

AN EYE TO THE FUTURE:  
DEFINING A FRAMEWORK FOR  
THE VR TOURISM EXPERIENCE

By

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To the women of my homeland and all over the world who are fighting for  
“Woman, Life, Freedom”.

## **Abstract**

The significance of new immersive technologies in tourism has been acknowledged in the literature. Specifically, the Virtual Reality (VR) technology experience is often theorised to be linked to the behavioural intentions of tourists. However, there is still unknown about how experiencing these kinds of technologies ultimately influences behavioural intentions of the tourists, such as their intention to visit the destination. Specifically, the lack of theoretical foundation leads to a lack of explanation to the dimensions and process that are involved in VR tourism experience. ‘Dimensions’ are defined as the key concepts of the VR tourism experience, whilst ‘process’ refers to the steps involved. This study investigates these dimensions and process in order to reveal how these connect and ultimately affect tourists’ behavioural intentions. In exploring these key concepts and their associations, this research aims to define a framework for the VR tourism experience.

This research comprises two studies, applying an exploratory sequential mixed methods design and connective phase between these two studies. This mixed method design included an exploratory qualitative approach followed by a quantitative one. In study 1, in-depth semi-structured interviews were designed with an exploratory approach. After experiencing a VR tour to Rome, interviews were conducted with 20 students at Te Herenga Waka Victoria University of Wellington in New Zealand to gain an initial understanding of the dimensions and process of the VR tourism experience. The data was transcribed, and the thematic analysis was performed using NVivo. Based on the qualitative results, the variables, and scales for a conceptual framework with eight factors and questionnaires were designed, using the connective phase between study 1 and 2. Then in study 2, the quantitative phase of this research was conducted with new groups of participants, including 63 individuals using three questionnaires. First, participants answered a pre-experience questionnaire that included demographic characteristics and measured participants’ intentions to visit Rome prior to the VR tour. This helped to explore the effectiveness of VR tourism experience after the tour. Having experienced the same tour as used in study 1, participants then answered an experience questionnaire, directly after the tour. One week after the tour, participants were emailed a post-experience questionnaire to be answered. This questionnaire assisted in measuring the durability of participants’ emotions, feelings and behavioural intentions towards the destination and the technology. The data were then analyzed using Structural Equation Modelling (SEM).

The analysis of study 1 focused on finding the dimensions and process of the VR tourism experience. As dimensions, authenticity was identified as a significant perception, awe as a complex emotion, sense of presence and place attachment as feelings that were associated with this experience. The behavioural intentions of tourists were also revealed, including intention to visit the destination, intention to recommend the destination, intention to use the technology, and to recommend it. The process of the VR tourism experience was identified as perceptions, feelings, emotions, and behavioural intentions.

The data analysis of study 2 focused primarily on the associations between these dimensions to discover how these connect to affect the behavioural intentions of tourists. In relation to tourists' perceptions of the VR experience, authenticity was found to be connected to presence, awe and place attachment; whilst presence was strongly associated with awe. The components of complex emotion of awe were found to positively impact place attachment. Finally, study 2 revealed that place attachment was the only dimension that connected all perceptions, feelings, and emotions to the factors of behavioural intentions.

The contribution of this thesis is twofold. It provides a general framework for the VR tourism experience by revealing the dimensions and key concepts of this experience. It also identifies the process or steps involved in the VR tourism experience. The effectiveness of the VR tourism experience was identified before, during and after this experience. This study connects experiencing new trends in technology to tourists' complex emotions, feelings, and their behavioural intentions. These technologies are at the forefront of changes that contain significant potential to affect behavioural intentions. By exploring the dimensions of the VR experience, this research reveals how this technology has the potential to change tourists' engagement and intention to visit the destination. Practically, exploring tourists' emotion, feelings, and behavioural intention through using VR technology could represent a significant step forward in attracting tourists to different destinations, as well as revealing their future intention to visit a destination. Based on the theoretical and practical contributions of the study, several recommendations are provided for future research and for stakeholders in this area.

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## **1. Introduction to the study**

### **1.1 Introduction**

Today, a world without technology is unthinkable as it has penetrated every aspect of our lives. We are living in an era where new immersive technologies could not only transform business, including tourism, but also revolutionise tourists' experiences. Beyond what the contemporary era offers, immersive technologies will likely be significant in the future, (Nadrljanski et al., 2018) in various fields including tourism. The significant growth of technology has had a profound impact on the tourism industry as today's travellers are working with technologies pre, during and after trips (Tom Dieck et al., 2019b). One of the most significant technologies making this transformation is Virtual Reality (VR) ( Leung et al., 2022). Virtual tourism is highlighted as the future of tourism (Verma et al., 2022). Therefore, understanding the impacts of experiencing these technologies on tourists' behaviour and the tourism industry is very important.

To define it simply, virtual reality (VR) is the use of a computer-generated 3D environment, called a "virtual environment", that can be navigated and interacted with, resulting in a real-time simulation of one or more of the user's five senses ( Lu et al., 2022). It is argued that tourists can experience visiting the destination prior to travelling, via VR technologies. In the pre-trip stage or while they are travelling, these technologies allow tourists with limited knowledge about the destination or attraction to inherently experience it (Chung et al., 2015). The technologies enhance tourists' experience and help them to explore their surroundings by providing personalised information (Jung et al., 2020). This provides numerous opportunities, allowing the destination to be better presented, providing tourists with a better view of what to expect, and helping them in decision-making and planning their travel (Cranmer et al., 2018). Therefore, the technologies can increase tourist numbers and present organisations with a greater opportunity to reach wider audiences (Cranmer et al., 2018). Accordingly, these new technologies (Krotov, 2019) are able to transform the behavioural intention of travellers towards a destination (Wang et al., 2013). Generally, behavioural intention refers to the motivational factors that influence a given behaviour where, the stronger intention to perform the behaviour, the more likely it is that the behaviour will be performed (Mamman et al., 2016). In the tourism context, many studies have applied the behavioural intention to discuss the intention to visit the destination ( Jeong et al., 2020; Wang, 2017) and to recommend the

destination (Kaur & Kaur, 2020; Yang et al., 2020). Notably, due to the COVID 19 pandemic, described as the world's most disruptive crisis after World War II (Gössling et al., 2020), technology use has peaked. This use will continue to change the behavioural intentions of travellers (Wenet et al., 2020), including the intention to visit the destination or to recommend it to others. Specifically, a tourism destination can benefit from virtual reality if it is used to market and promote the destination effectively, as it can offer potential visitors a more in-depth assessment of the destination without visiting it in person, which could impact the visitor's behaviour. Thus, the VR experience can positively and significantly influence behavioural intentions towards the destination (Marasco et al., 2018; Rahimizhian et al., 2020), and the use of VR can greatly increase the likelihood of future visits (Gibson & O'Rawe, 2018).

Although available literature connects the VR tourism experience to behavioural intentions, less is known about the key concepts involved. In particular, the dimensions of the VR tourism experience remain unclear. The dimensions refer to the factors that are involved in ultimately affecting the behavioural intentions after the VR tourism experience. Also, the possible processes and linkages of how tourist behavioural intentions are affected by VR, and what steps are involved to result in this impact remain vague. The lack of understanding of the dimensions and processes of the VR tourism experience, means that it is difficult to explain how this experience affects tourists' behavioural intentions. Consequently, existing research fails to define a framework for the VR tourism experience that includes the building blocks of this experience and the associations between them.

Exploring the behavioural intentions of tourists is regarded as one of the most fundamental issues in evaluating their purchasing behaviour, and guiding tourism companies in the future (Gharibi, 2020). This exploration will also be of a significant benefit in the growth of tourism sectors, with practical value for all tourism stakeholders (Juvan et al., 2017). Such an examination would assist tourism stakeholders to explore the potential of these technologies to attract tourists. Notably, the majority of the existing studies have not comprehensively investigated the dimensions and process of the VR tourism experience and the link to the behavioral intentions of tourists.

In summary, the significance of the VR technology experience in the contemporary and future tourism industry is clear. For this reason, this study focused on defining a framework for the VR tourism experience. In particular, this work identifies the dimensions and process of

experiencing these technologies, and explores how tourists' behavioural intentions, in regard to destinations, alter as a result of the VR experience.

Key questions arise in this work. The first, is to consider which framework defines the components or dimensions of the VR tourism experience. The next is to explore how the VR technology experience affects tourists' behavioural intentions in practical ways. The final question concerns what degree of potential VR technology may have for promoting the destination and affecting a tourist's intention to visit a tourism destination. Therefore, this study aims to investigate the dimensions and process of using VR technologies, and their effects on tourists' behavioural intentions. The thesis considers how these technology experiences can affect a tourist's intention to visit the destination, and also provides a framework for the VR tourism experience.

This chapter serves as an introduction to the background and importance of the topic of study, the research gap, and the context of the study. The overall objectives and the research questions guiding the study are identified, the research methodology is explained, and the contribution of, and outline of, the thesis is summarised.

## **1.2 The research gaps**

As the first step in identifying a framework for the VR tourism experience, exploring its dimensions and how it affects the behavioural intentions of tourists, this thesis began with research into existing knowledge in this area. Virtual reality is part of a broader category of technologies labelled X-reality (XR). This umbrella term incorporates all kinds of realities supported by immersive technology (including Virtual Reality (VR), Augmented Reality (AR), and Mixed Realities (MR)) (Chuah, 2019). XR technologies have been studied in a wide range of literature, however, there is a lack of knowledge on their use in the tourism context and their dimensions. The following section describes the background of the studies on XR technologies, specifically in tourism.

X-reality as the new generation of technology has entirely changed aspects of many lives by connecting the physical realm to a digital one (Rauschnabel et al., 2017). Additionally, it offers a way to alter the way that businesses approach the customers and handle their marketing strategies (Chmielewski, 2017). The first version of these technologies appeared in 1960, in the form of a multi-sensory simulator, a virtual reality system. In the early 1990s, this technology became much more mainstream, and the term "Virtual Reality" became extremely

popular (Mazuryk & Gervautz, 1996) and Augmented Reality (AR) and Mixed Reality (MR) were also introduced.

Recent developments in the field of these technologies have led to a new interest in research on gamification (Rauschnabel et al., 2017; Tabacchi et al., 2017), learning and education (Kerawalla et al., 2006; Yilmaz, 2016), and psychology (Quesnel & Riecke, 2018; Stepanova et al., 2019b). The United States and Spain were the first to perform practical research on VR and AR in physical education (Kuleto et al., 2021). XR is being applied to teach physical educators, enhance user motivation through gamification in physical education, and train physical educators to use different technological facilities (Calabuig-Moreno et al., 2020). According to Weber-Sabil & Han, (2021) in recent years, there is a growing body of literature on the potential use of VR, AR and MR in gamification and storification of content. This would be a great help in creating more interactive and immersive systems that produce memorable tourist experiences.

Due to their massive potential in the tourism industry, XR technologies have also been increasingly studied (Jung, Chung, & Leue, 2015) as they have recently shown the potential to create value (Han et al., 2013). Specifically, MR and VR have been admired for their capability to create virtual tours in store, for the destinations being marketed (Sheikh, 2016), prior to travelling. One recent source reveals the sense of presense as an outcome of experiencing VR as a tourism marketing tool (Yung at el., 2021b).

Suh and Prophet (2018) highlight the change in a user's attitude when using XR technology. Recent research suggests that the authentic experience of the destination provided by XR technology can influence a potential tourist's emotions and intentions to visit the destination (Kim et al., 2020) and alter their emotional state (Shank, 2014).

Previous research investigates XR experience outcomes such as different types of emotional connections, including place attachment (Pantelidis et al., 2018) However, these findings are not generalisable, due to the very limited number of participants in their study. Similar studies reveal emotional involvement (Saeed et al., 2009), enjoyment (Tussyadiah et al., 2018) and flow ( Kim et al., 2020) as emotional states induced by the VR experience. Additionally, a number of authors have considered the effect of the VR authentic experience in relation to a user's intention to visit the destination (Jung & Tom Dieck, 2017; Kim et al., 2020), recommend it to others and positive word of mouth (WOM) about it (Afonso, 2019; González-Rodríguez, 2020).

Literature pertaining to the connection between XR wearable technologies and tourism is still emerging (Atembe & Abdalla, 2015). Additionally, scholars note that the majority of the research about the XR technology experience, prior to travel, is conceptual (Simoni et al., 2021), and more research is needed regarding the empirical knowledge. A deep understanding of the roles of these technologies in creating value at different stages of the tourism journey and prior to travel is significant and more comprehensive research is needed (Rauschnabel, 2022).

There is some literature relevant to this research, however there are few studies focused on the behavioural intentions of tourists toward technology (Jeong & Shin, 2020) and XR such as VR (Kim et al., 2020). There is also a relatively small body of literature concerned with the impacts of XR technologies such as VR on tourists' emotions (Pantelidis et al., 2018). Furthermore, researchers have not treated these areas in much detail and no research has been found that surveys how this experience would lead to affecting the behavioural intentions of tourists towards the destination. No single study was found that closely examines the whole process of the VR technology experience and its dimensions.

New technologies are changing the world irreversibly (Mulder, 2013). Considering the huge impacts of new technologies in the future (Pitt, 2019) and the post COVID 19 world (Kim et al., 2021), this area has recently been challenged and future research is needed to explore how the XR technology experience may influence consumers' decision-making processes (Leung et al., 2020). As this area is new, there are research that are making small steps of understandings about the future. However, according to the scholars forecasting the future is one of the greatest human desires (Buhalis et al., 2006) and the present study tries to illustrate the future in relation to the behaviour of tourists towards new immersive technologies.

Having identified these gaps, this study focuses on the dimensions and process of experiencing VR technologies to uncover how they affect the behavioural intentions of tourists towards the destination and the technology. This will provide a basis for defining a framework for the VR tourism experience.

### **1.3 Research questions**

To fill the identified gap, in the literature review in chapter 2 investigates available research in detail, whilst attempting to define a framework for the VR tourism experience. Although very few literature reviews have tried to define a framework for the VR tourism experience

(Godovykh et al. 2019), there are no imperial studies that reveal a VR tourism framework as the main research problem.

### **What is a framework for the VR tourism experience? (RQ)**

To define a framework, a comprehensive understanding of the key components involved in the VR tourism experience are required. Also, it is necessary to identify the steps involved in this experience. However, these studies are very limited and do not identify a structured view of the concepts involved in the VR experience and their associations. Specifically, investigating the key concepts and steps involved in this experience will assist in finding the dimensions and process of the VR experience as the first sub-question of this research. Therefore, the first step to define a VR tourism experience, is to identify the dimensions and process of this experience.

### **What are the dimensions and process of the VR tourism experience? (SQ1)**

The dimensions and process of the VR tourism experience are significant as they are found to generate positive behavioural tendencies towards the destinations (Xu et al., 2019) and the technology. They also influence the behaviour of tourists. Understanding these impacts is critical, because the ability to explore probable future behavioural intentions of tourists allows us to shape the future, rather than merely survive whatever it brings (Tarka & Łobiński, 2014). The dimensions of the VR tourism experience include finding the key concepts involved in this experience. The process of the VR experience associates with steps involved in this experience. Therefore, exploring the dimensions and their process is the other fundamental issue of this research, which leads us to the next question.

### **How does the VR experience influence behavioural intentions of tourists? (SQ2)**

After identifying the dimensions or the key concepts and the process of the VR tourism experience, it is important to understand how these are related to each other, and ultimately to the behavioural intentions of tourists. According to Yung & Khoo-Lattimore (2019), previous research offers an adequate explanation for the impacts of these technology experiences on tourists' behavioural intentions. Although there is literature on a few concepts associated with the VR experience, the association between these concepts is not fully understood. For instance, previous studies fail to focus on how the technology experience can affect tourists' emotions, and ultimately enhance the experience. Therefore, identifying the correlations between these concepts will assist in building a basis for the framework for the VR tourism experience. Examining how these are all connected will assist in answering the second sub-

question of the research. Ultimately, connecting the two sub-questions, will answer the question of this study and define a framework for the VR tourism experience.

Drawing from the sparse existing literature, there is clearly not enough knowledge about the dimensions of the VR tourism experience; therefore, it was necessary to take an exploratory approach in this work. The key uncertainties or unknowns are the different dimensions of the VR experience, and the impacts on tourists' behavioural intentions. These provide a foundation for the two phases of data collection and analysis to determine the information needed to address the main research question and sub-questions. To answer these questions, this research conducted an exploratory approach to achieve a comprehensive understanding of the problem.

## **1.4 Methodology**

Conducting multiple paradigms including a constructivist and a post-positivist approach, the study used “an exploratory sequential mixed method” (Creswell & Clark, 2017). This research design included an exploratory qualitative phase followed by a quantitative approach, as shown in Figure 1.1. After designing the research questions and purpose, the available literature was reviewed to identify gaps. As the literature review did not provide sufficient material to answer the different sub-questions and main research questions, these two studies were conducted to achieve the related goals.

First, semi-structured interviews with 20 students at Te Herenga Waka Victoria University of Wellington were conducted, after participants had experienced a 15-minute tour to Rome using a Virtual Reality headset (HP) and a Microsoft application named Holotour. Participants' observations were also collected during the tour to add to the data. The data were analysed by thematic analysis to extract the relevant variables and develop a conceptual framework. This qualitative phase identified the dimensions and process of the VR tourism experience, as the first step in identifying a VR tourism experience framework.

Developing hypotheses based on the first phase of this study, the second phase of this research was conducted quantitatively to test the hypotheses. These hypotheses were created based on qualitatively identified dimensions and processes of the VR tourism experience. The analysis of this phase of research answers the second sub-question of the study, describing how the VR tourism experience affects behavioural intentions of tourists. As the ultimate goal of exploratory design is to generalise qualitative findings, based on a few individuals from the first phase to a larger sample gathered during the second phase (Creswell & Clark, 2017), the

developed hypotheses were tested using 63 new participants. Experiments, including 3 questionnaires, were used to obtain more accurate results of the effectiveness of the VR tourism experience on tourists' behaviour.

As Rome is a popular tourist destination, to prevent confounding variables interfering with results, participants answered a short pre-experience questionnaire regarding their intention to visit Rome using a 9-point Likert scale (Extremely agree to Extremely disagree). Then they experienced the 15-minute tour to Rome using the same device and answered an experience questionnaire.

Furthermore, one week after participants experienced the tour, they were sent a post-experience questionnaire via email to answer. This post-experience questionnaire included the same questions as the experience questionnaire. The intention was to test the durability of participants' behavioural intentions towards the destination and the technology. Then data was analysed by SPSS and Structural Equation Modelling. The overall view of the research design is illustrated in Figure 1.1. Concluding the results and findings of qualitative and quantitative approaches builds the basis for defining a framework for the VR tourism experience as the main research question.

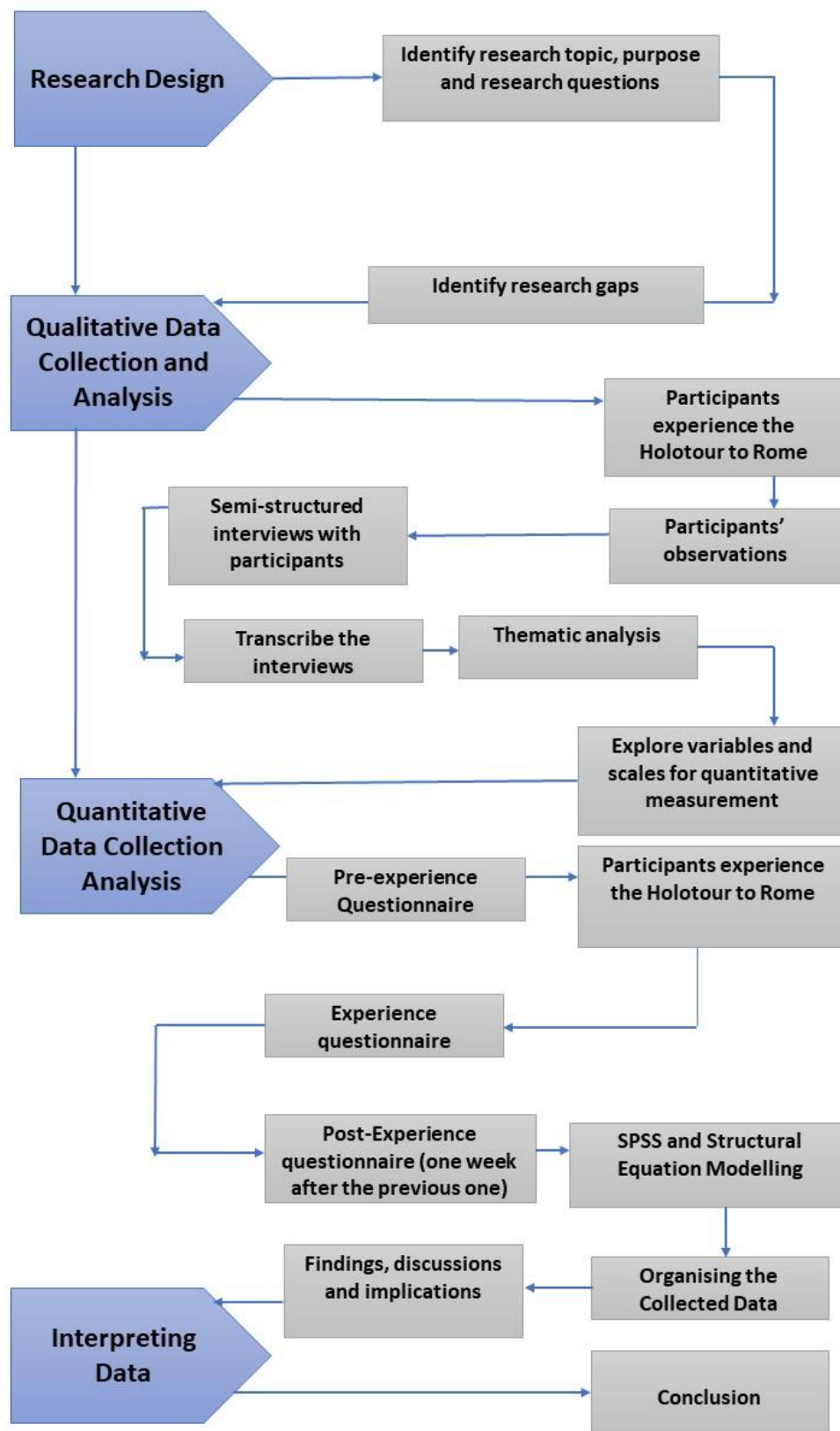


Figure 1.1. Overview of the research design

Overall, instead of relying on a single incomplete method, this research conducted a postpositivist approach, drawing on multiple observation methods. These different measurements were triangulated in order to solve problems regarding validity and bias. Accordingly, this research used a triangulation method that includes in-person interviews, observations and surveys (Mills et al., 2009). This research design is based on the premise that an exploration is needed, as measurements are unknown and there is no comprehensive theory (Creswell & Clark, 2017). Therefore, the aim of the two-phase exploratory design is to use the results of the qualitative method to assist in developing or informing the second phase, the quantitative method (Greene et al., 1989). The methodology of the research is comprehensively discussed in chapter three.

## **1.5 Contribution of the research**

### **1.5.1 Contributions to knowledge/theory**

By concentrating on three bodies of knowledge which include the VR technology experience, tourism, and consumer behaviour, the present study is intended to make three main contributions to research on the VR technology experience in the field of tourism. The first is to define a framework for the VR tourism experience that will be built on tourists' perspectives and several stages of investigation. This framework will assist in finding the key concepts that are involved in this experience. The second is to enable better understanding of the steps involved in this experience. The third contribution of this research to the body of knowledge is investigating how the VR technology experience is connected to tourists' behavioural intentions. These contributions are crucial to realising the potentials of these technology experiences for tourism academic knowledge.

Noting that the literature on the impacts of using these technologies is scarce (Vishwakarma et al., 2020), the present research will expand the academic knowledge on different concepts related to the VR tourism experience and its role in influencing the behavioural intentions of tourists. Also, most tourism literature studies (Elgammal et al., 2020; Yung & Khoo-Lattimore, 2019) are still theoretical; the present study expands the empirical knowledge of the actual use and experience of VR technologies.

Furthermore, the present study investigates the distinctions between all probable dimensions of experiencing these technologies. By applying an exploratory approach, this research expands the literature on probable dimensions of experiencing new trends of VR technologies

that will be added to a growing body of literature. Moreover, the desirable outcomes of these concepts in tourism, such as attracting tourists to the destinations, will be examined. By finding the association between all of the related dimensions, this research will define a framework for the VR tourism experience. This framework will explain different angles of the VR tourism experience that have not previously been investigated.

Moreover, this study improves our knowledge of tourists' behavioural intentions after experiencing these technologies. As behavioural outcomes of emotions induced by the technology experience are not clear, the findings of this research make several noteworthy contributions to the correlation of tourists' emotions and their behavioural intentions towards the destination. For instance, it will be explored how experiencing a new technology can affect potential tourists' emotions, feelings, and behavioural intentions to visit the destination, recommend it to others and state positive WOM about it. Therefore, the study makes several contributions to the current literature and expands this area of research through exploring the connections of the emotions, feelings, and behavioural intentions.

Finally, this research is noteworthy because it examines behavioural intentions of potential tourists. These technologies are regarded to be effective for anticipating the tourist experience and behaviour due to their interactive immersion (Flavián et al., 2021) and there is a lack of studies on these technologies as a significant touchpoint at the purchase stage (Sharples, 2019). Therefore, this study contributes in several ways to an understanding of the behaviour of tourists in relation to these kinds of experiences, providing a basis for expanding knowledge in this area.

### **1.5.2 Contributions to practice/management/marketing**

From the industry perspective, this study examines how experiencing new trends of VR technology leads to affecting the behavioural intentions of tourists. These behavioural intentions include intention to visit the destination and promoting the destination through using these technologies.

New immersive technologies are identified as the key element for future trends in tourism (Bowen & Whalen, 2017) and VR and similar technologies will shape future trends (Mohanty et al., 2020). These technologies have the potential to revolutionise the way that we experience and interact with the world, and the tourism industry is no exception. VR is expected to have a

significant impact on tourism behaviour, changing the way we plan, book, and experience travel.

Uncovering tourists' behaviour in regards to the VR tourism experience is essential in various ways. One of the main ways that VR tourism experience is expected to impact tourists' behaviour is through the use of VR in the planning and booking process. Potential travellers will be able to visit and explore destinations in a fully immersive way before they even leave home. This will allow them to get a sense of the place and make more informed decisions about where to go and what to do. It will also allow them to preview accommodations and activities, making the booking process more efficient and less risky.

In addition, VR technology is also expected to change the way we experience travel once we arrive at our destination. Tourists will be able to enhance their understanding of the place they are visiting. This will make the travel experience more engaging and interactive and will also allow travellers to learn more about the places they are visiting.

Additionally, the use of VR in the tourism industry will also facilitate new business opportunities, such as virtual travel agencies, virtual tours and excursions, and virtual reality theme parks. This will increase the competitiveness of the industry and will open new doors for innovation and growth. Therefore, it is important that tourism businesses stay informed and adapt to these changes, in order to remain competitive.

Notably, in a post Covid-19 world, the tourism industry needs tools to motivate potential tourists to travel again. Researchers have stressed that the new pandemic is changing tourism and hospitality and tourists' behavioural intentions (Wen et al., 2020). However, it remains unclear what behaviours result from using the new technologies. Therefore, research findings will shed light on the level of effectiveness of these technologies to attract tourists to the destinations and tourist attractions in the post-pandemic world.

Overall, understanding how experiencing technology could change tourists' emotions and behavioural intentions towards destinations is important. It could be very useful in attracting tourists to the destinations, as well as revealing their future intentions. While the overarching goal of this study is improving the tourism industry, its findings provide tourism marketers valuable knowledge concerning how tourists behave by experiencing these technologies. As tourism marketers in the private and public sectors decide what kind of VR technologies to support or organise, information regarding tourists' behavioural intentions would enable them

to consider strategic programmes for investing on these technologies for tourism development and influencing tourists to visit the destination. The present study sets out the significant advantages for both tourism companies and potential tourists as customers who are using VR.

## **1.6 Thesis structure**

The thesis is presented in eight chapters. **Chapter 1** (Introduction) starts with the background of the study and how the idea for this research developed. The relevance and importance of VR technologies in tourism and the dimensions of experiencing them are explained. The goal of the study and the main research question are also established, followed by a discussion regarding the methodology used in this study. The contribution of this research is also discussed.

The literature in **Chapter 2** (Literature review) begins with XR technologies and introducing their application in tourism. Then, various dimensions and process of experiencing these technologies are described. Then, the research gap is defined.

**Chapter 3** (The approach and the design of the study) starts with the research paradigms. Then, further details of the overall research approach are provided, followed by identifying the two methodological approaches including the qualitative and quantitative data collection of this research, as well as discussing their data analysis process.

**Chapter 4** presents the findings and results related to study 1 as the qualitative phase of this research. The results described in this chapter focuses on the first sub-question of this research.

**Chapter 5** defines the connective point between studies 1 and 2. Based on the finding of study 1 as the qualitative phase, this chapter assists in developing the variables and hypotheses and a primary framework for the VR tourism experience to be tested.

The results of study 2 are then addressed in **Chapter 6**. This chapter focuses on the second question of the study and presents the findings in terms of the associations between the concepts, to test the primary framework for the VR tourism experience.

**Chapter 7** (General discussion) synthesises and integrates the findings of the two studies and delivers a theoretical understanding and interpretation. In doing so, this chapter revisits the original conceptual framework in light of the findings of the study.

Through addressing supplementary questions, **Chapter 8** (Conclusion and Future research) answers the main research question by defining a framework for the VR tourism experience. The chapter also provides a summary of the key findings, study limitations, theoretical contributions of the study to knowledge, and practical contributions to policy and practice followed by providing recommendations and avenues for further research.

## **2. Literature Review**

### **2.1 Introduction**

The previous chapter outlined the importance of dimensions and process of the VR technology experience in the tourism context, the significance of these technologies, and also identified the questions that were designed to explore this issue further. As described in section 1.3, in order to define a framework for the VR tourism experience as the main answer the research problem (RQ), it was first necessary to investigate the dimensions and process of the VR tourism experience (SQ1). Searching the academic literature may provide information that enables a deeper understanding of the dimensions and process of the VR tourism experience and their influence on tourist behaviours.

Accordingly, before looking specifically at VR, this chapter reviews the literature, drawing on several areas of knowledge regarding XR technologies (as the encompassing term for these immersive technologies), their potential and roles in the tourism context, and their significance for the future of tourism. The objectives of this chapter are to draw different areas of knowledge together to identify the underlying concepts of this research and provide a guideline for the foundation of the research methodology.

First, the literature on XR technologies, their definition (Section 2.2.1) and significance (Section 2.2.2), and the available research on them will be reviewed (Section 2.2.3), and their potential in tourism will be defined (Section 2.2.4). Then, the available literature on the frameworks will be discussed to identify the dimensions and process of the VR tourism experience. (Sections 2.3 and 2.4). Third, the relevance and applicability of these dimensions and process of the VR experience for affecting the behaviour of potential tourists will be explored to trace the development and progression of the study and to define a framework for the VR experience (Section 2.5). Figure 2.1 provides a visual overview of the elements included in this chapter.

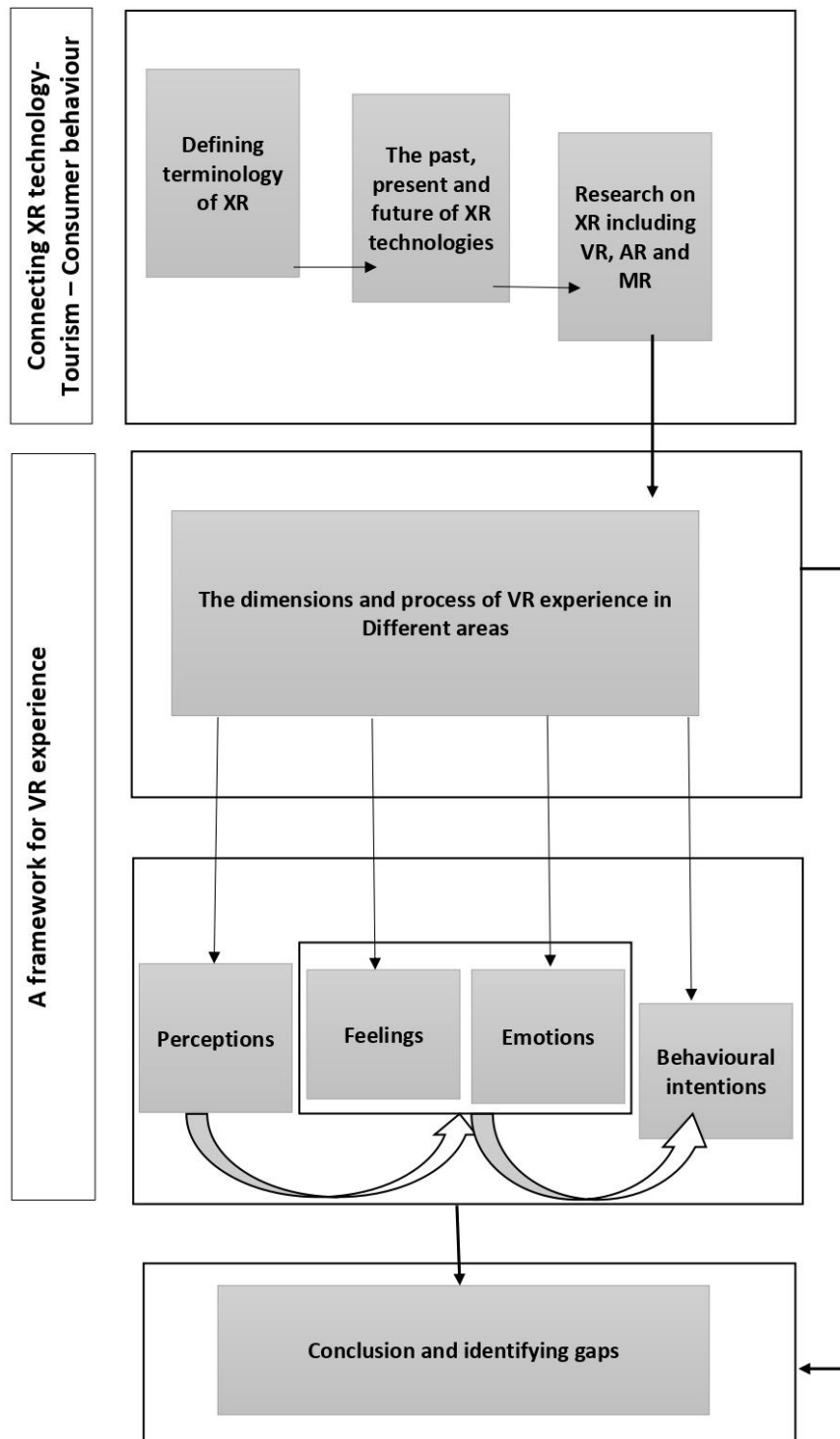


Figure 2.1. Overview of literature review

## **2.2 XR Technologies**

As VR technologies are included in a wider group of technologies labelled XR, it is important to define this umbrella term first. Specifically, XR lies at the intersection of three technologies that will be described in section 2.2.1.

The definitions of XR and its application in the tourism context will be defined. As this research aims to investigate the dimension and process of the VR tourism experience and how it is connected to the behaviour of tourists, it is crucial to gain a full understanding of XR technologies, their application in tourism and their importance for the future of tourism.

Scholars note that tourism, as a multifaceted economic segment, is vastly dependent on innovation and the ways that tourism services and products are presented to potential customers. Development of new technologies over the years has been significant in tourism services, resulting in increased competitiveness among marketers and stakeholders (Ilic & Nikolic, 2018). The ongoing progress of information technology has significantly revolutionised the tourism industry (Milicevic et al., 2013 ). Evidently, potential travellers are progressively relying on various new technologies to obtain information (Selvam et al., 2016). Relatedly, a rising interest in the field of technologies is simultaneously connected to technological progress in mobile, wireless data and sensory technologies. This leads to the extensive use of smartphones and wearable devices presented by XR technologies to the mass market (Yovcheva et al., 2013).

### **2.2.1 An introduction to XR terminology**

XR, as the new generation computing platform, has revolutionised almost every aspect of our lives by connecting the physical world to a digital one (Rauschnabel et al., 2015). The ‘R’ stands for reality or realities, while the ‘X’ has different meanings; most scholars read X as ‘extended’, whilst others use the verbs ‘expanded’ or ‘experiential’ (Rauschnabel, 2022). XR is an overarching term that considers all kinds of realities, including Virtual Reality (VR), Augmented reality (AR), and Mixed Reality (MR).

As one of the latest technology trends, researchers are increasingly interested in X-reality, such as virtual reality (VR), augmented reality (AR), and mixed reality (MR), as they see XR technologies (XR) as engaging tools for enhancing consumer experiences (Alcañiz et al., 2019). Virtual Reality refers to “computer-generated environments that replicate places, presence of people and objects, or fictional worlds, allowing realistic sensory experiences by

the full immersion in a digital environment” (Vaz et al. 2018, p. 39). Augmented reality is a mixture of the digital and real worlds, as it applies digital information to the real environment (Adams, 2016). VR and AR technologies are combined to create MR, which is a more immersive experience (Chuah, 2019). VR allows customers to interact in a stimulated virtual world, whilst AR combines virtual and real objects in an immediate display (Suh & Prophet, 2018). These two are joined together as MR to make users more involved in this immersive experience. Essentially, MR refers to bringing virtual constructs to the real world in an interactive way. It not only merges virtual objects with the physical world around us; it also enables us to interact with these virtual objects (Farshid et al., 2018). Figure 2.2 explains the different types of reality through an actual reality/virtual reality continuum, using the common example of the real world.

| Reality   | Augmented Reality   | Virtual Reality   | Mixed Reality  | Augmented Virtuality                                       | Virtuality  |
|---|---|---|--|--|---|
| The actual world that we experience with all of our senses. | Information and data overlaid on top of the actual world. | A complete digital representation of the actual world.                | The introduction of possible elements into an actual world.            | The introduction of actual elements into a possible world. | An imaginary world that mostly follows the rules of the actual world. |
| An actual house.  | A realty app provides details of an actual house.         | A 3D image of actual furniture.<br>A virtual tour of an actual house. | Simulation of different furniture, virtual or new, in an actual house. | Staging of actual furniture in a new house.                | A 3D model for a new house or of new furniture.                       |
| Key concept: Physical co-presence of people and objects.    | Key concept: Add utility to physical co-presence.         | Key concept: Enable perceived presence and full immersion.            | Key concept: Adaptation of actual scenarios.                           | Key concept: Participation in possible scenarios.          | Key concept: Vision of a completely different world.                  |
| Real  |   |   | Possible   |  |   |
| Actual Reality Continuum                                    |   |   | Virtual Reality Continuum  |  |   |

**Figure 2.2. The reality/virtual reality continuum. Adapted from (Farshid et al., 2018)**

The distinction between these technologies comes with AR and MR, which set themselves apart from VR by engaging with the user's immediate surroundings. Nevertheless, the influence of escapism in the utilisation of AR and MR has arguably been less pronounced to date, owing to the inherent integration of users' physical environment with digital content. Consequently, the act of distancing oneself from the real environment is generally not regarded as a primary

incentive for adopting these technologies. Instead, the predominant emphasis has shifted toward enhancing the consumer experience (Han et al., 2022).

This confusion and lack of clarity in terms and concepts are also evident in academic literature. Wedel et al., (2020), suggest that MR combines both VR and AR, and they use the term "VR" to refer to AR, VR, and MR unless a specific context requires distinguishing AR. In contrast, Milgram and Kishino's influential 1994 work conceptualises mixed reality as an overarching term that encompasses both virtual and real elements. However, some scholars challenge this view, proposing that mixed reality represents a distinct reality situated between AR and "augmented virtuality (AV)" (Flavián, et al., 2019).

