where VR and AR technologies can gratify the needs of patients and in turn promote their mental wellbeing through the maintenance of social relationships (Eckhoff et al., 2022). Referring to the social effects priorly stated, it could be argued that these equally relate to the satisfaction of psychological needs. As historically stated in Maslow's (1943) hierarchy of needs, in which social connection is thought to foster a sense of love and belonging.

The future of mental health within the Metaverse was further explored, specifically Usmani et al. (2022) reviewed the application of VR and AR in psychiatric treatment and how this will translate into a Metaverse context. It is thought that mental health effects will transcend different contexts i.e. whether used for tourism and marketing or educational activities (Bale et al., 2022). Meaning that in these examples it is the use of Metaverse technology, not the context in which it has been applied, that deliberates the psychological effects on its users. This is more apparent when considering the varying contexts discussed across the current literature.

Consistent with the Education context noted earlier, educational psychology was used to explain how the Metaverse improves learning effectiveness and influences students' behavioural intentions (Guo and Gao, 2022; Ren et al., 2022). Additional approaches (Appendix 1) were not consistent throughout the literature further evidencing the discombobulated nature of Metaverse research.

Theory

Like the array of technological components and psychological approaches used in Metaverse related research, a total of 34 theories were identified throughout the literature. Again, demonstrating a dissent between researchers' understanding of how Metaverse use

interplays with user psychology. Moreover, a third of the data went without theory – this may be due to the nascence of the Metaverse as suggested by Cho et al. (2023). Advocating for further research that clarifies the psychological processes which occur during Metaverse use. Considering the varied use of theories, it seems appropriate to assume that the Metaverse, being a multifaceted concept, has a multifarious effect on psychology. Thus, to understand its effects, researchers must take a holistic perspective when considering user psychology and wellbeing (Dwivedi et al., 2022).

Recognising the role of social psychology, it was clear that heightened social experiences within the Metaverse can affect behaviour. When attempting to explain changes in user behaviour, research alluded to the presence of social learning theory, in that avatars are useful in teaching behavioural skills, and the Proteus effect, the effect of digital representation on a person (Ceresa et al., 2022). Suggesting that virtual behaviour is the consequence of perceived expectations of others. Moreover, the mediating role of prior mental health in users was understood through the perspective of social facilitation and the social comparison theory, which was used to understand Metaverse sport performance (Huang et al., 2022) Similarly, Yang and Kang (2022) used the self-efficacy theory to predict outcomes of a nursing simulation programme. Further demonstrative of the influence of prior individual differences in determining the user behaviour. Although not utilising theory, Zhang et al. (2022b) instead listed theories which may be of some value to future research. This included the flow theory, the technology acceptance model, and the cognitive load theory. As previously mentioned, an array of theories has been advocated for due to the specificities of particularised research agendas. However, due to the current limits of this review, it is not possible to discuss them all.

Most prevalent themes

Increased healthcare efficiency: A prominent theme throughout literature is efficiency of treatment and therapy within a healthcare setting, specifically relating to the mental healthcare (e.g. Yin et al., 2022; Calabro et al., 2022; Cai et al., 2023). Debate surrounds the effectiveness of transforming healthcare services into the Metaverse, evidencing its efficient use in comparison to traditional deliveries of interventions (Han and Oh., 2021).

Social connection: Within the data also lied a consensus that the Metaverse enhances a person's perceived social connection (e.g. Ceresa et al., 2022). Social connection was

considered in terms of interaction (e.g. Eckhoff et al., 2022; Arpaci and Bahari, 2023), socialisation (e.g. Bojic, 2022; Zhang et al., 2022a), communication (e.g. Lee and Kwon, 2022; Zhang et al., 2022a) and perceived social support (e.g. Dwivedi et al., 2022). De Graaf (2016) explained this phenomenon by arguing that virtual social institutions counteract perceived social exclusion and loneliness. Despite this, it was also hinted that frequent use of the Metaverse may reduce interpersonal skills, enhance anti-social behaviours, and deplete people of physical human interaction (e.g. Bale et al., 2022). Evidencing the bidirectional interrelation between the Metaverse and a person's social wellbeing.

The Darkside of the Metaverse: Consistent with the adverse side of Metaverse use, the risk of addiction has been discussed (e.g. Puspitasari and Lee., 2022; Han et al., 2022; Petit et al., 2022). It is thought that the ubiquitous nature of the Metaverse risks technology reliance (Puspitasari and Lee., 2022). It also became evident that escapism was thought to be the mediating variable between XR technology and addiction (e.g. Han et al., 2022). And that abuse of virtual realities and subsequent detriments to mental health is influenced by a person's prior disposition (Ceresa et al., 2022; Zhang et al., 2022a). Underscoring the role of the mind as a mediating variable and an affected outcome of the Metaverse.

Presence and Immersion: Additionally, the literature explains that real effects, such as social connection, of the Metaverse are determined by perceived levels of presence and immersion (e.g. Eckhoff et al., 2022; Ceresa et al., 2022; Han et al., 2022). Presence was often compartmentalised into self-presence (e.g. Han et al., 2022; Plechata et al., 2022), social-presence (e.g. De Graaf., 2016; Zhang et al., 2022a), spatial-presence (e.g. Chen and Yao., 2021; Mandolfo et al., 2022), and telepresence (Guo and Gao., 2022; Chen and Yao., 2021). The literature proceeds to associate presence with psychological embodiment and immersion, as well as exemplify its ability to induce real emotion (Tsai, 2022; Han et al., 2022). Evidencing how psychological embodiment issued within the Metaverse (Calabro et al., 2022), interplays with three psychological concepts: social behaviours (Scattolin et al., 2022), holistic presence (Tsai, 2022) and digital identity (Zhang et al., 2022b).

Previous mental health: It is apparent that in relation to psychology, the Metaverse can interact with a person's emotional, psychological, and mental health. But additionally, we have seen how a person's prior mental health mediates the outcomes of Metaverse use (e.g. Cai et al., 2022; Huang et al., 2022; Tsai. 2022). For instance, mental health was found

to mediate the relationship between Metaverse applications and performance (Cai et al., 2023; Huang et al., 2022). Similarly, it seems that holistic presence, and its ability to influence user intention, is only probable if a user experiences holistic happiness (Tsai, 2022). Thus, evidencing that outcomes of the Metaverse rely on the psychology of its user.

Technology: Although the technology that was used to define the Metaverse appeared inconsistent throughout the literature, it is evident that many researchers acknowledge the integration of VR and AR. Despite, some recent opposition to include these technologies under the umbrella term of Extended Realities (XR) (See Rauschnabel et al., 2022). For the sake of this project and in line with previous literature, XR will be used to incorporate VR, AR, and MR. However, it is still important to recognise the nuances of the Metaverse and thus, the paper also recognises virtual worlds such as Secondlife, Roblox and Minecraft.

2.2.2 Conclusion of the scoping review

The two purposes of this scoping review were 1) to report on how the Metaverse has been discussed in relation to psychological research, and 2) highlight where the current review fits into the research domain. With purpose 1 in mind, it appears that most research takes place is within a healthcare and psychiatric context, where cognitive and behavioural theory has been applied to help in recovery and treatment. This is important as it demonstrates that XR technologies can have an affect the psychology of its users. Which could be indicative of the Metaverse's role within a healthcare setting. However, the need to understand how this will affect users' wellbeing remains.

It is presumable that the social aspects of the Metaverse will play an important role in facilitating wellbeing, given what is already known about the gratification of social needs. Referencing Pancheva et al. (2021) theory of wellbeing, we know that forming meaningful relationships works towards positive wellbeing. Meaning one way to assess effect on wellbeing will be to look at the quality and quantity of relationships formed through the Metaverse. However, literature suggests that outcomes such as these will ultimately rely on individual differences specifically related to mental health. Further exploration of this

may be able to explain the dual nature of the Metaverse in it's ability to affect user wellbeing both positively and negatively. Therefore, the current research sees it fit to acknowledge prior vulnerabilities in determining user wellbeing effects.

Moreover, the added levels of immersion and presence granted by newer technologies appears quintessential in allowing for effects on psychology. Specifically with presence, literature explains how this can affect both intrapersonal and interpersonal experiences. Understanding this means it is vital for future research to assess how creating sense of both presence and immersion affects the prevalence and potency of user wellbeing effects. Both literature within the scoping review and that cited in the background section seem to agree that the Metaverse can be broken down into core technologies. This includes VR, AR, and MR and applications that inhabit virtual worlds. The research recognises the use of additional technologies in literature such as artificial intelligence (AI). But with the promise of working towards standardisation, it shall only reference those mentioned previously.

Regarding purpose 2, the scoping review revealed previous research, although a vital starting point, fails to consider positive psychology and the need to respond to the increased mental health crisis. Therefore, opening a gap in research for this project to take place. With the hopes of exploring and promoting discussions of user wellbeing in a Metaverse context, this research takes an interdisciplinary approach that extends a theory of wellbeing and positive psychology into a Metaverse/ XR domain. Thereby, alongside previous psychological investigations of Metaverse and XR use, findings from this research works towards a holistic understanding of user psychology in a Metaverse context. As seen, cognitive, social, and behavioural considerations have already taken place, however, to understand user psychology holistically, research ought to focus on wellbeing. The purpose of Figure 2.2 (see below) is to visually illustrate how psychology has investigated user experience thus far. As we can see, literature that evidences how the Metaverse will affect psychological wellbeing is lacking. This links back to the objectives of the current study that aim to explore stakeholder opinions to identify wellbeing effects within the following chapters. Whilst also proposing an extended theory of wellbeing in the context of XR and the Metaverse.

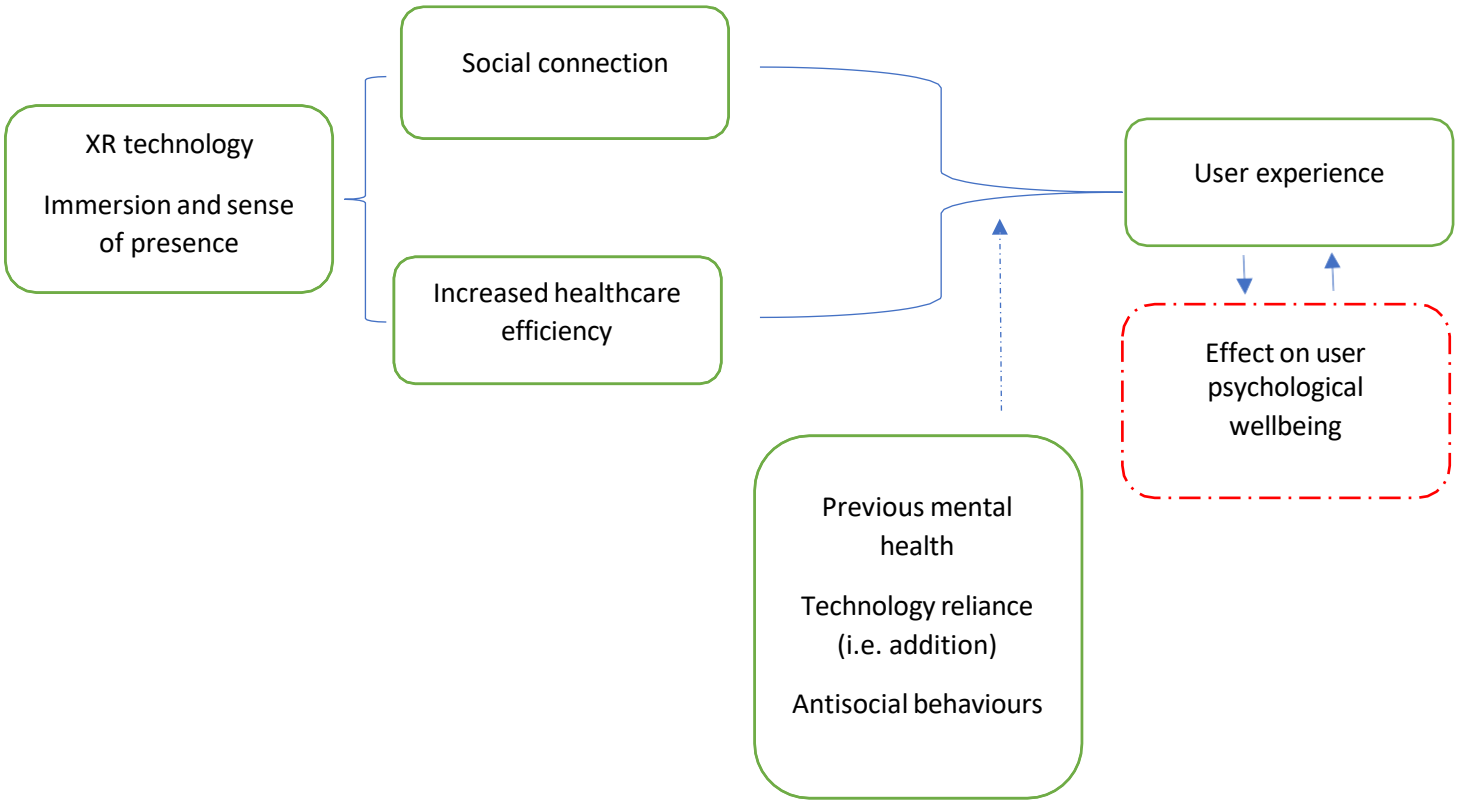


Figure 2.2. A figure to show how literature has previously understood the link between psychology and the Metaverse/ XR.

2.3 Summary

To sum up, the Metaverse, especially research pertaining to it, is still in its infancy. This has been met by a current rush to research the Metaverse and its associated technologies from a psychological perspective. Consequently, conclusions made about the Metaverse's relationship with user psychology are disordered. This challenge necessitates further research that will use what is already known to build a coherent theory that is specific to the Metaverse and its applications. What can be deduced is that Healthcare and psychiatry related research, as well as social psychological research as a context, approach, and theoretical background) permeate through this domain. Demonstrating the Metaverse's ability to interact with psychology in affecting psychological health and gratifying social

needs. Surprisingly, psychological wellbeing and positive psychology were seldom adopted as approaches to metaverse-related research. This is particularly interesting given the pertinence of health and wellness and the current trend within society to foster positive wellbeing (WHO, 2023). Therefore, it presents an opportunity to extend an integrated view of wellbeing (e.g. Pancheva et al., 2021) to gain insight into how the double-edged nature of the Metaverse holistically affects user psychological wellbeing.

Chapter 3 – Research methods

3.1 Overview

An underlying aim of this research is to achieve emancipatory objectives which are focused on achieving a better understanding of the Metaverse and XR from a holistic perspective. This is deemed important as to avoid detrimental societal affects imposed by Metaverse and XR adoption into quotidian life (Henz, 2022; Petringa and Musemeci, 2022). However, as hinted to earlier, the novelty of this domain means limited knowledge and thus, the effect of its adoption is unknown. To correct this and achieve the above aim, the current study assumes an exploratory approach that will uncover a previously neglected phenomenon.

As such, this research takes a qualitative approach so to obtain rich, detailed understanding of human experiences within a Metaverse context. Detailed insights such as these cannot be understood within a quantitative paradigm (Kalu and Bwayla, 2017). This is due to the added level of flexibility involved in qualitative research, versus quantitative research which is known to follow structured and rigid methodology (Cypress, 2017). Therefore, qualitative research seems most appropriate for exploratory research, as this offers a degree of freedom in nascent observations of the Metaverse. It can therefore expand current knowledge of user psychology within a Metaverse context, which can be used to develop preliminary theories that depict user experience (Kalu and Bwalya, 2017). Therefore, the current study is an inductive, qualitative study comprising of a review of literature and 10 semi-structured stakeholder interviews. The study examines stakeholder perspectives in a critical realist paradigm in the hopes of uncovering the causal mechanisms that determine the Metaverse's impact on user wellbeing as defined by Pancheva et al. (2021). Figure 3.1 shows the research process and how literature and paradigm informed methodology.

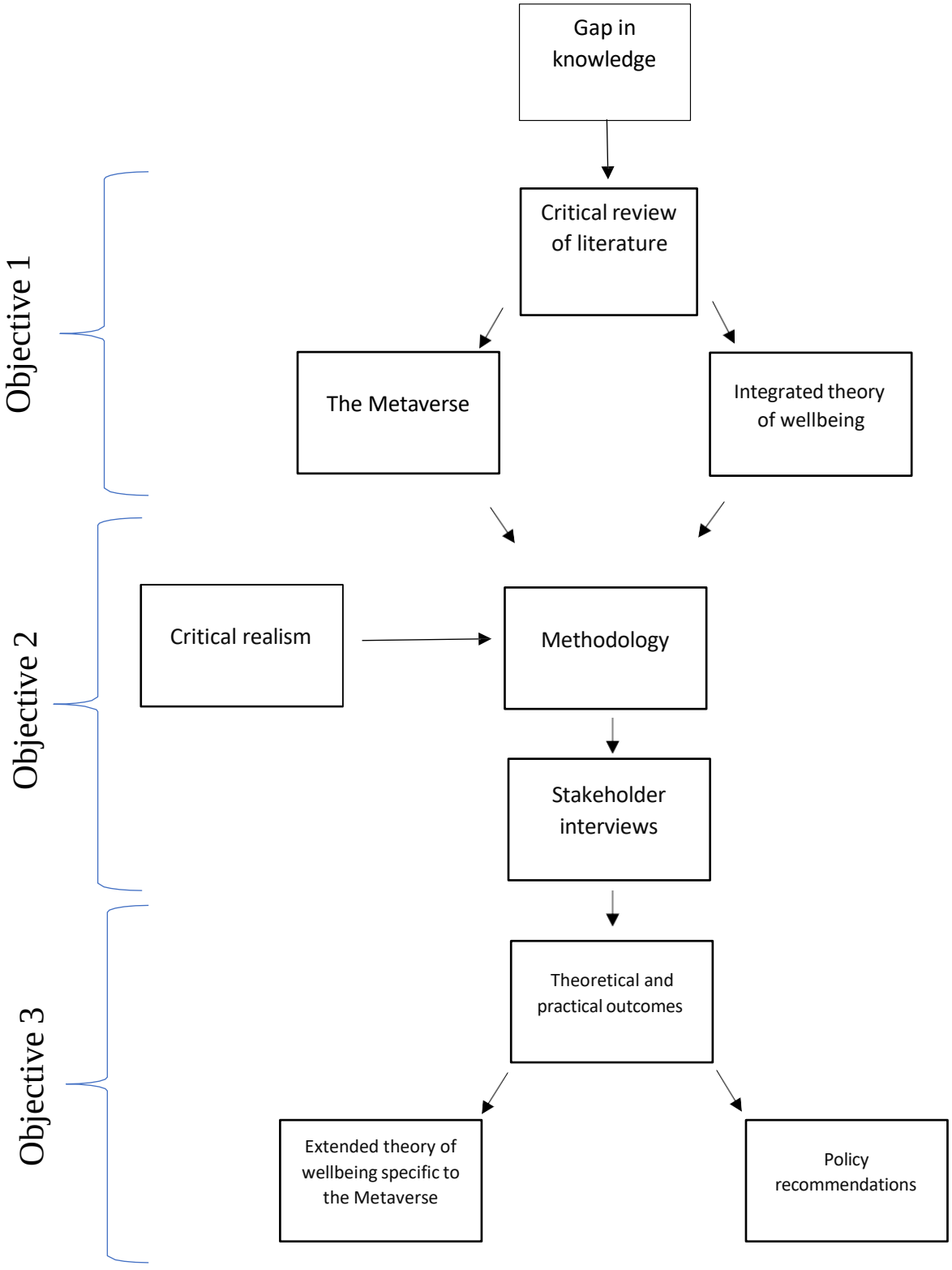


Figure 3.1. *Overview of research process*

3.2 Theoretical lens

In response to the aim and objectives of this study, a critical realist paradigm has been adopted which assumes that there is a real, objective existence of social events which can be understood through causal mechanisms (Fletcher, 2017; Wiltshire and Ronkainen., 2021). By uncovering these mechanisms, critical realism aims to produce theoretical explanations of how the Metaverse affects user wellbeing (Vincent and O'Mahoney, 2018). In answering how and why social events within a Metaverse context occur, we can make policy recommendations that aim to mitigate potential negative effects on consumers. This is in line with Huppert and So (2013) who suggest health promotion and policy should be founded by research. Moreover, through the identification of underlying mechanisms and judgemental rationalism – a key component of critical realism - this research bridges the current gap between academic comprehension and the reality of Metaverse use (Fletcher, 2017; Sturgiss and Clark, 2020). Therefore, addressing the need to further understand an otherwise novel area of research.