In their 2020 study, Hoyer et al, argue that mixed reality is an extension of AR, noting that AR primarily relies on smartphone apps, while MR requires a headset or a similar wearable device (p. 59). Furthermore, some authors emphasize the fundamental differences between AR and VR (Y.-C. Tan et al, 2022). Adding to the complexity, Milgram et al. in their 1995 observation state, "Surprisingly, we agree that AR and VR are related, and it's valid to consider them together" (p. 283).

Lastly, the meaning of the term "XR" remains unclear. The persistent ambiguity surrounding AR, AV, mixed reality, and related concepts has potential negative implications for user experience. Firstly, this uncertainty inhibits those interested in exploring the various possibilities offered by these new technologies (Farshid et al., 2018), restricting consumer value realization and producer revenue flow. Secondly, ambiguity and user confusion can affect managerial outcomes like customer intention to use a product (Deng et al., 2010). Customer perceptions misaligned with their expectations can lead to satisfaction issues, which are closely tied to equity and other crucial managerial factors (Poushneh & Vasquez-Parraga, 2017; Szymanski & Henard, 2001). Therefore, user experience holds significant importance for managers. In summary, Flavián et al. (2019) emphasise that the boundaries of AR, VR, and mixed reality require clearer definition, and it is proposed that the existing literature is ready for a reorganisation and reconceptualisation of current approaches to understanding reality.

XR as the new generation of modern technology is altering the way people can interact with, perform in, and integrate the digital world (Rauschnabel et al., 2017). It offers a unique sense of presence by extending reality, as users are positioned within the simulation (Kwok & Koh, 2020). XR technology engages users in a digital machine joined to the physical environment using computers and wearable devices in an immersive and attractive way (Mann et al., 2018).

There is growing interest in the use of these technologies in various fields. These technologies have the potential to reshape the future of industries (Eda, 2021).

However, as Hamad & Jia, (2022) highlight, there is still a lack of general understanding about the strengths and limitations of these technologies in different contexts. They refer to two main factors as limitations: technological limitations and accessibility. According to Hamad, (2021) it is critical to identify, for instance, VR-induced motion sickness or "cybersickness" as one of the important issues with VR usage. Moreover, currently VR headsets are still prohibitively expensive for the majority of the general population, and VR-ready computers tend to be more expensive than typical computers, potentially keeping this type of VR headset out of reach for most people (Hamad & Jia, 2022). Notably, Sony has introduced PSVR 2, a new VR headset that is considered the most accessible and reasonably priced VR headset so far ( Lee et al., 2023). However, this headset isn't stand-alone and self-contained, and it needs to be connected to a Play Station 5 (PS5). Furthermore, the rapid development of these technologies within and outside of the tourism field poses new challenges to policymakers and users, as it can outpace the ability of governments and societies to adapt to new technologies, with a result an impact on labour markets, perpetuating inequalities, and raising ethical concerns (Cozzens, 2019).

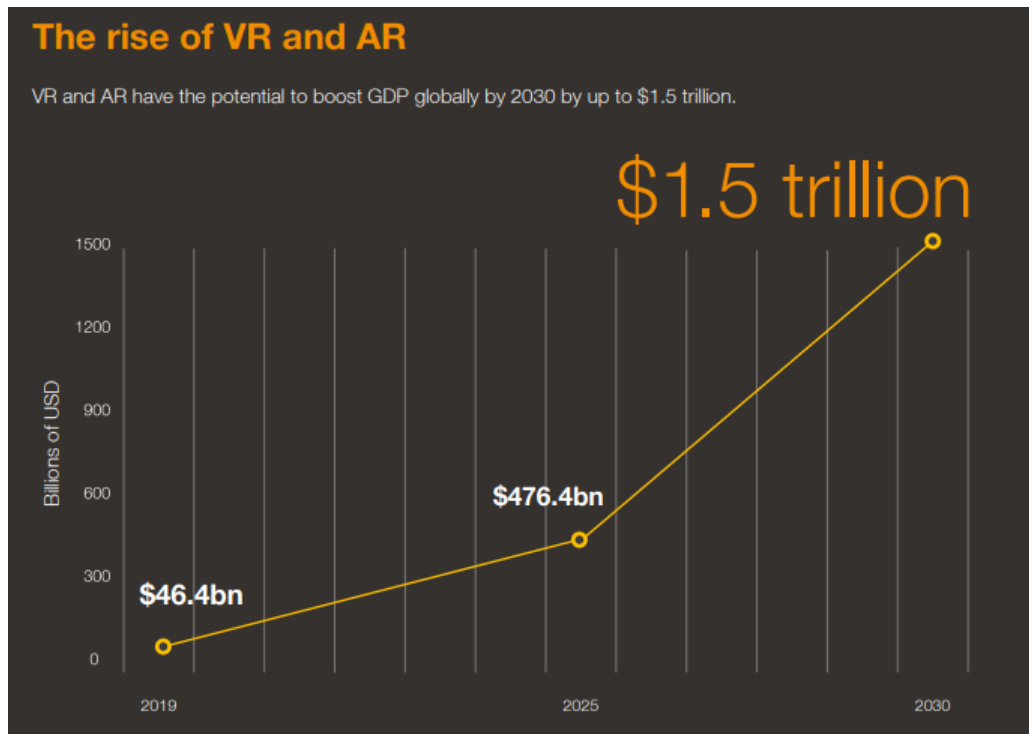
Furthermore, their limitations include the potential for cyber-attacks, which are similar to those of all other technologies, as well as the possibility of creating an environment in which people can communicate only through virtual environments and avoid one-on-one and physical interactions. XR equipment of all types can cause physical damage if it is used for a long time, resulting in financial losses, as implementing XR solutions and equipment will be very costly (Eda, 2021).

Nevertheless, the rapid evolution of XR and immersive 3D online worlds will likely benefit all aspects of society, including education, health care, gaming and entertainment, the arts, and social and civic life. In fact, proponents of XR believe that the development of artificial intelligence (AI) and creating novel experiences could vastly enhance humans' lives. despite the concerns related to these technologies, XR has sparked a great deal of speculation about its implications for society ( Anderson & Rainie, 2022). The next section discusses how these technologies were developed, their current roles and how they will be shaped in the future.

### **2.2.2 The past, present and future of XR technologies**

The first virtual world platform to feature a 2D interface was Habitat, which was launched in 1989 (Mystakidis, 2022). During the 1990s and 2000s, there was a second wave of social VR platforms, including “Second Life” (SL), and similar platforms (Mystakidis, 2019). Launched in 2003, SL is a digital platform that allows users to create their own avatar and roam the virtual world freely. SL was perhaps the most popular three-dimensional virtual learning environment (3-D-VLE) for virtually every subject, and, among its many uses, it was used for problem-based learning, collaborative learning, and a variety of other tasks (Reisoğlu et al., 2017). As an alternative experiential space, SL attracted a lot of attention, although the lack of current technological advancements caused it to fail as it was created during the Web 2.0 era (Pieters, 2022). Therefore, it didn't gain the steadiness that would have prompted it to make an impact on the world ( Anderson & Rainie, 2022).

In recent years, advances in 3D worlds and computer science have led to a significant advancement of XR technologies including VR, AR and MR. As shown in Figure 2.3, according to an economic impact assessment conducted by PwC’s experts, XR technologies could potentially deliver a \$1.5 trillion boost to the global economy by 2030. In addition to creating new customer experiences, accelerating product development, and improving workplace safety, these initiatives will add value to the different industries (PwC, 2019). Also, a report from Travel & Tourism (2022) shows that the AR and VR market in tourism will reach an output of \$152 billion by 2030, increasing the number of jobs related to this field in the travel and tourism industry (Dwivedi et al., 2022).



**Figure 2.3. Prediction of future rises in AR and VR (PwC, 2019)**

Other than the profit that these technologies bring to any industries, there are two fundamental factors that explain why XR is the future. First, the impacts of the COVID-19 pandemic have been extraordinary in scale, affecting almost all aspects of life and industries, including tourism. Given the domestic and international travel restrictions, tourist's destinations have cut off any arrival to reduce the spread of the virus (UNWTO,2020). Although the pandemic has had a negative effect on international travel and tourism, it has vastly increased the adoption of new technologies and promoted digital transformation (Morimoto et al., 2022). This has occurred due to increasing social distancing and quarantine regulations and adopting the technology for use in communication. Consequently, XR technologies such as VR have become a popular trend in not only destination marketing but also in on-site tourism experiences (Godovykh et al., 2022). According to recent research, the intention to use VR in the tourism field was raised during the pandemic (Schiopu et al., 2021). For instance, tourism attractions such as theme parks, zoos and museums could use XR technologies to attract and interact with tourists using 360 videos, virtual tours, and mixed reality experiences. Also, tourism companies could benefit from application of these technologies to recover tourism destinations in a post-pandemic world (El-Said & Aziz, 2022). Specifically, in a recent study, scholars found that VR plays a significant role in facilitating tourism destinations by affecting

millennials' attitude changes and visit intentions in a post-pandemic world (H. Kim et al., 2021).

Chang, McAleer, & Ramos, (2020) call for further research regarding how the tourism, travel, and hospitality industries will recover after COVID-19. Researchers highlight that this pandemic establishes opportunities for developing new technologies like VR in tourism (Godovykh et al., 2022) as these technologies play a critical role in changing consumer behaviour (Mirza Ali Khan & Gunnarsson, 2020), their decision making and purchasing behaviour (Kazmi et al., 2021). Specifically, with catalysing the technology usage in response to Covid-19, speedy advancement, and application of XR in tourism seems to have a significant role in future ahead (Kwok & Koh, 2021).

Secondly, as the development of virtual and augmented reality technologies advances, a new concept has emerged that aims to enhance the virtual experience by creating a complex, interactive and interconnected world, known as the metaverse (Rahaman, 2022). Using a virtual reality to create smart tourism destinations is a recent innovation created by the metaverse (Suanpang et al., 2022). In October 2021 Facebook CEO Mark Zuckerberg announced that the company had changed its name to Meta and introduced a new logo that looked like an infinity symbol, symbolising Facebook's future business (Rahaman, 2022). The metaverse is considered the realm of computer-generated XR, an acronym that incorporates all aspects of augmented reality, mixed reality and virtual reality (AR, MR and VR) (Anderson & Rainie, 2022). The company focuses on creating the “Metaverse” or “Virtual Reality-VR” as the world's largest social platform service company shifting to a virtual dual world and all circles considered it to be a turning point as the metaverse became the bridge connecting the new worlds together in future (Suanpang et al., 2022).

To conclude, the pandemic and the emergence of the metaverse in the age of digital transformation accelerate the virtual commerce, online education, and social networking. So, this necessitates the further exploration of future technology, and how it will be used to generate value and competitive advantage within a variety of industries (Troisi et al., 2022). As XR technologies are considered to be a fundamental future technology and the field of research, the next section reviews the research conducted in various contexts in relation to these technologies.

### 2.2.3 XR Research in various fields and gaps in academic knowledge

Due its huge potential, XR technology is increasingly studied in various contexts, ranging from learning and education (Yilmaz, 2016), to art (Ma, 2022), gaming (Rauschnabel et al., 2017; Tabacchi et al., 2017), healthcare (Glegg et al., 2017; Horesh et al., 2022; Morimoto et al., 2022), marketing and retailing (Yim et al., 2017), manufacturing (Choi et al., 2015; Hein & Rauschnabel, 2016), psychology (Hakim & Hammad, 2022; Pallavicini et al., 2022) and tourism (Martínez-Molés et al., 2021; Yung et al., 2021b). These studies consider different kinds of XR, including VR, AR and MR. The review of research on these technologies in different fields reveals that the technologies are mainly being applied in these contexts: education and learning purposes, and consumer behaviour and experience.

The application of these technologies in education and learning context is extensive. For instance, Shevchuk and Oinas-Kukkonen (2020) studied the effectiveness of VR (as compared to a non-immersive virtual environment) on the users' psychological and behavioural experiences in a gamification context. Moreover, a review of 115 studies on the use of VR and gamification demonstrated that the majority of applications of VR for gamification are for the purpose of learning and education (Loureiro et al., 2020). The applications of XR in healthcare are also related to education and training (Saxena et al., 2018; Son et al., 2022).

A comprehensive review of understanding the development of AR and VR in education over the twelve years by Al-Ansi et al. (2023), indicates that the adoption of AR and VR in education has experienced exponential growth in recent years, with a significant portion of this progress attributed to wearable devices. However, their analysis of secondary data also reveals a notable gap in the rapid implementation and customisation of these technologies within educational institutions. As AR and VR technologies continue to evolve and mature, an increasing number of educational applications are emerging within the learning process. These technologies are still in the developmental stage and require substantial investments and extensive customization to meet the increasing demand in the field of education (Al-Ansi et al., 2023).

In recent years, there has been a growing trend in the use of AR and VR in education, opening up numerous opportunities to harness technology for enhanced learning experiences (Y. Tan et al, 2022). The adoption of AR and VR technologies in education is steadily on the rise. These technologies enable students to engage with their surroundings in a more immersive manner, thereby enhancing their level of engagement and facilitating a deeper comprehension of various concepts (Young et al, 2020). Within the realm of education, VR provides learners with

immersive and interactive learning experiences, enhancing their ability to grasp complex concepts and ideas with greater efficiency and effectiveness. The utilisation of VR technology empowers educators to create a diverse array of learning experiences, spanning from virtual field trips to intricate simulations, all of which can be harnessed to engage students and facilitate their learning process (Zhang et al., 2022).

The integration of VR technology in education holds the potential to transform the learning journey for students, offering immersive and captivating experiences that significantly enhance their understanding of various subjects. By providing interactive VR experiences, educators can bridge the gap between theoretical concepts and practical applications, instilling students with the confidence to tackle future challenges (Maroukakis et al., 2023). As technology continues to advance, it is increasingly likely that VR will evolve into an indispensable component of the education system, offering students a powerful tool to augment their learning (Freina & Ott, 2015).

Furthermore, recent strides in full-immersion VR technology hold significant promise in enhancing the accessibility of experiential educational activities like field trips for educational institutions and numerous favourable viewpoints reinforce the appropriateness of VR technology for promoting experiential education (Schott & Marshall, 2021). The theory of experiential learning is a comprehensive model of the learning process, with a primary focus on the central role of experience in learning, as described by Kolb (2014). Schott (2017) highlights that continuous advancement of VR technology is progressively enabling the provision of high-quality and engaging experiential learning activities at a comparatively affordable price, especially when one takes into account the logistical, resource-related, and ethical challenges associated with alternative methods. Also, Tonteri et al. (2023), sought to elucidate how VR dimensions manifest in the context of experiential learning applying exploratory research. In their study, they conducted a systematic literature review to investigate the application of experiential learning theory within immersive VR environments finding that the experiential learning process serves as a valuable tool for evaluating the practicality, effectiveness, and subject comprehension within VR. Furthermore, it elucidates the significance of engagement in the VR experiential learning process, pinpointing how it shapes the distribution of learning focus between VR technology and the subject matter.

A review of VR research in marketing also found this technology promising in producing a satisfactory consumer experience (Alcañiz et al., 2019) and consumer behaviour and experience. Consumer behavior (CB) entails a range of decisions, actions, thoughts, or experiences that satisfy the needs and desires of consumers (Solomon et al., 2014). It

encompasses "all activities directly involved in obtaining, consuming, and disposing of products and services, including the decision processes that precede and follow these actions" (Engel et al, 1995, p. 4). In retailing, scholars investigated the positive sustainable relationship behaviour among different consumers (Huang & Liao, 2015). However, CB remains a highly scrutinised field within marketing and tourism, often referred to as "travel behavior" or "tourist behavior." Consumers typically form their expectations based on factors like familiarity, prior experiences, personal values, and motivations (Schiffman et al, 2013).

Consumers extensively employ technology for various consumption-related tasks such as information search, purchasing, sharing opinions and experiences, and entertainment, particularly evident in sectors like tourism (Buhalis & Law, 2008). Tourism consumption behavior pertains to the process through which tourists select and purchase tourism products to fulfill their desires for tourism enjoyment and other related experiences. This process encompasses the generation of needs prior to travel, the decision-making phase, consumption at tourist destinations, and post-purchase evaluation (Caber & Albayrak, 2016).

In the quest to uncover the patterns of tourist behavior, the interrelationships between various behaviors, and the central influencing factors, academia has introduced numerous models. Despite their divergent approaches, these models collectively underscore psychological activities and behavioral expressions such as travel motivation, travel decision-making, choice preferences, destination image, and satisfaction, both before, during, and after the journey (Li & Cao, 2022). Tourism motivation represents an intrinsic force driving prospective tourists to engage in specific tourism-related actions and plays a pivotal role in a series of future tourism behaviors. Unlike consumption demand, consumption motivation is associated with products, making tourism motivation the bridge linking tourism demand to particular tourism destinations (Stone, 2016).

Cohen et al., (2014) highlight that being a well-researched domain, there is a scarcity of comprehensive reviews on consumer behavior in the tourism field. They identify and explore five research contexts that represent key areas for future scholarly exploration: group and collective decision-making, under-studied consumer segments, cross-cultural issues in emerging markets, emotions, and instances of consumer misbehavior. Santos et al. (2022) identify the significance of emotions and engagement in specific leisure and tourism contexts in finding the factors that impact the behavior of tourist consumers.

The significance of technologies in the field of education and learning and consumer experience and behaviours, these two are also tied up together in the psychology context (Wilson & Soranzo, 2015). The advantages of employing virtual environments (VEs) in psychology stem from the brain's similar processing of movements and accompanying perceptual changes in virtual space compared to their counterparts in the real world (Foreman, 2010). VR represents a prominent subfield within the realm of immersive technologies extensively utilised in psychology. The progress achieved in this domain highlights the importance of comprehending the advantages that virtual reality offers in terms of human interaction and behaviour (Hakim & Hammad, 2021). The satisfaction levels of individuals regarding the effectiveness of VR have also been evaluated through a survey conducted on US Soldiers indicating the preference among most individuals for technology-assisted therapy for mental health over traditional methods (Wilson et al., 2008). Furthermore, the impacts of emotions on decision-making has been a subject of exploration for centuries, with a surge in interest over the past few decades in psychology context (Lerner et al., 2015) and employing VR for emotion elicitation will result in a heightened impact on the decision-making task (Susindar et al., 2019). Chirico et al., (2016) also found that VR enables the convenient monitoring of participants' actions and physiological reactions, facilitating a more comprehensive evaluation of emotional encounters. These studies show the significance of XR in psychology and other connected contexts.

Overall, in the scholarship from the XR field, the potential for XR in various industries is enormous. Timothy Jung, founder and director of the creative AR & VR Hub at Manchester Metropolitan University, has conducted extensive research on the application of these technologies in consumer experience in museums (Jung et al., 2022; Trunfio et al., 2022), healthcare training and education (Mathew et al., 2021), tourism (Cranmer et al., 2021), and many other fields. Other key researchers of XR such as Rauschnabel, and Tom Dieck, have also focused on the application of different kinds of XR in the consumer experience (Tom Dieck & Han, 2022), and marketing (Zanger et al., 2022).

Tourism research has been mainly focused on education and learning (such as in museums), or the behaviour of tourists and the tourists' experiences. Focusing on the behaviour of tourists, the pivotal role of XR technologies such as VR in tourism is highlighted in previous research (Eda, 2021). Specifically, VR, by providing a digital and immersive experience, can enhance the way consumers explore, choose and purchase products or services (Wei, 2019). VR is able to revolutionise the traditional marketing approach by presenting a wider range of marketing

tools (Yachin, 2018) in the pre-trip stage and also while traveling. In retailing, marketing and tourism, VR is revealed to be applied mainly for trip planning and destination marketing (Yu Chih et al., 2016). VR can be applied at the pre-trip stage or the destination stage. Overall, these technologies can be used extensively in tourism, and both tourism companies and tourists can hugely benefit from them. Furthermore, VR technology has been found to be one of the most recent trends, changing business outlines of the tourism industry by affecting the users' behaviour and information seeking (Cranmer et al., 2018). Using VR technologies, tourists with limited knowledge about the destination can inherently experience it (Chung et al., 2015). They can explore their surroundings and receive personalised information about their selection of destinations and attractions (Jung et al., 2020).

Leung et al., (2020) found that potential tourists' behaviour can be positively affected by the VR experience used to visit hotels before travelling. Eda (2021) also examined the effectiveness of the VR experience on choosing tourists' future destinations, by experiencing a city, walking around, even getting the smell of food cooked in a house, and exploring details of the local life of a city. Recent research also considered the effectiveness of these technologies in engaging the visitors of a museum in the learning experience by using VR glasses (Moorhouse et al., 2019). Evidently, VR provides numerous opportunities in regards to marketing destinations, allowing them to be better presented, and providing tourists with a better view of what to expect, to assist them in their travel planning (Cranmer et al., 2018).

Xi et al. (2022) also found that XR technologies such as VR can significantly influence consumer behaviour. XR is a powerful marketing tool for a tourism company, in that it can reshape the entire customer journey (Lemon & Verhoef, 2016). The mainstream application of immersive technologies not only enriches the experiences for tourists, but also tourism sites attract future costumers in a sophisticated way (Bekele & Champion, 2019). VR is found to be provide significant benefits in the tourism context. The next section discusses the significance of the VR tourism experience and the gaps in relation to this.

#### **2.2.4 The potential of the VR tourism experience**

VR technologies can serve the tourism industry in different ways, as they are reforming the consumer's experience (Flavián et al., 2021). First, VR allows individuals to experience tourism products such as distant destinations, while sitting on their couch. For instance, scholars have found that tourists perceive VR as a travel substitute during and even after a pandemic. Its effectiveness in the simulation of real-life experiences provides an opportunity

for virtual holiday making, especially when actual travel is not possible (Sarkady et al., 2021). Furthermore, in stages prior to purchasing, VR can be regarded as a tool to promote the destinations by presenting a sensory simulation of the travel experience to potential tourists (Spiellmann & Orth, 2021). VR can be applied in the trip-planning stage, as a promotional instrument while tourists are trying to decide about visiting attractions in the destination, enhancing one's perception of attractions, such as museums (Jung et al., 2016), art galleries (Tom Dieck & Jung, 2017), and theme parks (Wei et al., 2019).

VR is becoming an interesting area of research due to their recent developments and use as a powerful marketing tool for the tourism industry. For instance, the 'virtual tour' is increasingly popular with tourists after the pandemic, since it enables tourists to create a virtual experience of the destination before they visit (Qian & Zhong, 2019). VR allows all sectors, including tour operators, hotels, attractions, and destinations, to present immersive experiences to promote their services (Skard et al., 2021), enhancing tourists' experiences (Tredinnick, 2018) and potentially affecting their intentions to visit and their purchasing behaviour (Skard et al., 2021).

These technologies are emerging, and their application in tourism is expected to increase. Their application in tourism may be vast in the near future, so it is raising this significant question that how these technologies may affect the behavioural intentions (Xi et al., 2022). According to Sharples (2019), since most available research in the field of customer experience has considered the customers' perceptions after the consumption stage, there is a need for further investigation of the pre-purchase stage of the journey, which is significant stage to interact the potential tourists emotionally and stimulate their desire to purchase. More specifically, empirical research on the effect of VR on decision making is rare; previous studies have failed to address the detailed process of effects on elements of consumer behavioural intentions (Xi et al., 2022).

Furthermore, despite increasing advancement of these technologies, little attention is paid to that by users and marketers (Herz & Rauschnabel, 2019). Practitioners are increasingly interested in using these technologies in tourism as the application of new technologies are highly rising in gaming and leisure activities (Koivisto & Hamari, 2019) but, knowledge based on academic papers is scarce (Yung & Khoo-Lattimore, 2019). For instance, previous studies have noted that emotions and feelings are involved in affecting behavioural intentions of tourists experiencing VR. However, little is known about the types of emotions and feelings. This lack of academic knowledge specifically is related to key components and outcomes of

the VR experience in tourism (Cranmer, 2019) and it has been highlighted that most research has not considered tourists' perceptions about these experiences (Kourouthanassis et al., 2015). There is a need for further research on the impacts of experiencing these technologies on tourists' decision-making; our academic knowledge regarding the various aspects of this experience is insufficient (Tom Dieck et al., 2019b). Previous studies have not dealt with understanding how users react to wearable VR technologies, although they are currently receiving significant attention among all consumers (Kalantari & Rauschnabel, 2018). Also, researchers highlight that literature fails to fully define the potential of VR for tourism destinations (Godovykh et al., 2022), and there has been also little research on the effectiveness of virtual reality on purchasing behaviour of tourists (Flavián et al., 2021). According to Garrett et al., (2018), the complexity of the VR experience and the theoretical ambiguity in the field is one of most critical challenges. Therefore, there is a need for further research on the impacts of VR on tourism behaviour and associated factors (Tom Dieck et al., 2019b). Also, the potential of these technologies for destination marketing is yet to be comprehensively investigated (Bogicevic et al., 2019). These potentials VR experience include factors such as affecting intention to visit and representing a positive image of the destination (Oncioiu & Priescu, 2022).

Although a significant amount of literature is available on the potential and effectiveness of these technologies, less is known about the building blocks of these technology experiences. Specifically, the lack of academic knowledge leads to a lack of explanation as to why and how immersive interventions support behaviour change processes (Wienrich et al., 2021). Additionally, the dimensions and the process, meaning the key concepts and the steps involved in the VR tourism experience, remain unclear. This may be because the effect of these technologies on tourists' behaviour has still not been fully answered, and research on this topic is in its infancy (Trunfio & Campana, 2020). Also, there is a lack of knowledge on the whole process of the VR experience and how this experience influences behaviour. Therefore, defining a framework for the VR experience and exploring the dimensions and process of the VR experience, including the key concepts and their affects in tourists' behavioural intentions, is the main objective of this research. Although, based on previous studies, the VR experience appears to be closely linked to the behavioural intentions of tourists and their purchasing behaviour, the existing research fails to comprehensively address the process of these experiences that leads to behavioural change. The next sections review the literature to investigate the available frameworks for the VR tourism experience.

### **2.3 A framework for the VR tourism experience**

Having defined XR technologies and described the application of VR in tourism in the context of this study, the main focus will now be addressed – defining a comprehensive framework for the VR experience.

Identifying a theoretical framework for the VR tourism experience includes looking at the factors that are involved in this experience, and how and why these factors ultimately affect the behavioural intentions. Specifically, the goal of this framework is to examine the available body of literature, present a structured overview of the possible process and linkages of how tourist behaviour is affected by experiencing VR, and identify the steps involved in ultimately affecting their behaviour.

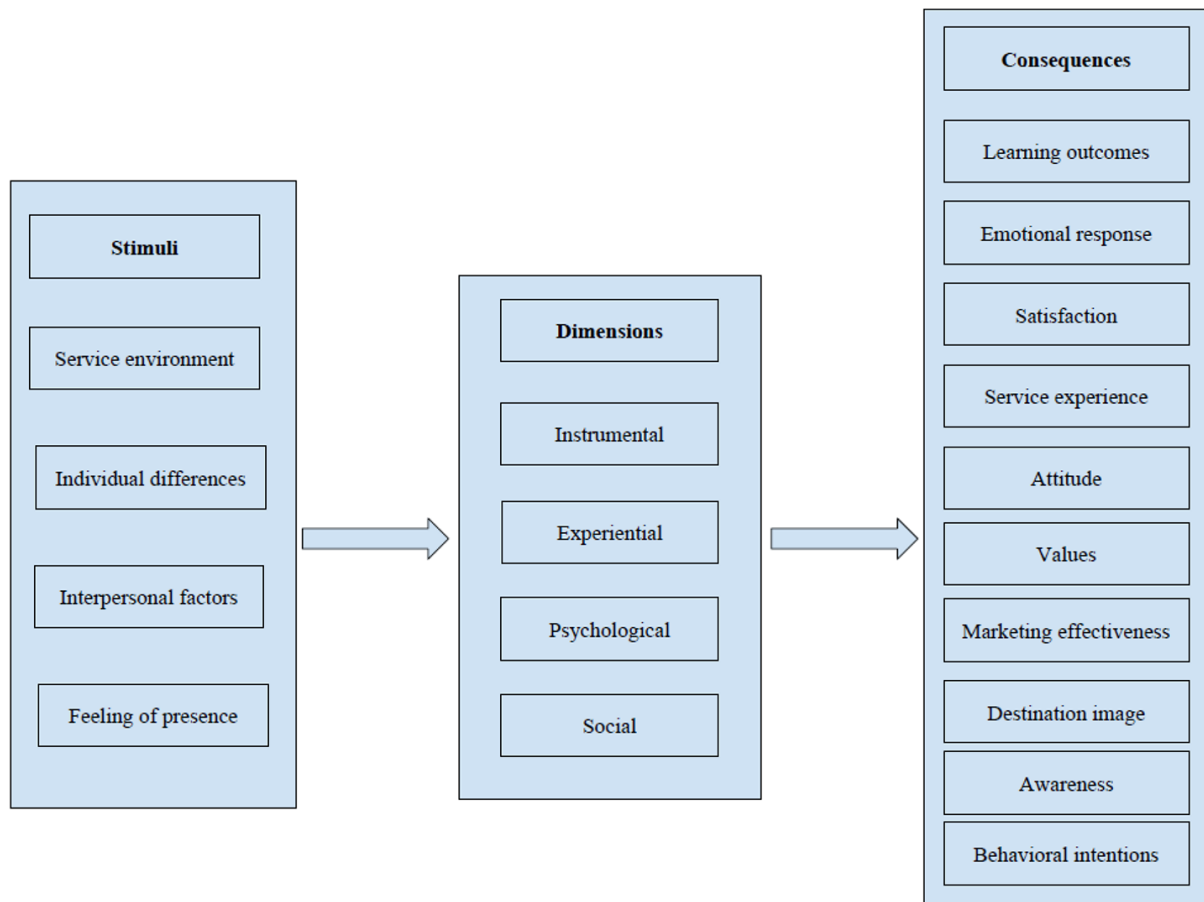
Since the appearance of technology, scholars have tried to develop frameworks and theories. Much of the literature since the mid-1990s emphasises an attitude towards technology and less is known regarding the actual experience of VR and the post-consumption phase of this technology. In particular, to date a huge amount of the available literature of frameworks relates to attitudes towards technology using theories such as Technology Acceptance Model (TAM) (Abd Majid & Mohd Shamsudin, 2019; Sagnier et al., 2020), one of the most widely used theories for exploring users' adoption of technologies. TAM explains that users will be motivated by three factors: perceived usefulness, perceived ease of use, and attitude toward use. Also, a large and growing body of literature has investigated external factors related to acceptance of technology (Fussell & Truong, 2022; Syed-Abdul et al., 2019). In fact, most of the researchers using TAM extend these theories by using additional external variables (Leue & Jung, 2014) such as user preparation and technology experience, system descriptions and quality, and the individual factors like gender and education that influenced the TAM model (Lin, Fofanah, & Liang, 2011).

Although TAM is considered one of the most popular models in the context of technology acceptance (Wu, 2009), and it has obtained considerable empirical support, such theories and frameworks have focused on attitude towards technology rather than the actual experience of that. Highlighting the absence of theories regarding post-acceptance of technology, factors related to attitude toward technology are fundamentally different from the actual experience of technology (Ghapanchi & Talaei-Khoei, 2018). Factors such as system quality and individual characteristics may affect the overall process of this experience, however these concepts should be separated from the concepts involved in the actual experience of VR.

To date there is no generally accepted organising comprehensive framework in this field of research and no empirical research was found defining a framework for the VR experience which considered the whole process involved in this experience. Only a number of studies set out to examine some related aspects in the VR experience (Ponsignon & Derbaix, 2020; Tussyadiah et al., 2018). These studies suffer from various limitations such as focusing on generally connecting emotions to behavioural intentions of tourists or investigating one or two factors related to emotions induced by the VR experience. There is also a confusing application of interchangeable feelings and emotions in this area.

Attempting to define a framework, a few studies tried to review the literature, investigating substantial factors and steps that are included in the VR experience, using various terminologies to describe these factors. For instance, Wei (2019) attempted to draw the available literature together to define a framework for this experience by investigating the research progress on VR/AR technologies using the available literature from 2000 to 2018. The author synthesises the stimuli, dimensions, and consequences of the VR/AR-related user behaviour experience, upon which a theoretical framework is developed (Figure 2.4). However, this framework, while an informative guideline, is general and unspecific, with limited consideration of the correlation of these factors. Some of the factors involved in this framework are related to technology and the industry professional's perspective, such as service environment. Also, some aspects, such as feeling of presence and user characteristics, are categorised in the same group, and this research fails to consider the difference between these categories.

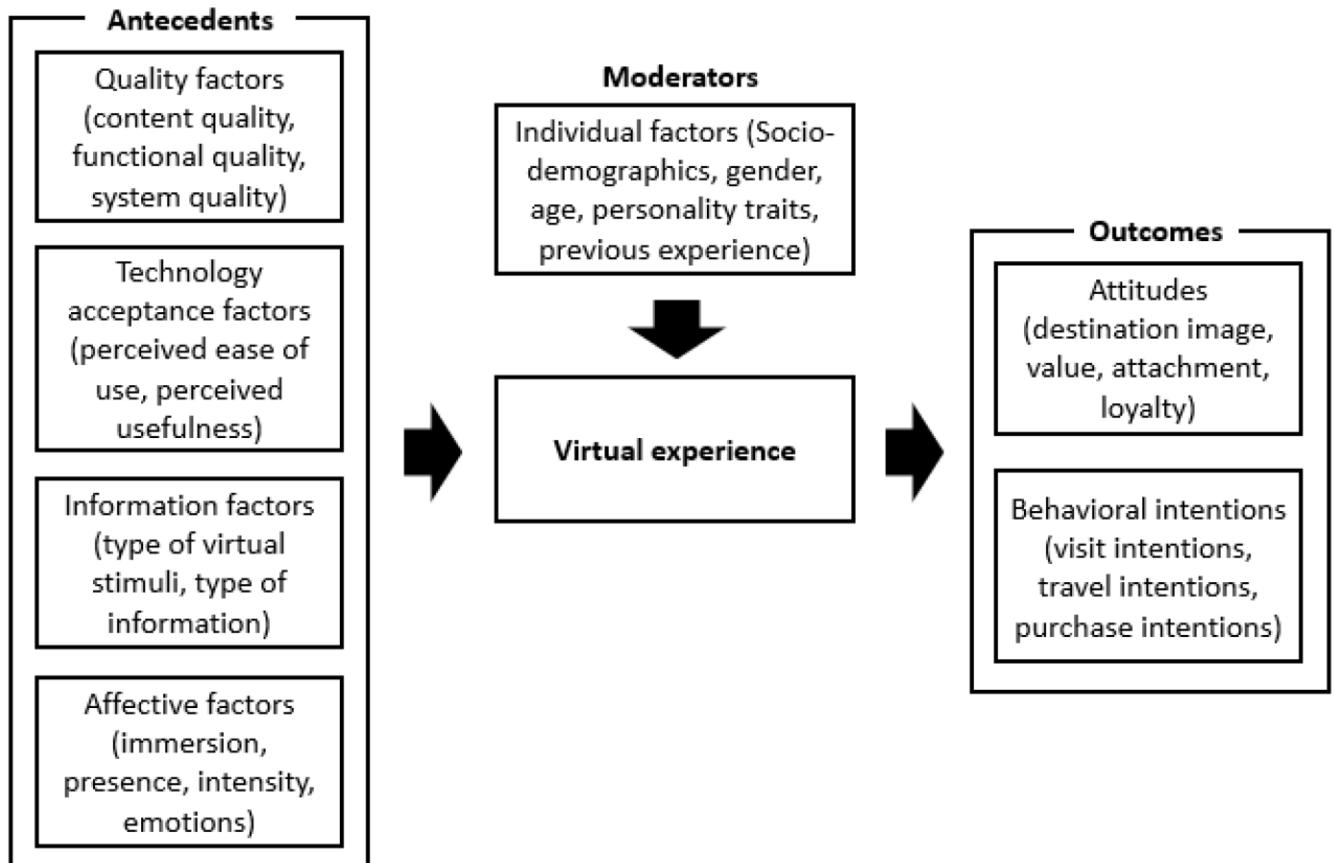
Furthermore, this review of literature considers AR and VR as the same experience. However, in recent research, scholars have found that AR and VR have fundamental differences and therefore should be treated as different experiences (Rauschnabel et al., 2022b). In defining an XR framework for different kinds of these technologies, authors separate AR from VR based on whether the physical environment plays a role in the user's experience. They highlight that level of presence is the primary discriminating factor between VR and AR. While VR provides a purely virtual environment, AR brings virtual objects to the real environment.



**Figure 2.4. A framework of VR/AR user experience by Wei (2019)**

A few years later the same attempt was made by Godovykh et al. (2022) (Figure 2.5). In their study, the steps involved in the VR experience are described as antecedents and outcomes of the VR experience. They contend that the whole process that ultimately leads to behaviour change, includes first the antecedents of the VR experience and then their outcomes. They identify these antecedents as theories such as Technology Acceptance model (TAM) including perceived ease of use and perceived usefulness (Disztinger et al., 2021), the demographic characteristics like age and previous experience (Venkatesh et al., 2003), and tele-presence (Hyun & O'Keefe, 2012; Lee & Kim, 2021). They also define emotions (Yung et al., 2021a), behavioural intentions like destination image (Rainoldi et al., 2018), and intention to visit (Zheng et al., 2021) as outcomes of the VR experience. However, the author offers no explanation for the distinction related to the attitude towards technology as comparison to the factors which are in relation to actual use of technology such as presence. Also, they refer generally to positive emotions and make no attempt to differentiate between different types of emotions. Furthermore, they ignore core components of the VR experience such as immersion

(Hudson et al.,2019), and authenticity (Afonso, 2019) which have been found in previous studies.



**Figure 2.5. A framework for VR experience by Godovykh et al. (2022)**

This review reveals that most studies in this area are not empirical, and only two were qualitative. The literature review implies a lack of explanation of theoretical foundation and explanation as to why and how immersive technologies influence behaviour (Wienrich et al., 2021). In the tourism context also, there is little understanding about how tourism destinations can effectively benefit from the virtual world to attract potential consumers, and how the process of the VR experience can affect tourists' behaviour (Yu Chih Huang et al., 2016).

According to Loureiro et al. (2020), although there are examples of the application of these technologies in tourism, a comprehensive analysis of studies employing VR technology in tourism and their dimensions is rare. Scholars highlight that the main dimensions of the virtual tourism experience are related to users' emotional responses, attitudes, and behavioural

intentions (Godovykh et al., 2022). However, a comprehensive framework for the VR tourism experience lacks empirical support, and the process and dimensions of this experience need defining which is the basis of the next section.

## **2.4 The dimensions and process of the VR experience in different contexts**

To define a framework for the VR tourism experience and deeply investigate this issue, it is first necessary to identify all the dimensions and processes involved in this experience. The dimensions in the context of this research consider all the key concepts induced by this experience. The definition of dimension is to explore the nature and relationship of the components of the experience and find the measurable constructs. The dimension refers to the meaning derived from the creative experience (Nelson & Rawlings, 2009). The process includes the steps that are involved in the VR tourism experience are connected to each other. The following sections define the wider literature on the VR experience and the other kinds of XR to identify an understanding of the dimensions of the VR tourism experience, what they comprise and how they are connected.

As noted in the previous section, a large number of available concepts in literature have focused on the acceptance phase of technology (Dwivedi et al., 2019). The acceptance phase of technology examines factors related to attitudes towards technology and does not necessarily lead to actual experience of technology. Ghapanchi and Talaei-Khoei (2018) highlight a difference between the practical use of technologies, and their acceptance phase, where it is not clear if the users ultimately use that technology (Ghapanchi and Talaei-Khoei, 2018). As noted, some dimensions regarding theories of technology, such as factors of technology acceptance model (TAM) including perceived usefulness and perceived ease of use, are related to technology acceptance and attitude towards the technology (Godovykh et al., 2022). Additionally, many external variables were added to the TAM. Some examples of these concepts are technology experience, gender, education, the quality of the technology and so on. However, although mentioned factors may affect the dimensions of the actual VR experience, different concepts are involved when it comes to the actual use and experience of VR. Scholars stress that the factors related to the VR experience change after the actual experience of technology, comparing to before (Nazar et al., 2020). Therefore, the following sections reviews the literature to find the dimensions related to the actual VR experience, beginning with “authenticity” as one of core concepts in the VR technology experience (Kronqvist et al., 2016).

### 2.4.1 Authenticity

One of the critical concepts associated with tourists' VR experiences is "authenticity". Evaluating the authenticity of virtual environments affects other elements involved in the VR experience (Kronqvist et al., 2016).

Generally, the concept of authenticity enlightens several central topics in different contexts, however there is widespread agreement that authenticity refers to that which is "real", "genuine" or "true" (Lehman et al., 2019). The concept generally refers to originality or being genuine (De Bernardi, 2019). Identifying the meanings of authenticity in tourist experiences, Wang (1999) proposed "existential authenticity" as an alternative source in tourism, regardless of whether the toured objects are authentic. This concept enhances the explanation power of the authenticity-seeking model in tourism by providing a more comprehensive explanation of tourist experiences. Kirillova et al. (2017) also defines existential authenticity as the outcomes of the tourism experience, indicating that it is affected by factors such as the tourist's gender, age, and educational level.

In terms of VR technologies, the user's experience of authenticity is defined by Lee (2004) as "a psychological state in which virtual objects are experienced as actual objects" (p. 27). When we discuss the VR experience, the perception of authenticity is regarded as one of the most fundamental issues, that has been highlighted as a critical antecedent that influences the effectiveness of VR (Pomerantz, 2019). The quality of authenticity is vital for improving tourists' VR experiences (Guttentag, 2010) as the term "authenticity" refers to whether the virtual environment brings the experience expected by the user, and how much it is real or genuine (Gilbert, 2016b).

Yung and Khoo-Lattimore (2017) stress that a high level of perceived authenticity of VR content brings significant value to virtual tourism. In the VR technology experience, potential customers buy services, or products based on their recognition of authenticity (Kim et al., 2020). This concept has been recognised as an important factor to explain souvenir-purchasing intention (Lin & Wang, 2012), and authentic experience plays an essential role in predicting tourists' behavioural intention (Meng & Choi, 2016). In the current digital era, individuals tend to buy and use services and products based on their perception of authenticity as they seek experiences that let them be fully immersed rather than solely entertained (Kim et al., 2020). Furthermore, the high level of perceived authenticity of VR tourism changes the focus from "how to travel to how to meet" (Yung and Khoo Lattimore, 2019). Scholars highlight that

authentic experience with tourism-related virtual activities is one of the essential dimensions in the effectiveness of VR (Kim et al., 2020). Additionally, perception of authenticity has been found to be the core and determinant factor affecting emotions and feelings of users in the tourism context (Gao et al., 2022).

Yung and Khoo-Lattimore (2019) underline that a high level of perceived authenticity of VR content brings valuable insights into the context of these technologies in tourism. For instance, scholars have found that authentic experience of the destination via VR technology can affect potential tourists' emotions and intentions to visit the destination (Kim et al., 2020). In a similar study, Afonso (2019) found that perceived authenticity of a virtual environment positively affects tourists' emotion and their behavioral intention to visit the destination, recommend it to others, and their positive WOM about it.

Accordingly, the level of authenticity affects other concepts related to the VR technology experience. In the virtual field, a more authentic environment provides a higher degree of immersion and entertainment (Pietschmann et al., 2012). In 3D virtual learning settings, more authentic perception results in a better immersive experience (Lan & Liao, 2018). Moreover, in a tourism context, scholars have found a connection between authentic experience and immersion (Schaffer, 2017) derived by VR experience. This will be discussed in the next section.

#### **2.4.2 Immersion**

This section discusses immersion as one of the possible fundamental feelings derived by the VR experience. According to scholars, "immersion as a feeling involves a lack of awareness of time, a loss of awareness of the real world, involvement and a sense of being in the task environment" (Jennett et al., 2008, p. 657). Immersion is also defined by Hansen & Mossberg, (2013) as "a form of spatio-temporal belonging in the word that is characterized by deep involvement in the present moment" (p. 212). In the tourism field, Pine and Gilmore (Pine, Pine, & Gilmore, 1999) were pioneers in using immersion in researching tourists' experiences. The concept of immersion in tourism signifies an absolute absorption and engrossment in the activities and environment of tourists (F. Li, Shang, & Su, 2023).

In the context of the VR experience, immersion has generally been defined as the quantifiable characteristics and features affecting the user's senses, making them forget the real world (Bailenson et al., 2008; Nash et al., 2000). These characteristics include measurable features

such as “display resolution (number of pixels in each dimension), image quality (perceived image degradation), field of view (extent of observable world seen), and motion-tracking (replication of user motion from real world to virtual environment)” (Yung et al., 2021b, p. 162). In this situation, users are able to immerse themselves in the experience and become “physically (or virtually) a part of the experience itself” (Pine et al., 1999, p. 31). According to the Human and Computer Interaction (HCI) literature, the term perceived immersion is “describes the extent to which the computer displays are capable of delivering an inclusive, extensive, surrounding, and vivid illusion of reality to the senses of a human participant” (Slater & Wilbur, 1997).

The concept of immersion has been studied in different fields such as music (Amatriain et al., 2007; Dura, 2006), gamification (Jennett et al., 2008; Reichenbach, 2017), virtual reality (Hudson et al., 2019), and tourism (Lunardo & Ponsignon, 2020). However, research on immersion remains scarce in tourism, particularly in relation to the conditions under which immersion is achieved and its consequences on visitors’ behaviour (Lunardo & Ponsignon, 2020). Only a few studies have investigated the field of VR in tourism (Lunardo & Ponsignon, 2020), despite it being posited as a core concept in tourism experiences (Lindberg et al., 2014) which affects other dimensions of the VR experience such as presence and tele-presence.

### 2.4.3 Presence

According to the available literature, presence has been described as the psychological state when a user feels lost or immersed in the mediated environment, the degree to which they feel physically “present” in a virtual place (Ijsselsteijn & Riva, 2003; Schubert et al., 2001). Further research distinguishes different aspects of presence such as social presence, physical presence, self-presence, telepresence and spatial presence (Skarbez et al., 2017). Unlike general reference to presence, some studies have focused on these specific types of presence.

Social presence describes the subjective experience of being present with a real individual and having access to their thoughts and emotions (Biocca, 1997). Self-presence refers to the extent that the “virtual self is experienced as the actual self” (Aymerich-Franch et al., 2012, p. 1). Telepresence or spatial presence can be defined as “the extent to which one feels present in the mediated environment, rather than in the immediate physical environment” (Steuer, 1992, p. 75). This dimension of presence refers to the extent that a user feels the vividness when experiencing a mediated environment. The more users feel the telepresence, the less they are aware that their experiences are being mediated through technology (Lombard & Ditton, 1997).

Some previous studies have highlighted the sense of “presence” or “tele-presence” as the reason for the effectiveness and outcomes of VR (Tussyadiah et al., 2018). Users of VR technology are able to interact with the virtual environments as if they are real and this creates a sense of immersive experience and presence (Soliman et al., 2017). Yung et al. (2019) found the effectiveness of VR as a destination marketing tool, on presence and its influence on emotions and intentions. Yung et al. (2019) argue that, despite early postulations about VR’s benefits as a destination marketing tool, theory-based VR research in tourism remains in infancy.

Furthermore, experiencing tele-presence in VR referred as “feeling of being there” found be connected to tourists’ emotions (Yung et al., 2021b) and the link between presence and emotions was also found by Riva et al., (2007). However, the majority of the research about the VR experience, emphasises the correlation of this concept to the perception of authenticity and feeling of immersion. This will be addressed in the following section.

#### **2.4.3.1 The association between authenticity, immersion, and presence**

The perception of authenticity is found to be firmly connected to the feeling of presence. Scholars highlight that perceived authenticity is a fundamental factor of feeling the presence (Weber et al., 2021b). According to the authors, in order to have an authentic experience in a Virtual Environment (VE), the user needs to be able to *feel presence*, that is, experience “being there” (Loomis et al., 1999). Therefore, the sense of presence in a virtual environment is regarded as a composite of perceived authenticity as the user constantly compares the look of virtual objects to real-world objects and judges the level of similarity (Sutcliffe and Gault, 2004). Previous studies on presence are based on the assumption that authenticity enhances presence (Bystrom et al., 1999; Lombard & Ditton, 1997). Moreover, the degree of feeling immersion as stimuli can be elicited from the perception of authenticity among players during game-play (Boonekamp et al., 2022). For instance, in the field of virtual computer games, it was found that a more authentic environment leads to a higher level of immersion (Pietschmann et al., 2012). These all show the strong association between these concepts in literature.

However, it is also important to highlight that there are some ambiguities regarding the concepts of “immersion” and “presence” as, since the appearance of VR, scholars have used the terms immersion and presence interchangeably, creating confusion between the concepts in the literature (Nilsson et al., 2016). According to more recent research, the terms “presence” and “immersion” are different concepts, although presence has been used since the early 1990s

for defining immersion (Price et al., 2021). Immersion is described as “the degree which the range of sensory channel is engaged by the virtual simulation” ( Kim & Biocca, 2018, p. 96), however the presence has been defined as “perceived illusion” (Slater & Sanchez-Vives, 2016).

The term presence has been used alongside immersion in literature, and scholars stress that these two are among the most probable potentials of immersive technologies (Hassenzahl et al., 2010). Finally, it has been agreed that immersion includes “what the technology delivers in all sensory and tracking modalities and that it can be objectively assessed” (Wienrich et al., 2020). In contrast, presence can be defined “as a human reaction to a system of a certain level of immersion and thus describes a subjective state” (Slater, 2003). Nevertheless, the two concepts are associated, as Li et al. (2002) found that higher immersion in a virtual environment increased the sense of presence; and ultimately the brand attitude and purchase intention of consumers.

A recent study on music, Jennett et al., (2008) explain the double disassociation between immersion and presence. He notes that the feeling of being immersed can be obtained when listening to electronic music, however the user may not feel present because of the lack of spatial indication in the content. Nevertheless, immersion and presence can be induced at the same time when experiencing an engaging game in virtual reality (Agrawal et al., 2020). Moreover, according to Witmer & Singer (1998) the feeling of immersion is a necessary condition for experiencing presence. Overall, while presence reflects a psychological feeling, immersion is the technology or practical application that generates the feeling of presence (Thompson et al., 2018).

Accordingly, immersion is described as the perception of being physically present in a non-physical world and it deals with factors related to technology. Authenticity is defined as the perception of being genuine and real; and presence is the physiological sense of being in a mediated environment (Draper et al., 1998) or being in a computer-generated world such as in VR (Slater & Wilbur, 1997). Scholars have found that these elements could fundamentally improve the quality of the VR technology experience (González-Rodríguez et al., 2020).

In the tourism context, these dimensions affect the other dimensions of the VR experience. For instance, authentic VR experience has been found to affect tourists’ attachment to a place presented by VR technology ( Kim et al., 2020). Additionally, the sense of presence has been discussed in relation to attachment (Wallach et al., 2009). The definition of types of attachment and their correlation to this study are discussed in the following sections.

#### 2.4.4 Attachment to VR place

As noted, a few studies have identified the feeling of attachment as one of the dimensions of the VR experience ( Kim et al., 2020; Pantelidis, 2019), noting that authentic experience of VR could make tourists feel attached to VR and ultimately affect their intention to visit the destination.

Attachment theory was originally formulated to describe and explain infant-parent emotional bonding (Mikulincer & Shaver, 2013). Attachment theory as an emotion regulation theory (Mikulincer et al., 2003; Schore & Schore, 2008), refers to “the act of altering one’s emotional experiences via the initiation, maintenance, or modification of their frequency, intensity, or duration” (Kobak et al., 1993). After defining attachment theory by Bowlby, (1973) different types of attachment have been described in various contexts, such as attachment to technology, or to place.

“Place attachment” may be one of the feelings associated with human emotions and experiences that could be influenced by technology. Researchers have defined that place attachment is “an affective bond or link between people and specific places” (Hidalgo & Hernandez, 2001, p. 274). In the tourism context, place attachment refers to “the sense of emotional belongingness to an environment and the perceived connection with the environment” (Bricker & Kerstetter, 2000), individual emotional bonding to a place and the emotions signified by the environment ( Williams et al., 1992). Place attachment, mostly referred to as “Destination Attachment” has been studied extensively in the tourism literature (Chen et al., 2016; Ram et al., 2016). Various factors have been identified in the tourism context as facilitators of place or destination attachment. Gross and Brown (2006) indicate that developing emotional attachments to natural environments is largely influenced by involvement. Other factors are also identified as determinants of the level of place attachment, such as past experiences (Hammit et al., 2006).

There are very rare studies investigating place attachment in relation to the VR experience. Pantelidis et al. (2018) surveyed the connection and effect of an VR technology experience on destination attachment in the tourism context and concluded that experiencing VR may influence destination attachment. However, this study is not generalisable, due to the limited number of participants. Nevertheless, place attachment is considered a significant factor in marketing tourism destinations, as it reflects the connections of tourists to the local community and destination (Ram et al., 2016). Scholars suggest that, due to the complexity of tourism

products and the difficulty in defining positive experiences and relationships, place attachment can be considered an effective construct to explain tourist and resident behavioural intentions (Chen & Dwyer, 2018; Chen et al., 2014; Hosany et al., 2017).

Furthermore, the relation of place attachment to other forms of attachment, such as technology attachment, has also remained obscure, as limited research has applied place attachment in a technological field (Wu et al., 2018), and the literature on the relation of place attachment and technology is restricted (Oz, 2014). Very few studies propose that technology attachment may lead to place attachment. Wu & Cheng (2018), using dimensions of place attachment, propose that it is possible to be attached to a virtual place.

#### **2.4.5 Attachment to VR technology**

As dimensions of the VR experience, there is a mixed use of attachment to VR technology and attachment to place presented by VR. Even though attachment is generally considered one of the fundamental theories related to users' feelings and experiences and is defined as an emotional bond between an individual and an attachment figure (Mikulincer & Shaver, 2013). According to Bodford et al. (2017), as the presence and experience of technology is vastly increasing, the behaviour of users and their relationship to using technology is changing, and they become attached to it.

Technology Attachment has been defined by researchers as an emotional bond between the individual and technology (Suh et al., 2011). Attachment to technology sometimes refers to emotional attachment to mobile devices. Attachments do not address acceptance, but instead focus mainly on the usage phase. The level of attachment to a technology forecasts the users' interaction with the technology (Friedrich, 2016). Hertlein and Twist (2018) note that expanding our knowledge about attachment to technology presents the missing link in deeply identifying the extent that these technologies affect our lives.

Farnham et al., (2009) investigated the standardised measures of place attachment in a virtual community and found that a psychological sense of community profoundly predicted the possibility of technology adoption. According to Plunkett (2011) it is possible to become attached to a virtual environment.

Relying on limited available literature, technology attachment has been also considered as one of the possible feelings induced by VR technology. When people are emotionally attached to their technology, they become more engaged in using the technology and enjoy the interaction

more ( Li et al., 2006). Although some studies have tried to explore the relationship between attachment and technology, it has remained a “*missing link*” (Hertlein & Twist, 2018), and previous studies have not addressed this emotional bonding in relation to the tourism context and XR technologies.

Furthermore, little research has considered technology attachment in the tourism context ( Wu & Cheng, 2018). In a study, researchers discovered that using an application on a smartphone leads to technology attachment (Roy et al., 2017). However, there is a research gap concerning the dimension of visitor attachment to VR technologies in the tourism context ( Kim et al., 2020).

As mentioned, this feeling can be related to awe as some studies have pointed out the relationship between of some complex emotions and technology attachment ( Ismail et al., 2018). The few available studies conducted on tourists’ experience towards technology attachment, refer to VR, which creates a simulated reality for its users such as virtual worlds.

As Loureiro (2014) highlights, tourists’ engagement and place attachment are connected, meaning that place attachment leads to emotional bonds. For instance, when tourists emotionally attach to the museum or another attraction, they are more enthusiastic to be engaged with the place ( Park et al., , 2010). Tourists who visit the destination may build a powerful emotional relationship interactions, positive attitude and behaviour with the place and they become attached (Loureiro & Sarmiento, 2019). Attachment to technology can be tied to users’ emotions (Friedrich, 2016) and this brings satisfaction to tourists (Zhou et al., 2020).

#### **2.4.6 Enjoyment**

As noted, emotions are one of the aspects tied up the VR experience in previous research, although there are a very limited number of studies. To determine the effects of the VR experience on consumer behaviour, a study defined enjoyment, emotional involvement and flow state as emotional dimensions of the VR experience that ultimately lead to visiting intention ( Kim et al., 2020).

According to Venkatesh (2000), enjoyment is “the extent to which the activity of using [a] specific system is perceived to be enjoyment in its own right aside from any performance consequence resulting from system use” (p. 351).

Scholars have found enjoyment as a dimension of the VR technology experience. For instance, enjoyment of mobile tourism sites has been found to significantly influence attachment to the sites (Kim et al., 2016), and the feeling of presence has been found to be connected to enjoyment in the VR experience (Tussyadiah et al., 2018). Additionally, researchers found that enjoyment positively affects behavioural intentions of tourists (Huang et al., 2016). In other contexts, like mobile social media sites, enjoyment has been found to play a critical role in better understanding users' behaviour (Kim et al., 2017).

Moreover, the study of M. J. Kim et al. (2020) found a positive connection of enjoyment affected by authenticity and their significant impacts on attachment to virtual place and intention to visit the destination. Also, the strong correlation of enjoyment with other dimensions of the VR experience, such as intention to visit the destination, has been acknowledged by scholars (Tussyadiah et al., 2018).

#### **2.4.7 Emotional Involvement**

In the study of M. J. Kim et al., (2020) emotional involvement was considered to be firmly associated to VR experience and other dimensions. For instance, scholars have noted that emotional involvement plays a significant role as one of the outcomes of the VR experience to be connected to presence (Hopkins et al., 2004).

Holsapple & Wu (2007) define emotional involvement as “the degree to which an individual is emotionally engaged in a behavior” (p. 87). In the tourism context, emotional involvement has also been studied in relation to the intention to visit a destination (Huang et al., 2013). Additionally, recent studies have extensively focused on this concept in relation to users' experiences of virtual worlds (Marasco et al., 2018).

Previous research on the emotional involvement of technology found the positive role of this concept in affecting users' behavioural intentions (Pohlmeyer & Blessing, 2011; Saeed et al., 2009). Wirth et al. (2012) investigate this concept in relation to virtual worlds, finding a strong correlation between emotional involvement and the formation process of presence in a virtual environment. This means that, when sense of presence or “feeling of being there” increases, users of VR feel emotionally involved with the experience. Additionally, emotional involvement has been found to be connected to flow, as one of the dimensions of the VR experience (Hassan et al., 2020).

#### 2.4.8 Flow

Finally, the flow was the last emotional response found, as mentioned in research by Kim et al. (2020). The flow theory was introduced by Mihaly Csikszentmihalyi (1990) in the 1970s, noting that people who do activities for pleasure, even when they are not rewarded financially, were found to have a positive attitude towards those activities. He discovered that these intense activities, in which their attention was completely absorbed, were the source of enjoyment, rather than relaxing or living without stress. He called this “state flow” because people described their intense experiences, as if they were being carried by a river.

Hassan et al. (2020) define flow as an experience “where action and awareness merge, there is high concentration on task and little attention is paid to time or self” (1196). In their study, they found that VR has a significant power for inducing the flow state. Additionally, their results indicate that flow in VR is positively connected to intentions to continue VR use.

Several years before, Huang et al. (2012) examined the influence of virtual experiences in Second Life on people's destination choice, by investigating the constructs of flow and involvement. Their results demonstrated that the achievement of flow experiences in a 3D virtual world motivate the acquisition of more information and the intention to visit the real-world destination. Further, their results demonstrated that flow experience mediated the relationship between involvement and behavioural intentions.

Furthermore, another study indicated that experiencing positive emotions such as emotional involvement and flow as outcomes of the technology experience has a positive and significant influence on behavioural intentions (Huang et al., 2013). The identification of these factors shows the capability of visual environments to increase the users' feelings of being immersed in the virtual environment (Disztinger et al., 2017), which includes their emotional involvement (Tan et al., 2015).

Overall, the emotional responses of enjoyment, emotional involvement and flow are considered dimensions of the VR experience. However, as noted above, some studies consider different emotions induced by the VR experience. For instance, Chirico et al. (2018) investigated awe as the fundamental emotion induced by the VR experience. The following section describes this emotion.

#### 2.4.9 Awe

In the reviewed literature, it was found that the emotion of awe is a fundamental dimension related to the VR experience. As noted, a number of studies in the psychology context consider the emotions induced by the VR experience. These studies found the emotion of awe in relation to the VR experience (Chirico et al., 2018) in the context of psychology, and this emotion was found to be one a significant aspect of the VR experience. The potential of VR to induce awe in controlled lab conditions through using virtual settings (Chirico et al., 2018) and immersive videos (Chirico et al., 2017) has been confirmed, and scholars were able to successfully elicit a self-reported awe response in some participants. Quesnel and Riecke (2018) and Gallagher et al. (2015) have also used virtual experiences of a spaceflight and evaluated its potential for inducing awe.

Importantly, the correlation of awe with other mentioned emotions such as enjoyment has been found in the technology context (Lehman et al., 2019). Also, previous studies have found that VR technology is able to provide individuals with an exceptional medium to design for and study awe-inspiring experiences, due to its capability to bring a sense of presence (Chirico et al., 2016) as a fundamental feeling induced by VR.

However, all the previously mentioned methods suffer from some serious shortcomings in considering only surveys when investigating emotions. More importantly, although awe is also found to be a complex emotion that is particularly relevant to tourism (Shiota et al., 2007) previous studies have failed to address this emotion in relation to the VR technology experience and in the tourism industry.

Awe is a very complex emotion that is described as powerful feelings of surprise, wonder and connectedness that occur when faced with something vast that exceeds previous knowledge (Keltner & Haidt, 2003). This concept is one of the most common emotional experiences for tourists (Coughlan et al., 2012), and is an inclusive emotion that includes feeling confused, surprised, fearful, modest, and other complex emotions (Keltner & Haidt, 2003). Wang & Lyu (2019) state that the “Tourist’ experience of awe consists of an immediate physiological response (e.g., shock, breath-taking), comparison with past experiences (e.g., unique, unusual) and a future-oriented, schema-changing component (change making, humbling)” (p.107).

The inducing factors of awe and its key features are demonstrated in the prototype theory discussed by Keltner and Haidt (2003). The key characteristics of awe include “the perceived

vastness” and “a need for accommodation”. The perceived vastness refers to the powerful force of an emotional stimulus, that can destroy or control people’s willpower and make individuals feel small, powerless, and humble. Items intended to measure vastness include: ‘I feel the presence of something greater than myself’ (Piff et al., 2015). A need for accommodation is the feeling of confusion and surprise when an individual encounters an experience beyond their previous experience, or that is difficult to understand. ( Lu et al., 2017).

Overall, with regards to the main previous scales proposed by other researchers, in a recent study, Yaden et al. (2019) have developed a robust state measure of awe naming the Awe Experience Scale (AWE-S), based on the extant experimental literature. The scale comprises a 6-factor structure including: altered time perception (F1); self-diminishment (F2); connectedness (F3); perceived vastness (F4); physical sensations (F5); and need for accommodation (F6), which is used in the current research.

In the field of tourism, empirical research on awe has been carried out by Coghlan et al. (2012), who conducted a qualitative study of 55 tourists. They found that awe was a positive emotion in the travel experience, and that the awe experience includes three components. The first is the physiological response, e.g., shock. The second is the comparative uniqueness, e.g., unforgettable. The third is the schema-changing for the future, e.g., inspiration. Visitors with a positive sense of awe will likely aspire to build stronger connections with the experience objects and be eager to extend the memory of the experience or to experience it again in the future (Su et al., 2020).

According to Wang and Lyu (2019), awe is a positive emotion specifically relevant for tourism. However, studies of its behavioural outcomes are scarce and research of the awe experience and its consequences in VR tourism experiences have been fundamentally missing from previous studies. Nevertheless, this emotion was found to be connected to the feeling and behavioural intentions (Van Cappellen & Saroglou, 2012).

#### **2.4.10 Intention to visit/Intention to use/ Positive word of mouth (WOM)**

One of the main dimensions of VR experiences relates to the behavioural intentions of tourists. Generally, behavioural intention refers to the motivational factors that influence a given behaviour, where the stronger the intention to perform the behaviour, the more likely the behaviour will be performed (Mamman et al., 2016). In the tourism context, many studies have applied this expression to discuss the intention to visit the destination ( Jeong et al., 2020;

Wang, 2017), to recommend the destination (Kaur & Kaur, 2020; S. Yang et al., 2020), and recommend and use the technology (Tsai, 2010). Some studies apply behavioural intentions to describe revisitation intention, positive WOM, and willingness to pay for products (Chi et al., 2020).

Although the behavioural intentions have been extensively studied as the predictor of actual behaviour, it is argued by some authors that past behaviour is a better predictor of future behaviour than intention (Sommer, 2011). Bălău, (2018) states that it is most commonly assumed that intention is a stable concept in consumers' minds and is easy to measure, but other perspectives suggest that intention can change depending on context, or the method of measurement. Thus, it is emphasised by this author that, due to the gap between actual behaviour and behaviour predicted on intentions, further exploration of these competing perspectives is needed.

Noting the gap between consumers' self-reported intentions and their actual behaviour, research methods and responses may have a social desirability bias, according to some scholars (Carrington et al., 2010). In all instances, this is an evident limitation of the models that focus on attitudes and intentions as determinants of behaviour, and isolate decision-making, thereby failing to integrate contextual influences (Fukukawa, 2003).

Focusing on moderators of the intention-behaviour relationship, Conner and Norman (2022) underline that the intention-behaviour gap can be reduced by making better predictions of behaviour based on strong intentions. Moreover, strong intentions are more likely to persist over time, and are less responsive to interventions to change them.

Behavioural intentions are regarded as a very significant area of research in tourism (Prayag et al., 2013) as they are the best predictor of future behaviour (Yang et al., 2020). Furthermore, exploring tourists' behavioural intentions vastly assists destinations in acquiring competitive advantages in the long term (Almeida-Santana & Moreno-Gil, 2018).

Behavioural intentions as a significant step in the process of the VR experience have been studied before. Researchers have found that experiencing VR technology creates positive word of mouth and visit intention (Jung & Tom Dieck, 2017). Similarly, Kim et al. (2020) found that a positive attitude toward the use of VR in the tourism context involves full immersion in the experience, which in turn influences the behavioural intention to visit the destination in the future.

In a recent study González-Rodríguez et al. (2020) examined the quality of tourists' experiences when visiting a cultural heritage destination by using a tourist product based on a virtual tour. They found the increased demand by tourists to have a memorable experience at a destination, as well as the growing offer on virtual reality and augmented reality technologies applied to the tourism sector. Additionally, they explored online comments posted in the e-WOM community and Trip Advisor regarding the tourists' experiences after the use of smart glasses.

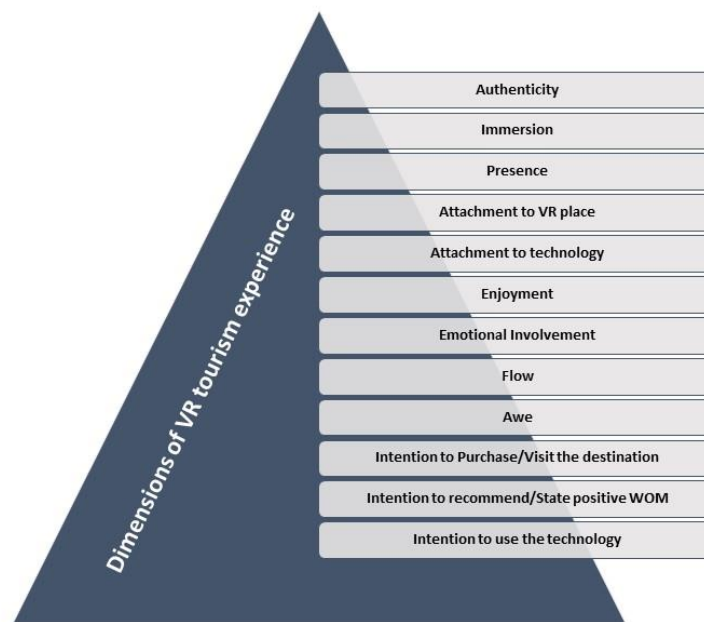
Chitturi et al. (2008) concur that tourism immersive technologies such as VR products can vastly enhance tourists' experience and improve destination image and positively affect it through positive electronic word-of-mouth (e WOM) recommendations. Additionally, scholars highlight that this 'try before you buy' experience presents potential tourists with new information and perspectives of a destination that will likely affect their behavioural intentions and encourage physical visitation and WOM recommendation, and consequently, increase visitor numbers and local business demand at the destination (Tom Diek et al., 2018).

However, there are only a few studies that explore how positive emotional experiences affect the generation of e-WOM statements (Serra-Cantallops et al., 2018). Nevertheless, scholars found positive connection involvement, destination image, place attachment, and behavioural intentions (Jeong et al., 2020). Similar studies reveal that positive emotions are ultimately related to behavioural intentions (del Bosque & San Martín, 2008; Lee et al., 2013), or have a direct positive influence on behavioural intentions (Khoo-Lattimore & Sitruk; Lin & Liang, 2011; Prayag et al., 2015). Furthermore, researchers have highlighted the importance of emotional experiences as predictors of tourist behavioural intentions in the pre-visit stage (Goossens, 2000; Prayag et al., 2013).

Notably, most of the existing studies have connected positive emotion to behavioural intentions but have not performed an in-depth investigation of related emotions and variables. However, grounded in the studies above, researchers found that these all increase the demand for using the VR experience in tourism as the experience has the potential to revolutionise tourism marketing by affecting the intentions of tourists to visit destinations and attractions (González-Rodríguez et al., 2020).

## 2.5 The contribution of the literature review for defining a framework for the VR tourism experience

In order to define a framework for the VR tourism experience, an attempt was made to find the dimensions and process of the VR tourism experience, during the literature review. Figure 2.6 illustrates that all the dimensions related to the actual experience of VR, in different contexts. These include the key concepts involved in the actual experience of VR.



**Figure 2.6. The dimensions of the VR tourism experience**

Section 2.4.1 described authenticity as one of the first dimensions of the VR tourism experience as a perception. The **perceptions** are regarded as the first evaluations of users when experiencing VR. Their understanding of this experience and their evaluations on the characteristics of this experience significantly affects the other aspects: previous research confirms the relationships between tourists' perceptions, positive emotional states and behavioural intentions (Pestana et al., 2020). Furthermore, the correlation between perceptions, feeling and emotions in VR has been stressed (Diemer et al., 2015). Scholars suggest that perceptions are the core aspects of experience (Godovykh & Tasci, 2020), and perception means the way in which something is regarded, understood, or interpreted. Ahadi et al. (2015) describes tourists' perception as tourists' evaluation on certain things. It is found that perception of tourists of their experience of the destination can significantly affect the image

of the destination (Collins & Millar, 2021), and the tourist's experience of a destination is fundamental for destination image (Jangra et al., 2021). Table 2.1 shows the perceptions of the VR experience found in literature.

**Table 2.1. Possible perceptions derived from the VR experience**

| Study                                    | Perceptions  |
|--|--------------|
| Afonso, (2019), Kronqvist et al., (2016) | Authenticity |

Furthermore, as described in previous sections (2.4.2, 2.4.3, 2.4.4, 2.4.5), immersion, presence, attachment to VR place, and attachment to the technology, were revealed as feelings related to the VR tourism experience. These **feelings** induced by VR are another significant part of experiencing this technology. Although feeling and emotion are interchangeably used in literature to describe the consequences of the VR experience, they have fundamental differences, including their causes, duration, intensity, and outcomes (Godovykh & Tasci, 2021). According to Godovykh & Tasci (2021), researchers often tend to use the words emotions and feelings interchangeably, creating a confusion in conceptual and methodological areas of tourism research. However, there are fundamental differences between these concepts. Damasio (2001) defines feelings as a mental representation of emotions. The author states that, while emotions present immediate bodily responses to external stimuli, feelings provide cognitive meanings of these emotions, improving learning, increasing the effects of the stimuli, and influencing future behaviour. Also, Steinert & Roeser (2020), highlight that, although the terms 'emotion' and 'feeling' are often used as synonyms, these concepts should not be treated as the same. The VR experience has been found to be in correlation with feelings in various contexts, including tourism. A list of the primary feelings is provided in **Table 2.2**.

**Table 2.2. Possible feelings derived from the VR experience**

| Study                    | Feelings               |
|--------------------------|------------------------|
| Hudson et al. (2019)     | Immersion              |
| Yung et al. (2021b)      | Presence               |
| Lee & Kim (2021)         | Tele-presence          |
| Pantelidis et al. (2018) | Attachment to VR place |

Having noted the differences between feelings and emotions, reviewing the literature in different contexts also revealed the power of the VR experience for inducing various types of emotions. Some of the available research focuses on a single emotion such as emotional involvement (Marasco et al., 2018) or enjoyment (Tussyadiah et al., 2018) in the field of tourism, and emotions like awe in other contexts such as psychology (Chirico et al., 2018). The next dimension of the VR experience is associated with **emotions** derived from the VR experience. As noted, tourists' perception of the VR experience and their feeling towards it could be connected to their emotions. Also, according to Shank (2014), the use of technologies can be complexly tied to altering one's emotional state. It is noteworthy that technology by itself can be the basis for emotional reactions, due to its novelty, capabilities, and malfunctions. According to Scherer, (2005) one of the definitions of emotions is related to elicited stimulus events that trigger a response. In their research, Serrano-Puche (2015) concluded that technology not only arouses emotions in users and serves as a channel for the expression of affection, but also influences the way in which this emotion is transformed, played out and displayed. Previous literature has noted that the VR experience is associated with arising emotions in different contexts. Nevertheless, a significant part of literature refers to the connection of the VR experience to general emotions, without specifying the types of emotions (Beck et al., 2019), or focusing on a specific emotion (Stepanova et al., 2019b). For instance, Kim et al. (2020) found enjoyment, emotional involvement and flow state as emotions derived from the VR experience. However, the approach of this study carries with it various well-known limitations. First, the researchers used participants who had previous experience with VR tourism. In fact, participants did not try a tourism-related VR experience during the study. Second, this study used only an online survey and a quantitative approach. The following sections describe these emotional states associated with the VR experience regarding this study. Also, literature is reviewed in various areas to describe the other emotions induced by the VR experience.

The correlation between VR experiences and emotions has been studied to date. However, a systematic review of literature focused on the VR experience and emotions revealed limited conceptualisation of how emotion and emotional processes operate when VR experiences are involved (Godovykh & Tasci, 2021). The main dimensions of the VR experience include

emotional responses, attitudes, and behavioral intentions (Godovykh et al., 2022). Table 2.3 shows the available literature focusing on the VR experience and emotions.

**Table 2.3. Possible emotions derived from the VR experience**

| Study                       | Emotions   |
|-----------------------------|--|
| Kim et al. (2020)           | Affective responses including enjoyment, emotional involvement, and flow |
| Chirico et al. (2018)       | Awe  |
| Rejón-Guardia et al. (2020) | Enjoyment  |
| Yung et al. (2021a)         | Emotions   |
| Tussyadiah et al. (2018)    | Enjoyment  |
| Huang et al. (2016)         | Enjoyment  |
| Marasco et al. (2018)       | Emotional involvement  |
| Huang et al. (2013)         | Enjoyment, positive emotions, emotional involvement, flow                |
| Beck and Egger (2018)       | Emotions   |

Finally, the factors related to **behavioural intentions** and the VR experience were found to be tied together, according to the available literature (Yung et al., 2021b; Zheng et al., 2021). These factors include intention to purchase or visit, in a tourism context, intention to recommend the product, destination or the technology, or state positive WOM, and intention to use the technology. One of the main dimensions of VR experiences related to the behavioural intentions of tourists. Many studies have focused on the relationships between the VR experience and behavioural intentions. Collectively, available literature indicates that research on the subject has been mostly restricted to quantitative methods. This approach fails to focus on experimental and qualitative methods that are fundamental tourists' behaviour (Tom Dieck et al., 2018). Furthermore, although extensive research has been carried out to connect different XR technology experiences to behavioural intentions, most of the studies evaluated fail to specify moderating factors such as emotions and feelings, and their fundamental effects. Table

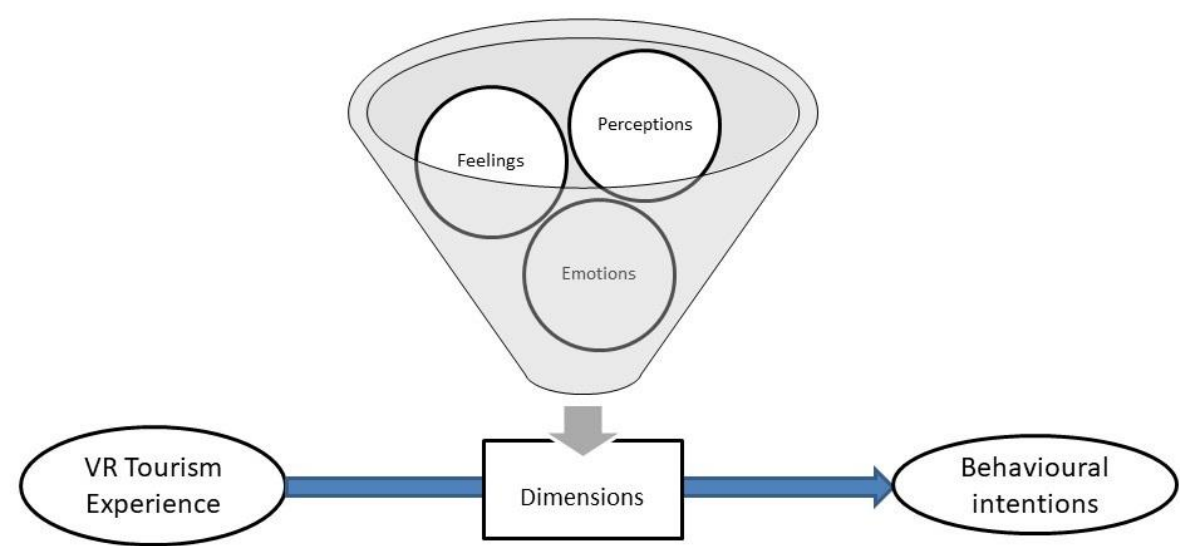
2.4 lists the studies that have focused generally on behavioural intentions, or specific factors related to them.