Critical Realism

The fundamental premise of critical realism (CR) is that it accepts an intransitive reality but understands that knowledge is discursive and subjective (transitive) (Vincent and O'Mahoney, 2018; Haigh et al., 2019). Thus, by distinguishing between epistemological assumptions (what we know) and ontological inquiry (what is real) realists claim to obtain the most accurate understanding of reality (Vincent and O'Mahoney, 2018; Fryer, 2022). It does this by renewing ontological positions previously embedded within positivistic and constructionist lenses (Vincent and O'Mahoney, 2018). By utilising both objectivism and subjectivism, CR recognises the power of both perspectives and overcomes their dichotomies and inherent epistemological neurosis (Vincent and O'Mahoney, 2018; Albert et al., 2020). By believing reality is independent from experience and observation (Haigh et al., 2019), it does not give inordinate truth to subjectivity. Whilst also acknowledging that empirical patterns of data are insufficient when used to prove or disprove theoretical

understandings of an event (Vincent and O'Mahoney, 2018; Haigh et al., 2019). Therefore, a Metaverse user's unawareness of its effect on wellbeing does not certify that there is no effect. Thus, knowledge is deemed fallible and something that is often mistaken (Haigh et al., 2019).

Entities and powers

As discussed, critical realism intends to understand an event by establishing the explanatory power of interacting entities that bring about a greater whole (Vincent and O'Mahoney, 2018). Entities are things that exist independently, material or immaterial, real or theoretical, and that cause a real effect (Vincent and O'Mahoney, 2018). The Metaverse, for instance, is an emergent entity which has recently come into fruition (Dwivedi et al., 2022). Multiple entities exist within the same reality and interact on differing levels, the relationship between them is referred to as an *emergence* (Vincent and O'Mahoney, 2018).

According to critical realism, entities consist of causal powers inherent to its properties (Vincent and O'Mahoney, 2018). Referring to literature, a property of the Metaverse could be its ability to increase perceived presence which may have causal properties that exacerbate emotion induction (this is just a theory) (e.g. Han and Oh, 2021). The actualisation of powers however may depend on countervailing powers provided by additional entities and *emergence* is dependent on the nominal essence of an entity. These relate back to specific properties intrinsic to an entity that are perpetuated by causal powers (Vincent and O'Mahoney, 2018).

"Change often occurs when the powers of one entity interact with another" (Vincent and O'Mahoney, 2018:4)

With this perspective it is therefore conceivable that the introduction of an emergent entity, such as the Metaverse, can interact with entities of hedonism and eudaimonism to perpetuate a new *emergence* that affects user wellbeing. Therefore, using critical realism, the current study intends to investigate the nominal essences (manifestation of properties)

and causal powers of the Metaverse, HWB and EWB, and how these entities relate to uncovering the Metaverse's effect on user wellbeing.

Stratified Ontology

CR accepts that whilst observable events occur, the underlying mechanisms which perpetuate them often unobservable (Vincent and O'Mahoney, 2018). This contrives a stratified ontology, or reality, made up of the *empirical*, the *actual* and the *real* (Fletcher, 2017; Vincent and O'Mahoney, 2018). All of which interconnect and are contained to form one reality (Fletcher, 2017). The empirical level to critical realist ontology represents observed events and experiences (Haigh et al., 2019). Whereas the actual layer refers to the occurrence of an event impervious to perception or observation (Fletcher, 2017; Vincent and O'Mahoney, 2018). Finally, the remaining level of ontology, the real, comprises of the causal mechanisms and structures necessitated by powers of an entity which enable change i.e. user wellbeing (Vincent and O'Mahoney, 2018).

In such manner, the current study aims to uncover the real by assessing the causal powers which relate to the Metaverse and user psychology, using an integrated theory of wellbeing. In doing so, the analysis will investigate the observed and unobserved potentials of the Metaverse at an empirical and actual level.

Epistemology

Traditionally critical realism has positioned ontology over epistemology as to reduce epistemic fallacy often associated with positivism and constructionism (Vincent and O'Mahoney, 2018). However, just as we should avoid epistemic fallacy it is equally important to avoid ontic fallacy (Albert et al., 2020). As such the current study will extend on epistemological relativism by adopting a critical realist social epistemology which accepts knowledge is fallible and that the social relations of observers are a part of the real (Albert et al., 2020). Therefore, ontology and epistemology become interdependent to one another (Albert et al., 2020). The current project will be based on Pancheva et al. (2021) integrated theory of wellbeing, in this the knowledge produced is theory-dependent and

transitive (Haigh et al., 2019; Fryer, 2022). Not only will knowledge be context dependent on the Metaverse, but also theory and knowledge may change depending on future development and regulation of XR and the Metaverse.

To determine themes, judgemental rationalism will be used whilst acknowledging the fallible nature of knowledge (epistemological relativism). In critical realism, judgemental rationalism is the process of using rational discussion to determine the truth of an *event* (Vandebergh, 2019; Albert et al., 2020). With both ontology and epistemology in mind, judgemental rationalism works towards a theoretical understanding that best suits a context (Isaken, 2022). Regarding this research, it will be used to identify the most appropriate theory of wellbeing within a Metaverse context.

3.3 Critical review of literature

As seen, the study commenced with a review of literature that aimed to increase insights relating to wellbeing, XR and the Metaverse. Subsequently providing the researcher with a holistic perspective on empirical explanations to how the Metaverse affects user wellbeing. Sourcing wellbeing literature was a case of collating the researcher's own library of journal articles. Whereas the scoping review of XR and the Metaverse research from a psychological perspective was made possible using sources gathered through Scopus and WOS; these offer peer-reviewed documents from an array of research domains (Loureiro et al., 2021) and access to descriptive and theoretical data. Once collated, information such as title, authors, sources, abstracts, and keywords were exported into Microsoft Excel. Here, articles underwent a series of screening to assess article relevance and identify duplicates. To ensure report and selection bias was limited and transparency promoted, this process followed the PRISMA method (Figure 3.2) (Drunker et al., 2016). This involved screening papers in accordance with a pre-determined inclusion/ exclusion criterion. This facilitated in identifying high-quality academic papers whilst furthering transparency and the consistency of paper elimination. Completing a scoping review provided the researcher an overview of the topic which was subsequently synthesised in a rudimentary fashion to highlight any gaps in research (Booth et al., 2016; Pollock et al., 2021).

Due to the nature of the scoping review, a lesser rigid inclusion and exclusion criterion was applied (Arksey and O'malley, 2007). The majority of the exclusion occurred *post-hoc* and was determined by relevance as familiarity with the research increased (Arskey and O'malley, 2007). Search terms consisted of "Metaverse" and "Psych*", thus allowing for both psychology and psychiatry to be investigated and ensuring all realms of psychology was included. Moreover, documents chosen must be published in English on account of the researcher's own language constraints. Books and book chapters were omitted following the guidelines for working with grey literature proposed by Adams et al. (2016). No parameters were observed regarding the publishing date, so to gain an understanding of when discussions of the Metaverse in relation to psychology have naturally progressed. A total of 101 journal articles, review articles, conference proceedings, and editorials were collected and assessed on relevance.

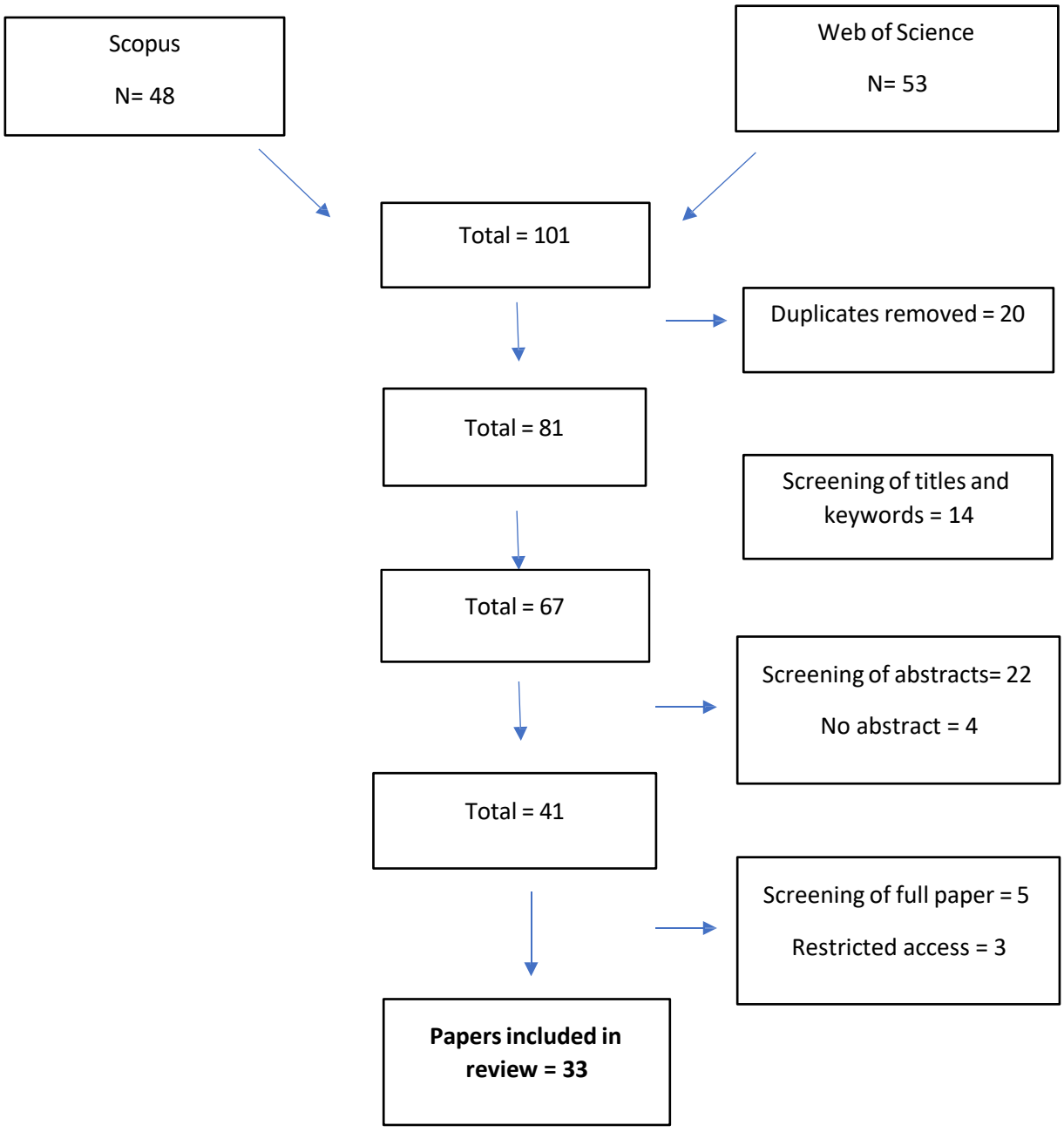


Figure 3.2. PISMA method

3.4 Primary data collection

3.4.1 Semi-structured interviews

Alongside the researcher's own previous knowledge founded in a BSc Forensic psychology degree, the insights attained from reviewed literature were used during pre-interview preparation. This consisted in following the suggestions of DeJonkeere and Vaughn (2019) and Kallio et al. (2016) in forming themed interview guides that were reflective of wellbeing and the Metaverse (See Appendix 3 & 4). Moreover, semi-structured interviews are pertinent for exploratory research as they provide an opportunity to collect nuanced data (DeJonkeere and Vaughn, 2019). They additionally prioritise the participants' perspective, engaging with their own meaningful experiences and interpretations (Josselson, 2013; Cridland, 2015). Exploration of stakeholder experiences was necessary in uncovering the causal mechanisms responsible for the Metaverse's effect on user wellbeing. Not only is this harmonious with a critical realist underpinning, it also ensures the voices of those most affected will be included.

As with most semi-structured interviews, the interview guides commenced with what Dejonkeere and Vaughn (2019) refer to as a *Grand Tour,* a question that encompasses the whole research topic and prompts the participant to explore their experience with the Metaverse. This was followed by a brief series of *Core questions* and when necessary *Planned* and *Unplanned follow up questions.* Interviews transpired over Microsoft teams at a time convenient for the participant. The flexibility of such a format allowed for the natural progression of participant answers. Permitting the participants to expand on matters important to them without rigid input from the interviewer. The types of questions were equally influenced by the decision to follow a Critical Realist Thematic analysis framework (see sub-section 3.4.3). This further guided questions in a manner that enhanced the depth, texture, and complexity of participant accounts (Smith and Elger, 2014). Meaning that transcripts included empirical, ontological perspectives from the observations of others. Moreover, by engaging in an active process of listening and asking questions, the observer obtained insider accounts that otherwise would have been difficult to gather (Smith and

Elger, 2014). These accounts possess information regarding events and processes the researcher wished to analyse, as well as the perspectives and attitudes – concerns, discursive strategies, and cultural frameworks – of stakeholders (Smith and Elger, 2014). Providing further opportunities to retrieve accounts of events, experiences and underlying mechanisms which are representative of a multi-layered social reality (Smith and Elger, 2014), congruent with critical realism. Prior to the interviews, the guides underwent internal testing with the researcher's supervisors to ensure the relevance of content and dismissal of ambiguities or leading questions (Chenail, 2011). Interviews transpired over Microsoft Teams, and once completed were anonymised to ensure confidentiality, and manually transcribed, using Microsoft Word, ready for analysis.

3.4.2 Population and sample

Adams et al. (2007) explain that exploratory research works best when the forcing factors of the persons involved within a scenario are unknown. Tailored to the current research it is therefore necessary to engage and interact with Metaverse stakeholders to gain preliminary insights into the underlying mechanisms that depict how the Metaverse can affect user wellbeing (Jain, 2021). This is especially important in response to the limited knowledge regarding the Metaverse (Kallio et al., 2016). Thus, the participation of expert stakeholders provides empirical knowledge used to develop the theoretical background of wellbeing within a Metaverse context (Kallio et al., 2016). Moreover, as judgemental rationality involves forming a consensus, it is important to include a multitude of voices. This can be achieved by the current population sample (detailed below) that inherits several perspectives born from an array of Metaverse/ XR experiences.

Participants comprised of 10 Metaverse stakeholders. This included a mix of conveniently sampled Metaverse users who have experience with applications found within XR and the Metaverse. Convenience sampling allowed for easy access to readily available persons involved with the Metaverse (Etikan et al., 2016). Additionally, purposive sampling was used to attain the perspectives of academics, healthcare professionals and service providers, from both private and public sectors. Purposive sampling facilitated in

information-rich cases from participants who can make well-informed contributions regarding the Metaverse (Etikan et al., 2016; Nyanchoka et al., 2019). Thereby, this sampling technique was deemed integral in obtaining relevant information regarding Metaverse use and user wellbeing. Recruitment began during the 8th International XR and Metaverse conference, Las Vegas. This environment provided the perfect opportunity to engage with key stakeholders. Correspondence was then followed up through linkedin or professional emails. Additional participants were conveniently sampled through previous collaborations, i.e. collaborative projects that investigated the role of XR in healthcare. Whilst one participant was contacted via personal connections. Finally, to be considered for participation, stakeholders were required to possess a strong understanding of the Metaverse and able to share experiences, intentions, and feelings towards its use. The combination of sampling techniques resulted in the participation of four healthcare professionals who use XR and Metaverse technologies in clinical settings, as well as three academics who research and utilise technologies in education, one technology developer, and two general users of the Metaverse and XR. More information regarding stakeholder types is discussed later within the analysis chapter. In addition to literature, the expertise of this population sample is integral to deepening the fragmented theoretical background that currently characterises the Metaverse research domain (Kallio et al., 2016).

3.4.3 Data analysis

Coherent with CR, a critical realist thematic analysis is proposed, following the framework provided by Wiltshire and Ronkainen (2021). This method of analysis combines inherent features of thematic analysis (Braun and Clarke, 2006) with distinctive features involved in a critical realist paradigm (Wiltshire and Ronkainen, 2021). As such, the current analysis adhered to data-driven coding at a deductive and inductive level, integrating abductive and retroductive reasoning. Abduction and retroduction are analytical tools involved in critical realism (Vincent and O'Mahoney, 2018). Considering the ontological perspectives of critical realism, Wiltshire and Ronkainen (2021) propose stratifying themes across the 3 levels: The *empirica*l, the *actual* and the *real*.

Abductive reasoning

Abductive reasoning is a method of inference used to broaden knowledge beyond a theoretical premise (Meyer and Lunnay, 2013). Using abduction in analysis results in the conceptualisation of new ideas. Dissimilar to deduction, abduction does not concern itself with proving certain existences, instead abduction uncovers the possibility of how something may come into fruition. Moving beyond theory allows associations to be formed which are indicative of unobserved relationships. As such, findings may differ slightly from the proposed theoretical priori (Meyer and Lunnay, 2013). Thus, the use of abduction within the current research will facilitate new ideas surrounding the interplay between the Metaverse and user wellbeing. This was necessary in uncovering the structures involved in the actual and real level of ontology, which is otherwise concealed. Thereby overcoming deductive reasoning's inability to identify and comprehend variables not involved in theory (Meyer and Lunnay, 2013). Using abduction alongside retroduction facilitated in the creation of new conceptual frameworks and stimulated the research process (Meyer and Lunnay, 2013).

Retroductive reasoning

Similar to abduction, retroduction uses but is not limited to a theoretical premise (Meyer and Lunnay, 2013). Instead, retroductive reasoning acknowledges theory as a starting point for inferences to be made (Meyer and Lunnay, 2013). Analysis is therefore concerned with the conceptualisation of knowledge by knowing and identifying fundamental conditions, that without which an emergence cannot exist (Meyer and Lunnay, 2013). For instance, when investigating the Metaverse and user wellbeing, we need to ask what conditions of the Metaverse occur for this relationship to exist. Therefore, this knowledge can be used to question basic conditions for priori assumptions made in theoretical frameworks (Meyer and Lunnay, 2013). Moreover, retroduction moves beyond empirical evidence as it assumes social reality is the result of unobserved social structures (Meyer and Lunnay, 2013). This is not a logical method of analysis and does not deliver conclusions (Meyer and Lunnay, 2013). However, it does allow for new assumptions of knowledge thus progressing domains, especially those still in their infancy.

As such emergent themes will be categorised into three groups: experiential, inferential and dispositional. Acknowledgement of which helped in the development of an interview guide. Experiential themes relate to the *empirical* level of ontology as it incorporates the

subjective viewpoints of participants regarding their intentions, concerns, and beliefs. On the other hand, inferential themes represent *actual* realities using inference and conceptual redescription of abstract data. These are followed by the theorisation of dispositional themes, which illustrate the properties and powers that must exist for a phenomenon to occur, thus exposing *real* level mechanisms. As with critical realism, all themes are contemporaneous and represent one reality (Fletcher, 2017; Wiltshire and Ronkainen, 2021). To ensure a high-quality standard, judgemental rationalism has been used to determine explanatory power (Bhaskar, 1989; Wiltshire and Ronkainen, 2021). Meaning that themes were judged on their suitability in explaining the relationship between the Metaverse and user wellbeing. A limitation of this is that theories better known to the researcher will inevitably influence the definition of themes (Wiltshire and Ronkainen, 2021). The method of analysis is as follows:

Experiential themes

Coherent with CR and subsequent use of a critical realist thematic analysis, as proposed by Wiltshire and Ronkainen (2021), the first stage of analysis is to read and familiarise oneself with each transcript. This method of analysis combines inherent features of Braun and Clarke's (2006) thematic analysis. During this initial step, the researcher began provisionally annotating transcripts, coding for participant Metaverse related experiences. Keeping consistent with the identification of *Experiential themes,* this included coding information relating to the intentions, feelings, concerns, and beliefs of participants, in relation to the Metaverse's effect on user wellbeing (Wiltshire and Rokainen, 2021). At the suggestion of Wiltshire and Ronkainen (2021), this time was additionally used to note contextual information of participant circumstances and relevant life experiences, as to further understand their perceptions. Moving through the transcripts, deduction was used to identify the reoccurrence of codes across the data set, which inevitably assisted in theme identification. Themes were identified and added to a master list, subsequently, themes were re-phrased to represent their presence in data. At this stage, evidence-based judgement was employed to establish the prevalence and strength of nascent themes – cross-checking them across the data and against contextual information. Finally, the strength of themes was determined by the level of vigour in which they were conveyed, as

well as the noteworthiness of themes from the researcher's perspective and whether the theme was considered a *hot spot* (Ringrose and Renold, 2014) – referring to emotive themes. Organising themes in this way enabled the researcher to counteract uniformity by acknowledging the diversity of participant experiences (Wiltshire and Ronkainen, 2021).