**Table 2.4 Possible behavioural intentions derived from the VR experience**

| Study                       | Behavioural Intentions   |
|-----------------------------|--|
| Yung et al. (2021a)         | Destination awareness, destination understanding, visit intentions |
| Lee & Kim (2021)            | Visit intentions   |
| Skard et al. (2021)         | Travel intentions and purchasing decisions                         |
| Zheng et al. (2021)         | Visit intentions   |
| Kim et al. (2020)           | Visit intentions   |
| Lee et al. (2020)           | Behavioural intentions   |
| Lo and Cheng (2020)         | Attitude towards a hotel, purchase intentions                      |
| Rejón-Guardia et al. (2020) | Use intention, changes in attitude towards the destination         |
| Leung et al. (2020)         | Brand attitudes, purchase intention                                |
| Kaur & Kaur (2020)          | Recommending the destination                                       |
| Yang et al. (2020)          | Destination recommendation   |
| Kim and Hall (2019)         | Continued use  |
| Hudson et al. (2019)        | Satisfaction   |
| Wei et al. (2019)           | Satisfaction, revisit intentions, recommending intentions          |
| Tom Diek et al. (2019)      | Behavioural intentions   |
| Marasco et al. (2018)       | Behavioural intentions   |
| Rainoldi et al. (2018)      | Destination image, information search process                      |
| Tussyadiah et al. (2018)    | Attitude changes, visit intentions                                 |
| Raska & Richter (2017)      | Purchase intentions  |
| Griffin et al. (2017)       | Destination image  |
| Huang et al. (2016)         | Travel intentions  |

|                     |                        |
|---------------------|------------------------|
| Huang et al. (2013) | Behavioural intentions |
|---------------------|------------------------|

Overall, Figure 2.7 shows that all the mentioned dimensions of the VR tourism experience were included in four categories, that appear to be the process of this experience (the steps involved in the VR tourism experience).



**Figure 2.7. The process of the VR tourism experience**

### 2.6 Conclusions and Implications from the Literature Review

This chapter discusses available literature regarding the dimensions and process of the VR tourism experience, to define a framework for this experience. The dimensions and process of the VR tourism experience could include all positive and negative emotions and feelings derived from that, and users’ perceptions of the technology experience and its meaning to them (Nurkka et al., 2009). However, a major gap that has been identified in the literature is the lack of knowledge on the dimensions of a VR tourism experience. Only a few literature reviews attempt to provide a framework for the VR experience, with no empirical studies. Also, although there is some VR tourism research available, the majority of this focuses on just one dimension, such as authentic experience ( Kim et al., 2020). Furthermore, currently, most studies on this area investigate the effects of these experiences on behavioral intentions. The

generalisability of much published research on this issue is problematic, due to a lack of a theoretical foundation leading to a lack of explanation on why and how immersive technologies influence behaviour (Wienrich et al., 2020). Also, it has been pointed out repeatedly, and in different research contexts, from tourism, learning and education to gamification and marketing research that, these variables are insufficient to portray the variety of the VR experience and explore the whole process of behavioural change.

Although previous studies note that emotions and feelings are involved in affecting behavioural intentions of tourists experiencing VR, little is known about the types of emotions and feelings. Most of these studies do not consider the mediating role of other concepts such as feelings and emotions, and they directly describe the role on the VR experience in influencing behavioural intentions, such as intention to visit. Notably, the available literature refers to emotions generally, or mixes academic knowledge of feelings and emotions. Also, there is a lack of academic literature defining the dimensions related to the technology acceptance phase/ attitude toward technology and actual experience of that. Furthermore, some aspects have been interchangeably described in relation to different XR technologies, although there is a fundamental difference between experiencing VR and AR.

Furthermore, the significant role of emotional responses as mediators between the VR experience and tourists' behavioural intentions appears neglected, and the categories considered in previous research do not sufficiently differentiate between these concepts. For instance, the absence of research considering the sense of presence and emotion in tourism is especially notable when the importance of emotion research in tourism marketing is increasing ( Li et al., 2018). These emotions play an essential role in consumer behaviour and their understanding is crucial for marketing (Santos et al., 2014), and also tourism marketing (Beck & Egger, 2018). Although, VR technology has shown its potential as a valuable marketing tool, more theoretical studies on VR and consumer behaviour are necessary to identify which aspects motivate potential tourists to visit destinations accessed via VR ( Kim et al., 2020).

Another gap in extant research concerns the prediction and understanding of the influences of the VR experience on future behaviour. The nature of the relationships between the VR experience and outcome variables is not understood. This critical analysis of previous empirical and conceptual studies on experience shows that conceptualisation and operationalisation of the customer experience requires a deeper understanding of its components, key concepts, the dimensions, and measurement methods (Godovykh & Tasci, 2020). It seems necessary to look

at tourists' behaviour in more detail and to develop an empirical conceptualisation, rather than using pre-defined categories based on researchers' assumptions.

Finally, there are presently only a few experimental or longitudinal studies in the literature on the VR experience, and most produced weak or ambiguous results. This limitation of previous studies reveals the lack of qualitative research, experimental designs, or a mixed method design (Tom Dieck et al., 2018). Cranmer (2019) highlights that it is necessary to comprehensively explore an effective application of realities to enhance tourists' experiences, as there is a lack of knowledge concerning how VR experience changes the behaviour of tourists, as scholars claim (Raska & Richter, 2017). The studies presented thus far provide evidence as to the significance of emotional experiences as influencers and predictors of tourist behavioural intentions in the pre-visit stage (Prayag et al., 2013). However, these emotions are not identified in detail.

Defining these determinant concepts and their relationships with other dimensions of the VR experience is critical, as a combination of these with other factors can ultimately lead to higher behavioural intentions (Chuah, 2019). Scholars highlight that it is necessary to comprehensively explore the dimensions of an effective application of these technologies to enhance tourists' behavioural intentions (Cranmer, 2019), as it is not clear how these technologies are capable of changing customers' behavioural intentions (Raska & Richter, 2017). Researchers are increasingly interested in using these technologies in tourism, however, there has been little discussion about them (Yung & Khoo-Lattimore, 2019). Therefore, there is a need for further research on the impact of these technologies on tourists' behavioural intentions. Since our knowledge is insufficient, we need to broadly perceive the potential for promoting the destinations by using VR technologies (Tom Dieck et al., 2019), and their advantages need to be highlighted (Adapa et al., 2018). Overall, as this area is relatively new, recent studies call for further research on the process of the VR experience (Lee & Kim, 2021; Skard et al., 2021). The available literature is not able to answer the research questions and provide a framework for the VR experience.

### **3. Methodology**

#### **3.1 Introduction**

The previous chapter presented an overview of the literature. The literature review tried to provide a comprehensive framework for the VR tourism experience by identifying the dimensions and the process of the VR technology experience. The dimensions include the key concepts related to tourists' perceptions, feeling', emotions and their behavioural intentions, and the process involved the steps included in this experience. However, the literature search provided insufficient data about these key concepts and the involved steps, as the process of this experience has not been studied in the tourism context. Thus, the review of existing literature identified research gaps regarding the dimensions and process of the VR tourism experience and led to exploring related aspects that have set the direction for this research methodology.

This chapter first discusses the research questions in detail (Section 3.2), outlining the rationale for the research paradigm and design which is needed to address the tourists' perceptions, emotions, feelings, and behavioural intentions towards the VR tourism experience. Section 3.3.1 outlines the constructivist and post-positivist approach that has been chosen as a research paradigm, followed by identifying the research design and its stages in Section 3.3.2. Then the first study, that includes an exploratory qualitative phase consisting of semi-structured interviews, is explained in Section 3.4. Subsequently, based upon results gathered throughout the exploratory phase, study 2 is defined, with a quantitative approach, as illustrated in Section 3.5.

## **3.2 Research questions**

The main research problem was defining a comprehensive framework for The VR tourism experience. The review of literature tried to investigate a comprehensive framework for the VR tourism experience. This required searching for research comprising relevant aspects of this experience and how they were connected. However, previous studies focus on very few related aspects, and no empirically tested frameworks regarding the VR tourism experience were found, to answer the main question of this research. There is very limited research attempting to provide a framework for the VR tourism experience (Godovykh et al., 2022; Wei, 2019). However, these are only reviews of the current literature, and lacking an empirical basis. This provides a foundation for the two phases of data collection and analysis to determine the information needed to address the overarching research question.

### **What is a framework for the VR tourism experience? (RQ)**

To answer this main question, first it was necessary to determine the aspects that best describe and distinguish the key concepts, and also the steps involved in the VR tourism experience. Specifically, to define a comprehensive framework and explain the steps that are involved in this experience, the literature review explored the dimensions and process for the VR tourism experience. The dimensions in the context of this research considered all the concepts induced by this experience, and the process included finding a series of steps that were involved in the VR tourism experience.

The limited available literature identified four categories that dimensions that could be included in the VR tourism experience: perceptions, emotions, feelings, and behavioural intentions. However, the dimensions related to these categories are not clearly defined in previous studies. Furthermore, regarding the association between the key concepts, the existing literature fails to explain how these concepts are related to each other. Drawing from the available literatures review on different aspects related to the VR experience, there was not enough academic knowledge about the dimensions and the process of the VR experience to define a framework for it. The key uncertainties or unknowns are first various dimensions and process of the VR experience. These include investigating the key concepts related to tourists' perceptions, emotions, feelings, and behavioural intentions induced by the VR experience as dimensions, and the steps or process involved as the first sub-question of this research.

### **What are the dimensions and process of the VR tourism experience? (SQ1)**

To fully investigate these dimensions, aspects related to tourists' perceptions, emotions, feelings, and finally behavioural intentions needed investigation.

Section 0 of the literature review tried to identify perceptions related to the VR tourism experience. However, existing studies consider the perceptions of tourists in the acceptance phase of technology, and actual use of that, within the same category (Godovykh et al., 2022). This is despite the fact that the behaviour of tourists could be very different after experiencing the technology, compared to before: the perception of consumers could dramatically change after technology usage (Nazar et al., 2020).

Furthermore, the previous studies on feelings and emotions lack depth as there was a missing literature on them and also these have been applied interchangeably in existing studies. According to Williams (2014), current studies on emotions should not only focus on how these emotions impact on individual behavior, but also on what factors motivate an individual to

produce different discrete emotions. Because different emotions can have different behavioural consequences, it is important to explore them first (Laros & Steenkamp, 2005). For instance, a negative emotion can lead to a positive attitude. Exploring emotions in general does not help to reveal their specific effects, as combination of negative and positive emotions could result in a specific behavioural consequence (Lerner & Keltner, 2001). Exploring emotions as core building blocks of a behaviour (Bastiaansen et al., 2019) will provide further insight for tourism organisers to better understand tourists' behavioural intentions, and provide useful information to marketing managers seeking to promote the destination and new technologies. Other dimensions such as tourists' perceptions and feelings also can play a crucial role in affecting behavioural intentions of tourists. Therefore, after defining different aspects related to dimensions of the VR experience, it is necessary to investigate the steps involved in this experience, which will help define the process of the VR experience, as these steps and how they are associated, are currently unclear.

Although some previous research focuses on one single dimension such as presence (Yung et al., 2019) or place attachment (Pantelidis et al., 2018) it fails to comprehensive knowledge regarding dimensions of the VR tourism experience and how they are connected. These single feelings and emotions are not able to define the whole key concepts involved in the VR tourism experience. Furthermore, these findings lack insight into the complexity of tourists' behaviour in relation to experiencing new immersive technologies. While the literature on the behavioural intentions identifies the impacts of the VR tourism experience, previous research offers an inadequate explanation for the impact of these technological experiences on tourists' emotions and behavioural intentions (Yung & Khoo-Lattimore, 2019). Specifically, the building blocks of the VR experience, that ultimately affect the behavioural intentions of tourists, remain unclear. This leads us to the second sub-question of this research.

### **How does the VR tourism experience influence tourists' behavioural intentions? (SQ2)**

This question seeks to explore the correlations of the dimensions of the VR experience as the associations of the perceptions, emotions, and feeling together. This will help reveal the impact and influence of these aspects on further knowledge on the behavioural intentions of tourists towards the destination and VR technologies.

Sub-question 2 is strongly connected to sub-question 1, explaining how the VR experience changes the behavioural intentions of tourists. The dimensions of the VR experience can be dependent on which aspects will be induced through the VR experience and their process

concerns with the steps. These will also be strongly connected to the main question of the study. Investigating the induced perceptions, emotions, feelings, and behavioural intentions will identify the key concepts of the VR tourism experience. Also, exploring their connections is fundamental to exploring what this means for tourists' behavioural intentions.

Some scholars attempt to connect tourists' emotional experiences to their overall image of the destination and their intention to recommend (Prayag et al., 2017). However, these connections have not been investigated in relation to VR technologies, and the current study appears to be one of the first attempts to evaluate these relationships and answer the main question. It is important for marketers and specialist organisations, such as travel agencies and tour operators, to promote a holistic and consistent image (Qu et al., 2011) based on specific emotions that a destination elicits. Marketing campaigns should emphasise the types of emotional experiences that can be evoked by the destination, and their contribution to the discussion of the concept of behavioural intentions. In summary, these questions connect three bodies of knowledge, including technology, consumer behaviour and tourism, but also answer the main question and sub-questions of this research.

As discussed, the VR experience could affect behavioural intentions such as the intention to visit the destination, positive WOM, and destination recommendation. However, the fundamental challenge in this literature is a lack of knowledge on mediating aspects that connect the VR experience to behavioural intentions of tourists, and changes in these intentions, such as their intention to visit. Overall, the specific key concepts of the VR tourism experience and connections, meaning the directions of the impact, remain unknown.

### **3.3 Methodology Overview**

Before describing the actual process of data collection, the following section defines the research paradigm and worldview that this study is based upon. Then the steps of the methods and process are addressed.

#### **3.3.1 Research Paradigm**

The literature review outlined the dimensions and process of the VR tourism experience for providing a VR tourism experience framework. These include the key concepts and steps involved in this experience. Furthermore, the previous chapter attempted to uncover associations between these dimensions to identify how they ultimately affect behavioural intentions of tourists. However, it was revealed that academic knowledge about these

dimensions and their association is scarce, and it is unclear how the VR experience changes the behavioural intentions of tourists. Therefore, the literature review was unable to provide a comprehensive VR tourism experience framework. Therefore, selecting an appropriate research paradigm for the current study should take into consideration not only the dimensions and process of the VR tourism experience, but also how they are connected.

This research adopted two paradigms, a constructivist, and a post-positivist approach. Discovering the dimensions and process of the VR tourism experience as the first sub-question of this research required an in-depth look into relevant aspects from the perspective and understanding of the tourists who experience VR. As individuals were sharing the subjective meanings of their experiences, the constructivist paradigm was considered suitable for the first phase of this research. According to Honebein (1996), an approach to philosophy based on constructivism asserts that people gain insight into and knowledge of the world through their own experiences. This paradigm relies on the analogy or premise that people learn through experience (Adom et al., 2016). Based on the constructivism paradigm, reality emerges from human interaction with the environment and human interaction with the world is thought to be a key factor in active construction of knowledge (Dawadi et al., 2021). While emphasising the qualitative components, a constructivist paradigm underlines that the role of the researcher who uses this paradigm is perceiving the reality from the participants' points of view and perspectives (Creswell, 2002; Mertens, 2019). Constructivists assume that people are seeking to understand the world around them, as throughout life, people develop subjective interpretations of their experiences - meanings that are directed towards specific topics. There are numerous meanings and multiple perspectives, requiring the researcher to look for complexity rather than focusing on a few categories. The aim of choosing this paradigm for this phase of the research is to rely as much as possible on the participants' views of the situation studied (Creswell, 2008).

The constructivism paradigm focuses on co-constructing perspectives which includes researchers engaging with participants (Creswell & Poth, 2016). Answering the first sub-question of this research was also dependent on finding the key aspects based on participants' understanding and perception of their VR experience. Therefore, aligned with a constructivist paradigm, it was necessary for the researcher to engage with participants as a facilitator of the conversation and to co-construct their point of view (Lincoln et al., 2018).

The second research paradigm adopted for this study comprises a post-positivist approach. Therefore, the previous paradigm changes into post-positivism when it comes to finding the association between dimensions of the VR tourism experience. This paradigm is chosen because it represents the thinking beyond positivism, challenging the traditional assumption

that there is an absolute truth of knowledge (Phillips et al., 2000), and recognising that we cannot be “positive” about our claims of knowledge when studying the behaviour and actions of humans (Creswell, 2008). The post-positivism paradigm confronts the certainty of positivism, arguing that it is necessary to revise established knowledge when new knowledge develops (Popper, 2014). Post positivists embrace a deterministic worldview that underlines the cause-and-effect relationship when studying various phenomenon, with experiments highlighting that causes probably determine impacts or outcomes (Creswell, 2009). In this paradigm, research includes the procedure of making claims and then revising these claims in order to get closer to the reality that exists (Creswell 2009).

Post-positivists also build the basis upon a foundationalist ontology that states that there is “a real world out there” with independent powers that can be measured to establish relationships and the impacts of a phenomenon (Furlong & Marsh 2010, p. 192). As an epistemology, a post-positivist researcher distances the self from the subjects to gain an accurate valid and reliable representation and tries to be unbiased and not introduce their own values or prior experience about conducting and analysing data.

While the first sub- question of this research relies on tourists’ perspectives and understanding of the experience and requires a constructivist world view, the second sub-question of this study requires the post-positivist’s paradigm. In this phase, the post positivist paradigm allows researcher opportunity to gather quantitative data on the association between the key concepts of the VR tourism experience, as not affecting the process in order not to impact the data ( Lincoln et al., 2011). By conducting a post positivist paradigm, the aim is to “get as close to the answer as possible” ( Lincoln et al., 2018, p. 119). As the second sub-question is concerned with how the key concepts of perceptions, feelings, and emotions on behavioural intentions of tourists are linked, in this regard post-positivism remains necessary to obtain the goal of objectivity and generalisability of findings ( Park et al., 2020). Moreover, the post positivist paradigm is aligned with assessing the causes that influence outcomes, such as those found in experiments (Creswell & Clark, 2017). Additionally, post-positivism is selected as the second paradigm to examine the behaviour and emotion of tourists, as the post-positivist paradigm tends to provide the worldview for the majority of research conducted on human behaviour (Kivunja & Kuyini, 2017).

Overall, the main question of this research, which is defining a framework for the VR tourism experience, requires looking at this research problem with several approaches, rather than one paradigm. As this framework identifies a set of variables and the relations between them, that are assumed to account for a set of phenomena objectively (post-positivism), the related variables and

key concepts of this VR tourism experience are examined subjectively (constructivism). These multiple paradigms affect the choice of approach.

Looking at sub-question one, the concentration is on finding the key concepts or the dimensions of the VR tourism experience, including perceptions, emotions, feelings, and behavioural intentions. Factors such as perceptions and evaluations considering the impacts of a subjective experience align with the constructivist paradigm. As Gamlen & McIntyre (2018) emphasise, quantitative methods rely heavily on probabilistic implication. However, in the social sciences, the feelings and emotions of human beings are not locked into predictable behaviours, and participants may have rationales for behaving unpredictably in any given situation. Therefore, it is not possible to apply only quantitative methods; research in this area requires qualitative methods such as interviews to elicit and interpret explanations for social action or behaviour. The focus of sub-question one in this research concerns how tourists evaluate the VR tourism experience and how they feel about it. The second sub-question, however, adopts a post-positivist paradigm to measure the association objectively. This is where the use of a quantitative approach is needed, to obtain a more objective understanding of these aspects.

According to Christ (2013), researchers need to build knowledge by using various sources of data and analysis, depending on research questions, data sources and the purpose of the study. Therefore, in applying multiple worldviews, this study will build the knowledge by using various sources of data and analysis, depending on research questions, data sources and the purpose of the study. The authors use a triangulation method, consisting of in-person long interviews, secondary data, content analysis, and surveys, to correct for problems of validity and bias (Mills et al., 2009). This methodological can be a call for mixing research methods other than relying on one approach. Mixed methods research is highlighted to be drawn upon multiple paradigms (Denzin & Lincoln, 2008; Mertens, 2019).

Overall, the combined constructivist and post-positivist research paradigm supports both the focus of this study, as well as the methodological approach performed to answer the research questions. In the following section, the logics of using mixed methods are defined.

### **3.3.2 Research Approach**

As stated in Chapter 2, available literature was unable to define a framework for the VR tourism experience and answer the main question of this research. Additionally, as described in section 3.2, to follow the main research question, it was necessary to answer a series of steps and sub-questions, to warrant the data quality. Specifically, related concepts and dimensions of this

experience were not comprehensively addressed in the literature. Therefore, concepts related to the VR experience, including perceptions, feelings, emotions and behavioural intentions of tourists and their relationships, were not clearly defined in previous studies. There was also a dearth of research related to the steps and process involved in the tourism VR experience, and how these influence the behavioural intentions of tourists. Therefore, the main strength of this research is its focus on the key concepts involved in this experience, and their associations, using different research approaches.

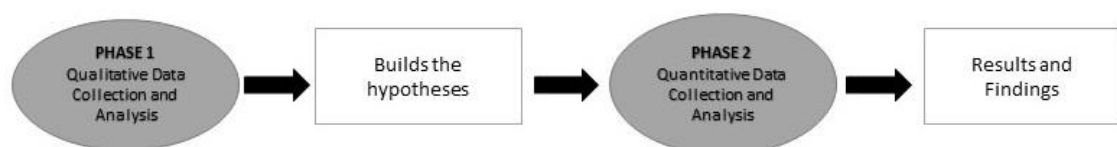
It is crucial to gain an understanding and knowledge of the problem and investigate all related variables, through interviews, before measuring the associations between these variables. To do so, an in-depth examination into this issue was necessary, which leads to exploring further implications. The limitations of the available literature were identified in chapter 2, and in order to address these limitations, it was necessary to select appropriate research methods.

In order to conduct this research, the research process needed to evolve at different stages as the methods, with data evaluation and method adjustments preceding each step, in line with the post-positivist philosophy that the research tools should be determined by the issue studied. Specifically, the research process included experiencing a VR tour to Rome as a tourist destination, followed by semi-structured interviews with a group of participants. In the first phase, in order to achieve the first goal of this research, finding the dimensions and process of the VR tourism experience, a VR tour using an appropriate technology was the first step. A 3D fully interactive VR experience was provided for participants. This experience presented tours including different tourist attractions in Rome. Then the participants were interviewed, answering the questions related to this experience. Analysis of this part of the data provided a basis for a primary framework and a survey, which was conducted after experiencing the same tour, with a new group of participants.

Having conducted this process, this study was conducted using appropriate exploratory mixed methods to obtain an in-depth understating of the VR tourism experience, its dimensions and process, and the connections between these dimensions. Beginning a study with an exploratory, qualitative phase, and moving sequentially to a quantitative phase is defined as “exploratory sequential mixed methods” (Mihas & Institute, 2019). Sequential designs are a case of mixed methods research in which first a qualitative study is conducted to gain general insights into the topic of interest and explore the variables, before being generalised or quantified with a larger sample in a quantitative study.

This research design is aligned with the multiple paradigms of the research. Since it begins qualitatively, researchers commonly use a constructivist worldview during the first phase of the research to consider the different perspectives of the participants and gain deeper understanding of the research phenomenon. When participants experienced the VR tour, they freely expressed their evaluation, and understanding of the experience. This resulted in finding the dimensions of this experience. In the quantitative phase, the core assumptions may shift to a post-positivist view, to necessitate identifying and measuring variables and associations. Therefore, multiple paradigms are used in this design, and the worldviews turn from one phase to the other (Creswell & Clark, 2017). This approach also assists in testing the applicability of the small qualitative sample in the first phase to a larger one in the second phase. Furthermore, the sampling criteria was expanded between phases, so that it was not only a larger sample that was tested, but also a more varied one.

The first phase of this study, therefore, is qualitative, and concludes with analysis producing codes or more conceptual themes. The result of this analysis is used to direct the quantitative phase. The main objective of this mixed method design is to develop theory (Creswell et al., 2018). Figure 3.1 describes a process in the exploratory sequential design suggested by Creswell (2021).



**Figure 3.1. Exploratory sequential mixed method design**

The purpose of the first study in part 1 was to identify a comprehensive set of relevant aspects of the VR experience that could be used as a core framework for describing tourist behaviour, and to inform the construction of an associated questionnaire. To ensure this framework was empirically based and reflects relevant aspects of the VR experience, a qualitative approach was used in this first study, to gain a better understanding of the dimensions and process of the VR experience. This helped in the exploration of any latent variables related to different

dimensions of the VR experience, as the first sub-question of this research, and has the potential to result in more comprehensive results. The qualitative phase is described as “exploratory” because it is data driven (Creswell & Clark, 2017), rather than driven by a conceptual framework. However, this does not mean that it is not allowed to use information from a literature review, only that the qualitative data will be used to better understand the research problem. In this study, first, there was limited evidence informing the dimensions and process of the VR experience. Second, the approaches of previous studies carry with them various well-known limitations. Consequently, this mixed methods research design allowed for rich conceptualisation of the research issue. The qualitative data was collected and then analysed, the results of which directed the next, quantitative phase, which was a survey. The qualitative analysis provides critical rationales for developing specific research hypotheses for the quantitative phase, which involved a questionnaire. The foundation for this approach lies in first exploring a topic, before deciding the variables that need to be measured. In this situation, the qualitative phase has the potential to allow discernment of a new dependent variable (Mihás & Institute, 2019).

In part 2 as a connective point between study 1 and study 2, a preliminary framework for the VR tourism experience was developed using the analysis of part 1 data, which provided the themes and sub-themes. As the second phase of exploratory sequential mixed method (Creswell et al., 2007), this connective point between the qualitative and quantitative components which is called the “point of interface” (Creswell & Plano Clark, 2018) helped in building the variables, hypotheses, and scales for this primary framework. The themes, sub-themes and participants’ statements were used to develop these variables, hypotheses, and questionnaire items. Ultimately, this built the basis for study 2, as the quantitative phase of this research. Specifically, qualitative data analysis included identifying meaningful quotations, coding them with related topics, and possibly developing larger themes. A quotation could be a phrase, sentence, or paragraph. A code is a subject deriving from the literature or inductively extracted from a close examination of data. A theme is a conceptual topic that is more abstract than a typical code. To transfer from qualitative analysis to developing a questionnaire, the codes become variables, themes become scales, and the quotations can become survey items. This again depends on prior knowledge gained during a literature review and from the qualitative phase.

Subsequently, in part 3 the questionnaire, which was constructed based on the aspects identified in study one, was tested with a larger sample. The rationale to postpone quantitative data

collection was because additional conceptual leverage was needed before conducting a survey or questionnaire. In this phase, a developed primary framework was tested with a new sample to ensure the quality of the data. This helped in answering the second sub-question of the research, which was associated with the relationships of key concepts of the VR tourism experience. This data explained how this experience is connected to the behavioural intentions of tourists. Finally, part 4, involved interpreting the results of both phases to reveal to what extent the results of the quantitative phase aligned with the qualitative results.

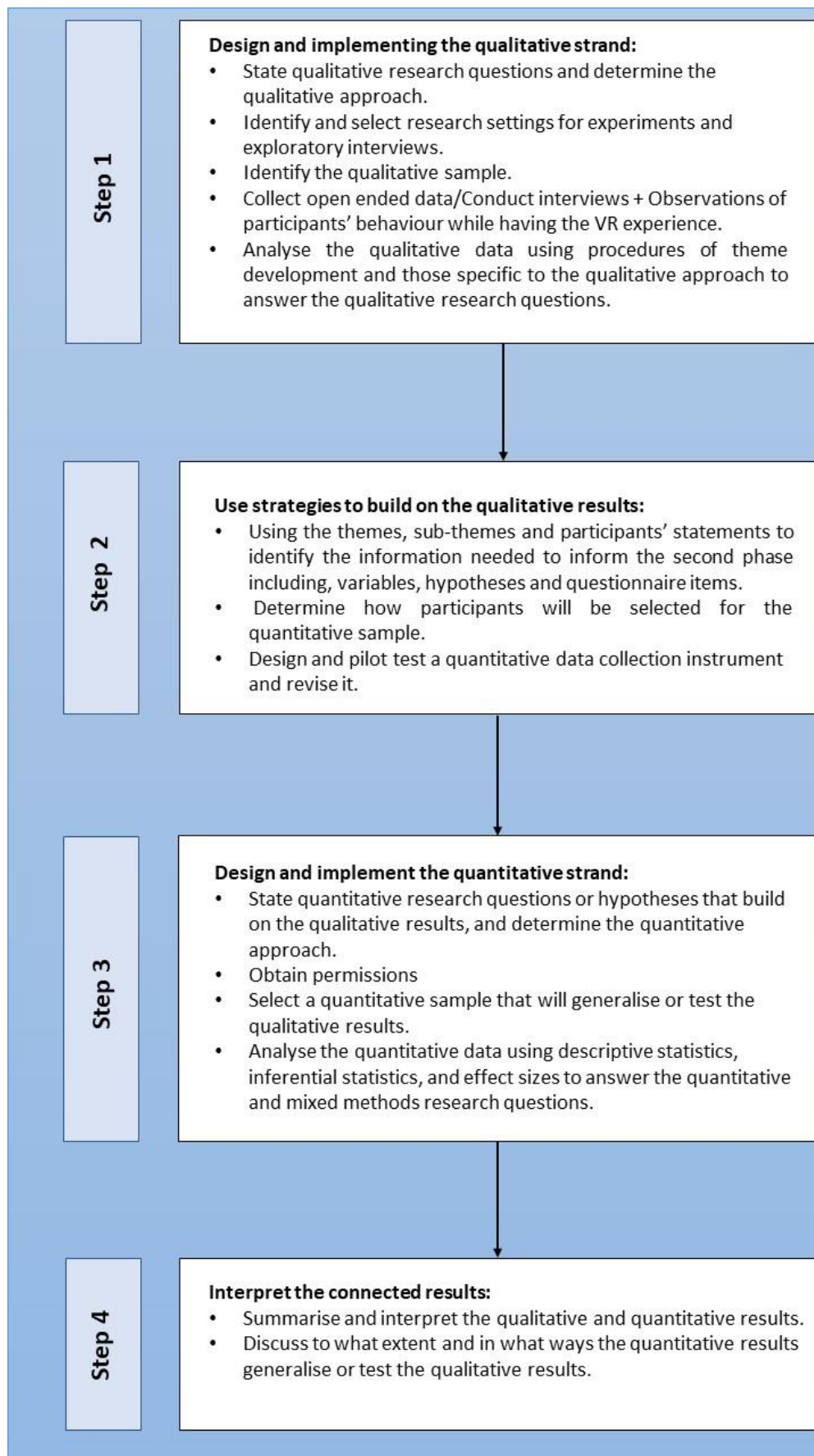
Overall, due to the limitation of the literature in regard to the different dimensions and the process of the VR experience, this study selected an exploratory sequential mixed methods design to gain a broad understanding of the research problem. The research strategy and overall plan for conducting this study included interviews, and surveys. The aim of triangulation is to increase the understanding of complex phenomenon, in which agreement among different sources confirms validity (Malterud, 2001). This combination of qualitative and quantitative methods results in more robust analysis, employing the strengths of each (Tashakkori et al., 1998). Mixed methods research has been described as a philosophically-underpinned model of inquiry, combining qualitative and quantitative models of research to increase the knowledge in a more meaningful manner than either model could achieve alone (Creswell & Clark, 2017). Mixed methods research involves not only including a qualitative and quantitative component in the same study, but also mixing and combining them.

The two main reasons for choosing a mixed methods design over other research designs are summarised below:

1. This research question requires a combination of a qualitative and quantitative approach.
2. There are insufficient studies available in the current literature in terms of the tourists' perceptions, emotions and feelings induced by the VR experience, and their connections to their behavioural intentions. Existing literature fails to provide a comprehensive framework for the VR experience, its dimensions and process. A combination of qualitative and quantitative methods enables this research to obtain a detailed understanding of the phenomenon. Accordingly, the exploratory sequential mixed method was applied.

Overall, applying this exploratory mixed method design, this issue was investigated qualitatively to gain an initial understanding of the dimensions and process of the VR tourism experience. This was followed by a quantitative approach using a larger sample to add

additional knowledge on the research problem. This improves the information richness of the data, which is another strength of this research methodology. Therefore, as outlined in Figure 3.2, the research process consisted of a multi-step approach. Part 1 included performing the qualitative approach, after identifying the research tools and sample. Applying a connective point between two phases of study in part 2, the results of the exploratory phase were analysed to build the basis for the second phase. Then part 4 was conducted, applying a quantitative approach, followed by interpreting, and reposting the results in part 4.



**Figure 3.2. Flowchart of the basic procedures in implementing mixed method design**

The following sections, 3.4 and 3.5, discuss respectively the methodology regarding study 1 as the exploratory qualitative approach, and study 2 as the quantitative approach of this research.

### **3.4 Dimensions and Process of the VR tourism experience - Exploratory qualitative phase – Study 1**

#### **3.4.1 Methodological approach**

Study 1 was the first step to address the main aim of the research, defining a framework for the VR tourism experience. This included determining the dimensions and process of the VR technology experience. The dimensions here refer to any perceptions, feelings, emotions, and behavioural intentions induced by the VR tourism experience. The process is related to the steps involved in this experience. The overall intention was to develop a conceptual framework that could be used as a basis for the construction of a corresponding questionnaire to be measured in study 2. An exploratory qualitative approach was used to investigate the aspects described below.

This qualitative phase is defined as “exploratory” because it is data driven (Cresswell & Plano Clark, 2011), rather than driven by a conceptual framework. In literature, exploratory research defines the type of research that usually focuses on creating hypotheses rather than testing them; data from exploratory research tends to be qualitative. In exploratory research, problems are formulated, concepts are clarified, and then hypotheses are formed, and it begins with a literature search (Sue & Ritter, 2012). Known as the inductive method, this type of research is used when the researcher aims to identify general principles that can explain observations and data; specifically, when they seek to learn as much as possible about the dependent variable and the independent variables (Singh, 2021). Exploration for discovery tends to be as broad and thorough as possible, which shows the researcher’s interest in searching systematically for a phenomenon before narrowing down related concepts (Stebbins, 2001).

Therefore, to gain new insight into the related dimensions and process of VR tourism experience, semi-structured interviews were conducted in this research, and the data were coded mainly inductively, to investigate any concepts related to the VR tourism experience. Study 1 of this research is called “exploratory” as the qualitative phase aims to explore any dimensions or key concepts related to the VR tourism experience that have remained unknown. Although this will include the concepts available in literature, this way of looking inductively at the qualitative data will lead to finding new concepts. Furthermore, the primary framework,

scales and items tested in study 2 are built upon this qualitative phase, rather than the available literature.

The purpose of the exploratory qualitative approach was to gain initial knowledge on the related components of the VR experience before moving to a quantitative approach. Additionally, further insight and clarification regarding the dimensions and process of the VR experience was necessary before answering the main question of the study. This qualitative approach was conducted in study 1 and the first phase of the sequential mixed method. In an exploratory design, first the qualitative data is collected and then analysed, to explore the themes that will be used to conduct the development of a quantitative instrument to further investigate the research problem (Creswell & Clark, 2017; Onwuegbuzie & Combs, 2010). This qualitative approach is used to “explore why or how a phenomenon occurs, to develop a theory, or describe the nature of an individual’s experience” (Fetters et al., 2013). In other words, the justification for this approach lies in exploring the issue before assigning which variables need to be measured.

To perform the qualitative phase of this research and investigate the dimensions and process of the VR tourism experience, two main research tools were selected. As participants were assigned to go through a VR tourism experience, a VR tour, and an appropriate technology for providing the tour was chosen.

### **3.4.2 The research tools**

#### **3.4.2.1 The technology**

When it comes to choosing the best XR immersive technology, comfort is a significant consideration. How comfortable the device is, and how easy to use, is a consideration for experts also. Rauschnabel (2018) found that the wearable comfort is a fundamental concept in the XR experience. Furthermore, a huge number of studies in XR that use technology acceptance models, found that “Ease of Use” is a significant concept affecting the behaviour of users. Therefore, the first attempt on searching was to find the most recent and comfortable XR technology. This led to choosing a Mixed Reality glass in the first step. MR technology is a medium that includes an immersive computer-generated environment in which elements of a physical and virtual environment are combined.

The most recent XR technology has been found to be a Mixed Reality Glass (Figure 3.3), Hololens 1 which has been developed by Microsoft. This device has been claimed to provide

one of the most realistic experiences ( Rauschnabel et al., 2022a). The device is wireless and does not require any specific set-up. In recent research, scholars tried this device and concluded that the HoloLens is a novel tool with several advantages. The device was comfortable to wear, easy to use as it has voice recognition, provided sufficient computing power, and supported high-resolution imaging (Hanna et al., 2018). For these reasons, it was selected as the primary tool.



**Figure 3.3 HoloLens Mixed Reality glass**

Overall, due to the mentioned reasons this technology was selected as the primary tool. However, it was tested during a pilot study and was changed to another device which will be discussed in section 3.5.2. After selecting of the technology, a VR tour to a destination was selected to be presented by this device.

#### **3.4.2.2 The tour**

As a virtual tour was supposed to be presented by HoloLens MR Glass, the best tour which was found was a tour to Rome<sup>1</sup>. This tour was developed by Microsoft using an app named, Holotour <sup>2</sup>, and was developed to mainly be shown via HoloLens. The Holotour to Rome provides a tour to four tourists' attractions in Rome, with, a tour guide named "Melissa" provides information about the attraction in an interactive way.

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<sup>1</sup> <https://www.youtube.com/watch?v=liO0v37xFV8>

<sup>2</sup> <https://apps.microsoft.com/store/detail/holotour/9NBLGGH5PJ87?hl=en-us&gl=US>

The first one is Piazza Navona which is a public open space in Rome, Italy (Figure 3.4). It was built on the site of the Stadium of Domitian in the 1st century AD. At the beginning of the tour, participants see themselves in this open space and they are explained how it was in ancient times by the tour guide. Also, the participant is able to see the names of the different main buildings in this place virtually and can ask the tour guide to tell them more about that building by looking at the building and saying, “Tell me more”.



**Figure 3.4. Piazza Navona**

When the participant decides to visit the next place, they speak to the tour guide and ask to the place. The second destination in this tour is the Pantheon (Figure 3.5), a former Roman temple and, since 609 AD, a Catholic church in Rome, Italy. It was rebuilt by the emperor Hadrian and dedicated c. 126 AD.



**Figure 3.5. The Pantheon**

After visiting The Pantheon, the participant goes to the third place, where they experience being in a balloon over the city (Figure 3.6). This provides an overview of the whole city. Also, upon request, the tour guide provides information about different places, which are labelled virtually.



**Figure 3.6. The balloon**

Then, by pointing to the next attraction, tourists go to the last destination, The Colosseum. This attraction is an oval amphitheatre in the centre of the city of Rome (Figure 3.7), the largest ancient amphitheatre ever built and still the largest standing amphitheatre in the world today, despite its age.



**Figure 3.7. The Colosseum**

Tourists can go inside the building (Figure 3.8) and experience what it was like in the past (Figure 3.9).



**Figure 3.8. Inside the Colosseum**



**Figure 3.9. The Colosseum in ancient times**

This is the last stage of the tour. After determining the research tool and the tour, the best setting for the data collection were searched.

### 3.4.3 The location for the experiments

As stated, the HoloLens is wireless and the only necessary condition for the location was to find a place for participants to be able to move around, and the ability to control the brightness of the room as this affects the quality of the tour experience, because participants are able to see the real environment around them while they are in the tour. An example of how this looks can be seen in Figure 3.10. Based on these conditions, in order to find an appropriate location for the experiment, a list of bookable rooms at Victoria University of Wellington was provided. As the device was wireless and the participants were able to move around, a spacious and empty room was needed. Also, it was necessary that the room have blinds, to increase the quality of the virtual tour. Finally, an available classroom in the old government building located at Pipitea Campus of Victoria University of Wellington was selected as a primary location for the experiments.



**Figure 3.10. Holotour using HoloLens MR glass**

After selecting a primary tool, VR tour and location, it was necessary to test these tools using a pilot study.

### 3.4.3.1 Pilot study - The technology and the location

Three participants were recruited through the researcher's personal network for the pilot study. The pilot participants experienced the 15-minute tour to Rome (Section 3.4.2.2) using this device. As mentioned in section 3.4.2, the tool that was applied for the pilot test was a Mixed Reality Glass, Hololens 1 which is one of the most recent XR technologies developed by Microsoft.

However, during the pilot study, "the feeling of being in the destination" was found to be very low, as this device lets the user see the real environment around them while they are experiencing the tour. This also resulted in low perceived. Also, the MR Glass is heavy, which was a distracting factor for participants. Additionally, the vision was narrow.

The disadvantages of using this model device were stated by pilot participants:

*The fact that it, it was enabling me to see places that I haven't been that was interesting for me, though, I really wish, it was like, covering bigger space. So, I didn't have to keep moving my head. You know what I mean, like the bigger area, because it was just this small, rectangular stuff that everything was very, I think the vision was narrow and it didn't feel like real.*

Another pilot participant mentioned that:

*Looking at the whole thing, and it just is a bit heavy, but it's more than being heavy a bit how you say this. It constrains you because of the dimensions of the thing doesn't let you move, and you have a very short, narrow screen thing and I didn't feel like I am there.*

The pilot study did not fulfil of criteria described by Rauschnabel et al. (2022b), that in mixed reality, users are not able to distinguish between reality and the virtual world.

Considering these results, it was necessary to substitute the tool. After a challenging process, a HoloLens 2 was borrowed from the School of Architecture to be tested. However, the Holotour app was unable to be installed on this device. Furthermore, the device was necessary to present a completely virtual tour to increase the "feeling of being there" and authenticity. Conducting another pilot study with the same participants, one of most comfortable and available devices was found to be the HP window mixed headset (Figure 3.11). This one was more comfortable,

lighter and as a fully immersive device, it enables users to engage more with the tour upon testing was found to be a better device in line with research objectives.



**Figure 3.11. HP Windows Mixed Reality Headset**

Furthermore, relocating the experiments to a lab-based room improved the perceived mood and feelings of participants. Considering the results of the pilot test, a VR lab in the School of Psychology at Victoria University of Wellington, New Zealand was determined as a suitable setting for this phase. After selecting the technology, the appropriate tour, and the location, a primary interview guideline was developed.

#### **3.4.4 The design of the research instrument**

As study 1 aimed to explore the variables related to the VR tourism experience and gain insight into what the dimensions and process of the VR experience were, semi-structured and in-depth interviews were conducted (Merriam & Tisdell, 2015). After the VR experience, the interviews were conducted which were deemed to be the most appropriate method for the first step. Semi structured in-depth interviews are commonly used instruments in qualitative research: these consist of a conversation between a researcher and participant, guided by a flexible interview protocol and follow-up questions. Besides allowing the researcher to collect open-ended data, this instrument was found to be appropriate for exploring a participant's thoughts and feelings about a particular topic, and to delve further into details of a phenomenon (DeJonckheere & Vaughn, 2019). When applying semi-structured interviews, not only can various themes arise but also, the interviews provide room for free responses from interviewees. Generally, this form

of interview is valued because they encourage flexible and deep conversation, and explore new ideas (Kakilla, 2021).

To determine the interview contents, the available literature was reviewed. However as stated before, a large number of previous studies have applied quantitative surveys to investigate the different concepts related to the VR experience (Chirico et al., 2018; Kim et al., 2020; Stepanova et al., 2019b). These quantitative approaches fail to answer the research question of the current study as they are unable to explore latent variables. Only a very few studies such as that of Lin & Lockwood (2014) conduct a qualitative approach investigating the concepts that have been used to describe and analyse people's feeling about a destination, using the concept of "place attachment". The interview questions in this research guided the design of some of the questions for the present study. An example of interview questions prompted by Lin & Lockwood (2014) are: "What does this place mean to you?", and "Are there some physical or social characteristics of this place that are particularly important to you? If so, why?"

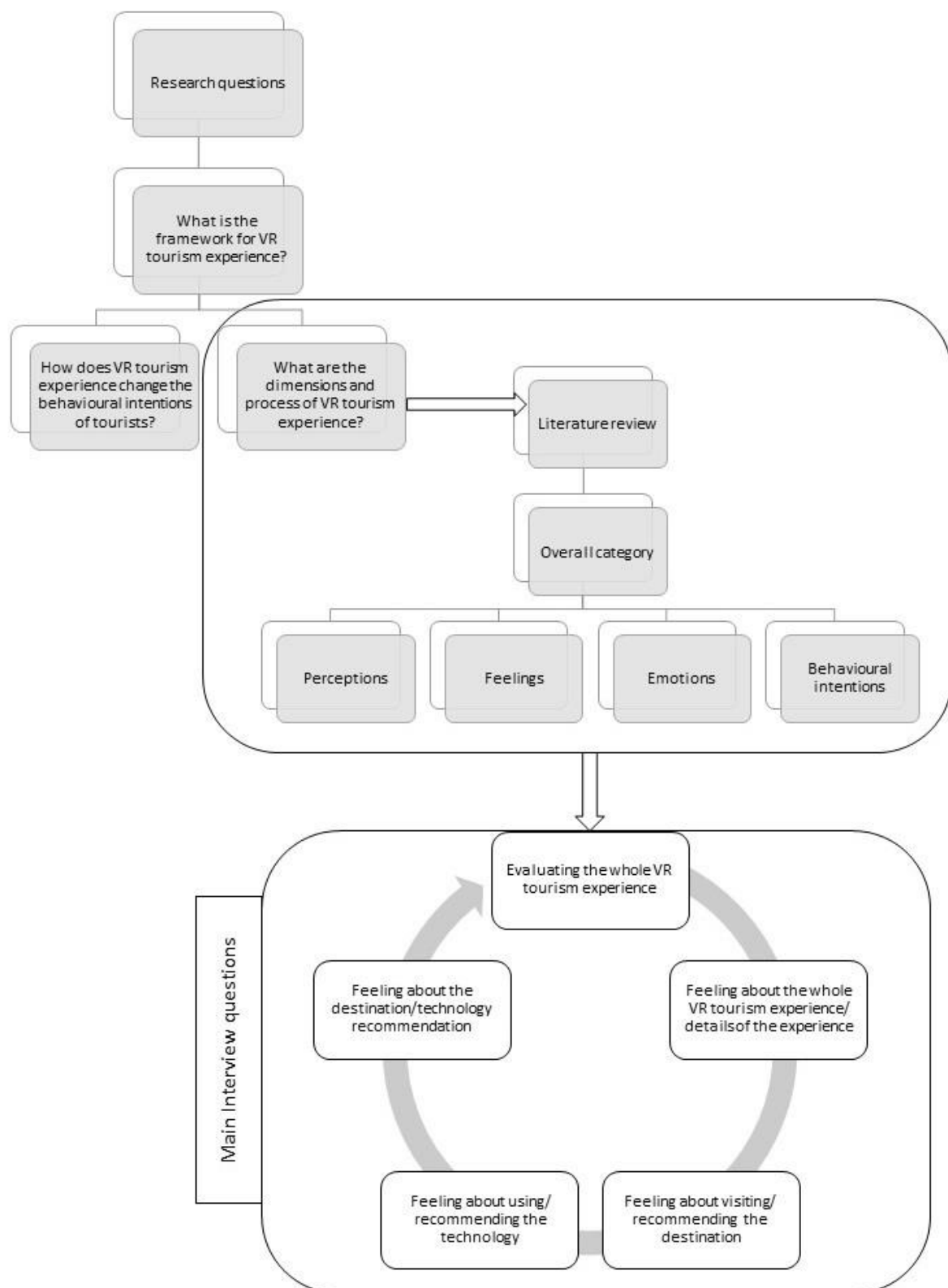
As the main purpose of this phase of study was to investigate a framework for the VR tourism experience, the interview topics included questions related to these concepts. The questions were mainly contained in three sections, including several sub-questions and follow-up questions.

The first part of the interview questions attempted to explore concepts related to tourists' perceptions of the VR experience. An example of a question designed to address this issue was, "How natural and genuine this experience was to you?"

The second part investigated feelings and emotions toward the experience, technology, and the destination. Questions related this area were asked such as, "How do you feel as a result of this experience?", "Could you please describe how do you feel about this experience?", "How do you feel about this place?", and "How do you feel about using this technology? Any negative or positive points?"

The last section of questions considered the behavioural intentions of tourists. The questions such as "How do feel about visiting this destination?", "How do you feel about experiencing these kind of tours before going on holidays?", and "What would you say about this destination to others?" tried to explore the behavioural intentions of the participants after the experience.

Subsequently, these interview questions were followed by the guide presented in Appendix A. Because this stage of the study was exploratory – it was not clear which concepts would be relevant – this guide and its critical part in the interviews had to be carefully managed. The way this specific guide was managed could narrow the focus of participants' responses, so it would increase the potential of research in exploring new concepts, which is a strength of qualitative research (Hennink et al., 2020). The interview approach aimed to engage participants in discussion to reduce the probability of only answering the prepared questions. Figure 3.12 shows a connection between research questions, the reviewed literature, and interview questions. As the main goal for study 1 and the qualitative phase of this research was to find the dimensions and process of the VR tourism experience, the literature was reviewed to identify these dimensions or key concepts and the process or steps involved. Concepts found in the literature review seemed to be related to four categories: 1. Perceptions or evaluations of the VR tourism experience, 2. Feelings toward this experience, 3. Emotions related to that, and 4. Factors related to the behavioural intentions of tourists. These factors helped in designing the interview questions. However, as the aim was to explore any dimensions related to the VR tourism experience, a range of additional questions were also asked (Appendix A).



**Figure 3.12. The association between the research questions, literature review & interview questions**

Furthermore, a number of questions in the guide were designed to help researchers start a conversation, manage a stuck conversation, and ensure critical topics were covered. Questions had to be applicable to a variety of concepts related to the VR experience or had to be adjusted for the specific context during each interview, and the structure of the guide was flexible. Examples from the guide include asking the participant to describe how they feel about the whole experience. After those introductory questions, the key question was phrased in three ways: “How do you feel about the place? Was there anything surprising? What aspects are relevant to describe this experience?” Later questions were, for example, to ask participants to compare this technology to other ones, and whether they would like to try VR for trip-planning. Finally, participants were asked if there was anything else that they thought of or wanted to mention. Before moving to the actual data collection, a pilot study was performed to test the interview guideline, and this prompted a revisitation of the interview guidelines.

#### **3.4.4.1 Pilot Study – Interview contents**

Before performing the actual data collection, a pilot study was conducted to test the interview content. Pilot interviews are found to be very beneficial in qualitative research, as they help in gathering primary knowledge on the research phenomenon (Mutz & Müller, 2016). According to Dźwigoł (2020), conducting pilot studies is necessary to identify not only the correctness of the selected techniques and procedures, but also the interview questions. Furthermore, they help researchers to refine research questions, and to identify how much time and what resources will be required to perform the study (Ismail et al., 2018).

The most critical objective of the pilot study was to select the best tool. An additional aim was to gain feedback on the interview implementation, to evaluate if the interview questions stimulated appropriate answers to address the study questions, to help with time management, and to practice the actual interviewing process. As mentioned, three participants were recruited through the researcher’s personal network for the pilot study. Pilot participants experienced the 15-minute tour to Rome using the device. The interview guideline for the pilot study included questions regarding the whole experience, the place (destination), and the technology, as stated.

This pilot study also assisted in revising the interview content. For instance, some of the research guidelines were revised to be more exploratory. For instance, the question “Do you feel attached to this place?” as the main question was too prescriptive and limited participants’ answers. It was therefore replaced with “How do you feel about this place?” and the first question was asked as the follow-up question, if needed.

Although pilot participants were not included in the final sample, the results of the pilot study helped immensely in conducting better interviews, in various ways. First, it assisted in finding more effective interview guidelines. It helped the researcher to manage the whole interview process effectively, observe the smallest details, manage emotional moments, and conduct the interview with a greater flexibility in terms of reordering questions based on the information provided by participants, asking follow-up questions, and providing examples and scenarios to clarify questions. Pilot participants were encouraged to communicate issues and provide feedback about the interview process. Based on that feedback, two longer questions were added, and some of the questions were rephrased or reworded. For instance, the question “Considering this experience are you more likely or less likely to travel to Rome?” was added. The pilot interviews helped the researcher become well equipped with the skills needed to conduct effective interviews for the field study. The final interview guideline is shown in Appendix A. Finally, after assigning the appropriate device, the location and the interview questions, the sampling was defined. This is discussed in the following section.

#### **3.4.5 The sampling**

According to the research objectives, the sample for this phase of data collection was selected based on three main criteria:

1. Participants who had not previously experienced the specific tour
2. Participants who had not travelled to Rome
3. Participants who have enrolled as students at Victoria University of Wellington (VUW)

The first two conditions were added as they could influence participants’ emotions and feelings towards the destination and the technology. As this tour provides a virtual trip to Rome, individuals who has already travelled to this destination were excluded, as they could have had previous feelings and perceptions about this destination. Also, the individuals who had tried the specific tour were eliminated for the same reason.

The third criteria were assigned in order to focus on students to increase the probability that they were familiar with using technology. For XR technologies and experimental research, many studies have applied students as participants in different contexts (Bucea-Manea-Țoniș et al., 2020; Chirico et al., 2018; Quesnel & Riecke, 2018; Stepanova et al., 2019b). Stepanova (2019b) highlights that using students as participants would lead to obtaining rich descriptions from knowledgeable participants in investigating concepts related to the VR experience. Croson (2007) also highlights that a vast majority of experimental research has considered

students as subjects, considering their background knowledge and being appropriate participants for investigating an emerging area, as they may provide new ideas and different points of view. Consequently, the samples for the first phase of this research were recruited from VUW students.

The other fundamental reason for choosing students for the study was that they were conveniently available. This target population could not only meet the research criteria, but also some practical criteria such as easy accessibility, availability at a given time, or the willingness to participate. It was necessary to perform the experiments in the university due to the set-up and location that was needed. Therefore, convenience sampling also helped the researcher in reaching the target sample.

Purposeful convenience sampling was applied for this phase of study. According to scholars, it is crucial to implement the purposeful sampling technique for the first phase of study as a part of the exploratory sequential mixed methods design (Creswell, 2021). Often used in qualitative research, purposeful sampling identifies familiar cases with the subject to maximise the effectiveness of limited resources (Patton, 2014). This involves identifying and selecting individuals who are acquainted with a phenomenon of interest (Creswell & Clark, 2017). In addition to knowledge and familiarity, Bernard (2017) highlights the significance of availability and willingness to participate and being able to communicate the experiences and new ideas in a reflective way.

Overall, participants of this research for the first phase of this study were students of VUW who had not experienced the tour and or travelled to Rome. They were recruited through campus announcements and the VUW newsletter.

### **3.4.6 Qualitative data collection**

After distributing flyers (Appendix B) in different campuses of the university, the individuals who were interested in participation contacted the researcher via email to set an appointment. Every participant was met individually at the VR lab in the School of Psychology.

As the first step, participants answered a short questionnaire about their demographic characteristics. This was followed by an explanation of the tour and guidelines that were necessary to be aware of while using the device. A safety protocol, an information sheet and consent form (Appendix C) were also shared with participants, to be signed. Each participant was provided with written informed consent for their participation. Next, they experienced a

15-minute tour to Rome by HP headset, using the Holotour app developed by Microsoft. Afterwards, tour interviews were digitally recorded, and handwritten notes were taken. In terms of the Human Ethics Committee guidelines, the objectives of the interview and the information included in an information sheet were clearly defined.

During the tour, participants were observed, and notes taken about participants' facial and verbal expressions. Some significant concepts such as "being real" were expressed during the tour. They also expressed their feelings using words such as "Wow", "amazing" and "this is so real". After the VR immersive experience, interviews were conducted with participants to develop a better understanding of the important components of an individual's evaluations, feelings, emotions and behavioural intentions, and other related concepts. It was necessary to follow the interview topic carefully, as describing perceptions, emotions, feelings, and behavioural intentions can be confusing and complex, according to Godovykh & Tasci (2021). These factors were considered in preparing for the interviews. During the interviews, an attempt was made to create a connection with participants by affirming and helping them describe their feelings, in order to prompt them to share more of their feelings, emotions, and ideas in detail. The aim was to make participants feel comfortable and for the researcher to engage in discussion with participants. This was done to extend the likelihood of getting detailed information and ensure that responses were understood correctly. Care was taken to avoid directing participants, and to instead support them to expand their ideas and thoughts.

To develop a better understanding of the different components of the experience, in-depth semi-structured interviews with this group of participants were performed. Interviews lasted between 15-30 minutes and were conducted between July 2021 and August 2021, with 20 participants. Figure 3.13 shows one of the participants having the tour and Figure 3.14 shows another participant who intended to have his coffee while walking in Rome to increase the feeling of being there (permission to use the photographs was provided).



**Figure 3.13. Participant of study 1**



**Figure 3.14.** A participant walking in Rome and having coffee

### 3.4.7 Qualitative data analysis

For qualitative data analysis NVivo was used. Thematic analysis was conducted to examine the data to identify common themes, topics, ideas, and patterns of meaning that recurred. Braun & Clarke (2006) state that thematic analysis is an independent qualitative descriptive approach, described as “a method for identifying, analysing and reporting patterns (themes) within data” (p. 79).

Therefore, the interview transcriptions were coded, both manually and also by using software for qualitative data analysis (NVIVO), to identify and extract repeated words, themes or concepts. Specifically, the six steps proposed by Braun and Clarke (2006) guided the approach used in this study, including familiarising oneself with the data, coding the data, developing themes, reviewing themes, defining, and naming them, and producing a report.

#### *Familiarizing oneself with the data*

The first step in data analysis was to transfer data from the interviews to written form and read them carefully. All data was read to obtain a general sense of the original responses. During this process, notes were taken, and key words were highlighted for better understanding of overall meanings. The accuracy of the transcription plays a significant role in determining the accuracy of the data analysed. Also, the researcher examines its content to determine what has been learned and what still needs to be discovered or needs elaboration (Stuckey, 2014). Therefore, the transcriptions were read several times to obtain a general sense of the whole data.

#### *Coding the data*

At this step, initial codes were generated. Several memos were written during this process, including potential codes, interesting statements that might be worth analysing further, or similarities and differences between participants' descriptions. Specifically, this step focused on identifying and marking all parts of the transcripts that seemed to be significant and relevant to the research. Thus, specific ideas were identified and were labelled. This process was continued until code labels were provided for each entire transcript. Then some initial coding was generated, which involved an initial list of ideas about what was in the data and what was of interest. The initial codes, for instance, included some more general concepts such as “feeling towards VR technology” and “feeling towards the destination”. The coding was continued until the first draft of codes were identified. Codes were a topic from the literature

or constructed inductively from a close reading of data. For instance, the code “feeling of being there” is a topic from literature that was used frequently by participants. In contrast, the code “being hyper realistic” was not found as a key concept in the literature and was instead selected from reading the data. During the data review, inductive topics were discerned, as well as deductive topics that were considered as provisional codes relevant for the study. However, in such studies which are more exploratory, or data driven, instead, inductive codes would be incorporated in large numbers, or possibly only inductive codes would be used. Thus, it was possible to uncover anything from the data since it was openly coded (Merriam & Tisdell, 2015).

### ***Developing themes***

The later steps included relating the themes that were connected to the codes. The list of generated codes was examined, patterns of the data were identified, and clustered codes were translated into themes. At this stage, the association between codes, themes, and different levels of themes was cautiously considered; for instance, the main overarching themes and sub-themes within them. An example of this was selecting “perception” as a main theme and “being real” as a sub-theme. Furthermore, a set of themes that did not seem to belong anywhere were temporarily categorised as “not sure”, to be disregarded or included in a set of themes at a later stage. Also, some themes were named as “negative points” which were mentioned by participants about the whole experience, their feelings, and emotions, and finally their behavioural intentions. As this qualitative phase was exploratory, the whole data was considered potentially relevant to the research problem. To avoid bias in developing themes, an alternative explanation was checked, and data was reviewed several times. Finally, the themes and sub-themes as conceptual topics that were more abstract than a typical code, were developed.

### ***Reviewing the themes***

The fourth step included reviewing and refining themes. The themes were identified in Step 3, making sure that labels or themes captured associated extracts and accurately represented the data. However, at this stage, the sub-themes were necessarily more specific. As this phase of research tried to identify perceptions, emotions, feelings and behavioural intentions, the themes were named after these concepts. For instance, “feeling towards the destination” was broken down to more specific concepts of “feelings” and “emotions”.

### *Defining and naming them*

This stage included naming the final themes. Some analytical tools in NVivo such as word cloud helped in naming the codes. At the beginning of naming the themes, some content did not relate to any categories. Thus, some sub-themes were put into the category of “not sure” to be later categorised as well or excluded from the themes. For instance, Participant 16 mentioned, “So I enjoyed. But I think one thing that I was a little, not sure about was, there are some places where you have staircase, right. And I feel like maybe I want to go, and you know, move around. But I wasn't sure like, do I need to behave like it's a step or do I just walk play?” This statement was initially considered as “not sure” and then disregarded as it was found to be irrelevant to the research problem. Finally, an example of coding has been shown in Table 3.1.. Initial codes were assigned in reflection of how felt about or evaluate the VR tourism experience, the destination and the technology. Initial codes also reflected the exact words of participants regarding their perceptions, feelings, emotions, and behavioural intentions. The first iteration of open coding yielded initial codes that were then condensed into four categories during the second iteration of coding. Finally, fifteen sub-themes were devised. that sought to answer research sub-question 1.

**Table 3.1. The themes, sub-themes and their examples**

| Themes      | Sub-themes               | Examples  |
|-------------|--------------------------|---|
| Perceptions | Being real               | “ <b>I feel like it was very, very realistic.</b> Because there were people, birds. The structuring, the architecture was very real. I really liked when they showed you what it was, years and years ago, and what it is now, and the history lesson was very nice. The tour guide was very clear. And <b>it was great was very, very realistic.</b> Great.” |
|             | Change in time and place | “It was sunny and warm....then there was such a <b>sudden transition, you know, in time.</b> ”  |
|             | Greatness                | “We can experience space and we could just be, suspended and experience <b>something like space bigger than us.</b> That's cool.”   |
|             | Being hyper realistic    | “Maybe I don't know if that's <b>a little bit hyper realistic.</b> Because if you're actually in a hot air  |

|          |                                |   |
|----------|--------------------------------|---|
| Feelings | Feeling of being there         | <p>balloon, you may not be able to see things really well.</p> <p>But it enhances the experience.”</p> <p><b>“I felt like I am in Rome.</b> And without paying tickets, I can still travel there. And it felt quite real honestly. Cool, especially with people moving around, if it would have been just the places, it might have felt a bit odd. But because you know, people were around and dogs and you know, the normal things going on. <b>It just felt like I am one of those and I'm going around in Rome.”</b></p> |
|          | Feeling of being small         | <p>“But the hot air balloon specifically was very, very real and <b>I felt like I was small.</b> Because even though you were so high things were so clear.”</p>  |
|          | Feeling connected              | <p>“I mean, <b>obviously beautiful.</b> That's a bit of an important one. I really thought, like, the history and the culture were more than history, actually. Oh, yeah. is history. And I did feel the energy of it as well. I think that was something maybe that was also a bit surprising. Like <b>I did feel the energy of being in a new place.</b> And yeah, being surrounded by things, like <b>historic beauty is pretty energising.</b></p>  |
|          | Feeling attached               | <p>“<b>I feel quite bonded,</b> maybe it's stronger and more”</p>   |
| Emotions | Confusion                      | <p>“It felt <b>a bit weird and confusing.</b> Because the people, they seem real to be looking at me”.</p>  |
|          | Surprise                       | <p>“It was <b>very very surprising!</b> the hot air balloon, I've never been and first of all, never been to Rome. So, <b>everything was new.</b>”</p>  |
|          | Fear                           | <p>“The interesting thing is at first I was scared, it felt real <b>and I was scared</b> to move.”</p>  |
|          | Intention to visit Destination | <p>“To be honest, I was not a big fan of Italy as a tourist destination. Never in my life. Because I think it's just like another old country, because I'm coming from an old country. So it's just like, yeah, 2000 years ago, 3000 years ago, people used to fight and die here or there, this city got invaded, like, like, it's just yeah, it's hard, because it's personal that I really didn't like, didn't like to go to Italy. But I think visiting Colosseum is kind of</p>  |

|                        |                                 |  |
|------------------------|---------------------------------|--|
| Behavioural intentions |                                 | like, it's, <b>it was tempting for me.</b> Now, I'm like, <b>I like to go there.</b> I want to answer your question very directly, it would be like, me, used to be like, no, Italy, I'll go to France. From that I'm now like, Italy can be also like, it's sunny. It's, you know, <b>it made me feel like, I can also consider Italy as a destination.</b> "   |
|                        | Intention to use the technology | "I think it's <b>a great thing to use this technology,</b> you get an idea of what kind of things you will be looking at. And sometimes, you know, you're really new and you have some language issues. So it's, it could be difficult to figure out what all you can do when you're here. But if you get a heads up from this technology, <b>you can, you know, make a map of what you'll be doing once you're there.</b> And you'll have a bit of knowledge of things that are there as well." |
|                        | Destination Recommendation      | "I would say <b>that is so beautiful, and it's culturally rich and got the beautiful weather and everything is shining.</b> It's very different from other places, and with a very long history. Yes, certainly it is a great place to be."  |
|                        | Technology recommendation       | " <b>I would really recommend it.</b> And I would even when I say this, I think others would realise. I'm actually thinking about my own clients, I did travel. And I think some of them would love it. Because a lot of them haven't travelled very much before. And so for them trying to choose a destination, can be really hard, because everything is quite fun by this technology."   |

### *Producing a report*

Subsequently, at the last step the codes, themes and sub-themes were reviewed and revised in preparation for making a report. At this stage, sub-themes were reviewed, and aligned within the definitions of each theme\ . The themes and sub-themes are presented and defined in Section 4.6.6, which forms the basis for developing a primary conceptual framework to be tested later in study 2.

### **3.5 Testing the VR tourism experience framework - Quantitative approach – Study 2**

#### **3.5.1 Methodological approach**

The qualitative phase of this research investigated the related dimensions and process of the VR tourism experience. As noted, the dimensions and process refer to the key concepts and steps involved in this experience. In pursuing the main goal of this research, which was defining a framework for the VR tourism experience (RQ), the previous part focused on the first sub-question of this research (SQ1). Finding the dimensions and process of the VR tourism experience resulted in developing a primary conceptual framework to be tested in study 2. To design the primary framework, the qualitative analysis showed that some of the dimensions of the VR tourism experience seemed connected. The associations between the dimensions and process of the VR tourism experience, and also the knowledge from literature helped in designing this primary framework. Testing this framework, is intended to explain how the VR tourism experience affects the behavioural intentions of tourists. As stated, the sub-themes were defined as variables and the participants' statements assigned the items of the research tool for this phase of study. The related variables were identified, including the tourists' perceptions, feelings, emotions, and behavioural intentions.

The aim of study 2 is to test the framework for the VR experience developed in study 1, re-evaluating the factors that describe and distinguish the dimensions and process of this experience. The variables were found, and the hypotheses were developed in study 1 and the variables were developed based on the sub-themes that emerged in the analysis of the data in study 1. Thus, the factors which were developed in study 1 will be tested for the empirical validation in study 2 using a quantitative approach. This provides the relationships between the constructs and enables generalisability of the proposed framework with the newly established dimensions and process from study 2. Specifically, this phase focuses on answering the second research sub-question, which investigates how these key dimensions connect together to affect the behavioural intentions of tourists (SQ2). The following sections describe the actual data collection related to the quantitative phase of this research.

#### **3.5.2 The design of research instruments**

As defined in section 3.4.7, the themes and sub-themes that emerged through the qualitative data analysis helped build the basis for the quantitative phase. Specifically, sub-themes turned into variables. Also, the participants' statements related to these sub-themes were used to create

the questionnaire items (See Chapter 5). Subsequently, these questionnaires were used to measure the variables and test the primary conceptual framework.

The three questionnaires were applied to quantitative phase of this study, described in the following sections. The sections comprise sub-sections, outline the process of developing and validating the survey questionnaire, and describe its psychometrics. All of these questionnaires were in the form of google forms.

### **3.5.2.1 The pre-experience questionnaire (Part 1)**

The pre-experience questionnaire comprised three sections. The first included a few standard questions about demographics such as age, gender, nationality, and education level.

The second section included questions regarding how frequent they were using XR technology and their travel experience before COVID 19. Likert-type scales were used for the frequency of using XR technology and travelling, ranging from *never* to *very often*. A 5-point Likert scale was selected for the frequency of travelling. Clarification was provided to participants about this frequency relating to the time before Covid, as the Aotearoa New Zealand borders were closed during this data collection. Also, both international and national travel were considered. They were also instructed to consider “Very often” as referring to more than five times a year, “Often” to more four times a year, “Occasionally”, three times a year, “Rarely”, two times per year, and “Very rarely” one time or less in a year. Then the same 6-point Likert scale was used for the frequency of XR technology experience. Participants were instructed that “Very often” refers to every month, “Often” to every couple of months, “Occasionally” for three times, “Rarely”, a couple of times, “Very rarely” refers to one time, and “Never” was to be selected if this was their first time experiencing such technology. The aim of this section was to reveal if the technology experience and frequency of traveling of participants affected their perceptions, feelings, emotions, and behavioural intentions.

The third section of this pre-experience questionnaire was included to assess participants’ intention to visit the destination and recommend it before the tour. Specifically, this section was added for a significant reason. Rome is a favourable destination for many people. Therefore, this section helped preventing confounding variables interfering with results, as participants may have previous perceptions, emotions, feelings, and behavioural intentions towards this destination. This section also assisted in more accurately and precisely determining the effectiveness of technology on participants’ behavioural intentions after the VR experience, as compared to before. The third section of the questionnaire for this study

was constructed around the themes and sub-themes identified in Study 1. Also, a 6-point Likert scale was initially chosen to explore the extent to which participants intend to visit Rome and recommend this destination before the tour, ranging from strongly agree to strongly disagree.

The items for this section were initially developed based on participants' statements. As the goal was to assess the behavioural intentions of tourists towards the destination, the five items included three frequent statements related to their intention to visit the destination, and two items related to their intention to recommend the destination or state positive WOM. These items were initially selected as the most frequent statements such as "I feel inspired to visit Rome" or "I would recommend visiting Rome to friends and others". To increase the validity, similar items in the literature review were also checked. This check assisted in ensuring these items were suitable for measuring constructs. This section initially included five items. The details of this questionnaire are depicted in Table 3.2.

**Table 3.2. The pre-experience questionnaire - First version**

| Sections and scales  | Number of choices |
|--|-------------------|
| Demographic information                                    |                   |
| 1. Age   | 4                 |
| 2. Gender  | 3                 |
| 3. Nationality   | 2                 |
| Educational background                                     | 4                 |
| Frequency of travelling                                    | 6                 |
| Frequency of XR technology experience                      | 6                 |
| Behavioural intentions                                     |                   |
| 1. Intention to visit Rome                                 | 5                 |
| 2. Intention to recommend the destination and Positive WOM |                   |

### **3.5.2.2 The experience questionnaire (Part 2)**

This section includes the development of the experience questionnaire used in Study 2. This questionnaire was also used as the post-experience questionnaire (See section 3.5.2.3). In the development of the survey instrument (experience questionnaire) the attention was given to the items to ensure that they measured what they were intended to measure. The development of the experience questionnaire was primarily based on the main themes and corresponding sub-themes identified in the qualitative analysis (see Table 3.1). Participants' comments and statements played a significant role in determining the contents of individual items.

Several revisions were made to the questionnaire. The goal was to make the questions as concise as possible, while representing each sub-theme. Each question was then assigned a response category. As final testing of the framework was to be conducted with factor analysis, the number of items used were limited to as few as possible.

In the qualitative phase of this study and during interviews, participants freely expressed their feelings and perceptions about the VR tourism experience and its dimensions. The items and scales presented in the qualitative findings were used as guidelines for developing this quantitative survey. To guide the development of the survey, the guidelines by DeVellis & Thorpe (2021) were also considered. According to this guideline, an important step is for the researcher to determine clearly what they want to measure. By doing so, the researcher ensures that the scale is inclusive of the constructs that are intended for measurement, thus maintaining the boundaries of the phenomenon. The specificity of the constructs that would be measured required several decisions. First, was creating a list of items to be included in the scale. Due to the fact that there are pre-existing scales for measuring the constructs, a survey that combines reliable scales to provide a more complete picture was created. For example, for the sub-theme of “being real” (Authenticity) several sub-themes were found. However, three key statements were found among them: being genuine, being realistic, and being natural. Based on the quotes from interviews, three questions were developed with different response categories: 1) The VR experience felt genuine, 2) The whole experience was very realistic, and 3) The virtual objects felt very natural. Referring to the pre-existing scales in literature, these were found to be the most suitable for measuring this construct.

During the second revision, the different types of scales used were reviewed. Participant confusion may result from too many different scales, which may compromise the strength of data analysis. Therefore, attempts were made to simplify and reword the questions. For example, the item for measuring the emotion of fear was changed from “I was scared” to “I felt fear”.

In the last revision, each item of the questionnaire was reviewed as a whole, including the layout and questions. Some items were removed because their content was included in a different item, and some were adjusted to fit more for measuring the concepts. For instance, the item “I explain my emotions about Rome with positive words.” was removed or the item “It will be a pleasure for me to visit the destination via XR technology” was adjusted to fit more for measuring the relevant construct (Intention to use the technology). The items were

constructed by the statements used by participants in Study 1, resulting in an initial scale consisting of 50 items. The first version of the questionnaire consisted of eight sections related to each scale as shown in Table .

The experience questionnaire included the items regarding authenticity, presence, awe, behavioural intentions towards destination, and the technology (Table 3.3). The items of the questionnaire were extracted from the statements of participants and a 6-point Likert scale was chosen due to its applicability of measuring opinions, beliefs, and attitudes (DeVellis & Thorpe, 2021). Likert scaling provides several advantages, resulting in it being the most extensively used technique in survey research (Maxfield & Babbie, 2017). The Likert scale technique includes two advantages. First, it determines the strength of agreement proposed by respondents (because researchers can calculate the average index score for individual items which shows respondents' degree of agreement or disagreement with these items). Second, Likert scaling assigns the differences in strength between a set of items, which is easy to understand.

**Table 3.3. The experience questionnaire - First Version**

| Sections and scales                            | Number of items |
|--|-----------------|
| Authenticity                                   | 4               |
| Presence                                       | 3               |
| Awe  | 23              |
| Attachment to virtual place                    | 3               |
| Intention to visit the Destination             | 4               |
| Destination<br>Recommendation and positive WOM | 5               |
| Intention to use the XR technology             | 4               |
| Technology<br>Recommendation and positive WOM  | 4               |

### **3.5.2.3 The post-experience questionnaire (Part 3)**

One week after the experiments, a post-experience questionnaire was individually emailed to every participant. This online survey was structured in the same way as the experience questionnaire, and all the questions were constructed in a same fashion. The aim of this survey was to test the durability of participants' emotions, feelings, and behavioural intentions over time. It also assisted in comparing participants' answers to the experience questionnaire, which was completed directly after the VR experience. Participants were asked to complete the questionnaire in regard to their previous week's VR tourism experience.

### **3.5.2.4 Questionnaire validation procedure**

#### **3.5.2.4.1 The experts' assessment**

After constructing the pre-experience and experience questionnaire items, researchers' network members were asked to provide feedback on the questionnaire, including its design and wording. Also, several experts independently and informally tested the questionnaire after its construction. Five experts, including two tourism academics, and others who are expert in quantitative methodology, were asked to evaluate the extent to which each item was relevant to the variables and research aims. These experts included one from the School of Psychology, and another from The School of Management, both at VUW. Two were from the Department of Tourism, Sport and Hotel Management of Griffith University, and the last one was from the Department of Tourism Management at Allameh Tabataba'i University. Their academic roles ranged from university lecturer to associate professor, and they had published peer-reviewed articles in relevant areas, including quantitative methods in tourism, technology, and consumer behaviour.

Due to their recommendations, some academically inappropriate wording was identified and revised. To optimise comprehension of questionnaire items, it was suggested that some complex concepts be simplified. For example, the item "I felt that I was in the presence of something grand" was changed to "I felt the presence of something bigger than me", to be more understandable. Comments on the order of items were also made. It was also recommended to delete some items and add some to other aspects of the questionnaire. For instance, the item "I quite felt the presence in Rome" was identified as unclear and confusing. This process resulted

in a second version of the questionnaire with changes in content, wording, and the order of items, as shown in Table 3.4. These adjustments and revisions resulted in 29 items.

**Table 3.4. The experience questionnaire - Second Version**

| Sections and scales                            | Number of items |
|--|-----------------|
| Authenticity                                   | 3               |
| Presence                                       | 3               |
| Awe  | 12              |
| Attachment to virtual place                    | 3               |
| Intention to visit the Destination             | 2               |
| Destination<br>Recommendation and positive WOM | 2               |
| Intention to use the XR technology             | 2               |
| Technology<br>Recommendation and positive WOM  | 2               |

#### 3.5.2.4.2 Pilot study

After revising the questionnaire based on experts' feedback, the questionnaire was tested via the formal pilot study. Pilot testing was performed with seven participants recruited through the researcher's personal network. The second round of revisions for the pre-experience and experience questionnaires were made based on this pilot.

Firstly, the first three participants revealed one significant issue regarding the last section of the pre-experience questionnaire, which was seeking the behavioural intentions of participants towards Rome before the VR experience. During the pilot, it was found that participants mostly

selected “strongly agree” as to their intention to visit Rome. This made it difficult to find the effectiveness of this experience on their behaviour as they also chose mostly “strongly agree” after the VR tourism experience. Another issue raised by participants of the pilot study related to behavioural intentions before and after the experience. Participants realised that these contained the same items and predicted the intentions of the pre-experience questionnaire. This affected their answers to the items related to behavioural intentions after the VR tourism experience, when answering the experience questionnaire.

To resolve these challenges, two revisions were made. The first was to change the 6-point Likert to a 9-point Likert scale. Finstad (2010) found that a Likert scale with more items provides a more accurate measure of a participant’s true evaluation. Therefore, a 9-point Likert scale ranging from “extremely agree” to “extremely disagree” replaced the previous one. Another revision which was made included revising the items. For instance, “I intend to visit Rome” was changed to “I have a strong intention to visit Rome in my future trip”. The next four pilots found that this issue was resolved, due to the revisions made. Now that the scales related to behavioural intentions to the destination were different in pre-experience and experience questionnaire, they provided more nuanced results. The number of items did not change in the pre-experience questionnaire.

Secondly, regarding the experience questionnaire, the first three pilot tests, indicated some concepts that may not have been fully understood by respondents. Therefore, these items were reworded make them more concise and simplify them. Also, after the pilot test, four items (that mostly received extreme responses) were considered for removal, as they appeared to be misleading or obviously right or wrong to respondents. For instance, the item “I felt like everything expanded around me” was found to be confusing and was removed. Table 3.5 shows the final items for the experience and post-experience questionnaire.