Inferential themes:

Unlike experiential themes, inferential themes consider social reality, where some aspects of reality cannot be empirically observed but can be inferred using empirical experiences (Wiltshire and Ronkainen, 2021). Identifying inferential themes involved the use of induction and abduction, allowing analysis to move beyond data-driven experiential themes (Wiltshire and Ronkainen, 2021). Moreover, this process involved the recontextualisation of experiential themes (Fletcher, 2017) into emergent abstract themes founded on empirical data. Inductive and abductive reasoning was used to shift empirical themes into generalised forms that are representative of the wider Metaverse context (Wiltshire and Ronkainen, 2021). This was reliant on knowledge the researcher gained during the review of extant literature regarding the Metaverse and wellbeing. Similar to the process of identifying experiential themes, this process involved the comparison and aggregation of themes across all transcripts to ensure that they are representative of the whole data set (Braun and Clarke, 2006; Wiltshire and Ronkainen, 2021). The use of conceptual redescription connected specific experiences to generalised instances involved during Metaverse use (Wiltshire and Ronkainen, 2021). However, where participants made generalised inferences, inferential themes were coded within the initial annotation of transcripts at the same time experiential themes were identified (Wiltshire and Ronkainen, 2021).

Dispositional themes

The last and final group of themes attempted to theorise the causal powers involved in the relationship between the Metaverse and user wellbeing (Wiltshire and Ronkainen, 2021). Retroductive reasoning was used to rethink experiential and inferential themes, where causal influence was determined by latent and dormant mechanisms (Wiltshire and Ronkainen, 2021). Causal powers are determined by their intrinsic properties and effect,

however it is important to note that their effect is context dependent, as such they may not always be observed (Wiltshire and Ronkainen, 2021). Retroductive thinking was guided by questions such as, what properties must exist for the Metaverse to influence hedonistic wellbeing? This was the main method of inference used in identifying dispositional themes (Wiltshire and Ronkainen, 2021). It was done by extending the integrated theory of wellbeing which depicts how wellbeing is assured, affected, and measured (Pancheva et al., 2021). Again, where participants have intentionally or unintentionally explicitly mentioned theory, coding of dispositional themes occurred during the initial annotation of transcripts. Demonstrating how emergent themes of all types can occur simultaneously (Wiltshire and Ronakinen, 2021). As hinted to, the aim of these themes is to generate statements that depict the underlying mechanisms responsible for the Metaverse's influence on wellbeing. They rely on theory but also attempt to understand unexpected mechanisms associated with the intricacies of XR technology and the Metaverse (Wiltshire and Ronkainen, 2021). The researcher additionally kept a *thoughts and questions* log. In which initial thoughts and conceptualisations of themes were kept, as well as reflexive thoughts that occurred during analysis (Fryer, 2022) (See Appendix 5). Data saturation was determined once no emergent themes were identified and subsequently no changes to the codebook occurred (Braun and Clarke, 2019).

3.5 Axiology

From an axiological perspective, the current study is embedded with emancipatory objectives that attempt to benefit the wider Metaverse community (Haigh et al., 2019). Theoretically, the extension of an integrated theory of wellbeing will further attempt to standardise a definition of wellbeing which is representative of a whole person. Moreover, this extension of theory will uncover the properties of wellbeing that are affected by Metaverse use. Alongside the integration of critical realism, our understanding of the Metaverse is enhanced; allowing for appropriate policy recommendations that aim to mitigate negative effect on wellbeing (Fletcher, 2017). This research can additionally provide users with the information they require to facilitate smart decision-making regarding Metaverse use and wellbeing. In turn, this will result in the long-term adoption of the Metaverse in a way that is not detrimental to societal wellbeing and mental health. Thereby, the benefits of this research extend to Metaverse users, as well as its proprietors. Thereby gratifying the social motivations of this study, whilst allowing for knowledge and

policy–based contributions. However, it is important to note that as an observer, the researcher's voice may influence the analysis process.

3.6 Ethics

Ethical approval from Manchester Metropolitan University was gained on the 03/03/2023. Following guidelines, a detailed *Participant Information sheet (PIS)* (Appendix 6) and subsequent *Consent form* (Appendix 7) were provided to participants. This ensured that they were fully informed about the processes involved with participation and were able to give informed consent prior to the interviews taking place. Information included details regarding data handling, analysis, and access; to which participants were assured confidentiality, in that no data sharing was to take place and any identifiable information were to be anonymised. Regarding risk, it was stated that no direct health and safety concerns were apparent. However, due to the general nature of the study and the discussion of wellbeing topics, participants were provided with the PI's email and Supervisors' emails, so that they could voice any concerns, or acquire about mental health charities – if necessary.

After interviews began to take place, it became clear that sampling users would take new identification methods. In response, an amendment was sent to the MMU's ethics committee so that participant collection could also take place via online discussion forums (VRchat and NHSXR). Again, following the ethos guidelines measures were taken to ensure the safety of the PI, including opening accounts with professional contact details only. Additionally, a link to a MS forms (Appendix 8) was provided so that potential participants could indicate age of 18+, consent and their contact details of choice. All ethics applications were reviewed and approved by the Manchester Metropolitan University's ethics committee. In the end, no participants were sampled through this avenue.

3.7 Summary

This project takes on an exploratory methodology consistent with a critical realist paradigm and a qualitative research design. This is with the hopes that the research can further an otherwise limited research domain. The purpose of this chapter was to ensure

transparency of the methods that took place and the justification for specific methodological choices. Mapping out the methodology should allow the reader to understand how analysis and subsequent discussion took place. Moreover, pinpointing the theoretical lens, critical realism, highlights where conclusive remarks fit into the current Metaverse research domain. Moving forward, the following chapter, Data Analysis, deconstructs participant transcripts following the analysis procedures stated above.

Chapter 4 Findings

4.1 Overview

The analysis adhered to a critical realist thematic analysis, following the proposed methodology of Wiltshire and Ronkainen (2021). In adherence to this, codes were developed and grouped to identify recurring experiential themes. Using retroductive and abductive reasoning, experiential themes were rearticulated to reveal inferential themes. Consequently, the researcher was able to identify generalised *events* that take place within the Metaverse and/or when using XR technology. Once again, abductive reasoning – inferences that extend theory with the purpose of uncovering the possibility of something - was used to uncover the dispositional themes (*causal mechanisms*). Therefore, analysis revealed the underlying mechanisms that determine the occurrence of *events*. Table 4.1 serves as a reminder of what each thematic group entails.

Table 4.1. Critical realist thematic groups and what they entail

Themes	What they entail
Experiential themes	Stakeholder experiences and perceptions
Inferential themes	Events
Dispositional themes	Causal mechanisms

The combination of retroductive and abductive reasoning means that findings incorporate and extend Pancheva et al. (2021) theory of wellbeing. Within Figures 4.1 -4.5, explicit mentions of theory are indicated to in *blue,* whereas themes that lie outside theory are highlighted in *red.* As with any critical realist thematic analysis, dispositional themes and abductive inferential themes were determined by evidence-based inferences supported by stakeholder interviews. Themes are laid out in an exploratory manner so to illustrate wellbeing effects, and their causal influences as revealed in analysis. Articulation of themes in this manner transparently presents thematic relationships in a logical and coherent manner (Wiltshire and Ronkainen, 2021). Additionally noted was contextual information, including participant background,type of technology use and technology type. The aim of

this was to comprehensively understand where stakeholder perspectives originate from.

The remnant of this chapter is laid out as the following. Firstly, the contextual information is tabulated and discussed. Followed by the articulation of thematic relationships uncovered during analysis. Here, preparatory links to the literature review are made. This chapter illustrates how and why XR and the Metaverse affects user wellbeing, whilst also setting the stage for the following discussion found in Chapter 5.

4.2 Contextual information

To contextualise the perspectives in which thematic relationships were founded upon, time was taken to note background information of each participant. This also facilitated in the reorganisation of experiential themes. Table 4.2 presents the type of stakeholders involved in the study. The majority of which originate from a healthcare background, where XR and Metaverse technology is used in a clinical setting for staff, trainees, and patients. Following this, we gained the perspectives of academics. These perspectives entail the experiences of both researchers and educators, who use technology to facilitate in knowledge and learning. The remaining participants included a technology developer and two participants who engage with technology for personal use.

Table 4.2. Stakeholder types.

Stakeholder type	Pseudonym
Healthcare professional	HP1, HP2, HP3, HP4
Academic	A1, A2, A3
Developer	D1
User	U1, U2

Despite their separation in Table 4.2, it is important to note overlap between stakeholder types. For instance, each healthcare professional, including HP1, HP2, HP3, and HP4, have experience in researching technologies in a healthcare setting. Likewise, U1 has career background in clinical health, however, their use of technology is not discussed in this

manner. But coherent with the inclusion criteria for participants, they can still provide opinions on how they think technology can assist in this arena. The diversity of stakeholder types and the connexion between them is important in understanding the holistic nature of opinions of XR and Metaverse use. For instance, perspectives gained from a healthcare context are equally reminiscent of providing efficient training opportunities, as well as providing positive technology. Despite perspectives originating from different experiences and contexts, it is important to remember that previous research has found effects are due to the technology itself rather than the context in which they are used (Bale et al., 2022). Subsequently generalised assumptions were made regardless of the contexts they were discussed within.

Table 4.3, Types of Metaverse use mentioned within transcripts.

Uses of reference	Pseudonym
Training and education	A1, A2, HP2, D1, HP4
Rehabilitation and treatment	HP1, HP2, U1, D1, HP3
Gaming	U2
Socialisation	A3, U2
Entertainment	U2
Sustainability of services	HP1, HP2, HP7, HP3
Therapy	A3
General	U1

The dispersion of stakeholders resulted in the discussion of technology in an array of contexts. Coherent with healthcare, XR and the Metaverse, discussions often related to how they can be used in *Rehabilitation and treatment*, *Therapy,* and *sustainability* of healthcare services. There is a consensus that technology can improve "… efficiency and effectiveness of tasks…" (A1) especially when considering its use in services. For instance, HP3 hinted that technology can be used to "… enhance in person therapy." (HP3). It is these benefits that mean technologies' implementation "… from a clinical and healthcare sort of delivery perspective… its sort of imminent…" (HP4). The added value given to the efficiency of tasks may further be due to the "… educational value…" (A2) of technology. In that "… it will help accelerate learning." (HP2). Moreover, discussion also detailed general uses of Metaverse

technology that relate to gaming, socialisation, and entertainment. Specifically, the Metaverse is a very "… experimental and explorative" (U2) space, that is predominately "… a lot of fun," (U2). It is from these experiences and assumptions that we can start to understand the benefits of XR technology and the Metaverse. Especially when thinking about eudaimonic constructs of happiness, that equate higher functioning to wellbeing (Ryff, 2014).

Table 4.4. Technology mentioned within transcripts.

Technology	Pseudonym
XR (AR, VR, MR)	HP1, A1, A3, HP2, U1, HP3, HP4
Simulation	D1
Virtual worlds	A1, U2
Virtual places	A3
Metahumans	A2
Metaverse	U1

The last efforts to understand contextual information involved noting the technology that participants referred to as the Metaverse (See Table 4.4). Like those technologies that were noted during the literature review, overall mentions of technology were highly consistent with The Metaverse Roadmap (Smart et al., 2007). This being, XR (AR, VR, and MR) seemed to be the first point of reference for participants. Signifying to XR's foundational role in the development of a Metaverse. Interestingly, avatars including metahumans, were highly referenced. HP1, A1, U1, U2 were amongst those who spoke of avatars and their relationship to user experience. Avatars have been lesser discussed in previous literature that aims to conceptualise the technological components of the Metaverse that influence psychology. But according to the current data, they play a vital role in determining user experience. This is evidenced further in section 4.3. Highlighting technological features facilitated in the inference of dispositional themes. This being, that mentions of specific technologies such as VR were indicative of what it is about the Metaverse and XR that caused experiential outcomes. Furthermore, this data is vital in addressing the need for a

standardised definition of the Metaverse that was uncovered in the background section of this research project.

4.3 Thematic relationships

A total of five thematic relationships were identified. These are presented below in an explanatory manner that pinpoints to a dispositional theme and its associated effects on wellbeing. In total 12 wellbeing *events* were identified (inferential themes). These have been labelled in a manner that indicates the effect that occurs in a Metaverse context. Some inferential themes are a direct extension of Pancheva et al. (2021) theory of wellbeing. Whereas other themes move beyond this theory and highlight alternative ways in which XR and the Metaverse can affect user wellbeing. Again, these are differentiated using *blue* and *red.* Figures 4.1-4.5 have been adapted from Wiltshire and Ronkainen (2021). They aim to present the effect of dispositional themes on user wellbeing. They have further been evidenced by codes from the dataset that inhabit participant experiences, opinions, and assumptions (experiential themes).

Table 4.5. Overview of identified inferential themes and dispositional themes.

Dispositional themes	Inferential themes	Inferential sub-themes
Increased immersion and presence	Meaningful relationships	
	Emotion induction	Positive experiences and emotions
		Negative experiences and emotions
Facelessness	Exploration	Self-acceptance
	Emotion induction	Negative experiences and emotions
Technology is a tool	Personal growth	

	Environmental mastery	
	Exploration	Self-acceptance
Freedom	Exploration	Positive experiences and emotion
	Emotion induction	Positive experiences and emotion
		Negative experiences and emotion
	Autonomy	
	Exploration	Escapism
Individual differences	Emotion induction	Prior vulnerabilities
		Positive experiences and emotions
		Negative experiences and emotion

Thematic relationship 1: Increased immersion and perceived presence*.*

It was evident that an important technological feature of XR technology and the Metaverse is its ability to provide immersive experiences and enhance perceived presence, leading to a "more embodied kind of experience…" (HP1). The level of immersion can be determined by the type of XR technology adopted, i.e. AR or VR. During analysis, links were uncovered between *Increased immersion and perceived presence* and the development of *Meaningful relationships,* and *Emotion induction.* Indicating to two inferential events on wellbeing

Meaningful relationships:

Firstly, added levels of immersion and presence facilitated in the development of meaningful relationships between users. Reportedly, social connections were aided at both a "virtual socialisation… and … physical socialisation" (A3) level. Moreover, users can easily share and bond over experiences, despite their physical locations. According to eudaimonia, meaningful relationships are vital in ensuring positive wellbeing. Therefore, by

assisting in the formation of friendships, the Metaverse can instil happiness. This was also true for the following sub-theme *Positive experiences and emotions.*

Emotion induction:

Due to the immersive nature of XR, users experience higher levels of realism. Subsequently, users react to online experiences in a much more active way. This differs from more traditional technology use – where engagement is considered much more passive (Montagud et al., 2020). It was clear during analysis that this effect can be both positive and negative. Where experiences within virtual worlds can produce real emotional reactions. As a result of *emotion induction*, two inferential sub-themes were identified: *Positive experiences and emotions* and, *Negative experiences and emotions.*

Positive experiences and emotions

This first sub-theme alludes to the fact that online, immersive, experiences have a way of affecting a person's emotional wellbeing. It is of the opinion of stakeholders that positive experiences, i.e. exploring with friends, increases in a person's happiness. What was most of interest to the research was how these affects go beyond the virtual realm. Meaning that they transcend into a user's daily life. For instance, "… Virtual reality in particular was gonna be helpful in providing mental wellbeing … make them happy… It gives them [users] freedom…" [P4]. Alongside *Meaningful relationships,* this event shows how the Metaverse can positively impact hedonic wellbeing in two ways, A) Indirectly through the satisfaction of eudaimonic needs i.e. meaningful relationships. B) Directly through positive experiences. This echoes Pancheva et al. (2021) in that changes in eudaimonic constructs ignite changes in hedonia, and vice versa.

Negative experiences and emotions

Despite positive effect, it became clear during analysis that for every positive opportunity, there is a negative counterpart. In this case, just as positive emotions can be induced, "… if you increase the technology to make it more real than you're going to increase the incidence of it triggering…" (A2) negative emotions. Participants therefore indicated that the immersive powers of technology can induce both positive and negative emotions. Occurring at both a hedonic and eudaimonic level.

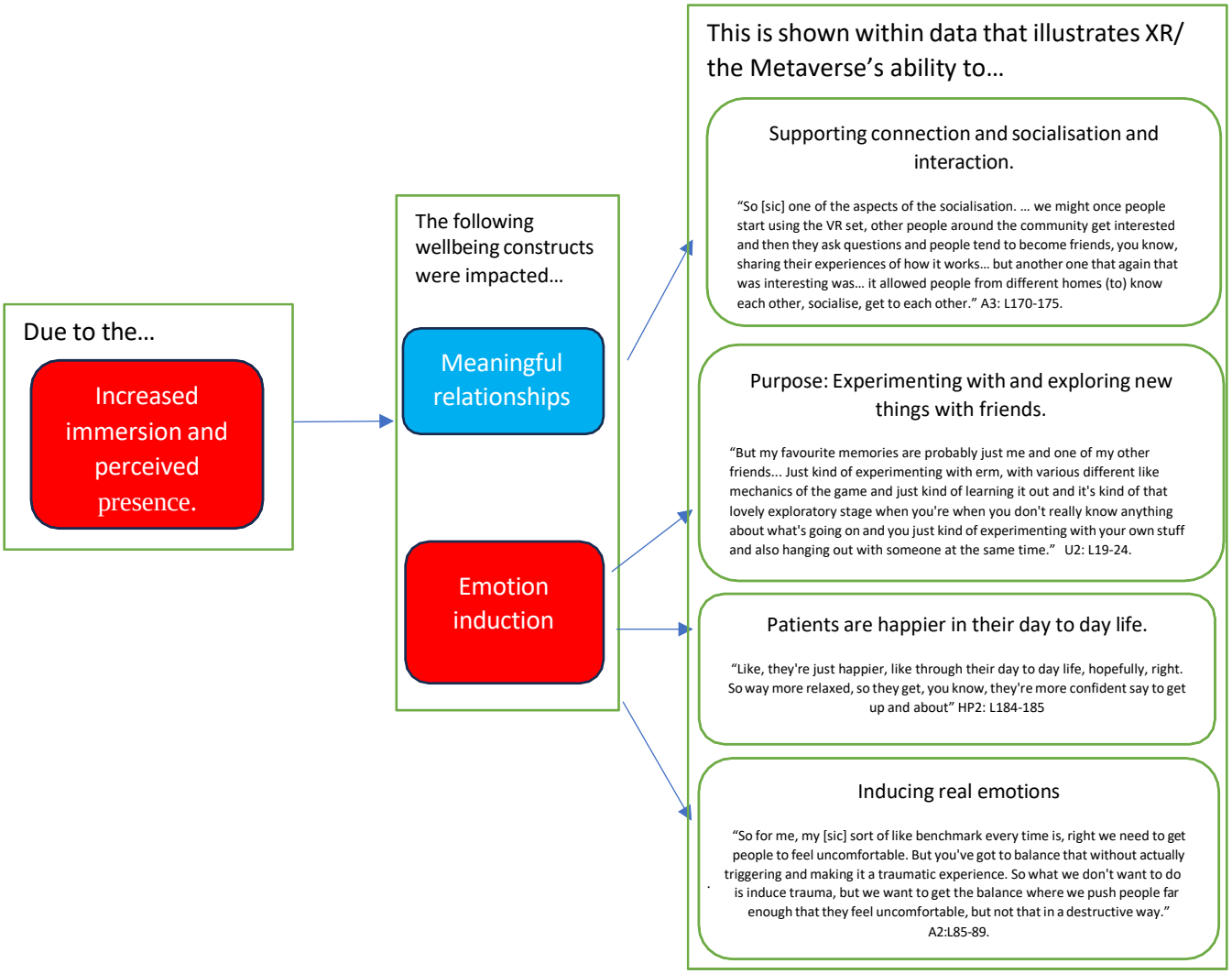


Figure 4.1. A causal explanation diagram, adapted from Wiltshire and Ronkainen (2021).