**Table 3.5. The experience questionnaire - Last Version**

| Sections and scales | Number of items | Item   |
|---------------------|-----------------|--|
| Authenticity        | 3               | <p><b>Q1- AU1:</b> The XR experience felt genuine.</p> <p><b>Q2- AU2:</b> The whole experience was very realistic.</p> <p><b>Q3- AU3:</b> The virtual objects felt very natural.</p>   |
| Presence            | 3               | <p><b>Q4- P1:</b> I felt like I was actually in Rome.</p> <p><b>Q5- P2:</b> In this computer-generated world, I had the feeling of “being there” in the destination.</p>   |
| Awe                 | 9               | <p><b>Q6- Awe1:</b> I felt a sudden change in time and place.</p> <p><b>Q7- Awe2:</b> I felt the presence of something bigger than me. (e.g. buildings)</p> <p><b>Q8- Awe3:</b> I felt I was small.</p> <p><b>Q9- Awe4:</b> I had the sense of being connected to everything and being one of those people standing in Rome.</p> <p><b>Q10- Awe5:</b> I felt confused.</p> <p><b>Q11- Awe6:</b> It was an awkward experience.</p> <p><b>Q12- Awe7:</b> I felt surprised.</p> <p><b>Q13- Awe8:</b> I felt fear.</p> <p><b>Q14- Awe9:</b> I felt challenged to understand the XR experience.</p> |

|   |   |   |
|---|---|---|
| Attachment to virtual place                 | 3 | <p><b>Q15-PA1:</b> I felt engaged with the content when experiencing this tour.</p> <p><b>Q16- PA2:</b> Visiting Rome through this tour was inspiring.</p> <p><b>Q17- PA3:</b> I felt attached to this destination.</p> |
| Intention to visit the Destination          | 2 | <p><b>Q18- IV1:</b> I felt quite inspired to go to Rome after this experience.</p> <p><b>Q19- IV2:</b> This experience tempted me to visit this destination in the future.</p>  |
| Destination recommendation and positive WOM | 2 | <p><b>Q20- DR1:</b> I would say positive words about this destination.</p> <p><b>Q21- DR2:</b> I would recommend visiting this destination to friends and others.</p>   |
| Intention to use the XR technology          | 2 | <p><b>Q22- IUT1:</b> It's worth trying this kind of tour when planning a trip.</p> <p><b>Q23- IUT2:</b> I would like to experience these kinds of tours before choosing my next destination.</p>                        |
| Technology recommendation and positive WOM  | 2 | <p><b>Q24- TR1:</b> I would say positive words about this technology.</p> <p><b>Q25- TR2:</b> I would recommend experiencing these kind of tours for choosing the future destination.</p>                               |

The final version of experience questionnaire had 25 items and was tested with another four pilot tests, whilst starting the actual data collection. The final version of the post-experience questionnaire was also changed, due to revisions made in the experience questionnaire.

### ***The research tools***

The same device applied in study 1, HP headset was used for this round of data collection.

### ***The location for the experiments***

The same VR lab in the School of Psychology at Victoria University of Wellington, New Zealand, which was utilized in Study 1, was also employed for Study 2.

#### **3.5.3 The sampling**

The objective of this phase of the study was to generalise the sample; therefore, it focused on including every individual interested in participating as a potential sample. However, as in Study 1, the research objectives guided the selection criteria for this phase of data collection, which were based on two main factors:

- Participants who had not previously experienced the specific tour.
- Participants who had not travelled to Rome.

Anyone meeting these criteria was eligible to participate in this phase of the study. Criterion sampling was applied for this phase, involving the selection of cases that met predetermined criteria of importance (Patton, 2001, p. 238). Criterion sampling is designed to select the sample based on specific, predefined criteria relevant to the research objectives. This approach allows researchers to focus on particular, narrow criteria and gain a deeper understanding of their implications (Elmusharaf, 2012). However, for the quantitative phase of this mixed-methods research, a probable random sampling technique was employed to enhance the generalisability of qualitative findings. Additionally, snowball sampling was utilised, involving participants in recruiting individuals to join the study.

The participants for this phase of study were recruited via different forums including social media (Facebook, LinkedIn, Instagram, etc.), the university newsletter, social venues (Gym, etc.) and word of mouth through friends and previous participants. Invitation flyers (See Appendix D) were shared, and interested individuals contacted the researcher via email. Subsequently, a meeting time and date were arranged for each participant at the Psychology Lab, Easterfield Building, Kelburn Campus, Victoria University of Wellington. Every participant was met individually.

#### **3.5.4 Quantitative Data collection**

After providing participants with an information sheet for them to read, they received verbal instructions regarding the specifics of the VR experience and were guided on how to operate the device. Additionally, they were presented with a consent form to be signed (Appendix E).

As previously mentioned, in order to investigate the impact of technology on tourists' behavioural intentions and destination promotion, the initial step involved participants completing a pre-experience questionnaire. This questionnaire encompassed demographic information and inquiries regarding their behavioural intentions concerning Rome prior to engaging in the VR experience (Appendix G). Immediately after, they took their tour to Rome using the Holotour app (as described in Study 1).

Following their tour experience, participants were requested to assess their encounter by responding to an experience questionnaire. This questionnaire comprised inquiries measured on a 9-point Likert scale (Appendix H).

Furthermore, to assess the enduring impact of the VR experience on tourists' behavioural intentions and emotions, a week after the experiment, participants received the post-experience questionnaire via email. This questionnaire aimed to investigate the longevity of their behavioural intentions and emotions toward the destination as influenced by these technologies.

Originally, the target number of participants was set at 90. However, an unexpected device failure occurred during the study, attributed to a complex error that halted data collection. Consequently, a Power Analysis was conducted, revealing that a total sample size ranging from 43 to 92 participants would be appropriate, as shown in Appendix I. All the questionnaires were provided online using a google form. The data was collected during November 2021 to the end of February 2022. In total 63 participants took part in this phase of the study.

### **3.5.5 Quantitative Data analysis**

Prior to commencing the actual data analysis, several preparatory steps were undertaken. Firstly, a comprehensive examination of the entire dataset was conducted to identify any potential issues, including errors, non-response bias, or missing data. Subsequently, the questionnaire items were systematically coded for ease of reference, such as coding the item "The VR experience felt genuine" as Q1. Since the surveys were administered online, they were checked for missing values and inconsistencies. The data was screened for missing values using simple frequency runs: no missing values were found.

#### **3.5.5.1 Partial Least Square-Structural Equation Modelling (PLS-SEM)**

SPSS and Partial Least Square-Structural Equation Modelling (PLS-SEM) were used for analysing quantitative data. The PLS-SEM technique helps to determine the structure of the

model and its path coefficients, and it can also show the crucial factors and their related effect sizes that influence consumers' behaviour (Liang & Elliot, 2020). The objective of SEM is to assess a set of relationships between one or more independent variables, and one or more dependent variables. SEM permits the testing of complex patterns of relationships, including mean structures and group comparisons (Werner & Schermelleh-Engel, 2009). Research demonstrates that SEM is the most commonly analytical tool used in XR research.

A PLS-SEM analysis is particularly useful when there is limited prior evidence of causal relationships, and a researcher lacks a well-developed theoretical base. This technique is most useful for exploring rather than validating data, since large data sets are not required, and assumptions about distributions of data are not made. PLS-SEM is therefore an excellent method for testing causality with relatively small data sets and little theoretical background (Hair et al., 2014). PLS-SEM has significant statistical power for exploratory research that examines less developed or still developing theory (Hair et al., 2019)

Analysis of the quantitative data will answer questions regarding the effectiveness of VR technology on tourists' perceptions, emotions, and feelings, as well as their potential for enhancing behavioural intentions. However, before analysing the quantitative data it was necessary to perform Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA).

### **3.5.5.2 Exploratory factor analysis**

Exploratory Factor Analysis (EFA) is a method applied for analysing the variance shared by multiple variables, such as items in a questionnaire (Raykov & Marcoulides, 2011). In exploratory research this method is used for different item removal strategies during scale development.

When conducting an EFA, it is recommended to test whether the data are suitable. Bartlett's test of sphericity assigns if the variance matrix of the data is different from the identity matrix which implies that common factors would not be identifiable (Cramer & Howitt, 2004).

The other test that should be done is the Kaiser-Meyer-Olkin (KMO) measure. KMO is applied to establish sampling adequacy and suitability for factor analysis (Fleming, 2003). It assigns the proportion of variance, which is shared by the variables, a requirement for EFA to be able to identify factors. Ideally, it should be at least  $>0.5$ , ideally  $\geq 0.8$ . However, the higher the KMO, the better.

A significant aspect of EFAs is factor rotation, the process of organising the factors identified in the original analysis. This modifies the loadings of individual factors on the items, which can ultimately affect which factor an item is mostly associated with. Two common options are varimax rotation or oblimin rotation (Raykov & Marcoulides, 2011). Multiple approaches to factor extraction and rotation are recommended to ensure that the specific factors and overall structure are replicated in the analysis, regardless of the general method used (Fabrigar & Wegener, 2011).

### **3.5.5.3 Confirmatory factor analysis**

Another approach to factor analysis is *Confirmatory Factor Analysis* (CFA), a simple case of Structural Equation Modelling that combines path analysis with factor analysis. A key aspect of this technique is that it tests for fit between observed and associated latent variables with various statistical techniques (Raykov & Marcoulides, 2011). The quantitative information that it provides informs decision-making about which model to choose, in a way that EFA cannot. It can be compared to EFA in that much of the decision is based on data, but essentially on the basis of subjective judgment (Thompson, 2004). The CFA compares and informs the choice of model with exact specifications, including which factors are correlated with which items, and which items are related to which factors. For the scale to be confirmed and a representation to be accurately perceived, it must be evaluated for reliability and validity.

For assessing the reliability, Cronbach's alpha is one of the most common methods, to measure reliability and internal consistency. A commonly accepted rule for describing internal consistency using Cronbach's alpha is the research of Sarmento and Costa (2017) which considers CA of 0.49 as unacceptable, 0.50 to 0.59 as poor, 0.60 to 0.69 as questionable, 0.70 to 0.79 as acceptable, 0.80 to 0.89 as good, and 0.9 to 1 as excellent.

Another alternative approach is a method such as Construct Reliability (CR). CR has been defined as the “measure of reliability and internal consistency of measured variables that represent a latent construct” (Hair et al., 2009).

After CR, the validity should be assessed. For validity, the scale is assessed to determine whether it measures or operationalises the construct that the researcher is trying to examine. The main techniques for assessing the validity are convergent and discriminant validity. The idea of convergent validity involves looking at relationship between two types of variables and their expected and plausible relationships. An example could be the inherent relationships between variables measured by different instruments with the same objective or indicators,

with which a relationship is expected to exist, based on other aspects of the instrument's measurement (Silva et al., 2013). This kind of validity is defined by CR and Average Variance Extracted (AVE), the latter being a measure of consistency that uncovers the mean percentage of explained variance between the items of a construct. According to Hair et al (2009), when CR is higher than the AVE, and the AVE is higher than 0.5, the convergent validity is confirmed. Additionally, discriminant validity is determined by the degree "to which a measure does not correlate with other measures from which it is assumed to diverge" (Sánchez, 1999). Therefore, for validation, it is necessary to specify which hypotheses are expected among the variables involved (Silva et al., 2013). Therefore, reliability and validity should be assessed for assigning CFA. Finally, after checking and finalising the EFA and CFA, the structural model measurement is conducted using SEM.

### **3.6 Strength and limitations of the methodology**

There are several significant strengths to the methodological approach used in this study, which are discussed in here. A previous neglected aspect in technology and tourists' experiences, this is examined in depth in this study as a way of contributing to existing knowledge. To do so, an in-depth examination of this issue was necessary, which led to exploring further implications. The limitations of the available literature were identified in chapter 2 and, in order to address these limitations, appropriate research methods were selected. As described in section 3.6, a variety of limitations were found in studies that have focused on the technology experience in a tourism context.

First, a vast majority of previous research focuses on one single dimension related to the VR tourism experience, applying a quantitative approach (Hudson et al., 2019). In these findings, little is understood about the complexity of technology experiences, and factors that influence those experiences. Applying an exploratory mixed method design, this issue was investigated qualitatively to gain an initial understanding of the dimensions and process of the VR tourism experience. This was followed by a quantitative approach using a larger sample to add additional knowledge on the research problem. This improves the information richness of the data as a strength of the research methodology and helps in finding the key concepts related to the VR tourism experience.

Additionally, there is very limited qualitative research on one key concept of the VR tourism experience when using a few numbers of participants (Pantelidis et al., 2018). In order to overcome this limitation, firstly the qualitative data derived from an exploratory qualitative

phase to find any concept related to the VR tourism experience. Also, this data can be further investigated by quantitative techniques in a subsequent quantitative stage. As a result of this exploratory qualitative stage, new facts are uncovered and new issues are addressed, resulting in a deeper understanding of this previously under-researched topic.

Moreover, defining a framework for the VR tourism experience has not been explored empirically in an in-depth manner. There is limited research that attempts to provide a framework for the VR tourism experience (Godovykh et al., 2022; Wei, 2019). However, this literature is reviews of the current literature, and lacks an empirical basis. As an exploratory, sequential mixed methods study, this research defines this framework by developing an instrument that also takes advantage of the qualitative findings. In fact, the validity of this framework was enhanced by the development of a quantitative instrument using qualitative data.

Furthermore, most research concerning VR and similar technology experiences has been carried out without participants experiencing the technology. (Rejón-Guardia et al., 2020). In other words, applying quantitative approach be the help of survey, the findings of these studies lack insight into the complexity of tourists' behaviour in relation to experiencing new immersive technologies. Having identified these gaps, this study conducted both qualitative and quantitative approach, after participants experienced a VR tour, to gain an in-depth understanding of the VR tourism experience and its dimensions and process.

Lastly, and notably, a major drawback of available research relates to assessing the behavioural intentions *after* the VR experience, without also considering these factors *before* the technology experience. As a result, these findings do not provide accurate knowledge related to this experience. As part of this mixed methods study, the experimental approach in the quantitative phase was employed to address these weaknesses. Responding to a questionnaire before the VR tourism experience, assisted in obtaining a more accurate result of the effectiveness of technology after the VR experience. The experimental approach in quantitative phase also, was conducted measuring the perceptions, emotions, feelings, and behavioural intentions of tourists one week after the VR tourism experience. This helped in investigating these aspects over time, which addresses the weakness of previously mentioned methods.

Nevertheless, some limitations originated from different aspects related to this methodology and accompany this PhD research. Firstly, one of the main limitations of this methodology related to the technology. The special setting and set-ups necessary to perform the experiments

limited the location to the university. This excluded some potential samples such as disabled participants and other individuals. The issues related to technology also affected the methodology. The quantitative phase of the research had to include a larger sample. However, due to the unsolvable errors of the device, the number of participants for this phase of study were limited. The special technology set-up also affected the diversity of the sample in the quantitative phase as the data collection was only connected in the university and due to these issues, the location of the experiments for the quantitative phase was at the university. This resulted in a large number of participants from Victoria University of Wellington.

Furthermore, this exploratory research offers a qualitative approach to data collection which is highly complex. As the instrument, the quantitative phase was developed using the data from the qualitative phase. It was challenging to decide which data to use from the qualitative phase to build the quantitative instrument, and to decide how to use these data to generate quantitative measures (Creswell & Clark, 2017). Also, the process of developing the procedures that should be undertaken to ensure that the scales developed on the instrument were reliable, was complicated.

The sampling method of this study had some limitations. While convenience and snowball sampling were considered to help in recruiting the participants in Study 2, it was also a limitation. Due to the location where this study was primarily conducted, a majority of the participants were less than 49 years old and were tertiary-educated. While Study 2 was supposed to generalise the findings of Study 1, the samples in the quantitative phase were mostly staff and students at the university. This limited the sample from including more individuals from the older generations.

### **3.7 Conclusion**

This chapter addressed the research method used for answering the research questions. It was fundamental to choose an appropriate methodology that could answer the research questions, minimise the limitations of previous research in the field of the VR tourism experience, and also serve the objectives of this research.

A multiple research paradigm, including constructivist and post-positivist, was found to be the most appropriate, as this paradigm enabled the current study to investigate different aspects of the VR tourism experience and tourists' behaviour. As the dimensions and process of the VR tourism experience, and how these aspects affect tourists' behavioural intentions, were unclear, a qualitative methodology (Study 1) was needed to obtain preliminary knowledge of the key concepts, and a

quantitative methodology was needed to investigate how these affect the tourists' behaviour. In-depth interviews were designed to be performed after participants experienced the tour using VR technology. Overall, 20 interviews resulted in detailed and rich information on the dimensions and process of the VR experience. The data from the qualitative phase informed a connective point that served the quantitative phase, building the variables and primary framework for the VR experience to be tested. Subsequently in Study 2, a quantitative approach was applied to test the hypotheses. 63 Participants answered three questionnaires, one before experiencing the VR tour, one after, and another one week after the experiment. The results of two studies are connected to each other, as the qualitative phase found the key concepts of the VR tourism experience, and the quantitative phase uncovered associations between these concepts. The next chapter discusses the results of the qualitative phase (Study 1).

## **4. Results and findings – Study 1**

### **4.1 Introduction**

To define a VR tourism experience framework as the main research problem, the literature review (Chapter 2) investigated the dimensions and process of this experience. Reviewing the available research showed that the dimensions involved in VR tourism experience are categorised within four groups: perceptions, feelings, emotions, and behavioural intentions.

The previous chapter described the analysis process and how the collected data were analysed, related to two phases to answer the study questions. This chapter provides the foundation to address the first research sub-question: What are the dimensions and process of the VR tourism experience? (SQ1). As stated, the main treatment of the data was conducted using inductive analysis, where the sub-themes were created. By identifying the key concepts of the VR tourism experience and the steps involved in this experience, this chapter provides the foundation for Study 2, which looks at associations between these dimensions that have emerged from the contexts about to be investigated.

The following sections address the actual codes, themes and sub-themes that include relevant aspects related to Study 1. As defining the dimensions and process of the VR experience was the main concern of the first phase of this research, codes included the key concepts related to tourists' perceptions, feelings, emotions, and behavioural intentions. This consists of a basis for a primary conceptual framework, investigated in the next chapter, as the connective point between the qualitative and quantitative studies.

Since data were openly coded, anything could emerge from them (Merriam & Tisdell, 2015). Initial codes were assigned in reflection of key concepts involved in the VR tourism experience. Initial codes also reflected exact words of participants regarding their evaluations and how they feel about the VR experience, the destination and technology.

In Section 4.2, this chapter discusses various categories of respondents that participated in this study, the sample characteristics. Then, the results related to qualitative analysis of data are discussed in Section 4.3, which deals with participants' perceptions and evaluations of the VR tourism experience. Subsequently, Section 4.4 addresses the key concepts associated with

feelings, and Section 4.5 defines the sub-themes related to the emotions. Additionally, Section 4.6 defines the concepts associated with the behavioural intentions of tourists. Finally, the chapter is concluded in Section 4.7. These sections describe the basis for a conceptual framework that is designed in the next chapter.

## 4.2 Sample characteristics

In total, 20 participants took part in the qualitative phase of this study (Table 4.1). The interviews were performed individually. The profile of participants can be seen in Table . Among the 20 participants, four were the researcher's colleagues, post-graduate students who expressed their interest in participating. As they fitted the sampling criteria, they were invited as participants. To avoid any bias, they were asked to read the information sheet and consent form carefully to be assured of their willingness to participate. After reading the information sheet, it was emphasised that participation was voluntary. Also, they were reminded several times during the interviews that this research is exploratory, and any negative or positive points were considered valuable data. The main interview process resulted in 20 complete interviews.

**Table 4.1. The profile of participants**

|                        | Number of Participant | Percent |
|------------------------|-----------------------|---------|
| <b>Gender</b>          |                       |         |
| Male                   | 10                    | 50%     |
| Female                 | 10                    | 50%     |
| <b>Age</b>             |                       |         |
| 18-29                  | 6                     | 30%     |
| 30-39                  | 13                    | 65%     |
| 40-49                  | 1                     | 5%      |
| 50 and over            | -                     | 0%      |
| <b>Education Level</b> |                       |         |
| Undergraduate Student  | 6                     | 30%     |

|  |    |     |
|--|----|-----|
| Postgraduate Student   | 14 | 70% |
| <b>Nationality</b>   |    |     |
| Domestic   | 9  | 45% |
| International  | 11 | 55% |
| <b>Frequency of Travelling (Either domestic or international for leisure purposes)</b> |    |     |
| Very Often (more than 5 times a year)  | 2  | 10% |
| Often (4 times a year)   | 6  | 30% |
| Occasionally (3 times a year)  | 7  | 35% |
| Rarely (2 times per year)  | 2  | 10% |
| Very Rarely (1 time or less)   | 3  | 15% |
| <b>Frequency of Technology Usage</b>   |    |     |
| Very Often (every month)   | 1  | 5%  |
| Often (every couple of months)   | -  | 0%  |
| Occasionally (at least three times)  | 2  | 10% |
| Rarely (a couple of times)   | 2  | 10% |
| Very Rarely (1 time)   | 9  | 45% |
| Never  | 6  | 30% |
| Total  | 20 |     |

As Table 4.1 illustrates, the number of male and female participating in this phase of research were equal. This shows a gender balance between the numbers of participants. This equality could be also seen in the nationality, with approximately half of the participants identifying as New Zealanders, and the other half international. As they were students, all of them were educated and a large majority of them were studying at post-graduate level. Regarding their age, as the participants were students of VUW, almost all of them were less than 40 years old, and the young generation was overrepresented within the sample.

A 5-point Likert scale was selected for the frequency of travelling. Participants were informed that the frequency related to the time before COVID 19, as the borders of Aotearoa New Zealand were closed during this data collection. Also, it was noted that travelling for leisure reasons was considered as the main purpose. Also, both international and national travel were relevant. Then they were also informed that “Very often” refers to more than 5 times a year, “Often” to more than 4 times a year, “Occasionally”, three times a year, “Rarely”, 2 times per year, and “Very rarely” one time or less in a year. Most of the participants self-identified as frequent travellers.

Then the same 6-point Likert scale was considered for the frequency of the XR technology experience. The participants were asked about their XR technology experiences other than VR, as these immersive tours could be performed with all kinds of XR (VR, AR, MR).

The participants were instructed that “Very often” refers to every month, “Often” to every couple of months, “Occasionally” three times, “Rarely”, a couple of times, “Very rarely” one time, and “Never” if this was their first time experiencing such technology. The large majority of the participants very rarely experienced XR technology, (45%) or had never tried it (30%). Overall, the young generation (Individuals less than 39 years old), and also individuals who have not had much experience with XR technology, are overrepresented in this sample.

### **4.3 Perceptions**

The first part of the interview questions focused on participants evaluating the whole VR tourism experience. Participants reported different aspects of this experience as their overall perceptions. In the following section, the meanings assigned to VR experiences are analysed, especially subjective aspects as perceived by the participants.

As the first round of interview questions were related to how participants felt about this VR tourism experience, it was mainly a state or condition viewed subjectively. The sub-themes that emerged from this part are included in the following sections.

#### **4.3.1 Being real**

As the first questions of the interviews (Appendix A) were designed to inquire about the overall evaluation of tourists of the VR experience, the fact that it was close to reality was stated by most of them (17 participants). Specifically, one of the most repeated statements from participants after experiencing the tour was that “it was very real”. This description or similar statements were received from almost all participants (except three: P9, P12 & P14). This

concept was also mentioned by the participants during the tour, while observing them experiencing the tour.

This concept was frequently reported by participants, some referring to the whole VR experience and others pointing to specific aspects of the experience. When asked how she was evaluating the VR tourism experience, P11 responded “genuine and natural”.

To describe the whole experience, participant #16 mentioned,

*I feel like it was very, very realistic. Because there were people, birds. The structuring, the architecture was very real, everything. I really liked when they showed you what it was, years and years ago, and what it is now, and the history lesson was very nice. And it was very, very realistic.*

Some other participants noted this concept related to some parts of the experience or perceiving virtual objects as real. For example, P8 noted,

*It was a lot more genuine than I thought it would be. Yeah, like at first and the square when she was showing the depth of the city like that felt very, very genuine. And sort of being in the balloon and seeing the city the cityscape. Yeah, that was very realistic.*

As crucial components to perceive a virtual experience as real, a few of participants mentioned sensorial involvement (Mura et al., 2017). P8 noted, “I wanted to touch the water. And I knew I couldn't, but I really wanted to”.

Interestingly, the level that participants reported this experience as being realistic was significantly different among participants who had more experience with these kinds of technologies. Specifically, the more participants had experience with XR, the less they perceived this experience as real. Three participants did not find the experience realistic: all were male and less than 29 years old and were frequent users of these technologies, and all pointed out the physical limitations of technology as the reason for not being realistic. P12 stated,

*Not that much! because the VR set is bulky, and especially because I wear glasses, I had to adjust it sometimes. And also, it was too cold. There's other senses that smell and touch with the wind and heat, the temperature. All of that was missing.*

A frequent user of XR technology in gaming, P9, applied the word “convincing” when he was asked how much this experience was perceived as real. He also mentioned the physical limitations of technology, as did P14, who was using these technologies extensively.

Interestingly, this description was very different for participants with no previous experience of VR or similar technologies. P15, for instance, claimed, “Because this is my first experience using this gadget. I don't know, what is the name of this, but I feel oh my gosh, this is so real”.

Overall, many participants reported this concept, applying similar terms such as: Real, Genuine, Natural, Realistic, etc. Interestingly, perceiving the whole experience or some aspect of that as real was found to be a predictor for other aspects involved in this experience, as described in the following sections.

It seems that from the participants’ perspectives, they understand that they are in a virtual reality environment, however, according to the knowledge they have gained through various sources of information, they do not care about what’s ‘real’, but instead search for clues that they believe are real.

#### **4.3.2 Change in time and place**

The sub-theme of change in time and place arose when participants described the beginning of the tour. P8, P20, P6 and P15 mentioned this transition referring to the time or place /location. Specifically, this code emerged from two conditions related to time and place; one was the sudden transition of time and place that happened when wearing the headset at the beginning of the tour, the other, according to participants, was that time expanded and was slower than reality. There were several ranges of descriptions. For instance, P8 stated,

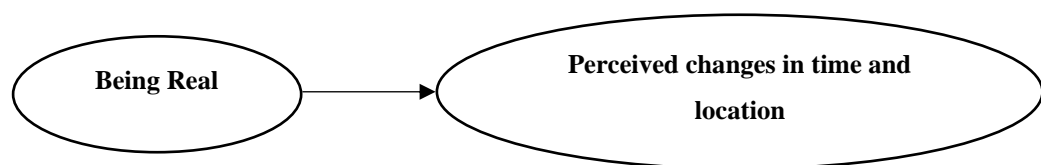
*I was there, then when I took it off? I was like, Well, I'm back in the room. That was like a more intense space transition than I expected.*

In a technology context it has been highlighted that VR can be used to alter the perceived boundaries of the body through the “incarnation” of the subject in the virtual environment (Riva et al., 2014). For example, participants could experience *ad hoc* “time travels” (Friedman et al., 2014). According to P20, “It was sunny and warm....then there was such as a sudden transition, you know, in time”.

Two participants however, pointed out that time was expanded. For example, P6 revealed “... you see people are walking. Exactly it’s like time passes slower than reality. That’s cool and huge”.

When asked follow-up questions, three participants mentioned “being real” as the logic for perceived time shifts. For instance, P15 noted, “Especially because it is so real, you forget that you are in this room”.

This perceived change in time or place could be linked to the previous concept that this experience was considered realistic. Figure 4.1 shows the connections between these concepts.



**Figure 4.1. The relationship of authenticity and perceived alteration**

#### **4.3.3 Being hyper-realistic**

To describe the whole experience, or the elements of that, four participants (P13, P16, P17, P20) responded similarly. This sub-theme cannot be included in the sub-theme of “being real”, as this experience was perceived as surreal and brought confusion to participants. Some participants described this as they were able to perform tasks that seem to be doable only in reality. For instance, P13 said, “That’s a little bit hyper realistic. Because if you’re actually in a hot air balloon, you may not be able to see things really well, but I was”.

Participant 20 also stated:

*That is something odd, you know, ...probably no one can do such thing for you in the real experience, but in the technology in the virtual reality it can be done.*

or Participant 17 noted this for the same reason,

*And then last word I’d use to describe it would be probably surreal.*

Participant #16 noted:

*Because I feel like that it's beyond my normal understanding of life.*

However, all of these participants were using such technology for the first time, and they were new to VR tours.

#### **4.3.4 Greatness**

Another perception of the VR experience mentioned by participants was related to the hugeness or greatness of virtual objects. They applied words such as “big”, “grand” and “huge” which was mainly related to the size of the virtual components. The interviewees had a similar statement of their feeling. For example, Participant 8 mentioned:

*I just thought the scale was very impressive, like, the height of the building, and just like the link to which, you know, it expanded around me.*

These statements were also raised by some participants such as Participant 1:

*That's very surprising for me, because I was thinking, like, we can experience space and we could just be, suspended and experience something like space as bigger than us. that's cool.*

This sub-theme seems to be closely related to one of the sub-themes of feeling, as discussed in Section 4.4.2 (feeling of being small). According to the scholars one of the capabilities of VR is that it can create extensive perceptual and conceptual virtual stimuli in the brain of the user and can also induce the feeling of presence of something greater than oneself (Stepanova et al., 2019a).

### **4.4 Feelings**

#### **4.4.1 Feeling of being there**

All except four participants (P2, P9, P12, P14) reported the feeling of being there in the destination, while having the VR tour to Rome. This feeling and perception of being real were the concepts which were mentioned by the participants even during the VR tourism experience and before the interview. Although there was no direct question if they felt being there, participants mentioned this, describing their feelings about the tour or the destination.

Here is an example from Participant 17:

*The highlight of this tour was the real feeling of being in Rome. To be honest, I can say that I could feel that I'm in Rome.*

Participant 6 noted this as their first impression of the VR experience and described that being close to reality made her feel like she was in the destination:

*It was really like reality. And the interesting thing is that at first, I was scared to move. but then I started to move and look around. The first thing that came to my mind was that I was really there.*

For example, Participant 13 noted:

*It was quite real. I think that's why I feel quite the presence of being there".*

Feeling of being there was reported by all of these participants without being prompted. How they described this feeling, seems to be related to their perceptions of how real this experience was. Looking at the characteristics of the participants who did not report this feeling, they were also those who did not perceive the VR experience as real. Specifically, the ones who were experienced with working with technology did not report only the presence, but also perceived authenticity. This could indicate the association between this feeling and perceived realism by participants. Although this was not asked directly, these participants also did not mention any feelings of being in the destination.

#### **4.4.2 Feeling of being small**

The code of feeling small emerged throughout interviews as some of the participants (P1, P5, P8, P13 P18, P19 & P20) applied the phrases or similar ones to express their feelings. For example, Participant 13 stated:

*But the hot air balloon specifically was very, very real and I felt like I was small.*

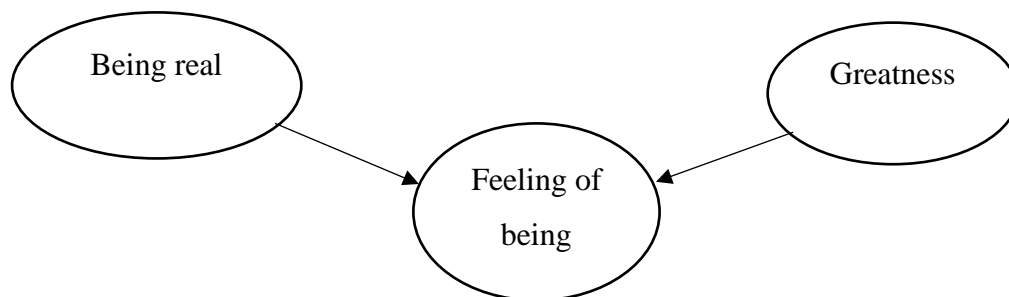
Participant 18 mentioned this several times when describing different aspects of the experience:

*It all felt kind of, you know, small because I'm a fan of history, and I've read quite a lot about Roman stuff, it's one of those things where putting these names and locations together, it just makes you feel like that small in front of history and all that sort of thing. Significant.*

Or describing one of the locations of the tour, he stated:

*Especially when you're high up in the air, it all felt kind of, you know, small.*

The similar reasons for this feeling mentioned by another four participants who felt scared due to the perception of reality. Additionally, three participants noted that feeling of being small could strongly relate to the vastness of the virtual objects. For instance, Participant 8 mentioned: *"Because the marble building felt very huge."* Figure 4.2 illustrates the relationship between the feeling of being there and being real and greatness. The more participants perceived the virtual objects as real and vast, the more they felt being in the destination.



**Figure 4.2. The relationship between feeling of being small and other concepts**

#### 4.4.3 Feeling connected

This sub-theme was also raised by fourteen participants. What participants reported to feel connected included a number of different entities, including feeling connected to the virtual place or virtual people.

This feeling reported by the participants in relation to Rome as the destination they visited. Here is an example from Participant 14:

*But because people were around and dogs and you know, the normal things going on. It just felt like I am one of those and I'm going around.*

Or Participant 6 stated that:

*You have a feeling that you're walking in the environment in reality and get connected, which is quite interesting.*

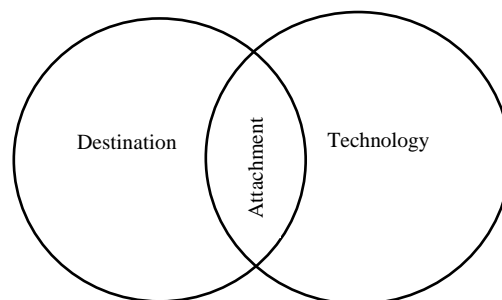
Six participants hinted at perceived realism as the link to the connectedness. Participant 20 noted:

*It was so real, and I can feel the atmosphere there and being part of it. It's kind of warm, yellow colour, you know, the blue sky and you feel this very calm weather. Yeah. And kind of the Mediterranean climate and nature there.*

#### 4.4.4 Feeling attached

In describing how they felt about the destination and the technology, all participants noted by lots of positive phrases and statements related to the virtual place (destination). For example, they applied, “detailed” and “complex” to describe the technology and “antique”, “scenic” and “stunning” to describe the destination.

Although the statements above related to the technology or the destination could be distinguished from each other, most of codes related to technology and destination appeared to overlap. For instance, to describe the feeling towards the destination, Participant #4 noted: “I feel engaged to both” and Participant 5 mentioned: “I feel quite bonded (to Rome), maybe it's stronger and more”. Interestingly Participant 11 stated that “It was very engaging” to describe their perception of the technology. Furthermore, Participant 4 noted: “It was super immersive, and yes, I feel attached to this destination” to answer the follow-up question (you mean you feel bonded?). According to the research of Wu & Cheng (2018), it is possible to be attached to a virtual place, which confirms the correlation between “place attachment” and “technology attachment”. Figure 4.3 shows how these two sub-themes connect to each other, based on the finding of this study.



### Figure 4.3. The overlaps between destination attachment and technology attachment

To describe their feeling about the destination, all participants shared positive feedback about Rome and visiting the destination using VR technology. A possible connection between perceived realism and place attachment was revealed. For instance, Participant 13 noted: *“because it looked very realistic”* as the reason for feeling bonded.

Furthermore, according to statements from participants, attachment to the VR destination could also be linked to the feeling of being there. For instance, participant 17 claimed, *“Because, it gives me the real feeling of being in Rome”*, and Participant 2 stated, *“because this immersive technology feels like being inside the place”*. Figure 4.4 shows the dependence of attachment to the feeling of being there and being real. The more participants perceived the virtual objects as real and felt being in the destination, the stronger they were attached to the virtual place.

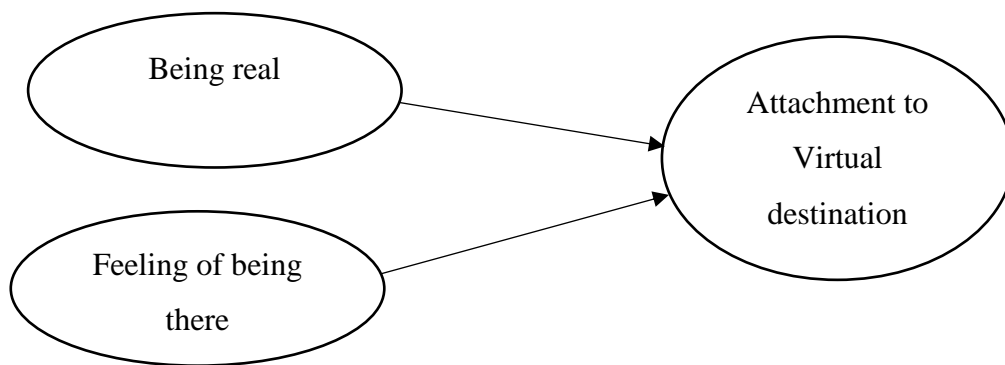


Figure 4.4. The relationship of feeling attached to other concepts

## 4.5 Emotions

### 4.5.1 Confusion

Several participants (P5, P7, P9, P15, P19) applied different words related to the concept of confusion, such as ‘odd’, ‘awkward’ and “confusing”. According to a few of the participants, this confusion was related to working with the device. Some of these statements by participants seem to relate to physical limitations of the technology. Participant 7 mentioned that when she was trying to explain the issues she had, working with the headset and controllers:

*Sometimes I was just very confused how to do things.*

She was referring to working with technology, which was often a little complex for early users of technology. This experience was echoed by participants who had little or no experience with using technologies. They applied some words to describe their reasons with words such as ‘New’, ‘Different’, ‘Innovative’, ‘Unique’ to explain the reasons for feeling confused. However, the majority referred to this as they mentally mixed up the reality and virtuality. For example, Participants 15 stated:

*Sometimes I'd love to touch the things. But I realised that's not real. You know, that's a very awkward feeling that you want to touch something that is too real to you. but logically, you know, that is not real.*

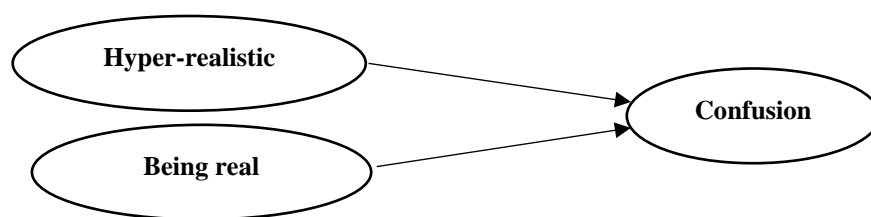
Or Participant 5 noted:

*It felt a bit weird and confusing. Because the people, they seem real to be looking at me.*

This could be linked to being real and surreal as well as Participant 9 who mentioned:

*Odd to see it is able to take it a step further than what reality allows.*

Figure 4.5 shows the relations between the perceptions of being real and being hyper-realistic with the emotion of confusion. The participants perceived the virtual objects either real or hyper-real and this made them feel confused during the VR experience.



**Figure 4.5. The relationships of being real, being surreal and confusion**

#### 4.5.2 Surprise

The sub-theme of surprise was brought up by a large number of participants. Described as ‘very surprising’ when participants were asked if they find anything surprising. However, according to participants, there were a wide range of reasons behind this surprise. Some of them mentioned this feeling of surprise in relation to their previous expectation, in comparison to what they experienced.

For example, Participant 11 indicated that:

*I thought I would feel maybe a tiny bit surprised and then I was thinking, Wow, this is amazing. It was very surprising. I think I was quite surprised how much change I did actually. Because I'm generally not into technology that much.*

This surprise derived by VR experience was also reported in a study of gaming in VR (Pallavicini et al., 2019). This emotion could also relate to perceiving this experience as surreal, as mentioned by participant 13:

*All of it was pretty surprising. But I didn't expect it to be like this... because you can't do that on a real tour.*

Others, such as participant 15 and participant 19, reported similar reasons for this surprise, which could be related to mixing reality and virtuality. Participant 19 mentioned:

*It was surprising because people were walking around you and kind of animated space and not a static one, as I said, and you have a feeling that you're walking in the environment in reality, which is quite interesting.*

As stated, different reasons were reported for being surprised. Participant 6 noted the change in time and location as the predictor for feeling surprised:

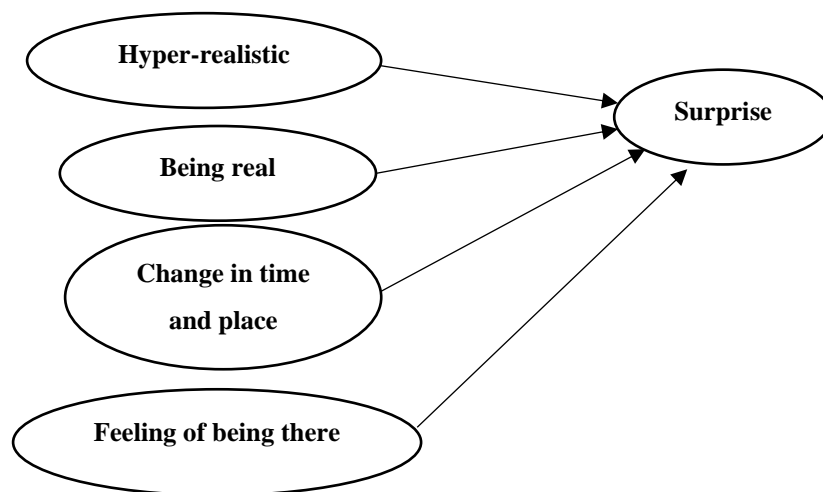
*I'm very, very, very surprised, as I mentioned before, it just changes your location and your perception of time, suddenly, this was very surprising.*

And participant 17 connected their surprise to not only being real but also the feeling of being there:

*Very surprising. Yeah, the surprising thing to me, was that the real feeling of being in Rome, you know, to me, it was so real, the statue, the things of course, in the balloon, I can even feel the height. So, to me, it was so real.*

These relationships are shown in

**Figure 4.6.** Overall, various factors emerged as contributors to the sensation of surprise. Participants' perception of virtual objects as either authentic or hyper-realistic played a pivotal role in evoking surprise. Furthermore, the abrupt alteration of their perceived spatial orientation, accompanied by a profound sense of presence within the destination, constituted another significant factor in inducing this state of surprise.



**Figure 4.6.** The relationship of other concepts to surprise

However, four participants (P12, P9, P2 & P14) noted that they did not feel surprised or any feeling similar. Looking at their profiles, three were among the age group of 18-29, and one was between 30-39 years old. Interestingly, all were frequent users of technology, and they chose “very often” when answering how much they use the technology. Participant 14 noted:

*“I don't think I found anything surprising. I kind of did with the Google things. It's kind of similar. Obviously, it's not as immersive, but kind of felt like the same. But it's just, it's so much more massive, doing that easier or more immersive. But in terms of*

*surprising, it was just, it was your typical VR but with a unique location, and you can tell it's been well made and stuff"*

#### 4.5.3 Fear

The feeling of fear was also noted by some participants. For example, Participant 10 mentioned:

*Yeah, I never think about it that way that I can, stand just in this room and experience this like I am in Rome. And you know, like, many people are passing by and have everything in front. You know, that makes me a little, scared.*

When it came to the part of the tour where participants experienced being above the city in a balloon, the emotion of fear was so intense for Participant 6 that she wanted the tour to be stopped which was stopped. She mentioned:

*The interesting thing is at the first I was scared, it felt real, and I was scared to move.*

The feeling of fear as reported by participants, mostly related to "being real" (Figure 4.7). They noted that fear was induced due to the fact that virtual objects were perceived as real. For instance, Participant also 3 mentioned:

*Everything felt real and that was scary.*

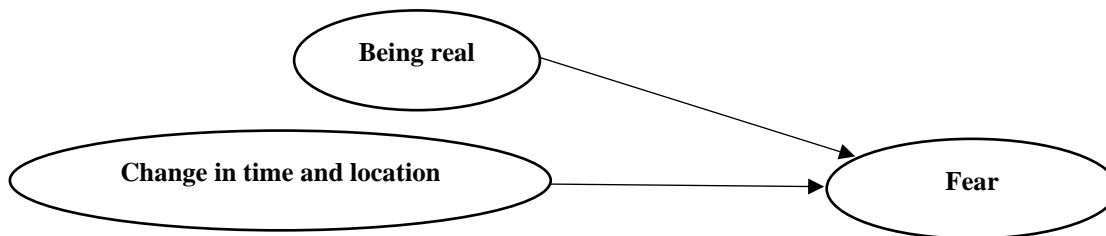
Interestingly, this emotion was expressed by the participants who were afraid of height, and it was mostly related to the part of the tour that they experienced standing in an air balloon above the city. Participant 6 explains,

*The only negative thing for me, I don't know it may be good for the other people because I have a phobia. So, the balloon part, and that glass floor was really scary*

Furthermore, this fear reported by participant 10, seems to be related to both the alteration in time and place, and perceiving virtual objects as real:

*I never think about it that way, I can stand just in this room and experience this. that it (the tour guide) said that I was in Rome.*

The Figure 4.7 shows this relationship. The sudden change in the location and time and perceiving the virtual objects as real were found to be the main reasons for the participants' fear.



**Figure 4.7. The relationship of fear and other concepts**

## **4.6 Behavioural intentions**

### **4.6.1 Intention to visit the destination**

All participants stated their intentions to visit Rome after experiencing the tour. For example, Participant 11 stated, *“I feel quite inspired to go to Italy.”*

As soon as the tour was finished, Participant 4 stated:

*“I want to go to Rome now”*

And Participant 5 mentioned:

*“It’s definitely worth visiting”*

Some participants even demonstrated a change in their intentions to visit this destination, after the tour. Participant 1 claimed,

*I was not a big fan of Italy as a tourist destination. But I think seeing the Colosseum, was tempting for me. Now, I’m like, I like to go there.*

Similarly, Participant 16 states,

*It never came up on my bucket list (Rome). But I think now it’s reaching way up high. And I would like to visit this place.*

Although the levels of motivation and intention to visit the destination were different among participants, all reported their intentions to visit the VR destination.

#### 4.6.2 Destination recommendation

Participants were asked what they would say to others about the technology or the destination. Almost all participants expressed their strong intention to recommend the destination to others and expressed positive WOM. For example, Participant 13 described that:

*I will tell that I have been to Rome, and it was full of history, the architecture is, a lot of the old architecture is still restored. There's so many touristy places and it looks like the weather's very nice. It's nice and sunny skies.*

Likewise, Participant 19 indicated that

*I would explain that I'd really like to go there, and I suggest Rome to the people who are keen to know about the history of architecture and the history of urban design aspects and all these things, because you can find so many interesting points.*

The only participant who mentioned that he does *not* intend to recommend the destination was participant 1:

*I wouldn't be recommending places based on this (VR tour). Like, I wouldn't be recommending it solely based on my 20 or 15 minutes experience of virtual reality. Even though if I've been to Italy, I wouldn't recommend it. Because it's subjective, you know?*

#### 4.6.3 Intention to use the technology

Participants were asked also about their intentions to use the technology and described their feelings with words such as “exciting”, and “very good idea”. When they were asked how they felt about using this technology and similar ones, all except participants #4 and #11 intended to use it. However, their reasons can divide into three groups. One group intended to experience such tours for travel planning and decision-making. For example, Participant 20 noted:

*Definitely I would like to use it, I think that's a great idea, actually, because it gives you the real touch of the place.*

Another Participant 10 mentioned:

*I intend to use that of course and it will help me increase the possibility that I choose this place as a destination.*

However, most participants had intentions to use these tours as “a short one” or “a taste” to describe how they like these kinds of tours to be. Participant 2 applied the word “a trailer of a movie” and participant 20 used “an abstract of a paper” as a definition of how they like these kinds of tour.

Participants # 4 and #11 were the only ones who did not intend to use these technologies for travel planning. Both considered themselves as professional travellers. Participant #4 noted:

*I think part of what I like going to a new place is seeing it all for the first time. And I think it would take a little bit out of that, because I'd be comparing it to the virtual reality version that I saw. So, I would probably not use it in that situation.*

Similarly, Participant 11 stated:

*I kind of think I wouldn't want to do it. Because I want to keep that full experience.*

Participants #1, #3 and #11 mentioned the potential for using such experiences for education and learning as a strong intention to use such technologies.

Notably, no participants intended to use these technologies as a replacement for real travel, except in the case of travel restrictions such as during a pandemic. Here is an example from participant 1:

*Given the current situation in the world with COVID, that people cannot travel. That's, gonna be really interesting for if you use it for traveling, but I would rather like to go to Italy, rather than sticking to this. You know, like, if I had the money and opportunity, definitely I would go to Rome rather than buying this.*

P11 that she would not use it for places she intended to visit:

*I would rather use it for places I know that I'm probably never going to get the chance to go.*

#### **4.6.4 Technology recommendation**

When participants were asked what they would tell others (family and friends) about this experience, all expressed their positive intentions to recommend the technology or state positive WOM. However, some recommended this experience as a fun and enjoyable experience, while others mentioned that they recommend it for travel planning. For example, Participant 15 noted:

*I really recommend it to people...Because I myself really love to gather information about where I'm going to.*

While Participant 10 stated:

*I will talk about it after I go back to work... that is kind of a brilliant experience (Tour) that takes you to all over the world.*

Although participant 1 mentioned earlier that he would not recommend the destination, he showed his intention to recommend the technology, most likely due to the technology enjoyment this experience brought:

*But about the technology, I think, yeah, I would recommend using the technology. Like it's, it's cool. Just even for only one time, I would recommend people to experience it.*

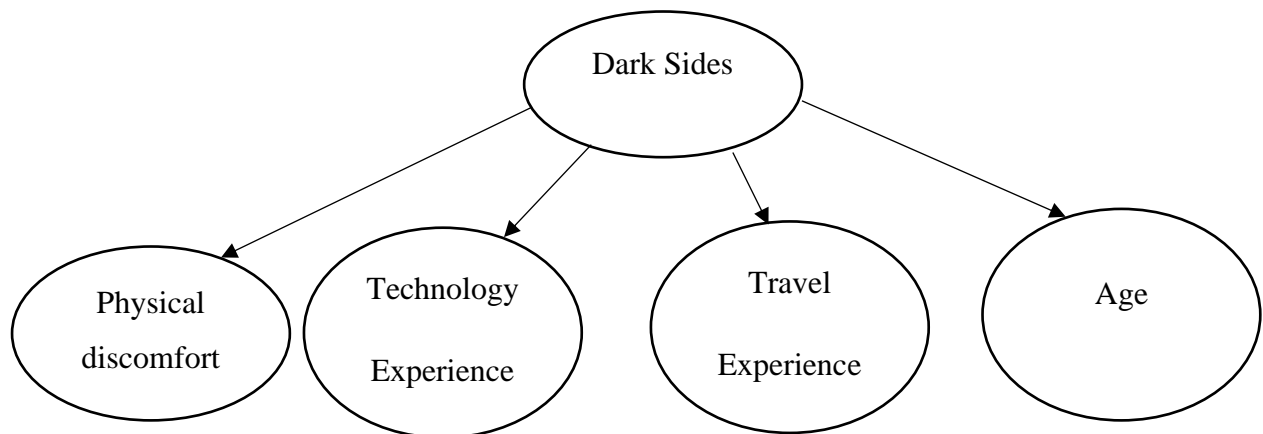
#### **4.6.5 Dark sides of the VR tourism experience**

Most of the negative points mentioned by participants related to “physical limitations” of the technology. For example, Participant 15 stated, *“if it would be a wireless, it was much easier as sometimes I feel I'm trapped with this wire because I don't feel I am free for the movement.”* Suh and Prophet (2018) have found a link between XR technology to negative consequences such as motion sickness, physical discomfort and cognitive overload. Murauer et al. (2018) state that discomfort caused by XR technology is a limitation of the system. Scholars emphasise that, by investigating the dark side of XR technology, we can expand our knowledge of factors associated with user resistance, which makes it possible to take actions to decrease them (Chuah, 2019). Most of the negative emotions were towards the technology and its physical limitations, which confirms findings in previous research (Muraier et al., 2018).

Among all participants, only four of them liked to visit the destination in reality and did not intend to visit the destination using these VR tours. All of them described themselves as travelling “very often”. For instance, Participant 3 mentioned: *“I kind of wouldn't like (To experience these kinds of tours before travelling), I would like to be surprised (at the real destination)”*. And participant 12: *“I wouldn't participate in the VR first because I want to see it in person for the first time.”*

Furthermore, four participants noted that they did not feel surprised or any similar feeling. Their profiles reveal that they were among the age group of 18-25, and that one and was

working with technology chose “very often” in answer to how much he uses the technology. The dark sides of the VR experience are shown in Figure 4.8.



**Figure 4.8. The factors related to the dark sides of the VR tourism experience**

Interestingly, participants’ characteristics were related to their perceptions, feelings, emotions, and behavioural intentions towards the technology and destination. Participants with greater experience with XR perceived this experience as less real. This group were also less surprised by the VR experience. Furthermore, behavioural intentions toward the technology were lower in participants who had more travelling experience. The age of participants also seemed to affect other aspects, as those between 18-25, who were also very familiar with VR, did not experience much surprise.

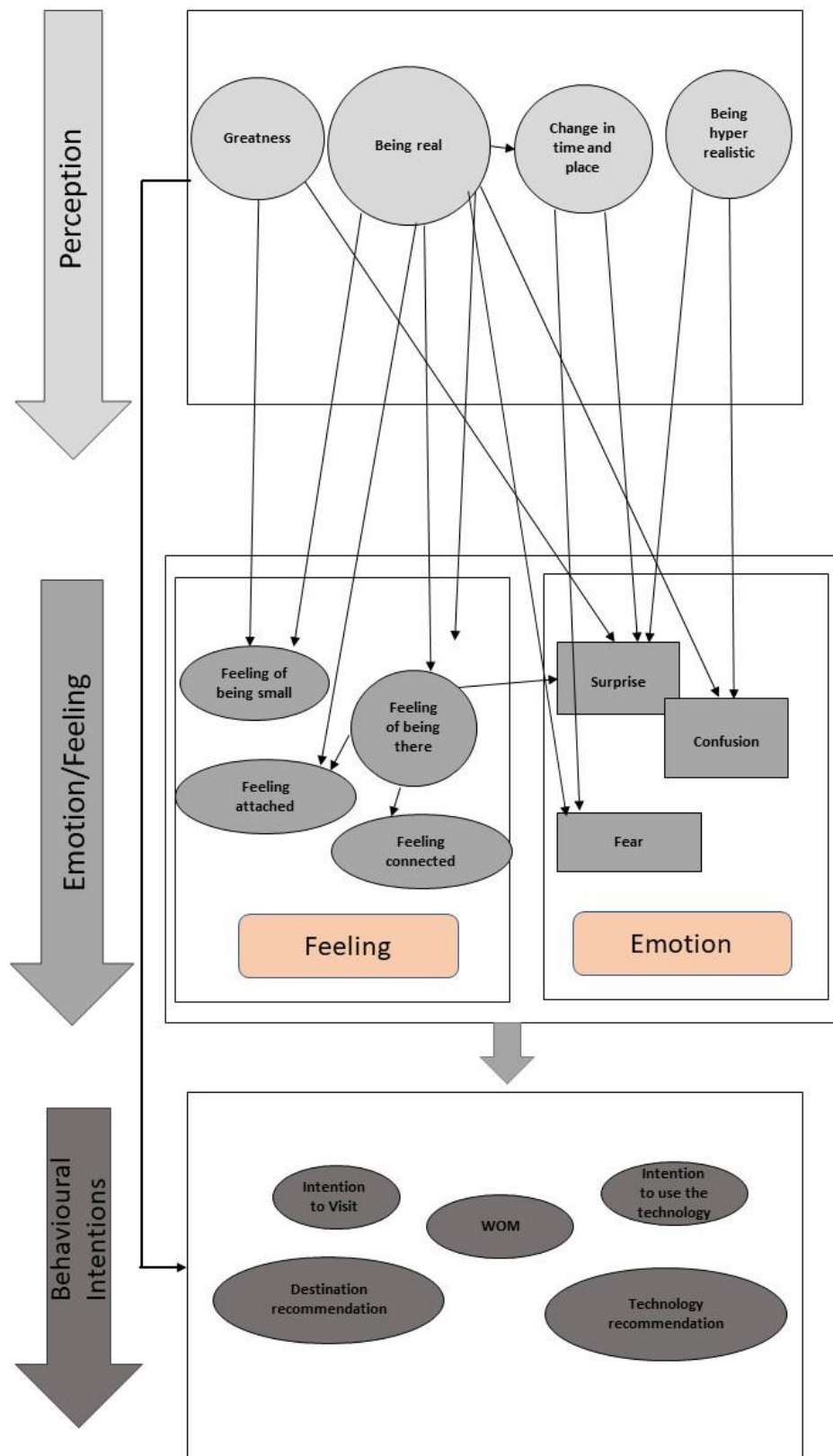
While VR tourism experiences offered a wealth of benefits to the most of participants, it is essential to acknowledge the negative aspects and technology limitations associated with this experience. One prominent concern was the potential for motion sickness and discomfort among users. VR-induced motion sickness, often referred to as "cybersickness," occurred when there is a perceptual mismatch between what the user sees and what their inner ear senses in terms of motion. This dissonance can lead to nausea, dizziness, and discomfort, detracting from the overall enjoyment of the VR tour.

Technology limitations also extend to the visual and auditory aspects of VR tours. While VR provided stunning and immersive visuals, limitations in resolution and field of view sometimes resulted in a less-than-optimal visual experience. Users may encounter pixelation or screen-door effects that detract from the realism of the virtual environment. Similarly, audio quality is essential for immersion, and subpar audio systems can diminish the overall impact of the VR tour. The lack of other senses such as smell and touch decreased the effectiveness of VR tourism experience, specifically for the participants who were frequent users of such technologies.

In conclusion, while the VR tourism experience succeeded in offering a remarkably realistic view of the destination for most participants, it did not serve as a compelling motivation for frequent travellers. These professional tourists tended to prioritise genuine, physical experiences over their virtual counterparts. This preference was closely linked to the quality of the VR experience and its ability to faithfully represent the tangible aspects of the real destination. The authenticity and faithfulness of the VR simulation to the actual destination emerged as pivotal factors influencing the reception and acceptance of VR tourism experiences among these experienced travellers.

#### **4.6.6 Study 1 – Contribution to the overall research**

Overall, the purpose for study 1 and the qualitative analysis of the data was to find the dimensions and process of the VR experience, to answer the first sub-question of this research (SQ1). These dimensions included the key concept related to perceptions, emotions, feelings, and behavioural intentions, and the process included the steps that were involved in this experience. A related goal was to consider any other related concept. Figure 4.9 illustrates the sub-themes as dimensions, and steps involved in the process of the VR tourism experience.



**Figure 4.9. The association of the main concepts and findings of Study 1**

To describe their perceptions, feelings and emotions, participants used a wide range of words and phrases that guided the researcher in creating relevant codes. These emotional states were very complex, including positive and negative feelings. After data analysis, relevant themes, sub-themes and their associations were identified as the dimensions and process of the VR tourism experience. The codes related to the dimensions of the VR experience led to four categories of participants' perceptions, feelings, emotions, and their behavioural intentions towards the destination and technology. Finally, 15 main sub-themes were identified:

- Perceptions: 1. Being real, 2. Being hyper-realistic, 3. Change in time and location, 4. Greatness.
- Feelings: 1. Feeling of being there, 2. Feeling connected, 3. Feeling of being small, 4. Feeling attached to VR place.
- Emotions: 1. Confusion, 2. Fear, 3. Surprise.
- Behavioural intentions: 1. Intention to use the technology, 2. Intention to visit the destination, 3. Technology recommendation/positive WOM, 4. Destination recommendation/positive WOM.

Defining participants' perception of the VR experience, "*being real*" was found as one of the main codes. It became clear during the interviews that the majority of participants evaluated the virtual objects and people as real. As P11 noted, "*I think that was probably what was most distinct about it feeling that it was live and felt so real.*"

The comment above succinctly summarises this concept as one of the main perceptions, emphasising the significance of this concept in the VR tourism experience. Some of the categories do overlap and distinctions between some sub-categories are not distinct. For instance, another concept similar to this was that the VR experience was perceived as "surreal" or hyper-realistic. This finding may be related to characteristics of this experience that mixes reality and virtuality so that they are indistinguishable, although they recognise that this a virtual experience. The other concept related to perceptions includes "*change in time or place*". Some participants referred to this as a sudden change in time and place, such as moving from a relatively dark room as the location of experiments, to a sunny midday summertime in Rome. This concept could relate to the perception of realism as participants perceived the virtual place

as real. According to participant 20, “*it was an amazing part of this experience*” feeling this change in where they were. Another concept related to the perception was greatness, where participants perceived virtual objects as huge. As an example, P8 stated, “*the height of the buildings was very huge and impressive*”. This finding could relate to the participants’ struggles to mentally process the experience and describe this perceptual vastness.

Participants’ feelings derived from the VR tourism experience created another main theme related to this experience. The sub-themes associated with feelings included several concepts. One of the main ones was the feeling of being there, which was frequently stated by participants, as expressed by P17: “*the highlight of this tour, that I can just mention, was the real feeling of being in Rome*”. This participant’s comment demonstrates the importance of this concept in the VR tourism experience. Another sub-theme related to feelings was “feeling connected”. The overlap between this concept and other feelings such as “*attachment to virtual place*”, and the distinction between the two, is unclear. However, P19’s claim that “*I felt connected to everything although I knew it was an animated space*” P7’s claim that “*I feel attached to this city*” by may explain the distinction between feeling connected and feeling attached to the VR place. The last sub-theme was “*feeling of being small*”, a concept strongly associated with greatness as a perception. Participant clearly showed this association, noting that “*the height of the building was very impressive.....I felt small*”. Therefore, it appears that these aspects may be largely dependent on each other.

Emotions of “*confusion*”, “*fear*”, and “*surprise*” were found as sub-themes associated with VR tourism experience. Like some other concepts, confusion can be connected to the mental struggles related to distinguishing virtual aspects as real. Fear was mainly related to the part of the experience where participants were experiencing significant heights. The last concept of surprise stated by the majority of participants was related to the fact that they did not expect this experience to feel this real.

The last main theme was the behavioural intentions, with many related sub-themes. A range of comments related to intention to using such technology, intention to visit the destination, intention to recommend the technology, and intention to recommend the destination, were expressed. These comments generally related to other sub-themes of perceptions, feelings, and emotions. P11, for example, said that “*this experience was much more real than seeing photos and videos of Rome and now I really want to go there*”: this could show the association between authenticity and intention to visit the destination.

Overall, the data analysis findings show tentative evidence of relationships between different dimensions of the VR tourism experience and related concepts and confirming that the overall approach used in this research is promising in identifying potential explanations for observations of positive and negative aspects.

#### **4.7 Conclusion**

The overall intention of Study 1 was to develop a basis for a conceptual framework that could be used as the construction of a corresponding questionnaire to measure the variables later in the research. The purpose of Study 1 and the qualitative analysis of the data was to explore the dimensions and process of the VR tourism experience, investigate related variables for a primary conceptual framework, and build stronger hypotheses for the quantitative measurements.

The qualitative phase of this research investigated concepts related to the VR tourism experience and the steps involved. Related sub-themes include the tourists' perceptions, feelings, emotions, and behavioural intentions. Then these all turn into the variables and lead to developing a primary conceptual framework to be tested in Study 2. As stated, sub-themes were defined as variables and the participants assigned the items for the quantitative research tool. The aim of Study 2 is to test the framework for the VR experience, as developed in Study 1, re-evaluating factors that describe and distinguish the dimensions and process of this experience. Therefore, factors developed in Study 1 will be tested for empirical validation, using a quantitative approach, which provides the relationships between the constructs and enables generalisability of the proposed framework with the newly established dimensions and process from Study 2.

The next step in this exploratory mixed method research will be a connective point between the two studies. Applying this connective point in the next chapter, the variables are identified, and the hypotheses are developed, and the original items of the questionnaire are developed, based on the sub-themes that emerged in the data analysis of Study 1.

## 5. Development of conceptual model and research hypotheses

### 5.1 Introduction

The previous chapter conducted a qualitative study (Study 1) as the first step of the research approach in performing exploratory sequential mixed method. While the overarching objective of this research is to design a framework for the VR tourism experience, Study 1 addressed the first research sub-question (SQ1) of this study, which was defining the dimensions and process of the VR experience. This involved finding the key concepts and steps involved in the VR tourism experience.

Accordingly, in this chapter, using the key concepts related to the VR tourism experience were found in Study 1, the variables are developed. Then the clear research hypotheses are formulated, alongside a conceptual model suitable for empirical model validation. In sequential mixed methods research, this step is the connective point between the qualitative and quantitative components and is referred to as the “point of interface” (Creswell & Plano Clark, 2018). Creswell et al. (2007) state that the “*exploratory sequential mixed method*” includes a three-phase approach. In the first phase, the researcher gathers qualitative data and analyses it; in the second, the analysed data is used to develop an instrument; and in the third, the hypotheses are tested, using a larger sample.

As noted by Creswell & Clark (2017), the primary purpose of the third phase of “exploratory mixed method design is *“to generalize qualitative findings based on a few individuals from the first phase to a larger sample”*. Because the themes, sub-themes and statements from participants will be used to make the variables and scales for a quantitative instrument, these all will be tested in Study 2 to test the explored variables. Therefore, the quantitative study will test whether the results of the qualitative phase are confirmed in the quantitative phase, with a larger sample.

The next step in defining a VR experience framework is to investigate the associations between these key concepts. This will specifically answer the second sub-question (SQ2) of this research, explaining how these concepts are connected together to ultimately affect the behavioural intentions of tourists. This chapter, therefore, presents the basis for Study 2 (Chapter 6) which will answer the second sub-question (SQ2) of this research. The findings will provide a framework for the VR tourism experience as the main research problem (RQ).

Furthermore, the second goal for Study 2 is to address the limitations related to Study 1. Although students were purposefully selected as the sample for Study 1, the similarity of the participants may interfere with the results, as they were all university students, despite being different nationalities. Thus, by expanding the sample to individuals other than students, Study 2 will be used to attempt to address this limitation.

Finally, the results of Study 1 found different dimensions related to the perceptions, emotions, and feelings. However, the results of Study 1 did not reveal how these concepts are related to the key concepts of the behavioural intentions. In other words, it remained unclear whether the concepts of perceptions, emotions, and feelings led specifically to specific behavioural intentions, including intention to visit the destination, intention to use the technology, intention to recommend the destination, or intention to recommend the technology.

This chapter attempts to resolve aforementioned limitations, starting with developing related variables in Section 5.2. In Section 5.3, associations between the variables are defined, via examining the results of Study 1 and the literature, to create the hypotheses. These sections define associations between identified factors and their relations and include 22 hypotheses. In Section 5.4, associations between these variables as key concepts of the VR tourism experience provide a primary conceptual framework that is tested for the empirical validation. This provides a basis for Study 2, in which these hypotheses are tested to describe how the VR experience affects behavioural intentions of tourists as the second sub-question (SQ2) of this research. Then, answering the research sub-questions will present a final framework for the VR experience as the main research problem.

## **5.2 Development of related variables and scales**

The results of analysing the qualitative data provided identified relevant themes and sub-themes. The themes related to the dimensions of the VR tourism experience were divided into four categories of participants' perceptions, feelings, emotions, and their behavioural intentions (Table 5.1). The sub-themes related to all themes include key concepts and participants' statements.

**Table 5.1. The themes and sub-themes related to the VR tourism experience**

| Themes                 | Sub-themes                         |
|------------------------|------------------------------------|
| Perceptions            | Being real                         |
|                        | Change in time and place           |
|                        | Greatness                          |
|                        | Being hyper-realistic              |
| Feelings               | Feeling of being there             |
|                        | Feeling of being small             |
|                        | Feeling connected                  |
|                        | Feeling attached                   |
| Emotions               | Confusion                          |
|                        | Surprise                           |
|                        | Fear                               |
| Behavioural intentions | Intention to visit the destination |
|                        | Destination recommendation         |
|                        | Intention to use the technology    |
|                        | Technology recommendation          |

Main themes were identified to define the related concepts of perceptions, feelings, emotions, and behavioural intentions induced by the VR tourism experience. Section 5.2 defines the related eight variables based on the sub-themes, and with reference to the literature. Also, the statements of participants are defined as scales for measurement (questionnaire items). Participants' statements related to each concept are discussed and used as scales. This results in creating questionnaires that include a list of questions or items used to gather data from respondents about their attitudes, experiences, or opinions. To assist in the development of this

quantitative survey, research questions are considered, to determine which items and scales would best measure the themes presented in the qualitative results.

### 5.2.1 Perceived authenticity

One of the main perceptions referred to was “being real”. As stated earlier, this concept is related to participants perceiving the virtual objects as real. This concept was defined as one of the main dimensions related to VR experiences, according to many participants. This perception is identified and defined as “authenticity” in previous studies (Afonso, 2019; M. J. Kim et al., 2020), as noted in section 4.3.1. As it was stated in Chapter 2, the level of authenticity plays a fundamental role in the VR experience. The term “authenticity” refers to whether the virtual environment brings the experience expected by the user (Gilbert, 2016a). In terms of XR technologies, the user’s experience is defined by Lee (2004) as “a psychological state in which virtual objects are experienced as actual objects” (p. 27). Authenticity is defined as a new consumer sensibility that involves perceptions of the extent to which real, original, and unique experiences, or services are genuine (Gilmore & Pine, 2007). All of these terms were used to describe the perceived authenticity (Section 4.3.1). From the point of view of most of the tourists, the VR tourism experience was realistic, and the virtual destination was a genuine version of a place. This finding was in line with previous studies on the sense of authenticity (Kronqvist et al., 2016).

According to Gao et al., (2022) tourists are aware that this experience and this place is virtual. However, rather than worry about the “real”, they seek clues that they believe to be real, based on the knowledge they gain through other information sources.

Data analysis related to authenticity showed that three words were the most frequently used when describing authenticity: realistic, genuine, and natural. Three statements from participants describing authenticity were chosen as items to measure this concept including: “*The VR experience felt genuine*”, “*The whole experience was very realistic*”, and “*The virtual objects felt very natural*” (Appendix F). The available literature applied similar scales for measuring authenticity. For instance, Lipp et al. (2021) applied “*Proportions of the virtual space was realistic*”, and “*Reflection in virtual space seemed to be natural*”, to assess a self-report measurement of perceived authenticity of a virtual environment.

### 5.2.2 Feeling of presence

As described in Section 4.4.1, “the feeling of being there” was one of the key concepts of the VR tourism experience. Feeling of being there is extensively referred to the psychological sense of ‘presence’ in an environment (Beck et al., 2019). According to the tourists, this feeling was described as one of highlights of the VR tourism experience, it has been found in recent VR research (Yung et al., 2021b). As more precise and interactive simulations of reality are developed, users are able to experience Virtual Environments (VE) as a more immersive experience than the surrounding physical world, so they can feel present in them. When individuals have a strong sense of presence, the VE can be perceived as a place visited, rather than as a mere image (Krassmann et al., 2022).

This concept is different from immersion, as this feeling is a subjective sense as compared to immersion which has an objective point of view. There has been a longstanding argument in the field of Human Computer Interaction (HCI) and finally there is an agreement that *“immersion stands for what the technology delivers in all sensory and tracking modalities and that it can be objectively assessed. In contrast, presence can be defined as a human reaction to a system of a certain level of immersion and thus describes a subjective state”* (Slater, 1999; Slater, 2003).

Section 4.4.1 notes that the sense of presence was interestingly higher for the tourists that had less experience with these technologies. In other words, the ones who had much VR experience did not report this feeling. Wei et al. (2019) also highlight that VR creates a sense of presence for tourists if they are able to feel themselves shifting from the physical world into a virtual one through the VR experience. A critical goal of VR systems is to induce a subjective perception that the simulation is real. Technology developers have also tried to achieve this goal by promoting the sense of presence - the feeling of being present when one no longer has a conscious awareness of the simulated environment. It is important to distinguish these factors from those of the technology itself, as quantifiable factors of VR are often referred to as immersion and immersive qualities, and sense of presence is promoted by these objective qualities (Riva et al., 2003).

Different aspects are referred to as the sense of presence such as social presence, telepresence, spatial presence or being there, physical presence, self-presence, or place illusion, and plausibility illusion (Skarbez et al., 2017). However, there is a general understating that

presence is a “largely automatically generated and mostly sensory-driven perceptual sensation or feeling that is introspectively accessible” (van Brakel et al., 2023, p. 2)

Overall, this was a significant feeling related to the VR experience explored in Study 1. Being related to” the feeling of being there”, participants used different but similar statements to describe this feeling. Three statements were chosen to measure this concept including: “*I felt the presence of Rome*”, “*I felt like I was actually in Rome*”, and “*In the computer-generated world I had a sense of “being there”*” (Appendix F).

### 5.2.3 Place attachment

Another concept which to be a significant concept related to the VR tourism experience, was feeling attached to the VR place. This attachment could be related to not only the real place/destination but also the VR place. Some statements related to the destination, such as “*I feel bonded to Rome*” and some related to VR, such as “*This technology was really engaging*”. VR technology and place/destination overlapped in relation to the factor of attachment.

Previous research confirmed the significant potential of VR to have a positive impact on tourist attachment (Pantelidis, 2019). Scholars highlight that the reason for this relates to the high degree of perceived authenticity of VR tourism, which exceeds the physical boundaries of corporeal travel (Yung & Khoo-Lattimore, 2019). Although place attachment is widely defined as an emotional bonding between physical place and a person, in a recent study, scholars identified potential visitors’ cognitive and affective responses to VR tourism experiences as significant mediators in predicting attachment to VR tourism experiences and visit intention to the destination, presented in VR (M. J. Kim et al., 2020). They used similar statements such as, “*During the visit I felt related to the history*”, and “*The overall sight and impression inspired me*”, which have been used as the scales of place attachment (Ram et al., 2016).

Also, Pantelidis (2019) investigated the impacts of the VR experience on tourists’ attachment to a rural destination and found great potential for VR to have a positive impact on tourist attachment. Scholars highlight that the reason for this relates to the high degree of perceived authenticity of VR tourism which exceeds the physical boundaries of corporeal travel (Yung & Khoo-Lattimore, 2019). According to Plunkett, (2011) virtual worlds can now present an alternative world that can be perceived as very real to its consumers.

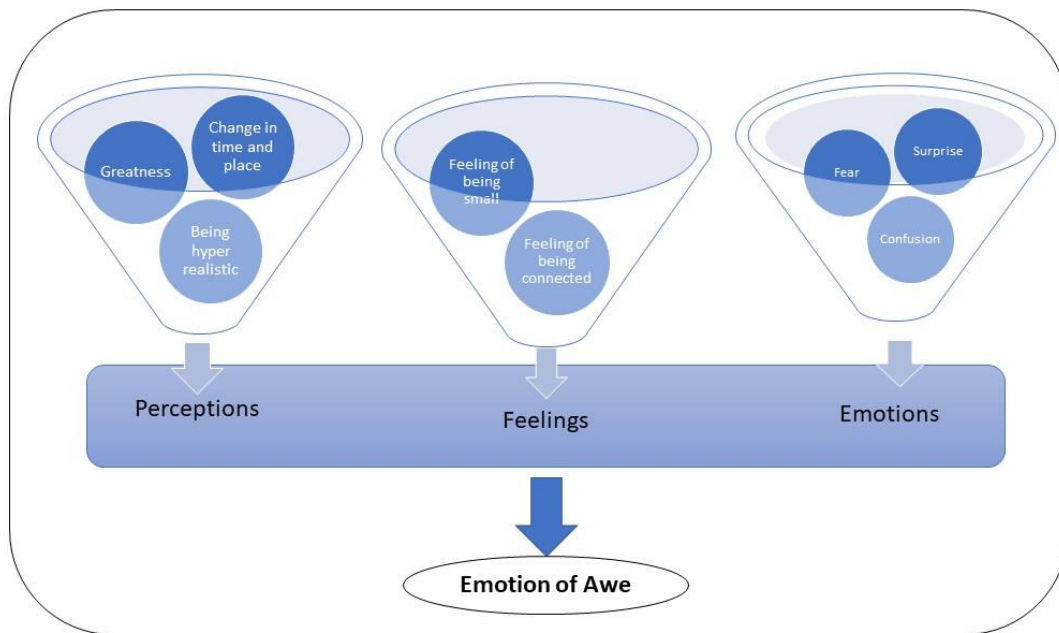
In a similar study, Oleksy & Wnuk (2017) tried to test the potential for improving place attachment, by interacting with places using location-based AR games such as Pokemon Go.

However, because their study was correlational, it did not establish causal relationships between variables and showed only minimal effects of playing Pokemon Go on place attachment. Farnham et al. (2009) investigated the standardised measures of place attachment in a virtual community and found that psychological sense of community profoundly predicted the possibility of technology adoption. According to Plunkett (2011), it is possible to become attached to a virtual environment. Meschtscherjakov et al. (2014), presented the term “mobile attachment” as a bond between individuals and a mobile phone. This research identifies that the emotional connection does not appear between children and the physical object of the mobile device, but to the mobile devices with access to game applications or internet for video streaming and online game.

The concept of place attachment or attachment to the virtual place was found to be a significant concept related to the VR experience in this study. Participants applied three main statements related to this: *“I felt engaged with the content when experiencing this tour”*, *“Visiting Rome was inspiring”*, and *“I felt attached to Rome”* (Appendix F).

#### **5.2.4 Awe**

Overall, some of the sub-themes related to perceptions, feelings and emotions induced by the VR tourism experience were found in the literature, including authenticity, presence and place attachment, as discussed. However, qualitative analysis of data discussed in the previous chapter identified other factors described by participants of this research to express their perceptions, emotions. and feelings. Examining these sub-themes, this section discusses how these concepts are related to a complex emotion, awe (Figure 5.1).



**Figure 5.1. The sub-themes related to awe**

As noted in the previous chapter, one of the perceptions of tourists defining the VR tourism experience was the greatness and vastness of the virtual object or place (Section 4.3.4). This perception correlated to the feeling of being small as another key concept of the VR experience (Section 4.4.2). As a consequence of perceiving virtual objects as huge in size, tourists felt small. These two feeling and perception are highlighted as specific characteristics of awe. According to Shiota et al. (2007), awe is significantly associated with feelings of being small, and sensing the presence of something greater than the self. Scholars note that a virtual stimulus can facilitate the experience of something that is much greater than oneself (Stepanova et al., 2019). According to Keltner & Haidt (2003), this is called “perceived vastness”. In describing this complicated emotion, Shiota et al. (2006) note that it arises when one encounters something strikingly vast in size, scope and complexity. Therefore, the phrases and themes mentioned in Sections 4.4.2 and 4.3.4 are signs of awe as a very complex emotion.

Awe has also been shown to diminish or reduce certain aspects of the self. For example, awe can make individuals feel a perceived reduction in their body size (van Elk et al., 2016). Moreover, from the point of view of participants, awe has been described as reducing one’s “being and goals” (Piff et al., 2015). In the research of Piff et al. (2015) an item used to measure

this was “I feel small or insignificant”. Interestingly, this is the exact statement which was used to describe feelings towards the VR tourism experience in this study (Section 4.4.2). According to van Elk et al. (2016), in four different studies, including lab-based and field experiments, it was found that complex emotions are related to estimating a smaller body size. Stepanova et al. (2019b) highlight that this admiration of vastness is also often related to the realisation of how small each individual human is in relation to the scale of the whole world. These concepts are found to be associated with each other, according to Rauhoeft et al. (2015) “A space is vast if it seems to extend without limits away from you, making you feel like a small element within the space” (p. 52).