Thematic relationship 2: *Facelessness*

The preceding thematic relationship explains how the Metaverse will have a doubtful advantage over user's wellbeing, in that effects can be bad or good. This is again true for the following dispositional theme, *Facelessness.* This incorporates effects of wellbeing which are caused by the anonymity of online presences. It follows the idea that "… you don't know who [people are]" (D1). Anonymity brings with it good and bad experiences for users, further highlighting the "double-edged" (A1) nature of XR and Metaverse technology.

Anonymity within a Metaverse context, instigates two sub-themes that relate to *Exploration* and *Emotion induction.*

Exploration:

Self-acceptance

Steering to the positive end of the spectrum, is this idea that users are able explore and "project your ideal self in an avatar." (A1) within a safe environment. This can be ideal for those wanting to explore not only identity but equally complex matters of mental health. Exploring oneself in this manner is a steppingstone to *Self-acceptance,* where experiences illuminate users to their strengths and weaknesses. According to Ryff (2014) satisfaction of such needs fosters positive wellbeing. Further evidencing the applicability of eudaimonic constructs found within Pancheva et al. (2021) theory of wellbeing in a Metaverse context. However, with anonymity comes a lack of consequence, allowing people to act differently behind avatars in a way where "… they would treat everyone worse." (U2).

Emotion induction:

Negative experiences and emotion

Similar to *Increased immersion and perceived presence, Facelessness* was identified as a perpetuator of emotion induction. Specifically, this was a recurring notion for experiences that induced negative emotions; especially in experiential themes that depict instances of cyberbullying and harassment: "You know there's been articles in the news about sexual harassment…" [P2]. It appears that the Metaverse era will not escape the social injustices that affect the real world; including the social powers and hierarchies that perpetuate disproportionality. Meaning just as there is opportunity to enhance socialisation, there is also risk of perpetuating anti-social behaviour. The effects of which are equally able to transcend into the lives of users and detriment their wellbeing outside of the Metaverse (Diener et al., 1999). Especially if negative experiences overshadow the positive.

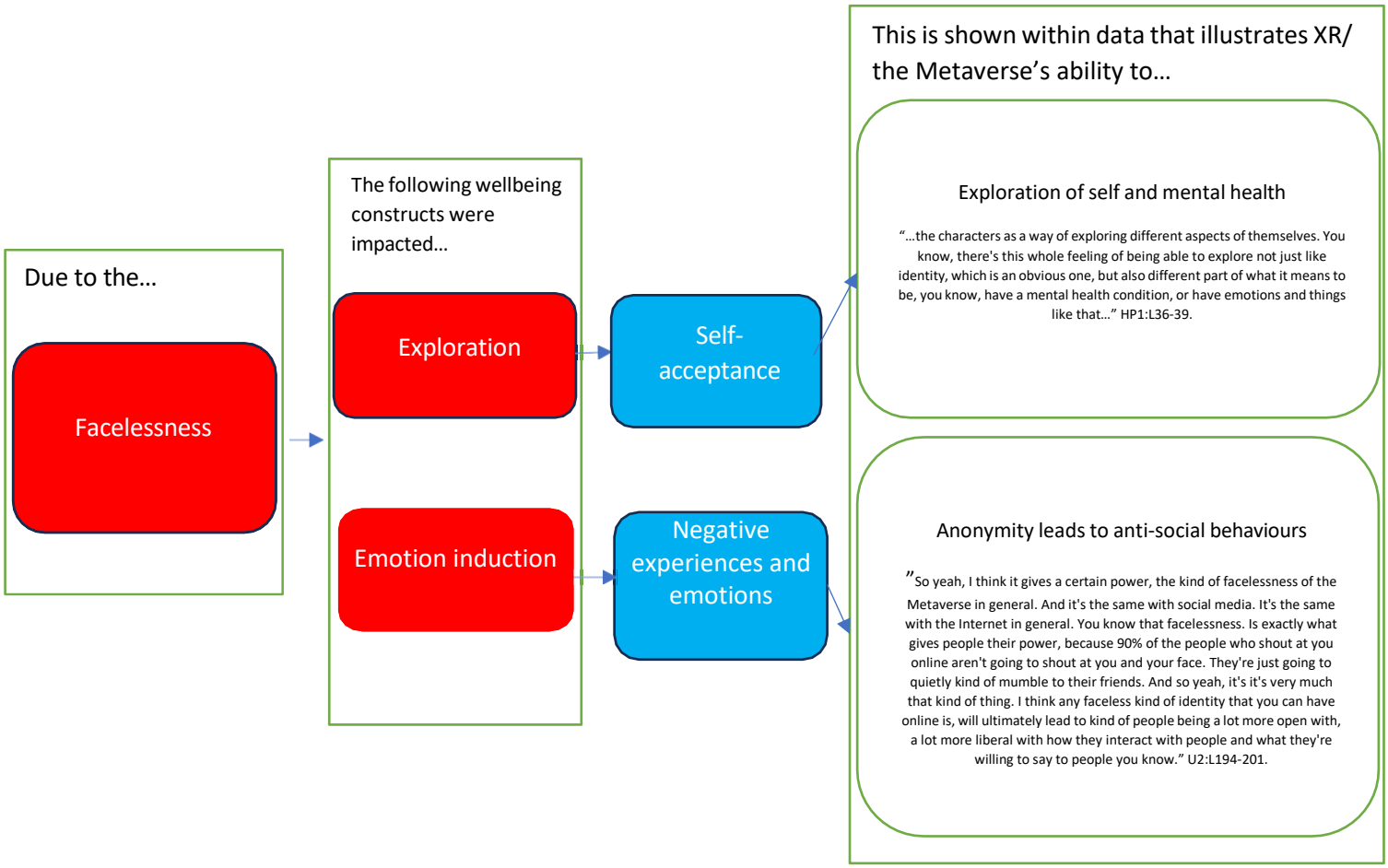


Figure 4.2. A causal explanation diagram, adapted from Wiltshire and Ronkainen (2021).

Thematic relationship 4: *Technology is a tool*

Thematic relationship 4 aims to emphasise how XR technology and the Metaverse can be used to serve specific needs and tasks. For instance, thematic relationship 1 evidenced how technology can address social needs and assist in identity exploration. If we expand on this narrative, we start to uncover when used with a purpose technologies become "… beneficial tools…" (D1). One potential purpose being the completion of everyday tasks. When considering wellbeing, analysis revealed how this fosters eudaimonic constructs found in Pancheva et al. (2021) theory of wellbeing. Specifically, effects were noted in relation to

Personal growth, Environmental mastery, and the sub-theme of *Exploration: Self-acceptance.*

Personal growth:

Specifically, when used in preparatory experiences that aim to develop and strengthen one's skills and talents – a "… practice run" (A2) as it were – technology can be used for everyday tasks. In that it enhances performance and efficiency of tasks. According to Ryff (2014) high levels of personal growth consist of a person's development of improved behaviours including self-knowledge and effectiveness. Therefore, through preparatory XR exercises that are brought closer to reality (think back to *Immersiveness and perceived presence*), users can grow their knowledge, skills and talents, resulting in "… optimised" (D1) task completion.

Environmental mastery:

Moreover, to leverage XR technology and the Metaverse to complete a task facilitates *environmental mastery*. The opportunity to practice for tasks in virtual spaces gives user "… an idea [of a real-world event] as opposed to no idea…" (A2). Due to the knowledge and skills, they gain (*Personal growth*), users gain confidence in their ability to shape and manage a given scenario. Participants related this to healthcare training purposes and in overcoming social anxiety. Both the former and the latter directly relate to eudaimonic constructs, *personal growth*, and *environmental mastery*. The latter also indirectly links to hedonic wellbeing, where reductions in social anxiety are met by exposure to positive experiences. Furthering evidence of the links between hedonic and eudaimonic wellbeing constructs found by Pancheva et al (2021).

Exploration:

Self-acceptance

Returning to the exploration of identity, preparatory uses of XR can help users explore their abilities, giving light to their strengths and weaknesses. Increasing one's awareness and acceptance of self. Overall, it appears that XR's ability to supplement the real-world effects user wellbeing by addressing eudaimonic needs; specifically, personal growth,

environmental mastery, and self-acceptance. Using technology as a tool therefore leads to higher functioning which eudaimonic theorists suggest is the way to happiness.

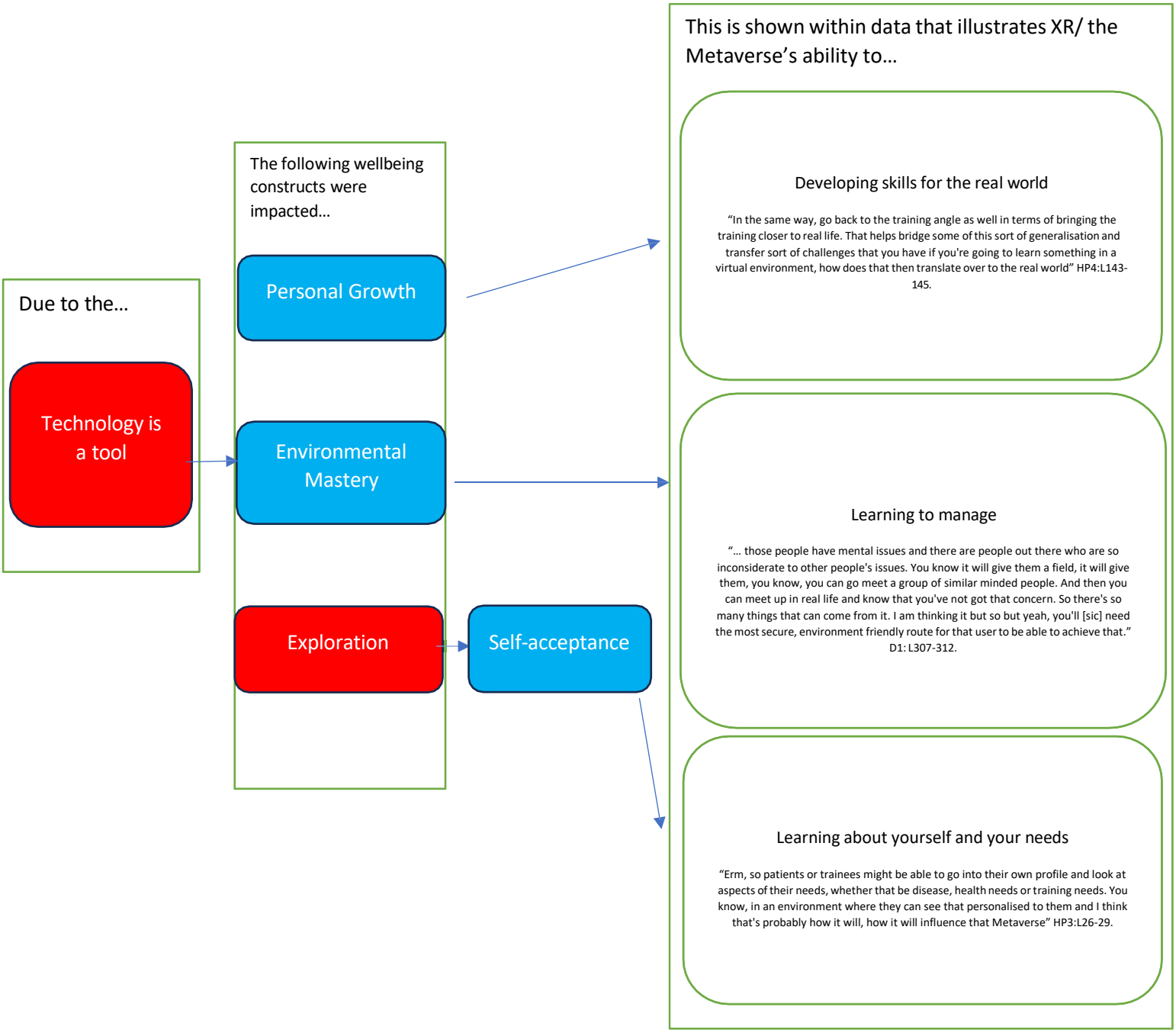


Figure 4.3. A causal explanation diagram, adapted from Wiltshire and Ronkainen (2021).

Thematic relationship 4: Freedom

Although using technology as a tool to assist in quotidian duties is one purpose inferred from analysis, it is not the only. Truthfully there is no one purpose to this technology; in actual fact it is up to the user themselves to determine the nature of its use. This *Freedom* granted by XR and the Metaverse can affect users in four ways: *Autonomy, Exploration, Negative experiences and emotion,* and *Escapism.*

Exploration

Escapism

Introspectively, freedom allows for the exploration of self and identity, as already evidenced in *thematic relationship 2.* But *Exploration* additionally extends to the investigation of virtual spaces themselves. This freedom to explore new worlds allows users to escape from the real world, overcoming any physical restraints that may occur. This then gives people "… the freedom" (A3) to connect and experience things otherwise out of their reach. Unlike physical activities, the Metaverse is not bounded by time, location, or ability, providing easy access to new, undiscovered virtual worlds.

Positive experiences

Similarly, the freedom to explore can affect perceived levels of fun that have previously been linked with positive experiences. The possibilities are endless, "…you can find literally anything on there" (U2). This participant further explains that for them, this feature of technology supported community building. Further evidencing the social element of the Metaverse. Moreso, it evidences how wellbeing constructs feed into one another. Suggesting a holist effect on user's wellbeing.

Emotion induction

Negative experiences and emotion:

As discussed above, freedom enabled in these worlds can incite Positive experience and emotions. However, like the outcomes of anonymity, these positive effects are counterpoised by negative parallels. In this instance, lack of regulation adds a certain tolerance for anti-social behaviours – seen also in *Facelessness.* People are free to act

outside the normal consequences of behaviour. With this it appears pro-social behaviours will ultimately rely on "… social contracts…" (HP1) and users will have to take "… moral responsibility [for] themselves." (A1).

Autonomy:

Autonomy was identified through experiences which evidenced people's ability to use technology "… and adapt them for their own purposes…" (HP1). Additionally, this notion was inferred through the current lack of policy and regulation; "I think the downside of not… having a regulatory or a policy made infrastructure in place is that you just get very heterogenous uses of it." (HP3). Meaning there are no limits to how a person chooses to engage with these technologies. In other words, they are autonomous over their own experiences. Optimistically, this encourages user centred approaches to Metaverse use that can be dictated by individual purpose and needs.

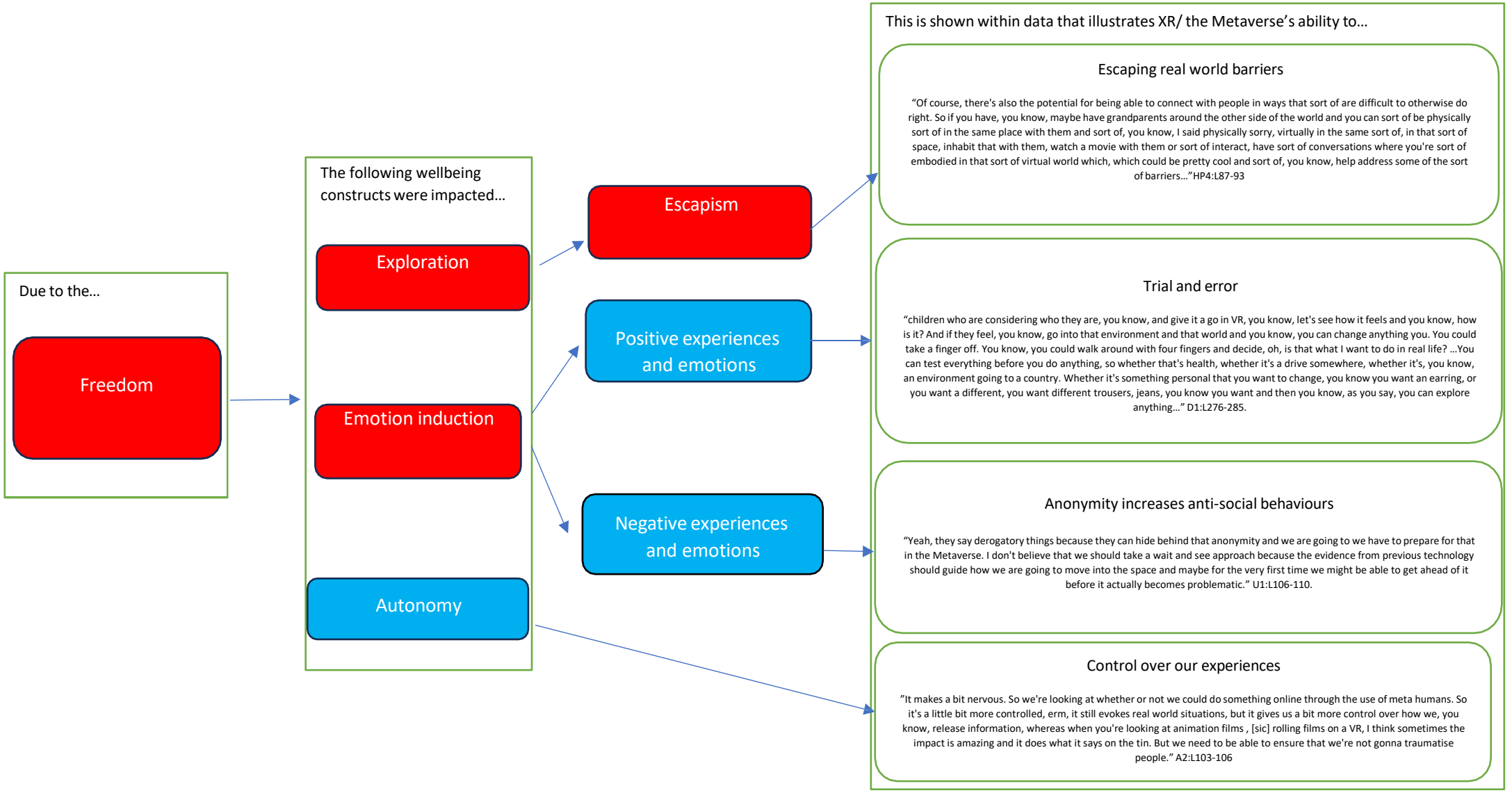


Figure 4.4. A causal explanation diagram, adapted from Wiltshire and Ronkainen (2021)

Thematic relationship 5: Individual differences

The above thematic relationships clearly demonstrate how XR technology and the technological features of the Metaverse, i.e., *Freedom,* can simultaneously detriment and support a user psychological wellbeing. However, analysis further revealed that this relationship additionally relies on the user's predisposition. Like the Interpersonal-connect-behaviours framework (Clark et al., 2017), this dispositional theme underlines the importance of the user in predicting outcome. In particular, a person's prior mental state, and digital knowledge (also referred to as digital literacy) were identified to be key mediators. Acknowledgement of this suggests that users need to be made aware that they are "… still autonomous from this technology… that is not real. It's an extension, but it is not real." (U1). Highlighting a need for manuals that are not only digestible "… for the layman." (U2), but that additionally catalogue protective measures that reduce the risks evidenced in this research. It is these individual differences that determine the hedonic outcomes of Metaverse use. Like the outcomes seen previously, these effects fall under *Emotion induction*: *Prior vulnerabilities*, *Positive experiences and emotion,* and *Negative experiences and emotion.* The latter two will be discussed together to emphasise the double-edged effect of Metaverse use. Ultimately, due to the person-centred nature of wellbeing, it is unsurprising that effects rely partially on the user themselves.

Emotion induction

Prior vulnerabilities:

Firstly, *Prior vulnerabilities,* suggest that the intensity of effects felt by users is influenced by their existing mental health. As figure 4.5 illustrates, participants have reported both positive experiences and negative ones. Thinking back to the ability for technology to induce emotion; it is these double-edged experiences alongside prior mental health that depict level of emotional affect. So just as prior mental states mediate wellbeing, these mental states are also risked by online experiences.

Positive effect and emotion/ Negative effect and emotion:

As previously unveiled, there is opportunity for both negative and positive experiences when engaging with the Metaverse. It is a combination of technological mechanisms and individual differences that determine wellbeing outcomes. Unveiling the double-edged sword effect of XR and the Metaverse. For instance, we have previously discussed the detrimental effects of anti-social behaviours and realistic negative experiences. But considering the positive, "… there is an opportunity out there to not have to stress yourself. For example, if people have got certain concerns, psychological or medical or mental concerns, you know you can tentatively go out there and meet people if you're a bit introverted or maybe even, you know, mental health you need to not face some of the people that are out there." (D1). Again, demonstrating how experience incurs emotion. Furthermore, however, it also presents a link between *Technology as a tool* (using technology to satisfy needs), *Autonomy,* and *Individual differences*. Suggesting that it a play of multiple underlying mechanisms at once that affects the type of outcome on wellbeing.

Interestingly, however, individual differences such as these have seldom been used to understand wellbeing outcomes. There have been previous attempts to understand their effect on performance (See Cai et al., 2022; Huang et al., 2022). But little to non on how they relate to hedonic and eudaimonic wellbeing.

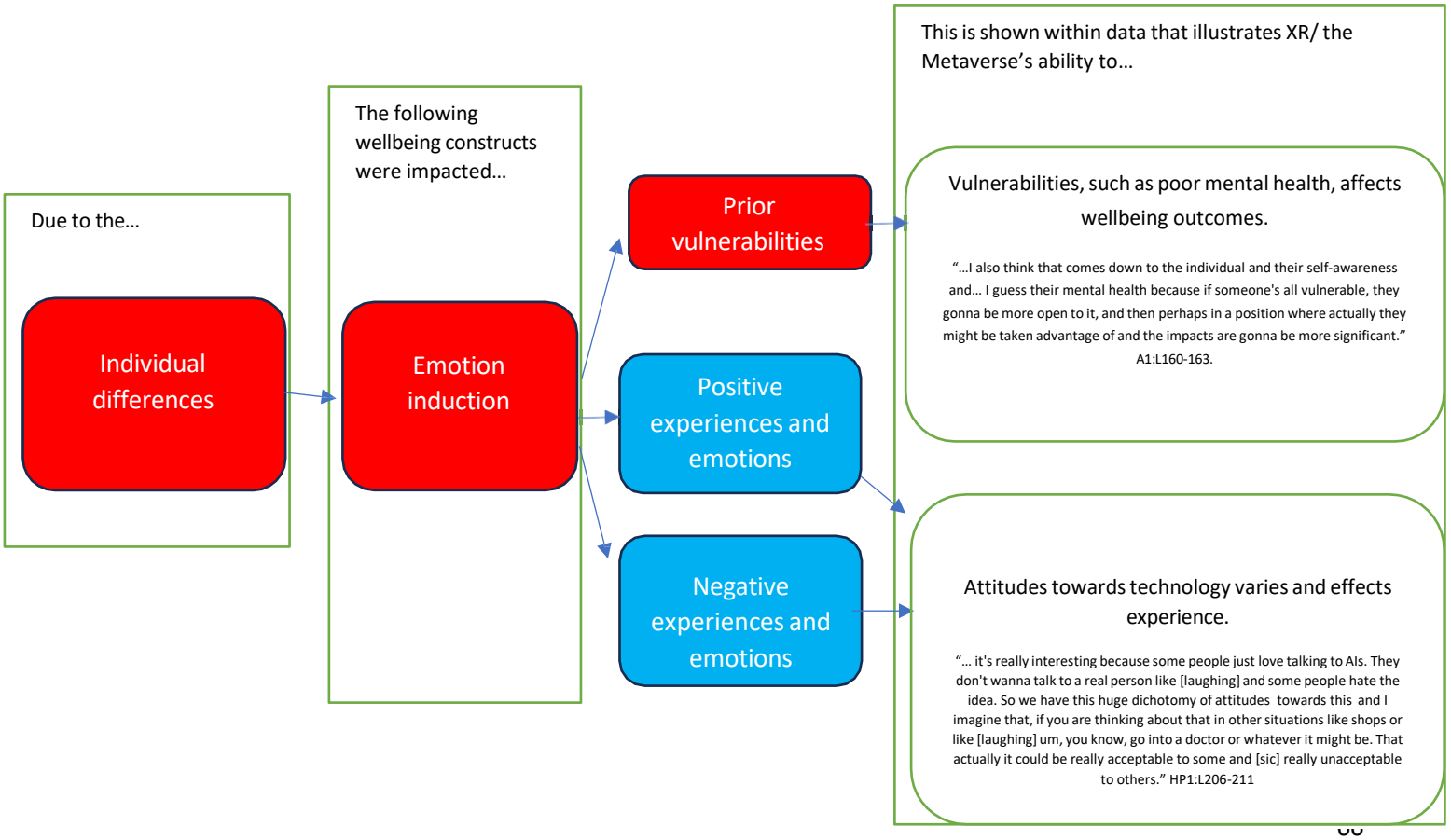


Figure 4.5. A causal explanation diagram, adapted from Wiltshire and Ronkainen (2021).

4.4 Summary

The critical realist thematic analysis of stakeholder transcripts uncovered five dispositional themes: *Immersivness and perceived presence, Facelessness, Technology is a tool, Freedom,* and *Individual differences.* The articulation of thematic relationships describes how each of these dispositional themes affect the outcomes of wellbeing (*Events*). As evidenced, the Metaverse and XR technology affects hedonic wellbeing, through positive and negative experiences and their related emotions. Additionally, effects have been related to eudaimonia, in particular, *Meaningful relationships, Personal growth, Environmental mastery, Self-acceptance,* and *Autonomy.* Conversely, however, there were no experiential themes that explicitly echoed *purpose in life* – the final of eudaimonic construct according to Ryff (2014) and Pancheva *et al.* (2021). Supplementary outcomes were additionally uncovered. These extend the theory proposed by Pancheva et al. (2021) and include *Emotion induction, Exploration, Escapism, and Prior vulnerabilities.*

Despite sitting outside of Pancheva et al. (2021) theory, exploration of thematic relationships revealed intersections between outcomes stated within and beyond theory. This is like how hedonia is supported through the gratification of specific eudaimonic needs - reiterating the links presented in *Table. 1.1.* What is clear is that the Metaverse will have a holistic effect on wellbeing in which multiple wellbeing measures can be impacted at a given time. Supporting the idea that the Metaverse will have a multivarious effect – as hypothesised in the literature review chapter. Moreover, convergences lie between dispositional themes, meaning that it is a combination of these *underlying mechanisms* which account for the evidenced *events.* The following chapter will delve deeper into these findings, relating them to previous literature and theory. Additionally, it will organise findings and theory to extend a wellbeing framework within a Metaverse context.

Chapter 5 Discussion

This study used a critical thematic analysis of stakeholder transcripts to uncover how XR technology, in context of the Metaverse, affects levels of psychological wellbeing. In doing so the research sequentially achieved three research objectives. The point of which was to address the current uncertainties surrounding use of XR and Metaverse technologies (Smart et al., 2007), and the ongoing reductions in global mental health (WHO, 2022). The Metaverse and XR technologies have already proven their use during COVID-19, in helping industries and users stay connected during times of isolation (Ud Din and Almogren, 2023). This use is indicative of XR technologies/ the Metaverse's overlap into Positive technology in helping users maintain their wellbeing (Gaggioli et al., 2019). The uptake of immersive technologies during the pandemic perhaps spearheaded their adoption into everyday life. So much so, that by 2026, 25% of the global population will access these technologies for at least one hour per day (Henz, 2022). Alongside the expansion of digitally native generations, the Metaverse will no doubt enter the mainstream. These assumptions essentialise proactive investigation of the societal and psychological effects of XR and Metaverse. Especially when considering the effects of more traditional technologies and social medias on user mental health (Song et al., 2014). Despite importance of such investigations, the novelty of the Metaverse means little is known about its impact on user wellbeing (Dwivedi et al., 2022).

To address limited literature, assumed Metaverse uptake, and current reductions in global wellbeing; the current thesis aimed *to explore the influence of XR and the Metaverse in user psychology, using the theory of wellbeing.* To do so, a literature review and stakeholder interviews took place to explore current insights and experiences that link two research domains: Positive psychology and emerging XR, Metaverse technologies. In so we addressed objectives 1 and 2 (See section 1.4). This remaining chapter will interpret findings revealed in analysis to answer how and why the Metaverse and XR affects user wellbeing. Finally, formatted as a framework, an extended theory of wellbeing will be proposed, that is specific to XR and Metaverse technology. The hope of which is to enhance knowledge of this domain, so that going forward stakeholders can promote positive technology use. Conclusions will therefore align with the aims of positive psychology.

This is considered an explorative study engrained with emancipatory objectives that aim to better XR and Metaverse user experiences. The qualitative research methods within a critical realist paradigm allowed for a holistic understanding of wellbeing effects. Moreover, we were able to uncover the underlying mechanisms that perpetuate their prevalence in user experiences. Thereby enhancing understanding of how and why technology affects users which can be used to promote positive technology experiences.

5.1 Discussion of key findings

Literature review

The literature review demonstrated that wellbeing is important when considering mental health, especially in overcoming the previous reductions that focus wholly on pathology (Kraus, 2022; WHO, 2022). Additionally revealed was an evidence-based overview of wellbeing measures, which signals to the equally significant roles of hedonia and eudaimonia. As previously enlightened to, HWB implies that positive wellbeing emanates from positive experiences, happiness, and higher degrees of life satisfaction (Diener et al., 1984; Kahneman et al., 1999). Conversely, EWB refers to more objective measures relating to how well a person is functioning in accordance with their abilities (Ryan and Deci, 2001; Ryff, 2014). Often, HWB and EWB have been explored on separate axis – recognising the power of both in determining one's psychological wellbeing. However, rarely has research examined how the two combine to cause an overall effect on one's wellbeing. This was until, Pancheva et al. (2021) took it upon themselves to investigate this joint effect, revealing the relationships presented in Table 1.1.

With regards to the Metaverse and XR research domain, there have already been attempts to showcase and theorise upon their use and risk. XR is thought to facilitate healthcare by enhancing the efficiency of services (Yin et al., 2022; Calbro et al., 2022; Cai et al., 2023). Additionally, emerging technologies are assumed to increase social connection (e.g. Ceresa et al., 2022; Eckhoff et al., 2022). However, what was also revealed was the potential for increased antisocial behaviours (E.g. Bale et al., 2022). This has led to further inquiries surrounding the *darkside of the Metaverse* (E.g. Puspitasari and Lee, 2022: Danny-han et

al., 2022; Eckhoff et al., 2022). Suggesting that like most technologies, the Metaverse and XR will have both positive and negative traits.

Moreover, there is a consensus between researchers that the Metaverse is founded by XR technology (e.g. Rauschnabel et al., 2022). Additionally noted was the increased sense of presence and immersion this affords (e.g. Han et al., 2022; Plechata et al., 2022; Eckhoff et al., 2022). Surprisingly, little attention has been paid to the investigation of wellbeing and positive psychology in the Metaverse domain. Alongside the previously stated research problem, this gap motivated the current study. Aiming to not only enhance understanding of its users, but also to progress the Metaverse and XR research domain.

Semi-structured interviews

During analysis of interviews, five thematic relationships were uncovered. The articulation of these relationships aimed to illustrate how specific dispositional themes (underlying mechanisms), equated to certain inferential themes (wellbeing events). It seems that it is due to a mixture of technological features and individual predispositions that influence the manifestation of wellbeing effects. Sorting through codes revealed effects of both a hedonic and eudaimonic nature. Interestingly, like Pancheva et al. (2021) suggest, hedonic and eudaimonic measures intertwine with one another to take an overall effect on user wellbeing. Predominately, Pancheva et al. (2021) theory of wellbeing was applicable in the Metaverse/ XR context. All constructs but *Purpose in life* were identified as effects of Metaverse use. Effects also seem to surpass this theory suggesting nuanced effects that are applicable in a Metaverse context versus a daily one.

5.2 Interpretation of results

It appears that the Metaverse will be double-edged in effect. Meaning like more traditional technologies, it can be both constructive and detrimental to a person's wellbeing (Smart et al., 2014). An example of this was realised when considering the social effects of

technology. Where analysis revealed that support to relationship maintenance will be challenged by an increased risk of anti-social behaviours. Furthermore, it seems an array of outcomes can occur from Metaverse use. These include a mixture of hedonic and eudaimonic effects and additional outcomes that extend past Pancheva et al. (2021) theory of wellbeing. In keeping with Pancheva et al. (2021), technology affects users by directly supporting eudaimonic goals such as *Meaningful relationships*, *Self-acceptance, Autonomy, Environmental mastery,* and *Personal growth*. Besides indirect avenues such as *Exploration.* Findings also registered on the hedonic scale of wellbeing through *Emotion induction, Positive experiences and emotions, Negative experiences and emotions,* and *Prior vulnerabilities.* The assortment of effects found in this study support the presumption made following the literature review; this being that the Metaverse will have a multifaceted effect on user wellbeing. More on effects are discussed below.

5.2.1 Outcomes on wellbeing

Meaningful relationships are important in fostering eudaimonic happiness (Ryff and Singer, 2008; Ryff, 2014; Ryan and Deci, 2010). According to Pancheva et al. (2021) measuring higher in EWB through constructs such as *Meaningful relationships,* places individuals in wellbeing clusters 4 and 5 (See Table 1.1), which respectively describe somewhat high and mostly high wellbeing. Regarding previous literature, it is not surprising that relationships are transformed in a Metaverse context. Martin (2017) already spoke of the social spaces offered by such technology and how this can enhance social involvement. With this, is the idea that such technologies can combat loneliness (De Graaf, 2016), transform social interaction (Han et al., 2023) – seen through the more active position of users, and perhaps through the facilitation of social communication (Lee and Kwon, 2022). Overall, the findings of this study support the consensus that Metaverse and XR technology support social connection (e.g. Ceresa et al., 2022; Zhang et al., 2022a; Eckhoff et al., 2022). When considering the importance of psychological needs, enhanced relationships and connection gratify needs of love and belonging (Maslow, 1943). Therefore, enhanced *Meaningful relationships* additionally works toward the satisfaction of needs. This builds upon

empirical evidence that show how education and mental health needs can be benefitted through Metaverse use (Eckhoff et al., 2022; Arpaci and Bahari, 2023).

Working through eudaimonic constructs, the Metaverse can additionally support a person's *Autonomy.* In a Metaverse setting, *Autonomy* is achieved when individuals determine their own experiences in accordance with their personal convictions (Ryff, 2014). Generally, those who experience higher levels of autonomy are considered more independent and less vulnerable to social pressures (Ryff, 2014). Previously little research has been done on how the Metaverse shapes autonomy. However, the current evidence supports the notion that the Metaverse will transform traditional passive use of technology into engaged experiences (Montagud et al., 2020). Thus, putting autonomy at the forefront of user experience (Flavian et al., 2019). This is more evident in purpose driven uses that use XR technology to assist in everyday activities. However, according to Pancheva et al. (2021) at a certain point between cluster 4 and cluster 5, *Autonomy* no longer equates to positive wellbeing – as only in cluster 4 *Autonomy* was measured above the mean.

Using technology in a way to facilitate everyday tasks additionally facilitated in *Environmental mastery, Personal growth,* and *Self-acceptance. Environmental mastery* is often measured by a person's ability to manage their surroundings (Ryff, 2014). Due to the healthcare and education perspectives gathered through interviews, this was often the case in healthcare training. Where users are given the opportunity to master tasks in virtual environments. However, it is important to note that effects on wellbeing have previously thought to have been from technology use, instead of the context in which they were delivered (Bale et al., 2022). Therefore, despite originating from a healthcare perspective, it is assumed this effect will transcend across contexts. Regarding previous literature, although not directly titled as *Environmental mastery,* research has already demonstrated the positive impact of XR in improving learning effectiveness (Guo and Gao, 2022). Thus, we can insinuate through an amalgamation of literature and current findings that through practice and exposure, users can better manage their environments, while reaping the benefits associated with higher confidence levels. Similar technology use was an additional facilitator of *Personal growth.* Ryff (2014) has already explained that *Personal growth* is achieved through new experiences – something the novelty of the Metaverse will most definitely account for. Like *Environmental mastery, Personal growth* is additionally achieved

through practice scenarios, where users can extend and solidify their skill base. Both *Environmental mastery* and *Personal growth* can be inferred in previous research that alludes to higher performance rates, mediated by Metaverse use (e.g. Cai et al., 2023). Again, suggesting that these effects are due to the technology and not the applications or context in which they have been used. The last eudaimonic construct to be identified was found in a sub-theme of *Exploration.* The freedom given by technology allows for introspective exploration. This self-reflection and added knowledge of oneself is thought to aid in positive self-examination - referred to as *Self-acceptance* (Ryff, 2014). Interestingly, in a Metaverse context, it appears that changes to these eudaimonic constructs influence one another. Where *personal growth* can enable *environmental mastery*, and *environmental mastery* can illuminate a person to their strengths and weaknesses; thus, feeding into *Self-acceptance.* Again, reiterating Pancheva et al. (2021) conclusion that constructs are interrelated.

Considering hedonic effects, analysis unveiled the Metaverse's ability to induce emotion (See *emotion induction* section 4.3.). Under which three sub-themes were identified. Firstly, there is an opportunity for *Positive experiences and emotions*. These experiences are essential in overcoming additionally present negative emotions (Diener et al., 1999; Ong et al., 2021). This becomes even more important given the Metaverse's risk of *Negative experiences and emotions.* Concerningly, it appeared that any emotions triggered in the Metaverse have a way of transcending into a person's everyday life. This has already been seen in more traditional uses of technology, where online experiences affect everyday life (Kozinets, 2015). Suggesting the Metaverse will carry with it similarities of older technology use.

The effects discussed above are all involved in Pancheva et al. (2021) theory of wellbeing. The only construct missing within a Metaverse context is *Purpose in life.* This refers to the level in which a person experiences feelings of worth (Huppert and So, 2013). Instead, constructs that surpass Pancheva et al. (2021) were identified. This is interesting given the seminal hype given to hedonic and eudaimonic philosophy and their foundational position in Pancheva et al. (2021) theory. Perhaps then these added effects are due to the nuances that occur during Metaverse/ XR use, rather than in an everyday situation. Firstly, unveiled was this idea of *Exploration,* and what this can do for a person. As previously discussed,

exploration of self can occur in the Metaverse working towards *Self-acceptance.* But *Exploration* further inhabits opportunities for positive experiences in reconnoitering new worlds, as well as the potential for fun, shared social experiences that incite happiness. *Exploration* additionally facilitates in *Escapism. Escapism* has previously been discussed as a mediating variable for technology use (e.g. Danny Han et al., 2022), but less so as an outcome in wellbeing. Analysis evidenced that *Escapism* gives respite to users, away from real world issues. However, there lies concerns that this avoidance can lead to technology reliance and addiction which risks cognitive overload (Hoehe, 2020; Puspitasari and Lee, 2022; Petit et al., 2022). This risk demonstrates the fine line between positive and negative technology use and the dual nature of the Metaverse, where positive effects are challenged by negative consequences. This duality has already been seen in investigations of social medias (Song et al., 2014). Further recognising similarities between older and newer technologies and medias. Also noted was the influence and subsequent impact on *Prior Vulnerabilities,* where those with previous mental health concerns are perhaps more susceptible to incur *Negative experiences and emotions.* One participant spoke of this idea that users could overcome issues such as social anxiety through trial runs within the Metaverse. Meaning that when used correctly, the Metaverse could help overcome *Prior vulnerabilities.* Again, reminiscent of positive psychology and even more so of positive technology.

Since we have established in what ways Metaverse/ XR use can affect user wellbeing, the question now becomes how and why these happen. To do so, analysis involved identifying the underlying mechanism (dispositional themes) of technology use that perpetuate the above effects. In total, five dispositional themes were uncovered, the first four pertaining to the technology itself and what it offers. Whereas the final dispositional theme, *Individual differences,* shows how user-centred factors influence the manifestation of wellbeing effects.

5.2.2 Underlying mechanisms that affect likelihood of outcomes

The first dispositional theme alluded to effects that occur due to the immersive experiences and added sense of presence allowed by XR technology. Whereas immersion is the extent to which a user feels the virtual world around them is real, presence is the cognitive effect of this, in which a person feels as if they are there (Flavian et al. 2019). The idea that effects can be assisted by *Increased immersion and perceived presence,* did not come to a surprise to the researcher. As seen in Figure 2.2, the literature review revealed that immersion and presence is an integral feature of XR and the Metaverse (E.g. Flavian et al., 2019; Montagud, 2020). Furthermore, Flavian et al. (2019) EPI cube illustrates how levels of interactivity can influence levels of perceived presence, and they go as far to say that immersion is the antecedent to presence. Therefore, it is congruous that higher immersive levels equate to higher presences and embodied experiences (Ekhoff et al., 2022). The first effect resulting from higher levels of immersion and presence is *Meaningful relationships.* This was unsurprising as previously the Metaverse has been defined as an interactive space that promotes community building and social connection (Montagud, 2020; Cho et al., 2023). Ceresa et al. (2022) explains that it is the immersive powers of technology that allow social presence, this being the feeling of being there and connected with others. Thereby, it is assumed that as technology develops, social presence shall increase to the point where shared experiences occur (Ceresa et al., 2022). Evidence of which have already been reported in this research by participant U2. Interestingly, social connection is also facilitated in less immersive environments governed by AR (See Laor, 2022). Showing how AR and VR can be used to fulfil needs relating to social bonding and maintenance (Laor et al., 2022).

Next revealed was how *Increased immersion and perceived presence* triggers *Emotion induction,* resulting in real emotions as they would occur in the real world. Diener et al. (1999) explains that hedonic wellbeing is achieved by positive experiences that induce happiness over pain. From this we can delineate how experiences in the Metaverse can induce positive emotions; and for the same to be true with *negative experiences and emotions.* Previous literature suggests this to be due to immersion, perceived presence, and embodied experiences (e.g. Tsai, 2022; Danny-han et al., 2022; Newman et al., 2022). Something the Metaverse and XR are evidently able to provide. Moreso, analysis revealed that hedonic outcomes can be the result of gratified eudaimonic goals. Echoing the relationship between hedonia and eudaimonia and the power this has in determining a

person's overall wellbeing (Pancheva et al., 2021). The intensity of these emotional effects can transcend outside of a Metaverse context, despite originating in one. By that it appears that these nuanced online experiences, like more traditional technology experiences, continue to affect everyday life (Kozinets, 2015).

Continuing, the dispositional theme *Facelessness,* uncovered how the anonymity of avatars and metahumans can impact user experience in two ways. Firstly, analysis revealed how anonymous use allows for the *Exploration* of self away from judgement. As a result, this facilitates a person's *Self-acceptance* and in turn eudaimonic happiness can be achieved. This occurs due to the added capacity for identity exploration expedited through avatar design and the anonymity of digital identities (Ceresa et al., 2022). Even though digital identities are separate from the physical body, they continue to reflect a user's consciousness, ego, and cognitive abilities (Ge, 2022; Zhang et al., 2022b). Thereby becoming an extension of themselves that is free from real world judgement. Allowing for realisation of self, skills, and weaknesses (Ryff, 2014). Despite this, *Facelessness* can additionally be a causer of *Negative experiences and emotions* due to the lack of direct consequence to the acting user. The pseudo-drama effect suggests that due to anonymity, users can hide behind avatars and act outside of socially regulated behaviours (Ge, 2022). This was a recuring theme throughout transcripts, suggesting that user behaviour will extend past social contracts seen in real world social exchanges. As users are less identifiable, the risk of direct consequence is removed, permitting the likelihood of antisocial behavior (Kye et al., 2021; Ge, 2022; Bale et al., 2022). This goes hand in hand with previous work that found avatars mediate changes to online behaviours, also known as the Proteus effect (Ceresa et al., 2022). Like seen in *Increased immersion and perceived presence,* the maladaptive effect of online anti-social behaviours follows users into their everyday lives (Kozinets, 2015; Ceresa et al., 2022). Moreover, U2 reported navigating the nuances of self-appraised entitlement that occurs in virtual worlds and the disproportionality of social powers this instigates. This echoes Scattolin et al. (2022), in that sense of ownership can distort honest, moral behaviours. Further necessitating the need for social contracts within the Metaverse to reduce risk of anti-social behaviours that negatively impact user wellbeing through hedonic means.

We have already seen the impact XR technology and the Metaverse can have on business, healthcare, and education operations (Han and Oh, 2021; Calabro et al., 2022; Ud Din and Almogren, 2023). Considering healthcare specifically, technology has been used to highlight and address the unmet needs of palliative care patients (Eckhoff et al., 2022). Furthermore, Metaverse healthcare has been judged sufficient in providing performance and training support to traditional services (Tang, 2019; Cai et al., 2023). On a more individual basis, analysis revealed that immersive technologies can support users in *Personal growth, Environmental Mastery,* and again in *Self-acceptance.* All of which ensure eudaimonic happiness according to Ryff (2014) and Pancheva et al. (2021). On this basis, the following dispositional theme was labelled *Technology is tool.* This aimed to highlight the use of technology in everyday life. For instance, tailoring technology use to training and preparatory needs has effectively ensured individual awareness to one's abilities facilitating in *Personal growth* and *Environmental mastery*. This further supports findings that the Metaverse can facilitate performance rates and educational sustainability (Gao, 2022; Cai et al., 2023; Arpaci and Bahari, 2023). Which has since been linked to psychological needs. Thinking back to Maslow (1943) hierarchy of needs, we can begin to understand how purpose led technology use ensures wellbeing through the gratification of needs and life satisfaction; specifically, those found in eudaimonia. Illustrating the role eudaimonic happiness has in curating hedonic life satisfaction. Yet again emphasising the links between hedonia and eudaimonia made by Pancheva et al. (2021), and their holistic role in determining wellbeing.

The last of the dispositional themes that reflect features of technology relates to *Freedom.* As we saw in *Technology is a tool,* users can tailor their experiences for specific need related purposes. This is one example of *Freedom* when discussing XR and the Metaverse use. However, the current thematic relationship concerns itself more with how the Metaverse facilitates ongoing *Freedom* whilst in use. As the analysis of transcripts revealed, like most dispositional themes, *Freedom* can incur both positive and negative effects on wellbeing. On the positive end of the spectrum, *Freedom* permits *Exploration* of virtual worlds. Analysis revealed links between this and *Escapism,* depicting that users can avoid real world problems or restrictions whilst using technology. Optimistically thinking *Escapism* can incur *Positive experiences and emotions* that counterpose negativity in the real world. According

to HWB, positive wellbeing is then achieved through experiences that promote positive emotions over negative ones (Diener et al., 1999; Pancheva et al., 2021). However, coherent with the above themes, for every positive attribute there lies a negative counterpart. Regarding *Escapism,* literature has found evidence that this can lead to technology addiction and cognitive overload (Hoehe, 2020; Puspitasari and Lee., 2022; Petit et al., 2022). Further evidencing the fine line that sits between positive and negative technology use when considering the Metaverse and XR.

In a previous paragraph we spoke of a need for social contracts, the same is true for policy and regulation. As currently, it is of the opinion of stakeholders that the current lack of rules and regulations permit anti-social behaviours due to the *Freedom* it gives users. This risks *Negative experiences and emotions,* as seen in *Facelessness.* Echoing the uncertainties underlined by Smart et al. (2017), in that virtual worlds will escalate issues of trust, social roles and interactions in both virtual and physical realities. On a eudaimonic level, *Freedom* will naturally enhance user *Autonomy* (Ryff, 2014). Again, this is permitted by the current lack of regulation and policy and the personalisation of avatars (Ge, 2022). Meaning users have autonomy over their choices, and depending on their morals this can be both good and bad. Therefore, policy should ensure that rules steer users to act accordingly with social contracts.

Differing from the previous dispositional themes which describe what technology can offer, the last dispositional theme, *Individual differences,* details how effects can additionally arise depending on the users themselves. Analysis revealed individual-specific variables such as digital literacy and prior wellbeing, and their effect on user wellbeing. This is unsurprising given academic efforts made in Human-computer interaction (HCI) research. HCI incorporates designing technology that ensures positive user-computer interactions; a sub-division of which considers the emotional interaction of its users (Wang et al., 2021). The importance of this is to further evidence the role of users in outcomes of technology use. Considering previous research, findings reiterate the idea that individual differences do indeed affect outcomes (Hoehe, 2020). Thereby signifying the role of the Interpersonal-connections-behavioural framework (Clark et al., 2017) within the Metaverse experience. Variables such as mental health, perceived ability and self-efficacy have been showcased as influencing factors (Zhang et al., 2022a; Huang et al., 2022; Cai et al., 2023).

However, there is little talk about the effect of digital literacy regarding XR and the Metaverse specifically. Therefore, this research illuminates to a previously undiscovered driver that perpetuates individual differences in Metaverse experiences. Furthering knowledge as it reveals that familiarity with technology increases risk awareness. For instance, the stakeholder participants who have previous knowledge of this technology were able to give detailed, expert insights regarding the risk of Metaverse and XR use. Regarding impact, analysis revealed how *Individual differences* mediate emotional outcomes. For instance, having a secure knowledge base on technology appears to be prudent in ensuring users can navigate negative experiences as well as attitude towards technology. Currently however, there is no one-stop shop as it were, in which users can be signposted to. An oversight perhaps due to novelty of technology and the discrepancy found between involved organisations. This becomes an even bigger issue for those who already experience poor mental health. It is well established knowledge that someone who is vulnerable to loneliness will engage more with technology (Morhan-martin and Schumacher, 2003). But without protective knowledge that helps navigate virtual worlds and the ability to differentiate between physical and virtual worlds; vulnerable users risk perpetuated *Negative experiences and emotions* and worsening mental health.

5.2.3 Extended theory of wellbeing in a Metaverse and XR context

Below is the proposed framework that illustrates how and why the Metaverse and XR technology can affect user wellbeing. This also includes necessary factors (addressed considerations and precautions) needed to ensure positive user wellbeing.

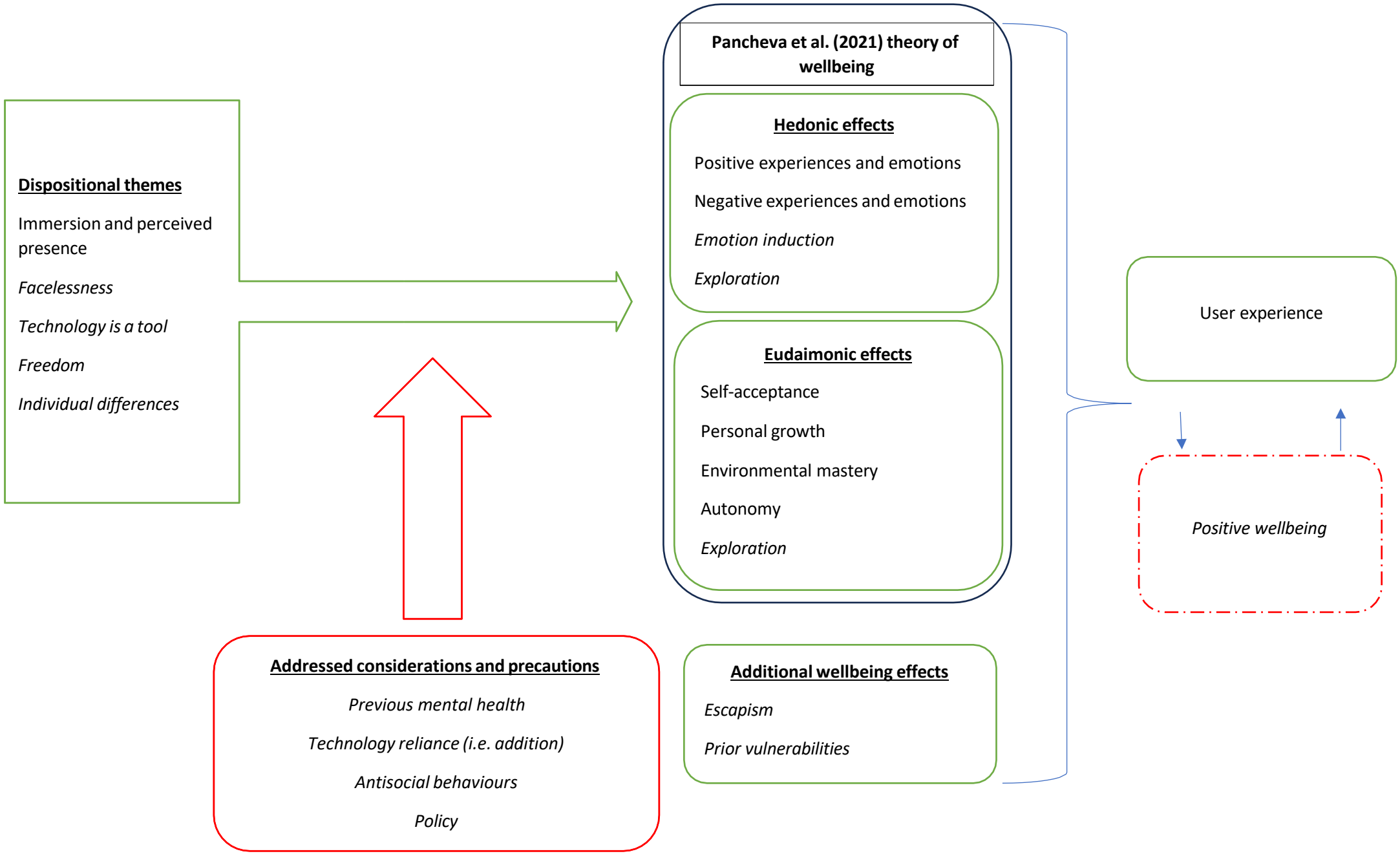


Figure 5.1. Proposed framework to show how the Metaverse can facilitate positive wellbeing for its users

Chapter 6 Conclusion

This chapter serves as a reminder of the research objectives and how these were achieved. Additionally, time has been taken to consider theoretical and practical implications of the above research whilst highlighting the strengths and limitations of both the research process and findings. It is acknowledgement of both these and the findings of analysis that is then used to propose future research agendas and considerations. Lastly, the researcher reflects on the research process and describes the measures taken to overcome any chance of bias.

6.1 Achievement of research objectives

The overall aim of this research was *to explore the influence of XR and the Metaverse in user psychology, using the theory of wellbeing.* This entailed the completion of three research objectives. The first of which was to *critically review the research areas including XR, the Metaverse, the theory of wellbeing, and user psychology.* Whilst additionally aiding in the conceptualisation of wellbeing in the context of this research, this process helped identify where this thesis fits within the research domain. Furthermore, attained knowledge provided the groundwork for the second objective, *to explore stakeholder opinions to identify constructs of the theory of wellbeing in relation to user psychology.* Analysis of which facilitated in the extension of wellbeing theory into a Metaverse context. Whilst providing opportunity to identify new knowledge that alludes to Metaverse specific wellbeing effects and the underlying mechanisms that cause them. Lastly, findings from the above objectives have been used *to propose the extended theory of wellbeing in the context of XR and the Metaverse.* More on how these objectives were achieved are discussed below.

The first objective involved a review of wellbeing literature, followed by a scoping review of Metaverse research within a psychological domain. The latter of which followed the PRISMA method for literature reviewing. In achieving this objective, the researcher was able to define and conceptualise a holistic theory of wellbeing, whilst pinpointing where in the

domain the current research belongs. Given its interdisciplinary nature, this was essential in understanding how the research bridges together two disciplines which have yet to be jointly explored: Wellbeing and the Metaverse. Additionally, the chosen theory of wellbeing was later used to understand how the Metaverse affects user wellbeing during analysis.

To achieve objective 2, semi-structured interviews of stakeholders took place. This relied heavily on the review of literature, as the constructs relating to wellbeing and previous understanding of how the Metaverse interacts with psychology were used to develop interview guides. The chosen sample of Healthcare Professionals, Academics, Developers and Users allowed for an understanding of the Metaverse the considered an array of perspectives. Analysis of these perspectives, given by stakeholders, resulted in the identification of three thematic groups. The first relating to personal experiences with technology, the second uncovering the generalised effect this technology can have on user wellbeing. Lastly the remaining thematic group alluded to the underlying mechanisms that perpetuate effect. These were articulated in a manner that demonstrated thematic relationships. In doing so, the research was able to illustrate how and why using Metaverse and XR technology impacts user wellbeing.

As well as the exploration of literature, stakeholder interviews additionally fed into the third and final objective which can be identified as the framework seen in Figure 5.1. This being an extension of wellbeing theory, that involves the identification of new theory found during analysis, and considerations that ensure positive user wellbeing. Thereby this final objective used what was learnt from objective 1 and 2, in answering the overall aim of the study. Not only does this show how each objective was achieved, but it also shows how achievement of one objective was necessary in completing the others.

6.2 Theoretical contributions and practical implications

When it comes to the Metaverse and XR technology, there are still many uncertainties in how best to implement and monitor use (Smart et al., 2017). The current research however makes good progress in advancing the Metaverse/ XR research domain. Especially considering its uncovering of user psychological outcomes. By doing so, it initiates

discussion of user wellbeing in a Metaverse/ XR context. Thereby addressing the previous avoidance of user wellbeing in this area. The implications of this study are vast and should interest academics, users, and technology developers alike. Besides outlining the type of wellbeing effects, choice of methodology allowed us to understand how these can occur.

Using an existing model of wellbeing (See Pancheva et al., 2021) the research shows how the Metaverse affects established wellbeing constructs relating to HWB and EWB. In that Metaverse use can induce happiness through positive experiences, as well as through the gratification of *Meaningful relationships, Self-acceptance, Personal growth, Environmental mastery*, and *Autonomy.* But also given the nuances associated with XR and Metaverse technology, new avenues that lead towards wellbeing were introduced. This included *Emotion induction, Exploration, Escapism,* and *Prior vulnerabilities.* However, as adoption of technology expands and research progresses, it is likely more wellbeing effects shall be uncovered. These variations in outcomes necessitated an adapted model of wellbeing that is specific to the Metaverse. As seen in Figure 5.1 we can visualise how and why outcomes occur, and what is needed to ensure positive wellbeing when using the Metaverse.

The organisation of thematic relationships uncovered the fine line situated between positive and negative outcomes of technology use. As such in the context of wellbeing, the Metaverse should be considered a double-edged sword. Meaning just as there is opportunity for positive wellbeing, without proper regulation, there is also risk that negatively impacts wellbeing. The identification of dispositional themes show that the nature of outcomes is reliant of five factors. These incorporate the influencing powers of technology itself, social behaviours, type of technology use, as well as individual based factors. Through abductive reasoning, the research additionally found considerations that need to occur to ensure positive technology use. This was done in accordance with the underlying positive psychological approach that motivated the current investigation. As seen in Figure 5.1, this involves establishing social contracts, rules and regulations, whilst taking precautions against technology addiction, and existing vulnerabilities of users. Furthermore, this fed into the future research agendas presented below. In conclusion, the study achieved its aim and objectives. We uncovered wellbeing effects of Metaverse and XR technology, in addition to the causal mechanisms that make them possible. The result of which can be seen in the proposed framework (Figure 5.1) which demonstrates how

positive wellbeing can be secured during Metaverse use, assuming the *considerations and precautions* are addressed. It is built upon existing knowledge of wellbeing and the Metaverse, as well as the evidence of new insights found within the current data. This framework can not only form the basis of future research but can also serve a reference point for policy that aims to mitigate risk of negative user effects, in a Metaverse and XR setting.

6.3 Strengths and limitations

Due to the subjective nature of qualitative research (Galdas, 2017), there are inherent limitations that can risk the reliability of conclusions. In response to this, appropriate methodological choices were followed which aimed to reduce such limitations. This entailed transparently detailing the entirety of the research process, including a description of theoretical paradigm and a discussion of methodological choices. In addition to a clear description of data analysis that details the role of abstraction and retroduction. Additional limitations should not take away from the current research, but instead provide avenues for future research that hope to advance the Metaverse and XR research domain. Already this research has done so by bridging together two fields of research. As such, conclusions illuminate towards the effects of technology on user wellbeing, and the underlying mechanisms that exacerbate them. Whilst inviting further consideration of wellbeing in the Metaverse and XR research domain and indicating how users can best ensure their own wellbeing. However, due to the qualitative nature, it does not assess the strength of thematic relations nor the probability of outcomes. Instead, it provides future research with a starting point that can be advanced using quantitative measures.

In accordance with exploratory research, a total of 10 interviews were obtained from a diverse group of stakeholders. Although reaching thematic saturation, acquiring further interviews would help argue both the reliability and validity of these findings. Whilst additionally, assessing and ensuring research bias is not present. As with all qualitative research, the subjectivity of methodology risks input of researcher bias (Galdas, 2017). However, a strength of this research can be identified in its transparent description of

methodology. Including detailed explanation of the critical realist philosophical paradigm – which allowed for the uncovering of underlying mechanisms – and the theoretical lens founded within Pancheva et al. (2021) theory of wellbeing. As well as facilitating in replicative studies, transparency of methodology also facilitates reader comprehension of how conclusions were made. By outlining the steps that were taken to identify thematic relationships displayed in Chapter 4.

Despite gaining perspectives of four different stakeholder types (See Table 4.2), most stakeholders originated from a *healthcare professional*. Unfortunately, due to the time restrictions of this project and the difficulties that emerged when sampling participants; only two participants were considered *Users,* and only one fit the *Developer* category. Again, more interviews with participants that fit these lesser explored stakeholder types should be considered when proposing new research agendas. Moreover, the generalisability of findings can be challenged for two reasons. Firstly, although stakeholder types were quite diverse, demographic differences were not noted and due to ethical reasons, all stakeholders were 18+. As such, findings do not consider differences between ages and genders. Secondly, it does not consider edge cases, such as those with mental health conditions, and how Metaverse and XR experiences differ accordingly. Despite this, the data does provide insights that can facilitate the promotion of positive wellbeing in policy and technology development. Whilst highlighting what needs to take place from a user perspective to ensure positive wellbeing is achieved. Therefore, this study is the first (to the researcher's knowledge) that introduces positive psychological agendas in a Metaverse and XR research domain.

As with most qualitative papers, the researcher inherently has a role in the research process meaning careful attention is needed to ensure that their previous knowledge, assumptions, and experiences do not influence the conclusions drawn from analysis; in this case this includes knowledge gained from the literature review and a previous undergraduate psychology degree. Regarding the conceptualisation of wellbeing, the researcher drew from their own personal library of literature to carefully evaluate seminal works and assess the appropriateness of the chosen background theory. Although evaluation of literature was thorough, there is chance that additional wellbeing theories were forgotten. Despite this,

Pancheva et al. (2021) theory of wellbeing was thoroughly assessed for evidence and proved to be suitable for its purpose in the current thesis. The literature review process additionally challenged any previous assumptions the researcher, and reader, held when it came to discussing wellbeing and what that entails for people.

It was also vital for the researcher to continuously reflect upon the analysis process to ensure identification of codes and themes were not limited to wellbeing constructs mentioned by Pancheva et al. (2021). In doing so, the researcher remained open to new constructs and knowledge regarding wellbeing effects. Thus, ensuring the identification of nuanced effects specific to a XR and Metaverse context. Thereby in keeping with the explorative nature of the research aim and objectives.

To limit research bias, continuous examination of the researcher's role in methodological decision making occurred. This included transparently examining the appropriateness of data collection, sampling and analysis techniques that transpired in Chapter 3. Certain procedures, such as interview guide construction and data analysis, followed the suggestions of researchers who have previously enlisted the same tasks. It was essential that interview questions did not reflect the researchers' own assumptions regarding effects on wellbeing. For instance, knowledge pertaining to the effects of traditional technologies such as technology addiction. Furthermore, the semi- structured nature of interviews allowed participants to freely expand on their own opinions and experiences without influence. As stated, the construction of interview guides followed Dejonkeere and Vaughn (2019) and required crosschecking amongst supervisors to ensure neutrality. Similarly, the analysis process followed that of Wiltshire and Ronkainen (2021) and Braun and Clarke (2006). These were beneficial in assuring analysis procedures were not altered in favour of assumptions.

In certain instances, interviews became reflected a conversation between interviewer and interviewee. This allowed for a more natural flow of answers but also risked the interviewers' own opinions being included in transcripts. Where this occurred, extra attention was paid to ensure the participants answers were not simply an omission of what the researcher may have said, and if so, they were excluded from analysis. Therefore, ensuring codes and themes were of the opinion of stakeholders and not the researcher. Moreover, analysis involved descriptive coding that allowed for new information to be

articulated. This was instead of single word coding that would be more likely to omit to the identification of words that fit within the researchers' previous assumptions. Thus, descriptive coding allowed the researcher to see past theory and previous knowledge as it is data driven (Fryer, 2022).

Finally, to battle biased perspectives the research included stakeholders from an array of backgrounds. However, it would have been beneficial, given more time, for more interviews to have taken place. This is something that can be rectified by future research. Overall, the researcher took necessary precautions to counteract researcher bias in the current research. This should reassure the reader that identified thematic relationships and conclusions stem from stakeholder expertise entirely. Thereby strengthening the trustworthiness and rigour of this research project

6.4 Future recommendations

This sub-section will consist of research agendas and developer considerations that aim to advance knowledge surround XR, the Metaverse and user wellbeing. In addition to considerations that reflect the positive psychological agendas of this current research. Both of which are founded on the findings and interpretations of stakeholder transcripts, and additionally consider the limitations discussed above. Research agendas:

1) Due to the preliminary and qualitative nature of this study, quantitative research is needed to statistically analysis the truth of each thematic relationship. To do this, researchers should consider causal analysis techniques that will evidence the causal power of each of the dispositional themes in relation to their associated wellbeing outcome. Moreover, structural equation modelling may prove useful in analysing the strength of relationships. Alongside predictive analysis techniques this will help evaluate the likelihood of a wellbeing-related events to occur. Researchers should also investigate considerations and precautions variables (illustrated in Figure 5.1) and their ability to reduce the probability of an adverse event happening.
2) To counteract the novelty and generalisability issues of the current findings. Future research should consider identifying effects associated with different sample populations. Using methods such as edge cases, we can then decipher how effects vary for different groups and make recommendations and policy changes

accordingly.

Considerations

3) Proprietors of Metaverse technology and applications should consider publishing use cases that describe how best to use technology in a way that ensures the wellbeing of users. Enduing users with a *how to guide* or *one-stop shop* for protective information was deemed necessary by stakeholders in guaranteeing positive Metaverse experiences. This should include notes on acceptable behaviours, information regarding technology addiction. As well as steps for reporting and blocking users who act anti-socially. Revisiting HWB, ensuring positive experiences over negatives ones will simultaneously ignite positive emotions and aid in technology satisfaction. Which according to the Bottom-up theory of life satisfaction (Veehoven, 1996), will feed into overall life satisfaction.
4) Moreover, we must ensure responsible implementation. This is especially important given the novelty of technology and the rush to implement and investigate its effects. In doing so we should question whether its implementation into services etc. is acceptable among employees and weigh this against the promise of efficiency. Additionally, implementors should continually question the risk that may occur given the increasing accessibility of Metaverse technology i.e. the long-term effects that will sustain in digitally native generations.
5) Collaboration between academics, developers, and proprietors of technology, that involves knowledge sharing is strongly encouraged. Globally there lies individual groups with a special interest in these technologies, whether this be for academic reasons or working on their implementation into differing services. However, currently as a community, it is severely disconnected. By bringing together people's knowledge and evidence we can work collectively in developing rules of best practice and policy.

6.5 Reflexivity

The motivation behind the current research project stemmed from an internship that preliminarily investigated the relationship between XR technologies and user psychology. This sparked my interest in these technologies and illuminated me to the gaps in research

addressed within this project. Additionally, it led to my application for this current MRes, in hopes of furthering my knowledge of the domain and research skills. My overall experience with this has been extremely positive. It has gifted me with the opportunity to engage in a highly interesting research topic and to develop research skills needed in a further academic career. In particular, this project has deepened my knowledge regarding the theoretical and technical side of XR and Metaverse technologies. While also allowing me to experiment with interdisciplinary research through the extension of positive psychology. As a result, I have become interested in exploring the domain further through a PhD project that will investigate further the implications of these technologies. However, as with all research projects, there were times of stress and concern.

Congruent with MRes timelines, this research project was allowed a year for completion. As such, a strict timeline was needed to ensure all aspects of the project was completed in a timely manner. On reflection, this aspect added a level of pressure that required quick and flexible problem-solving skills. For instance, it is in my experience that enticing professionals to participate in an MRes project is not all that easy. Facing this, it was necessary for me to rethink my sampling process and expand on methods so to reach a sufficient number of participants. In response to this, it was vital to reapply for ethical approval so that potential participants could be recruited through social media applications including VR chat.

Moreover, I feel that depth could be added through the acquisition of more interviews. In response, I will be personally working on this by conducting further interviews that will explore the identified themes more thoroughly. Not only will these validate findings, but also produce a more impactful piece of research ready for publishing. On a more personal note, this experience has encouraged my participation of further research activities that I hope to turn into a career. I am passionate about research that produces insights valuable for stakeholders in response to turbulent nature of emerging technologies. I have gained much confidence in my ability to do this, whilst still acknowledging areas of self-development. Thereby giving me agendas for the upcoming years that will focus on skill development.

6.6 Reflection

In adhering to a critical realist paradigm, the current study was able to understand the characteristics that facilitate user wellbeing in context of the Metaverse. By which this research provides the groundwork needed to develop positive health policy (Huppert and So, 2013). This is important considering the increased technology implementation and the global reductions in mental health. In conclusion, it illuminates readers to the effects they should expect to see when engaging with such technology and unveils how this occurs. It uses stakeholder expertise and previous research to determine the trustworthiness of thematic relationships. Whilst also following preventative measures that aim to limit researcher bias. By doing so, this explorative piece of research lays the foundation for future investigations and policy decision making. It is starting point of an interdisciplinary domain that wants to understand completely the relationship that occurs between Metaverse and XR use, and user wellbeing. Whilst bridging a gap between positive psychology and Metaverse technology. To summarise, it is a preliminary piece of work that gives evidence-based insights regarding wellbeing in the context of the Metaverse. Finally, this thesis has motivated the researcher's own desire to remain in academia and in conducting similar research that investigates the implications of up-and-coming technology and applications. As such the researcher is looking to extend their passions into a PhD, and hopefully find a career within this research domain.

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Appendices

Appendix 1. Table charting the documents included within the scoping review.

Paper	Psychological approach.	Metaverse application.	Theory	Technology	Themes	Document type
Cai et al., 2023	Behaviourism. Cognitive approach.	eSport	Theory of behaviourism. Cognitive theory.	MOBA	Mental health. Digital personality. Performance. Metaverse based digital health care. Psychological wellbeing.	article
Arpaci and Bahari., 2023	Psychological needs.	education and learning	Maslow's hierarchy of needs. Education sustainability.	Decentraland, Axie Infinity, Second life, 3D visualisation.	Multimodal learning. Psychological needs. Autonomy. Hedonic motivation.	article
Lee and Kwon., 2022	not specified.	Health and beauty	N/A	3D space, VR, AR, Direct-to-customer genetic testing, Web 3.0	customisation. Health and beauty management efficiency. Covid-19 response. Enjoyable.	article
Danny-Han et	Psychological wellbeing.	virtual escapes	N/A	VR	virtual escapes. Consumer experience. Psychological and social	article

al., 2022					wellbeing. Escapism. Immersion. Consumer-centred research & design. Addiction.	
Cerasa et al., 2022	Cognitive approach. Behaviourism.	Psychiatry.	The proteus effect. Predictive coding theory. Social learning theory.	VR. AI. Blockchain. IoT. Tangible interfaces.	Improved services. Immersion. Cognitive and behavioural treatment. MedVerse.	article
Yin et al., 2022	Schemas.	Psychiatry.	Genetic epistemology.	VR. Secondlife.	Improved services. Presence. Personality disorder. Schema therapy. Overcoming barriers associated with traditional therapy.	article

Huang et al., 2022	sport psychology	Sports.	Social facilitation theory. Social comparison theory.	VR. Digital avatars.	Performance anxiety. Mental health. Performance.	article
Calabrò et al., 2022	Neurological. Cognitive approach.	Psychiatry.	n/a	VR. AR. AI. Interoceptive technologies. Digital twins. Digital avatars.	Neurorehabilitation. Sense of presence. Prevention and diagnosis. VR based treatment.	article
Usmani et al., 2022	Mental health.	Psychiatry.	n/a	VR. AR. MR. 3D internet. NFTs.	VR and AR based treatments. Simulated environments. Therapy. Proteus effect. Fear of missing out. Internet gaming disorder. Mental health.	article

Scattolin et al., 2022	Behavioural neuroscience.	not specified.	n/a	VR. 3D worlds.	Moral decision making. Embodiment. Sense of body ownership. Dishonesty. Bodily self-consciousness. Higher- level psychological functioning.	article
Liu et al., 2021	psychotherapy.	Psychiatry.	Psychosomantic medicine.	VR	Physical, mental, and social wellbeing. Metaverse mental health care. Pain management. Diseases of the neuros system. Anxiety and fear disorders. Medical decision making. Therapy and intervention.	article
Eckhoff et al., 2022	Psychological needs. Mental health.	Psychiatry.	N/A	VR. AR. Haptics.	Palliative care. Mental health. Spiritual wellbeing needs. Psychological needs. Psychological	conference proceeding.

					wellbeing. Presence. Intervention.	
Tsai., 2022	Positive psychology.	Marketing.	cognitive theory. Holistic happiness. Utilitarianism.	VR. Haptics.	Hedonism. Eudaimonism. Happiness. Holistic presence. Self-presence. Social presence. Spatial presence. Avatar embodiment. Positive Psychology. Meaningful experiences. Immersion. Engagement. Visit intention.	article.
Kriklenko et al., 2022	Psychophysiologi cal.	not specified.	n/a	VR 3D environments.	Emotion elicitation. Psychophysiological effect.	article.
Bale et al., 2022	Menta health. Psychological health	education and training. Tourism and marketing.	n/a	VR. AR. AI. Digital twins. Blockchain. IoT.	Reduced physical social contact. Overdependency on virtual worlds. Worsened mental health.	article.

		Ecommerce and trading. Conferencing.			Abuse and harassment. Anti-social behaviours. Dual personalities.	
Loveys et al., 2022	social psychology.	digital humans.	n/a	AR. Digital humans.	Human-computer interaction. Emotion. Empathy. Affective behaviour.	conference proceeding.
Han and Oh., 2023	Cognitive approach.	psychiatry	stress reduction theory.	AR. VR.	Health Metaverse. Enhancing traditional therapy. Prevent/ control/ treat disease. Healthcare efficiency. Digital therapy.	conference proceeding.
De Graaf., 2016	social psychology.	VR games.	N/A	VR. Secondlife. VayaV.	Social psychology. Loneliness and social exclusion. Virtual social institutions. Elderly. Forgetting real life circumstances (escapism). Immersion. Social and spatial presence.	conference proceeding.

					Suspended disbelief. Social perception. Self-confidence. Confusion and trust. Identity. Playing and wellbeing. Friendships and intimacy.	
Puspitasari and Lee., 2022	Persuasive technology.	not specified.	Theory of persuasive technology.	AR. VR.	Addiction. Persuasive technology. Persuasive nudges. Planned behaviour. Self-determination. Control. UI design.	conference proceeding.
Bojic., 2022	social psychology. Addiction.	Gaming. Social media.	Sociology of expectations. Socio- technical imaginaries.	VR. AR. social media. Smart phones.	Power disproportions. Addiction. Gaming addiction. Escapism. Validation. Social needs. Regulation.	article.

Dwivedi et al., 2022	not specified.	E-commerce. Manufacturing. Tourism. Operations and supply chains. Cosmetics. Retail. Maintenance. Education. Financial services. Gaming. Healthcare. Public services. Real estate. Transportation.	economic theory. Social theory. Theory of mind.	XR. VR. AR. MR. VR headsets. Blockchain. Avatars. 3D interactive platforms i.e. Roblox, SecondLife, Fortnite. NPCs. Eye-tracking technology. AI. Advanced protection technologies. Machine learning. NFTs. The user-metaverse interface. User interfaces. Web 3.0. Information technologies. Information communication technologies. Haptics. 5G. MMORPG. Brain computer interface. Digital twins.		article.
Zhang, XL; Chen, YC; Hu, LL; Wang, YM	not specified.	education	(need to explore) Embodied cognition distributed cognition	VR. AR. MR. XR. Blockchain. 5G. AI. Digital twins. Holography. Internet of Things. Cloud computing. Edge computing. Distributed computing. Big data. Second life. Roblox. Zepeto.	Metaverse based learning. Response to Covid-19. Digital identity. Sense of presence. Immersion. NPCs. Embodiment. Self- expression. Addiction. Privacy and data	article.

			, flow theory, cognitive load theory, technology acceptance model.		concerns. Identity issues. Decision making. Avatars.	
Zhang et al., 2022	engagement psychology. Human psychology.	Social interaction and communication.	Embodied social presence theory. Embodied presence theory.	VR. AR. Digital twins. Blockchain. Rendering technology. Mixed reality. AI.	Embodiment. Social presence. Co-presence. Interpersonal communication. Individual psychology. Continued use. Enjoyment. Social interaction.	article.

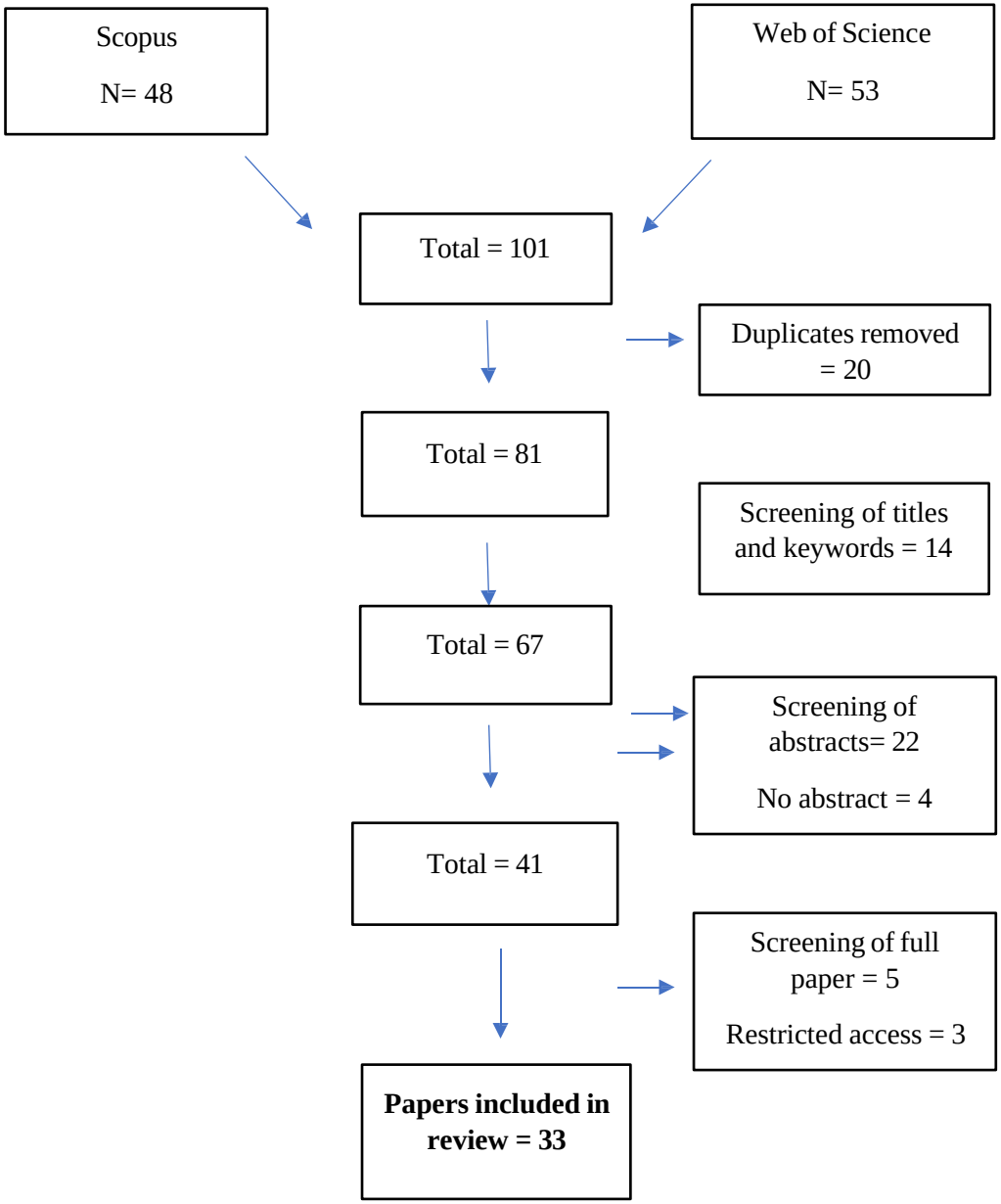
Guo and Gao., 2022	educational psychology.	Education	Theory of deep learning.	VR. AR. 5G. AI. Blockchain.	Metaverse learning. Experiential English learning. Sense of immersion. Interaction. Cognitive learning. Emotion recognition.	article.
Ren et al., 2022	educational psychology.	Education.	Technology acceptance model. Flow theory.	VR. AR.	Perceived ease of use (PEU). Perceived usefulness (PU). Attitude (Att). Behavioural intention (BI). User behaviour (UB). Flow.	article.
Martin. , 2017	social psychology.f	Avatar Orchestra Metaverse	Flow theory. Grounded theory.	second life. Avatars. 3D environments. Head-up displays.	Feeling of belonging. Creative freedom. Positivism. Group flow state. Strength for change. Attentive listening. Virtual instruments. Symbolic	article.

					interactionism. Subjective self-being or social involvement.	
Plechata et al., 2022	not specified.	healthcare.	Protection motivation theory. Construal level theory.	VR.	Health communication. Threat and coping appraisal. Presence: Physical-, self-, social-. Embodiment. Agency. Self-efficacy. Behavioural changes. Response efficacy. Social influence.	article.
Han et al., 2023	social psychology.	virtual environments.	n/a	VR headsets.	Transformed social interactions. Collaborative virtual environment. Self- presence, social presence, spatial presence. Self-avatars. Uniform avatars. Behavioural changes.	Article.
Chen and	presence	Marketing.	telepresence	VR.	telepresence. Narrative transportation. Attitude.	article

Yao., 2021					Memory. Behavioural intention. Persuasion.	
Mandolfo et al., 2022	Neurophysiological.	virtual environments.	body-mind theory.	immersive virtual environment.	Immersive virtual environments. Behavioural realism. Interactive behaviour. Arousal. Valence.	article
Yang and Kang, 2022	not specified.	education.	Person-centred counselling theory. Communication theory. Self-efficacy	3D technology. Virtual realities. Second Life, Gathertown. Jump Virtual meetup. Icograms. Spot. Ifland.	nursing simulation. Schizophrenia. Person-centred therapy.	article

			planned behaviour.			
Petit et al., 2022	psychoanalytic.	Marketing.	n/a	XR. VR. AR. Haptics. SETs. Smell interfaces.	Consumer consciousness. Sense stimulation. Marketing. Body ownership. Consumer behaviour. Decision making.	article
Branca et al., 2022	not specified.	Marketing.	The utilisation theory.	VR. Head mounted displays.	Consumer behaviour. Perceived sustainability. Willingness to pay. Marketing strategic decisions. Packaging.	article.

Appendix 2. PRISMA method



Appendix 3. Interview guide for academics, healthcare professionals and developers

Question	Prompts (dependent on answer)	Theory	Objective	Purpose
What is your experience with XR technology and the Metaverse?		CR thematic analysis: gathering contextual information regarding the participants' circumstances and relevant life experiences which potentially influence their perceptions (Wilshire and Ronkainen, 2021).	2	Initiating the interview. Used to break the ice. Discussing their link to the Metaverse. Prompting contextual information.
How do you think the Metaverse and XR will influence users with their everyday life?	(Dependent on answer) How do you see this effecting a person's ability to… - handle situations within or outside of the Metaverse?	Relating to human functioning (eudaimonic wellbeing) (Ryan and Deci, 2001; Ryff, 2014; Pancheva et al., 2021) (Develop on using planned follow-up questions). Depending on the prompts used this will relate to the five eudaimonic factors found	2,3	Exploring stakeholder opinions. Relating directly to the research question and prompts stakeholder to discuss in an exploratory way.

	- Form meaningful connections? - Ensure virtual behaviours are in accordance with one's morals? - Make use of their talent and or skills? - Build a sense of purpose?	within Pancheva's et al. (2021) integrated wellbeing theory: - Environmental Mastery - Positive Relationships - Autonomy - It is argued that people present themselves differently within the Metaverse, causing concern relating to anti-social behaviours. Ge (2022) use the pseudo drama theory to suggest users will package and beautify their virtual identities but additionally that due to avatars, users are less identifiable (Kye et al,, 2021) which risks increased anti-social behaviours (Ge, 2022). - Personal growth - Purpose in life		
Given what is known about overuse of	- How do you think by affecting	Eudaimonic wellbeing (Pancheva et al., 2021).	2,3	Exploring stakeholder opinions. Relating directly to

traditional technologies, how do you expect the Metaverse and use of XR technologies to affect the wellbeing of users?	(*insert eudaimonic factor),* the Metaverse will affect a person's emotional state? i.e. socialisation, achievement (gaming), autonomy, purpose etc. - From your own experience, how satisfactory is the replication of real-world activities using XR? – i.e. engagement –	With prompt questions relate directly to positive and negative affective states (hedonic) (Diener et al., 1999; Pancheva et al., 2021) - In this way, measures of pleasant and unpleasant emotions, such as joy versus anxiety, are used to capture the essence of an experience, indicative of a person's wellbeing (Pancheva et al., 2021). - Negative consequences of social connection online are likely to occur if when individuals engage in networking behaviours that fail to meet needs. This can be impeded by social isolation (Song et al., 2014) and through social comparison (Clark et al., 2017). Hedonic wellbeing – experiences that promote pleasure over pain and life satisfaction (e.g. Diener et al., 1999)		the research question and prompts stakeholder to discuss in an exploratory way.

	flow of experience.	- How does meeting eudaimonic needs affect hedonic wellbeing and overall wellbeing. As suggested by (Pancheva et al., 2021). Relating technology satisfaction with overall satisfaction which can be argued will benefit users s overall satisfaction with life. Thus, relating to hedonic wellbeing (Pancheva et al., 2021) - Bottom up theory of life satisfaction = life satisfaction as a result of satisfaction in the many domains of life i.e. life chances – personal resources – material property (Veenhoven, 1996). And flow of experience (Veenhoven, 1996). - Social technology use can negatively impact wellbeing or help		

		perceived friendships (Zerebecki and Opree, 2022).		
What specifically about the Metaverse technology do you expect will exacerbate these effects? And how do you think this will manifest?	- Could this facilitate or implicate perceived social connection? - Could this risk mental health? - For instance, do you think access to virtual worlds will facilitate socialisation and in turn encourage users to form positive relationships?	Psychological embodiment, emotion induction and immersion seem to be determined by presence (Eckhoff et al., 2022; Ceresa et al., 2022; Danny-han et al., 2022; Kosa et al., 2020; Mcintosh et al., 2019; Schebella et al., 2020; Newman et al., 2022). - Both spatial presence (Chen and Yao, 2021; Mandolfo et al., 2022) and social presence (De Graaf, 2016; Zhang et al., 2022; tsai, 2022). Increased social connection as a result of XR (See Laor, 2022; Miller et al., 2014; WIngerbach and Zana, 2022).	3	Exploring stakeholder opinions. Relating directly to the research question and prompts stakeholder to discuss in an exploratory way. This will facilitate with CR thematic analysis. Specifically, when coding for inferential themes. - Extending wellbeing theory into the Metaverse context.

How do you think the novelty of the Metaverse including lack of research, policy and regulation will affect its use in everyday life?	- What changes behavioural changes do you expect this could lead to? - What is the risk of knowing little about the long-term societal effects of the Metaverse?	It is argued that people present themselves differently within the Metaverse, causing concern relating to anti-social behaviours. Ge (2022) use the pseudo drama theory to suggest users will package and beautify their virtual identities but additionally that due to avatars, users are less identifiable (Kye et al,, 2021) which risks increased anti-social behaviours (Ge, 2022; Bale et al., 2022) Proteus effect and social learning theory (Ceresa et al., 2022)	2	Exploring stakeholder opinions. Relating directly to the research question and prompts stakeholder to discuss in an exploratory way.
What future regulations on technology and use would you suggest that would work towards ensuring users wellbeing and safety?	- How will this benefit users? - How will this ensure the longevity of the Metaverse?		2, 3	Exploring stakeholder opinions. Relating directly to the research question and prompts stakeholder to discuss in an exploratory way. Can use these answers to infer risks to wellbeing based

				on their suggestions. And to make propositions that will ensure long term adoption of the Metaverse that does not impact users health and wellbeing.

Appendix 4 – Interview guides for users.

Question	Prompt (dependent on answer)	Theory	Objective	Purpose
What is your experience with XR technology and the Metaverse?	- What is your most positive memory of the Metaverse? - Have you had any negative experiences within the Metaverse? - What emotions did this bring up for	CR thematic analysis: gathering contextual information regarding the participants' circumstances and relevant life experiences which potentially influence their perceptions (Wilshire and Ronkainen, 2021). Exploring negative experiences in VWs touches on the prediction that the	2	Initiating the interview. Used to break the ice. Discussing their link to the Metaverse. Prompting contextual information. Discussing experiences which can be used to

	you? – how does this make you feel when going about your everyday activities?	Metaverse and VWs issues of identity, trust, reputation, social roles, rules and interaction will occur in both virtual and physical worlds (smart et al., 2017). Relate positive or negative feelings to hedonic wellbeing. – and how they relate to functioning and affect overall wellbeing as depicted by Pancheva et al. (2021). In this way, measures of pleasant and unpleasant emotions, such as joy versus anxiety, are used to capture the essence of an experience, indicative of a person's wellbeing (Pancheva et al., 2021) – and identify how this affects eudaimonic wellbeing. Hedonic wellbeing – experiences that promote pleasure over pain and life satisfaction (e.g. Diener et al., 1999)		inform experiential themes which can later be recontextualised into inferential themes.

Why do you use the Metaverse?	- When are you most active on the Metaverse? - What functions do you carry out in the Metaverse? i.e. socialisation, work, creativity? - What do you gain from the Metaverse that you do not from the real world? -	Eudaimonic wellbeing – looking into what functions the Metaverse can facilitate. - Negative consequences of social connection online are likely to occur if when individuals engage in networking behaviours that fail to meet needs. This can be impeded by social isolation (Song et al., 2014) and through social comparison (Clark et al., 2017).	2,3	Understanding the motivation for use. An indicator of what users get out of using the Metaverse. By comparing to the real world – it ensures answers are specific to the Metaverse. – extending theory to a Metaverse context.
What features of XR or the Metaverse support you in achieving *insert purpose for use*?	- What technological components of the Metaverse assist this?	Critical realism: looking at what properties of the Metaverse/ XR affect properties (constructs) of wellbeing theory (Pancheva et al., 2021).	2,3	By associating properties of the Metaverse and Wellbeing we can assume underlying mechanisms

	- What applications assist this?	The Metaverse road map (2017) – does the Metaverse work on an intimate and external level and is this due to its ability to augment or simulate environments? For instance: Psychological embodiment, emotion induction and immersion seem to be determined by presence (Eckhoff et al., 2022; Ceresa et al., 2022; Danny-han et al., 2022; Kosa et al., 2020; Mcintosh et al., 2019; Schebella et al., 2020; Newman et al., 2022). - Both spatial presence (Chen and Yao, 2021; Mandolfo et al., 2022) and social presence (De Graaf, 2016; Zhang et al., 2022; tsai, 2022).		that perpetuate the effects of the Metaverse. Extending theory into a Metaverse context.

		- Increased social connection as a result of XR (See Laor, 2022; Miller et al., 2014; WIngerbach and Zana, 2022).		
How do you feel the Metaverse has affected your overall mental wellbeing?	- Do you use the Metaverse to supplement wellbeing resources you can otherwise not access? - How has this affected (POSITVELY OR NEGATIVELY) your physical life? - How satisfactory is replication of real-world activities within the	Relating to hedonic and eudaimonic wellbeing? – does its effects transfer into users' real life. - Functioning - Life satisfaction Previous research has shown that XR can be used to increase accessibility e.g., VR exposure therapy (Miloff et al., 2019), VR in environment exposure (Newman et al., 2022) and Digital psychiatry in VR (Torous et al., 2021). Satisfaction can be attained via perceived friendships (Zerebecki and Opree, 2022) – equally it threatens offline friendships.	2	Exploring stakeholder opinions. Relating directly to the research question and prompts stakeholder to discuss in an exploratory way.

	Metaverse? i.e. online friendships	Life chances – personal resources – material property = life satisfaction (Veenhoven, 1996)		
From a user perspective, what recommendations would you make to ensure your health and wellbeing?	Why would X be beneficial?		2,3	Exploring stakeholder opinions. Relating directly to the research question and prompts stakeholder to discuss in an exploratory way. Can use these answers to infer risks to wellbeing based on their suggestions. And to make propositions that will ensure long term adoption of the Metaverse that does not

				impact users health and wellbeing

Appendix 5 – Thoughts and questions log

File Edit View

oes physical restraints stop ppl from benefiting from tech - how does this impact overall wellbeing and access?

Differences in opinion in whether everyone should have access to technology.
Dlfferences in opinion on whether it will becomemainstream

TEch is a tool perfomance/ efficiency etc.

FOr industry to reap benefits - use cases are needed

Implmented in industry quicker than general use

Like with all technologies preceding XR and the MEtaverse it is apparent that there will be both pros and cons when *it* comes to ivellbeinge effects.

Others are a threat

Sustainability of services | efficiency, access to info, prep etc

Different views on acceotable behaviour - limits how people want to behaviour according to their own morals

Will regulation and rules affect autonomy

environmental mastery affected by uncertainty?

Mastering environments requires developed tech that is easy to use and digest

EM PG tool performance

SA PG Identity

Personal growth - need for equitable tech

Data originating from a healthcare perspective can be thepretically generalised to wider adoption.

Theme learning about yourself and the societal sturcutreS??

Uncertainty relates to security and privacy, long-term effects and knowing who is who and what is real.

It is assumed that with the development of technology we will understandmore about effects, howveer currently, technology is not developed enough for us to make objective conclusions

Nothing on purpose was identified

Appendix 6 – Participant information sheet.

Manchester Metropolitan University

Participant Information Sheet

The Metaverse and consumer wellbeing: A psychological perspective.

1. Invitation to research

I would like to invite you to take part in a research study which aims to identify the psychological mechanisms which influence the Metaverse's effect on consumer mental wellbeing. My name is Alexandra Taylor, and I am currently a Masters by Research student studying at Manchester Metropolitan University. This project is an opportunity to explore the psychology of consumer wellbeing and the perspectives of stakeholders regarding Metaverse use.

2. Why have I been invited?

You have been invited to take part in this study as you are considered a stakeholder of the Metaverse. Whether it be you are a consumer, academic, investor or supplier, you offer valuable knowledge and expertise of the Metaverse which will facilitate, in the otherwise limited, academic exploration of the domain.

3. Do I have to take part?

It is up to you to decide. We will describe the study and go through the information sheet, which we will give to you. We will then ask you to sign a consent form to show you agreed to take part. You are free to withdraw at any time, without giving a reason.

4. What will I be asked to do?

The project from start to finish will last approximately 12 months, however, you will only be asked to spare around 15-20 minutes of your time. You will be asked a set of questions during a semi-structured interview where you are free to explore your answers in detail and provide any knowledge you deem significant. The questions will be geared towards your understanding of the Metaverse and how it is used, as well as the potential psychological benefits and consequences you expect or have experienced as a consumer. Prior to the interview you will be asked to provide your consent using the consent form sent alongside this information sheet. If you obtain any enquires regarding the consent process, do not hesitate to contact me. The interview will conveniently take place online using Microsoft Teams, in conjunction with MMU recommendations. I plan on using a device to record the interview. This will not be shared with anyone other than myself and the recordings will not be published as part of the project. I will use the recordings to transcribe the interview later in the process. The recordings will be securely deleted at the end of the project.

5. Are there any risks if I participate?

Manchester Metropolitan University

There are no risks involved in this study.

6. Are there any advantages if I participate?

There are no direct rewards offered for your participation, however, your insights will be a part of a project that aims to stimulate and develop discussion of an otherwise limited academic domain. Additionally, if you chose to volunteer your email, you will be sent a discussion of the findings which you should find some interest in.

7. What will happen with the data I provide?

When you agree to participate in this research, we will collect from you personally identifiable information.

The Manchester Metropolitan University ('the University') is the Data Controller in respect of this research and any personal data that you provide as a research participant.

The University is registered with the Information Commissioner's Office (ICO) and manages personal data in accordance with the General Data Protection Regulation (GDPR) and the University's Data Protection Policy.

We collect personal data as part of this research (such as name, telephone numbers or age). As a public authority acting in the public interest, we rely upon the 'public task' lawful basis. When we collect special category data (such as medical information or ethnicity) we rely upon the research and archiving purposes in the public interest lawful basis.

Your rights to access, change or move your information are limited, as we need to manage your information in specific ways for the research to be reliable and accurate. If you withdraw from the study, we will keep the information about you that we have already obtained.

We will not share your personal data collected in this form with any third parties.

If your data is shared this will be under the terms of a Research Collaboration Agreement which defines use and agrees confidentiality and information security provisions. It is the University's policy to only publish anonymised data unless you have given your explicit written consent to be identified in the research. **The University never sells personal data to third parties.**

We will only retain your personal data for as long as is necessary to achieve the research purpose. All collected data will be kept safe on a password protected laptop only accessible to the principle investigator, additionally, personal identifiers will be kept separate from the data and participants will be allocated random numbers so to anonymise their inputs and preserve confidentiality.

For further information about use of your personal data and your data protection rights please see the University's Data Protection Pages.

Version: 2 Date: 03/03/23
Ethical approval number (EthOS): 50927 Date: 03/03/23

Manchester Metropolitan University

What will happen to the results of the research study?

The results of the study will be written up to be submitted as part of my master's by Research. Additionally, the research aims to publish their findings within an academic journal.

Who has reviewed this research project?

This project has been reviewed by my academic supervisors and Manchester Metropolitan University's ethics committee.

Who do I contact if I have concerns about this study or I wish to complain?

For questions and concerns please contact the project team:

Principle investigator: Alexandra Taylor alexandra.taylor5@stu.mmu.ac.uk

Supervisor: Mandy Claudia tom Dieck c.tom-dieck@mmu.ac.uk

Timothy Jung t.jung@mmu.ac.uk

Faculty ethics: Business and Law faculty, Manchester Metropolitan University, FOBLEthicsEnquiries@mmu.ac.uk

If you have any concerns regarding the personal data collected from you, our Data Protection Officer can be contacted using the legal@mmu.ac.uk e-mail address, by calling 0161 247 3331 or in writing to: Data Protection Officer, Legal Services, All Saints Building, Manchester Metropolitan University, Manchester, M15 6BH. You also have a right to lodge a complaint in respect of the processing of your personal data with the Information Commissioner's Office as the supervisory authority. Please see: https://ico.org.uk/global/contact-us/

THANK YOU FOR CONSIDERING PARTICIPATING IN THIS PROJECT

Version: 2 Date: 03/03/23
Ethical approval number (EthOS): 50927 Date: 03/03/23

Appendix 7 – Consent form.

Manchester Metropolitan University

CONSENT FORM

The Metaverse and consumer wellbeing: A psychological perspective.

Participant Identification Number:

	Please tick your chosen answer	YES	NO
1.	I confirm that I have read the participant information sheet version 2, date 03/03/23 for the above study.	☐	☐
2	I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐	☐
3	I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected.	☐	☐
4	I agree to participate in the project to the extent of the activities described to me in the above participant information sheet.	☐	☐
5	I agree to my participation being audio recorded for analysis. The recording will be securely deleted at the end of the project.	☐	☐
6	I understand and agree that my words may be quoted anonymously in research outputs.	☐	☐
7	I wish to be informed of the outcomes of this research. I can be contacted at:	☐	☐
8	I give permission for a fully anonymised version of the data I provide to be deposited in an Open Access repository so that it can be used for future research and learning.	☐	☐

Name of participant Date Signature

Alexandra Taylor

Name of person taking consent Date Signature

When completed: 1 for researcher, 1 for participant to keep with the PIS
EthOS ID: 50927, version 2 and 03/03/23

Appendix 8– MS forms link.

https://forms.office.com/e/5ZYxctYBt8