To describe vastness, Yaden et al. (2019) refer to one of the main studies regarding awe in literature, that of Keltner & Haidt, (2003). They defined the inducing factors of awe and its key features, demonstrated in a prototype theory consisting of two characteristics. One of these key characteristics of awe is “the perceived vastness”, referring to the powerful force of an emotional stimulus that can destroy or control people’s willpower and make individuals feel small, powerless, and humble. As noted in the previous sections, perceived vastness was found to be connected to the feeling of being small, which is in line with the limited existing literature addressing this concept (Stepanova et al., 2019b). People who watched the earth from space using a virtual reality (VR) simulation reported feelings of awe and feeling small and insignificant in the face of the vast and incomprehensible universe (Bockelman et al., 2013). Yaden et al. (2016) argue that vastness can represent the perceptual vastness, such as experienced when viewing an enormous mountain or a gigantic building. Items to measure vastness include, ‘I feel the presence of something greater than myself’ (Piff et al., 2015). In this study, this was also stated as *impressive scale* (referring to the height of the building) or *experiencing something bigger than us* (Section 4.3.4).

Awe is recognised as one of the most common emotional experiences for tourists (Coghlan et al., 2012). Psychologists depict awe as a positive emotion with two key features (Keltner & Haidt, 2003). First is “perceived vastness” which arises when one encounters something strikingly vast in size, scope, complexity, ability, or number (Shiota et al., 2007). This was found as one of key concepts. Second, is “a need for accommodation” which alters one’s understanding of the world and stimulates new mental schemas (Rudd et al., 2012).

Characteristics of this concept were also found in Study 1. Specifically, perception of being hyper-realistic (Section 4.3.3), emotions of confusion (Section 4.5.1) and surprise (Section

4.5.2) may be related to the need for accommodation. As the last perception of the VR experience, some participants defined this experience to be “hyper-realistic”. The reasons for this perception, according to participants, was “*being beyond understanding of normal life*” or “*being odd*”. These reasons could be linked to the sense of “need for accommodation”. It is defined by Yaden et al., (2019) that as another key characteristic of awe, according to (Keltner & Haidt, 2003) a need for accommodation is the feeling of confusion and surprise when an individual encounters an experience beyond the previous experience or difficult to understand. Many participants applied “surprising” as their perception of the VR experience. One example of an item that has been used to measure the need for accommodation as a feature is, ‘I seek out experiences that challenge my understanding of the world’ (Shiota et al., 2006).

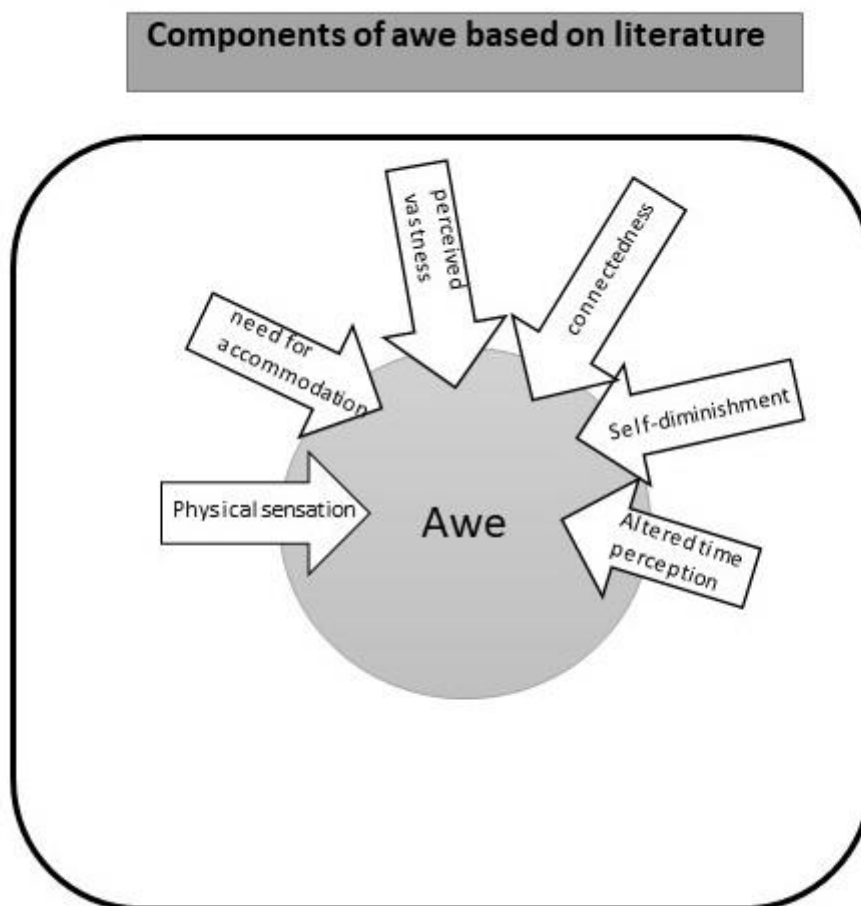
Furthermore, the need for the accommodation component has been related to surprise (Keltner & Haidt, 2003). According to Lorini and Castelfranchi (2007), there may be a link between the need for accommodation and specific concepts of surprise since they can require us to revise our well-established viewpoints.

Participants also reported the sense of fear as their emotion towards the VR experience (Section 4.5.3). Beside the six scales described by Yaden et al. (2019), awe has been defined to reflect by other feeling. According to Harrison (1975), although awe is a primarily positive emotion, it can include the possible exception of feeling stressed or scared. In their research, Yaden et al. (2019) also found that “scared, fearful, afraid” clusters were significantly correlated with the total of the awe experience scales. Furthermore, Keltner & Haidt (2003) have applied “fear” as a characteristic of awe. This result is line with previous studies on fear as an emotion elicited in VR (Susindar et al., 2019).

A feeling of connectedness was also identified by a number of participants (Section 4.4.3). Previous research describes feelings of connection to other people or the environment beyond oneself as one of the characteristics of awe ( Yaden et al., 2017). When awe is induced, participants repeatedly define a deeper sense of connection with other people and things around them (Krause & Hayward, 2015). Connectedness to nature is defined as the degree to which an individual considers themselves a part of nature (Schultz, 2000, 2002). Connectedness differs from immersion, as immersion is a state related to the VR system itself (like resolution, field of view, and sound quality). However, according to James (1985), an example of connectedness is, “*I felt myself one with the grass, the trees, birds, insects, everything in Nature. I exalted in the mere fact of existence, of being part of it all*”. Based on the existing literature, the immersive

capability of VR could lead to the feeling of virtual presence, and this could induce the feeling of connectedness (Yeo et al., 2020). According to Plunkett (2011), virtual worlds can now be presented as an alternative world that can be perceived as very real to consumers. The profound emotion of awe that is experienced in response to witnessing vastness, and that creates the need for accommodation, can lead to restructuring of one's worldview and an increased feeling of connectedness (Stepanova et al., 2019b).

One of the most recent comprehensive studies on awe is that of Yaden et al. (2019). Considering the previous scales proposed by other researchers as characteristics of awe, they have developed a robust state measure of awe naming the Awe Experience Scale (AWE-S), based on the extant experimental literature. The authors revealed a 6-factor structure: altered time perception (F1); self-diminishment (F2); connectedness (F3); perceived vastness (F4); physical sensations (F5); and need for accommodation (F6) (Figure 5.2).



**Figure 5.2. The components of awe according to Yaden et al. (2019)**

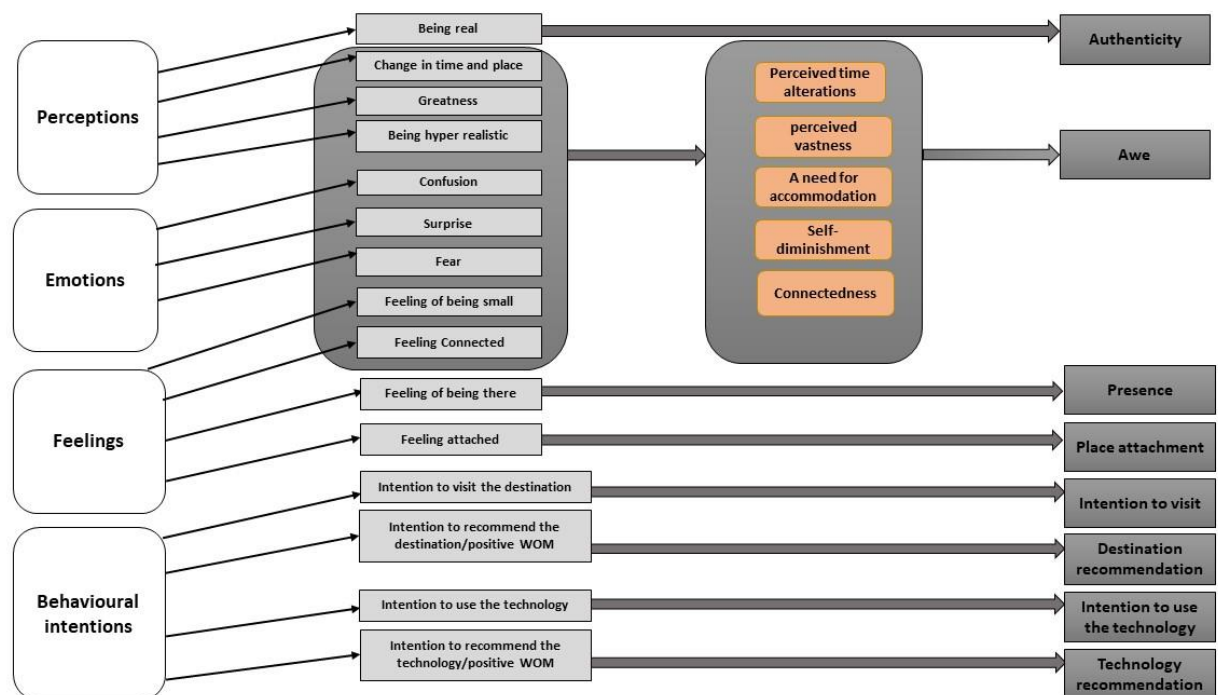
Concepts related to (AWE-S) were also found in this study. Another perception, a change in time and location, was reported by some participants (Section 4.3.2). According to Yaden et al. (2019), this altered time perception relates to the complex emotion of awe and his study assigns a distinction between awe and other emotions, as alterations to such fundamental faculties of consciousness are unusual in the emotion literature. This factor is described as a state in which the sense of self and time is altered. It is also defined as loss of space and time (van Elk et al., 2016). These were recognised as factors of awe according to previous studies (Keltner & Haidt, 2003; David B Yaden et al., 2019).

Although studies regarding awe in relation to VR technologies are rare (Stepanova et al., 2019b), the potential of VR to induce awe in controlled lab conditions through using virtual settings (Chirico et al., 2018) and immersive videos (Chirico et al., 2017) has been confirmed, and scholars were successfully able to elicit a self-reported awe response in some participants.

Some key concepts of awe in the tourism context were also found to be relevant to this study. For instance, powerful feelings of surprise, wonder and connectedness that occur with faced with something vast that exceeds previous knowledge (Keltner & Haidt, 2003). Furthermore, in the field of tourism, empirical research on awe has been carried out by Coghlan et al. (2012) who conducted a qualitative study and found that awe is a positive emotion in the travel experience. Their research identifies three components: 1. physiological response, e.g., shock; 2. comparative uniqueness, e.g., unforgettable; 3 schema-changing for the future, e.g., inspiration. Wang & Lyu (2019) also applied some concepts to explore tourists' experiences of awe: their study identified factors such as "an immediate physiological response (e.g., shock, breath-taking), comparison with past experiences (e.g., unique, unusual), and a future-oriented, schema-changing component (change making, humbling)" (p. 107). Keltner and Haidt (2003) also identified the state of being supernatural as one of themes describing awe. These emotions were also brought up by participants of this study.

Just one scale of awe related to the research of Yaden et al. (2019) was not verbally reported by participants in this study: "physical sensations". The phenomenon of "goose bumps" and chills have been revealed to coincide during experiences associated with awe (Schurtz et al., 2012), and are defined as "physical sensation". For instance, Stepanova et al. (2019b) applied a goose bumps navigation device to investigate awe among participants. However, awe has been also recognised in terms of its relation to facial expressions (Ekman & Friesen, 2003). In

particular, previous studies found some facial expressions linked to awe such as widened eyes and a dropped jaw (Shiota et al., 2003). Yaden et al. (2019) suggest that physical sensations in participants are reportable. According to a lack of facilities, this research did not apply specific devices to investigate goose bumps. Although the participants' observations were not part of the data collection, facial expressions such as participants' dropped jaws were observed many times during the experiment. Participants also used phrases such as "wow" or "amazing" several times during the VR experience, which could be considered as confirming results of previous studies. Overall, expressing feeling towards the VR experience, destination and the specific technology, these statements were applied by participants which guides the analysis to choose "awe" as one of emotions induced by this experience. Figure 5.3 shows how the sub-themes found in the previous chapter connect to different components of awe.



**Figure 5.3. Sub-themes associated with different components of awe**

### 5.2.5 Intention to visit the destination

Intention to visit the destination, as one of the key concepts of the VR tourism experience, was found in Study 1 (Section 4.6.1). The concept was identified as one of the aspects of behavioural intentions of tourists. As noted before, generally, behavioural intention refers to the motivational factors that influence a given behaviour, where the stronger the intention is to perform the behaviour, the more likely the behaviour will be performed (Mamman et al., 2016). In the tourism context, many studies have applied this expression in discussions concerning the intention to visit the destination ( Jeong et al., 2020; Wang, 2017). However, most of the available research has looked generally at factors of behavioural intentions (Kang et al., 2021; Prayag et al., 2013). The results of Study 1 show that there were positive and negative approaches about four factors of behavioural intentions in this study (Intention to visit the destination, Destination recommendation, Intention to use the technology, Technology recommendation). For instance, one tourist intended to visit the destination, however he was not motivated to recommend the destination (P1). Therefore, the four factors of behavioural intentions are being considered as separate variables.

A number of studies have found the effectiveness of VR tours to positively affect the tourists' intentions to visit the destination. In a recent study González-Rodríguez et al. (2020) examined the quality of tourists' experience when visiting a cultural heritage destination, using a tourist product based on a virtual tour. They found the increased demand by tourists to have such an experience in as well as the growing offer on applying VR and AR technologies in the tourism sector.

The common statements participants applied to express their intentions included, *"I felt quite inspired going to Rome after this experience"*, and *"This experience tempted me to visit this destination in near future"*. Similar scales of measuring behavioural intentions are applied in previous studies: *"I intend to visit this destination"* ( Guo et al., 2018; Serra-Cantallops et al., 2018), or *"I am likely to visit this city in the near future"* (Byon et al., 2009).

### 5.2.6 Destination recommendation

To connect potential tourists' perceptions, feeling and emotions to their behavioural intentions towards the destination, a vast majority of sub-themes reported by participants reveals their

intention to recommend the destination and express positive WOM (Section 4.6.2). Recent studies on similar tours confirm this association (Yung et al., 2021b).

The statements involved were “*I would say positive words about this destination*”, and “*I would recommend visiting this destination to friends and others*”, which are also the most commonly used items in previous studies. Some of these studies have found the application of VR technology to result in positive WOM (Jung & Tom Dieck, 2017), and to recommend the destination (Kaur & Kaur, 2020; S. Yang et al., 2020).

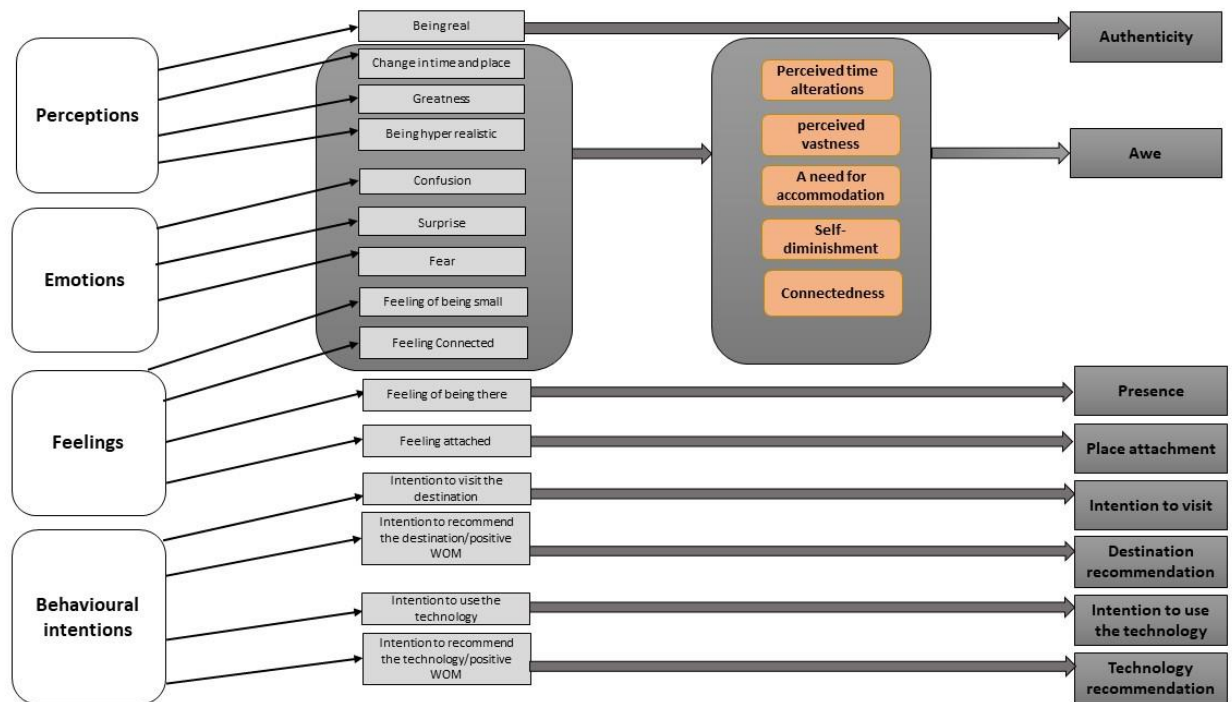
#### **5.2.7 Intention to use the technology**

Other than two tourists who are professional travellers, all other participants intended to use the technology (Section 4.6.3), specifically for travel planning, or choosing tourist attractions. They applied these statements to define their intentions, “*It's worth trying this kind of tour when planning a trip*”, and “*I would definitely like to experience these kinds of tours before choosing my next destination*”. Similar studies have also shown the effect of technology on tourists’ motivation to use the technology (González-Rodríguez et al., 2020).

#### **5.2.8 Technology recommendation**

Tourists showed their high motivation to recommend the technology to others (Section 4.6.4). Some intended to recommend the technology for travel planning to others, and some for the enjoyment of technology usage. They applied these statements or similar ones: “*I would say positive words about this technology*”, and “*I would recommend experiencing these kinds of tour by technology for choosing the future destination*”. Tsai (2010) refers to “recommending using the technology” as a behavioural intention of a technology user.

Overall, the above sections described how the themes and sub-themes turned into variables to be measured. Figure 5.4 visualises this process and shows the sub-themes which were related to the variables.



**Figure 5.4. Themes, sub-themes and their relevant variables**

The following section describes correlations between these variables, to develop the hypotheses.

### 5.3 Development of related hypotheses

The previous section identified variables related to the VR tourism experience. Overall, factors found to be dimensions (key concepts) of the VR experience were: 1. Authenticity, 2. Awe, 3. Presence, 4. Place attachment, 5. Intention to visit the destination, 6. Destination recommendation 7. Intention to use the technology, and 8. Technology recommendation. The following sections identify the hypotheses, based on associations between these variables.

#### 5.3.1 Hypotheses for Authenticity

The concept of authenticity was discovered to be related to the component “awe”. The perception of time alteration was found to be associated with tourists perceiving virtual objects as real (Section 4.3.2). The concepts of perceived vastness and self-diminishment were identified as connected to perceived authenticity (Sections 4.3.4 and 4.4.2). The fact that the VR tourism experience was realistic made tourists feel small and perceive virtual objects as huge. The authenticity was also revealed as prompting the feeling of connectedness, as tourists felt connected to the destination by it being presented as very similar to the real place (Section

4.4.3). Three emotions of fear, confusion and surprise were also found to be associated with authenticity. Their perceived realism was the reason tourists felt fear, as the confusion over the combination of reality and virtuality surprised them. The connections of authenticity to the awe have been also confirmed in the available VR literature (Quesnel and Riecke, 2018). Considering this association, it could be hypothesised that:

*H1: Authenticity will significantly affect awe emotion.*

Furthermore, the authenticity was found to be related to the feeling of “Presence” as another dimension of the VR tourism experience (Section 4.4.1). This correlation was stated by the majority of the tourists and, according to them, the perceived authenticity was a strong predictor for the feeling of being there in the destination. This association was also found in the work of Gilbert (2016a). As reported by tourists, a sense of presence was related to authenticity. In the XR context, when a sense of presence in a VE becomes extreme enough, the user will begin to experience the virtual environment as an actual, physical place and forget that this is a virtual place being viewed via technology (Nicovich, 2017). This study could confirm the link between presence and authenticity which has been confirmed by previous research (Gilbert, 2016b; Kronqvist et al., 2016). Considering this association, the following hypothesis is proposed:

*H2: Authenticity will significantly affect presence.*

Furthermore, authenticity was revealed to be associated with “place attachment” or attachment to the virtual place (Section 4.4.4). Tourists felt attached to the destination as it was realistic. As noted, Wu & Cheng (2018), found the probability of attachment to a virtual place. Another study found a connection between authenticity and attachment to the VR place (Pantelidis, Jung, et al., 2018). Therefore, the following hypothesis is proposed:

*H3: Authenticity will significantly affect attachment to the virtual place.*

Also, authenticity was found to directly influence concepts related to behavioural intentions, including “intention to visit the destination”. The literature also suggests a general association between factors of behavioural intentions with authenticity (Hong, 2021; Li et al., 2016). Perceiving the virtual destination as real motivated tourists to visit the destination. Considering this association, the following hypothesis is proposed:

*H4: Authenticity will significantly affect intention to visit the destination.*

Furthermore, the tourists' perceived realism was the reason for them recommending the destination to others. The fact that this virtual destination was closely resembled a real one, made them state positive WOM about the destination, and increased their intention to suggest this destination to friends and family. Previous studies also found this connection (S. Yang et al., 2020). Thus, this hypothesis is suggested:

*H5: Authenticity will significantly affect intention to recommend the destination.*

Moreover, the authenticity was found to be connected to the tourists' "intention to use the technology". Although their motivation to experience these kinds of tours and technologies differed, they showed a high motivation to use these technologies for travel planning, or fun and enjoyment. This is also has been confirmed in the available literature (Shi, Liu, Kumail, & Pan, 2022). As noted, some available literature also confirms this. Considering this, the following hypothesis is proposed:

*H6: Authenticity will significantly affect intention to use the technology.*

Lastly, tourists showed an intention to recommend the technology to others. This was also found to be connected to their perception of authenticity (Beerends & Aydin, 2021). As this technology provides a close-to-real representation of the destination, they were encouraged to recommend using that to others. Thus, this hypothesis is suggested:

*H7: Authenticity will significantly affect intention to recommend the technology and positive WOM.*

### **5.3.2 Hypotheses for presence**

According to the findings of Study 1, the sense of presence or feeling of being there was correlated to the components of awe. For instance, the feeling of being there in the destination was one of the predictors for the emotion of surprise (Section 4.5.2). The fact that tourists felt as if present in the destination, made them surprised. Although this connection was not found

directly in the available literature, some aspects of awe such as being hyper realistic were related to the sense of presence Yaden et al. (2019). Accordingly, this hypothesis is proposed:

*H8: Presence will significantly affect awe.*

Also, the sense of presence in the destination was connected to participants feeling attached. As stated, (Section 4.4.4), there was an overlap between attachment to the VR place and the destination. However, the fact that tourists felt the real feeling of being there, made them feel attached and bonded to the destination. This relationship also has been found in the previous studies (Wallach, Safir, & Almog, 2009). Thus, this hypothesis is suggested:

*H9: Presence will significantly affect attachment to the virtual place.*

The feeling of presence was found to relate to behavioural intentions towards the technology and the destination. The association between the presence and behavioural intentions, including intention to visit the destination, was discovered in a recent study (Yung et al., 2021b). Therefore, the following hypothesis is proposed:

*H10: Presence will significantly affect intention to visit the destination.*

Furthermore, the feeling of being there was found to be the predictor for recommending the destination. The sense of presence encouraged participants to suggest the destination to others. This connection has been discussed in the recent studies (Jiang, Qin, Gao, & Gossage, 2022). Considering this, the following hypothesis is suggested:

*H11: Presence will significantly affect intention to recommend the destination.*

Moreover, tourists showed motivation to use the technology as they felt they were in the real destination. The relationship between these two has been confirmed in the literature (Jiang, Qin, Gao, & Gossage, 2022). Therefore, the following hypothesis is proposed:

*H12: Presence will significantly affect intention to use the technology.*

Finally, participants felt their presence in the destination, and this increased their intention to recommend the technology to others. Similar to the other factors of behavioural intentions, this is also has been confirmed (Jiang, Qin, Gao, & Gossage, 2022). Therefore, this hypothesis is proposed:

*H13: Presence will significantly affect intention to recommend the technology.*

### 5.3.3 Hypotheses for awe

As described in Section 5.2.4, the components of awe were included in some perceptions, feeling and emotions. The concepts were: perceived time alteration, vastness, self-diminishment, connectedness, and need for accommodation. These concepts combined to create the complex emotion of awe. Therefore, the statements related to all of these concepts were used to measure this emotion. Table 5.2 shows the statements related to every component of awe.

**Table 5.2. Components of awe and participants' statement**

| Components of awe                                  | Participant's statement   |
|--|---|
| Change in time and place / altered time perception | I felt a sudden change in time and place.   |
| Perceived vastness                                 | I felt the presence of something bigger than me (e.g. buildings)  |
| Connectedness                                      | I had the sense of being connected to everything and being one of those people standing in Rome.  |
| Self-diminishment                                  | I felt I was small.   |
| Need for accommodation                             | <p>I felt confused.</p> <p>It was an awkward experience.</p> <p>I was fear.</p> <p>I felt challenged to understand the experience.</p> <p>I felt surprised.</p> |

Also, it was described a correlation between presence and awe, as the components of awe such as connectedness were explored to be related to feeling of presence. Moreover, the results of qualitative data analysis a connection between presence and “attachment to virtual place”.

The components of awe were found to relate to “the attachment to the virtual place”. As an example, “surprise” made participants feel attached to the destination. Therefore, the following hypothesis is proposed:

*H14: Awe will significantly affect the attachment to virtual place.*

Also, components of “awe” and its scales found to be related to the concepts related to behavioural intentions. Some components of awe such as connectedness were tied up to the intention of tourists to visit the destination. In other words, the more they felt connected to destination, they were more motivated to visit that in future. No research was found on the awe affecting intention to visit the destination in technology experiences, however, awe- inspiring experiences has been found positively affective for visiting nature-based tourism destinations. So, this hypothesis can be suggested:

*H15: Awe will significantly affect intention to visit the destination.*

Although Study 1 did not identify a direct association between components of awe, and destination recommendation, or positive WOM, the factors of feelings and emotions were found to be connected to the aspects of behavioural intention. Serra-Cantallops et al. (2018) also found that positive emotional experiences have a positive effect on generating positive WOM. Therefore, this hypothesis is proposed:

*H16: Awe will significantly affect intention to recommend the destination and positive WOM.*

Regarding the factors of behavioural intentions, Study 1 did not find a solid relationship between components of awe and intention to use the technology. However, as in the intention to visit, the feelings and emotions of participants were found to be connected to the factors of behavioural intentions. Although the research on technology has not investigated connections between awe and intention to use the technology, the effects of awe as key concepts of behavioural intentions have been found (Van Cappellen & Saroglou, 2012). Therefore, this hypothesis is proposed:

*H17: Awe will significantly affect intention to use the technology.*

Finally, Study 1 did not find a relationship between components of awe and technology recommendation. The connection between awe and eWOM has been also recently found (Kautish, Purohit, Filieri, & Dwivedi, 2023). Then, according to the fact that that feelings and emotions were connected to behavioural intentions, it can be proposed that:

*H18: Awe will significantly affect intention to recommend the technology and positive WOM.*

### **5.3.4 Hypotheses for place attachment**

The concept of “place attachment” was found to be associated with “behavioural intentions of tourists toward the destination and the technology”. This was found in the qualitative phase of this research (Study 1), and has also been revealed in recent studies Wang et al., 2022).

The concept of attachment to a virtual place or place attachment was also found to be related to participants’ intention to visit the destination. The more they were attached to the destination and found it inspiring, the more they intended to visit the destination. The concept of place attachment has also been identified as connected to visit intention in previous research (Hosany et al., 2020; Jiang et al., 2017). Therefore, this hypothesis is proposed:

*H19: Attachment to the virtual place will significantly affect intention to visit the destination.*

Also, the evidence of place attachment being connected to the intention to recommend the destination was found in Study 1. The fact that participants felt attached to the destination, was a predictor for their intention to state positive WOM to others or recommend the destination. This is also confirmed in a recent research (Geng, Li, Zhang, Jiang, & Xue, 2023). Therefore, this hypothesis is suggested:

*H20: Attachment to the virtual place will significantly affect intention to recommend the destination and positive WOM.*

It was not clear in Study 1 how attachment to the virtual place could affect participants’ intention to use the technology, however, place attachment is found to be associated with the factors of behavioural intentions (Loureiro, 2014). Therefore, this hypothesis can be proposed:

*H21: Attachment to the virtual place will significantly affect intention to use the technology.*

As stated, the evidence of place attachment being associated with the intention to recommend the destination was found in Study 1. This was not clearly found regarding the connection of place attachment to recommend the technology. However, feelings and emotions were connected to behavioural intentions. Also, the literature has found this connection. Therefore, this hypothesis is suggested:

*H22: Attachment to the virtual place will significantly affect the intention to recommend the technology and positive WOM.*

#### **5.4 Development of the conceptual model and the VR tourism experience questionnaire**

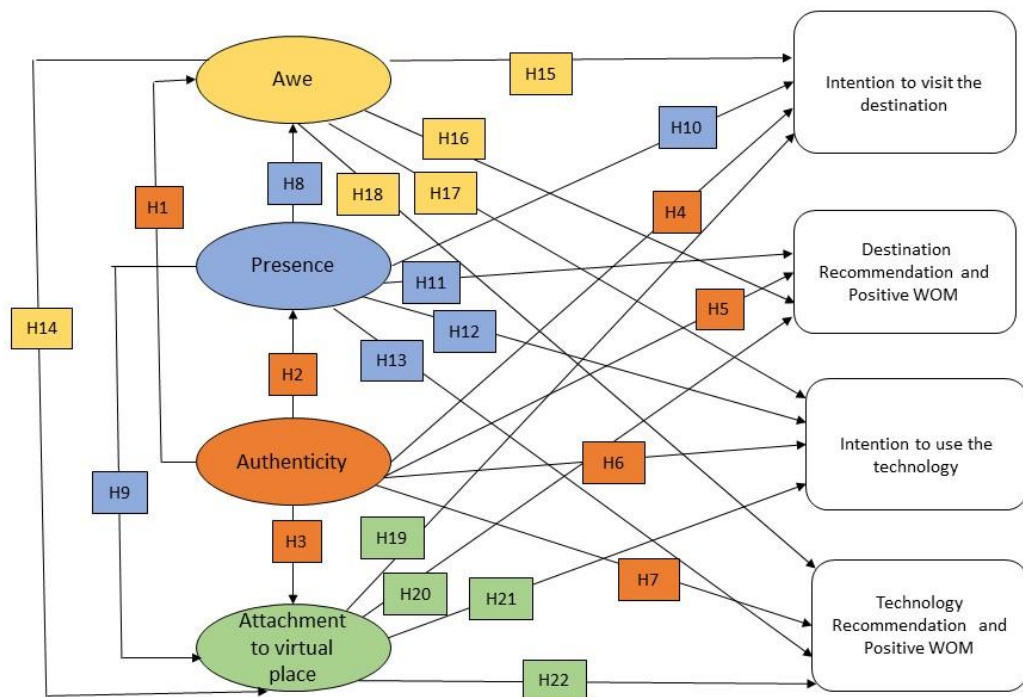
Overall, the previous section discussed associations between the key concepts of the VR tourism experience and provided hypotheses leading to the development of a preliminary conceptual model. Table 5.3 summarises the research hypotheses of this study.

**Table 5.3. Summary of research hypotheses**

| Variable     | Hypotheses   |
|--------------|--|
| Authenticity | <b>H1: Authenticity will significantly affect awe emotion.</b>   |
|              | <b>H2: Authenticity will significantly affect presence.</b>  |
|              | <b>H3: Authenticity will significantly affect attachment to the virtual place.</b>                         |
|              | <b>H4: Authenticity will significantly affect intention to visit the destination.</b>                      |
|              | <b>H5: Authenticity will significantly affect intention to recommend the destination and positive WOM.</b> |
|              | <b>H6: Authenticity will significantly affect intention to use the technology.</b>                         |
|              | <b>H7: Authenticity will significantly affect intention to recommend the technology and positive WOM.</b>  |
|              | <b>H8: Presence will significantly affect awe.</b>   |

|                  |   |
|------------------|---|
| Presence         | <p><b>H9: Presence will significantly affect attachment to the virtual place.</b></p> <p><b>H10: Presence will significantly affect intention to visit the destination.</b></p> <p><b>H11: Presence will significantly affect intention to recommend the destination and positive WOM.</b></p> <p><b>H12: Presence will significantly affect intention to use the technology.</b></p> <p><b>H13: Presence will significantly affect intention to recommend the technology and positive WOM.</b></p> |
| Awe              | <p><b>H14: Awe will significantly affect the attachment to virtual place.</b></p> <p><b>H15: Awe will significantly affect intention to visit the destination.</b></p> <p><b>H16: Awe will significantly affect intention to recommend the destination and WOM.</b></p> <p><b>H17: Awe will significantly affect intention to use the technology.</b></p> <p><b>H18: Awe will significantly affect intention to recommend the technology and positive WOM.</b></p>                                  |
| Place attachment | <p><b>H19: Attachment to the virtual place will significantly affect intention to visit the destination.</b></p> <p><b>H20: Attachment to the virtual place will significantly affect intention to recommend the destination and positive WOM.</b></p> <p><b>H21: Attachment to the virtual place will significantly affect intention to use the technology.</b></p> <p><b>H22: Attachment to the virtual place will significantly intention to recommend the technology and positive WOM.</b></p>  |

Having noted the hypotheses, Figure 5.5 illustrates the research model tested in Study 2. Measuring these relationships, will answer the second sub-question of this research (SQ2), explaining how the VR tourism experience is connected to the behavioural intentions of tourists.



**Figure 5.5.**The primary conceptual research model, including the associated hypotheses

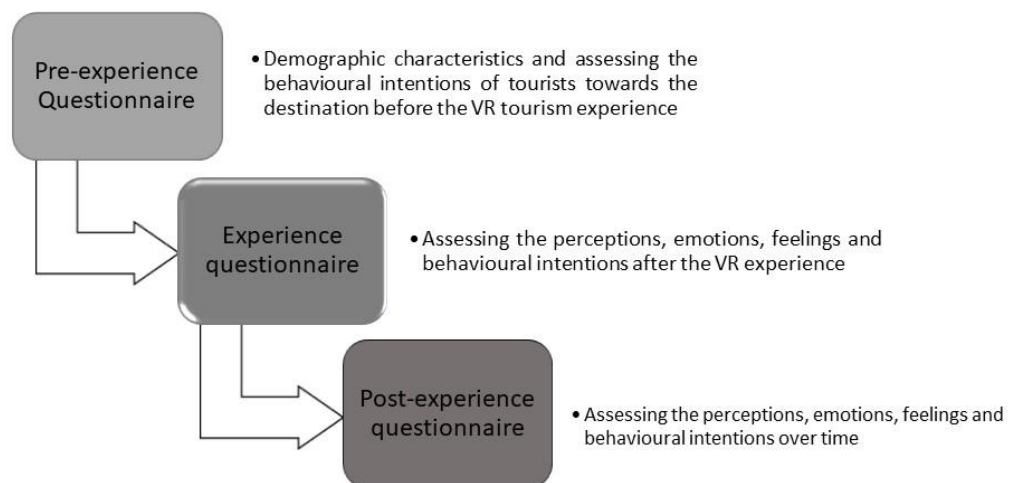
## 5.5 Conclusion

As the second phase of exploratory mixed method design, this chapter included a connective point between Study 1 and Study 2. Specifically, this chapter provided eight variables and 22 hypotheses based on the data analysis of Study 1. The statements noted by participants of the qualitative study provided the items for the research instrument. The association of the concepts related to perceptions, feelings, emotions, and behavioural intentions provided a primary conceptual framework for the VR experience to be tested in Study 2. The next chapter discusses the testing of the hypotheses with a quantitative approach, using a larger sample. Applying a quantitative approach, will provide relationships between the constructs and enable generalisability of the proposed framework with the newly established concepts from Study 1.

## 6. Data analysis and results – Study 2

### 6.1 Introduction

The previous chapter as a connective point between Study 1 and Study 2 defined the related variables, hypotheses and a primary framework to be tested using a quantitative approach and a larger sample. As described in Section 3.5, Study 2 used three questionnaires (Figure 6.1).



**Figure 6.1. Three questionnaires for study 2**

As shown in Figure 6.1, the first questionnaire was a pre-experience questionnaire that was answered before experiencing the VR tour (Section 3.5.2.1). This questionnaire consisted of two parts, one related to demographic characteristics of the participants, and the other included assessing the behavioural intentions of tourists towards the destination before experiencing the tour. The data analysis and results related to this pre-experience questionnaire are discussed in Section 6.2 of this chapter, starting with describing the sample characteristics in Section 6.2.1. Then, to compare the behavioural intentions of participants towards the destination before and after experiencing the tour, the answers to questions of this part of the pre-experience questionnaire will be compared to the responses to similar questions in the experience

questionnaire. This will assist in comparing participants' behavioural intentions before and after the VR tourism experience, to find the influence of technology on their behavioural intentions, including intention to visit the destination, and intention to recommend the destination, or state positive WOM. These results are discussed in Section 6.2.2.

The second questionnaire, the experience questionnaire, was answered immediately after the tour to test the variables and the primary framework for the VR tourism experience (Figure 4.9). The scales, hypotheses and framework were built in Chapter 5. Moreover, the last questionnaire was the same experience questionnaire that was sent emailed to participants one week after the experiment, to assess the durability of their perceptions, emotions, feelings, and behavioural intentions (post-experience questionnaire). Before conducting the SEM analysis for these two questionnaires, some steps were performed. First, the data cleaning and preparation was performed, as described in Section 6.3.1. Second, the Exploratory Factor Analysis (EFA) was applied, which is discussed in Section 6.3.3; followed by Confirmatory Factor Analysis (CFA) for adjusted questionnaire, as described in Section 6.3.4. Then, Section 6.3.5 discusses measurement model assessment for experience questionnaire. Finally, Section 6.3.6 and Section 6.3.7 describe the SEM results for the experience and post-experience questionnaire. Overall, this chapter discusses the results related to the analysis of the pre-experience questionnaire, experience questionnaire, and post-experience questionnaire.

## **6.2 Pre-experience questionnaire**

### **6.2.1 Sample characteristics**

The pre-experience questionnaire included two sections. The first considered the demographic characteristics of the participants. In total, 63 people participated in the experiments (Table 6.1). The profiles of participants are depicted in Table 6.1. Of these, 54% identified as male and 46% as female. The average age of participants was 30-39 years (41%). Thirty one percent were 20-29 years old, and 25% percent were aged between 40-49. Only 1% of participants were over 50. In terms of their education level, 1% had no academic education, 11% were undergraduates, 14% had graduated, and 73% were post-graduate. Furthermore, they were primarily international (61%) in nationality and 31% identified as New Zealanders.

Participants' frequency of travelling (Before Covid), and XR technology experience was assessed via a 6-point Likert rating from "Very often" to "Never". In terms of their frequency of travelling, 12% of participants selected very rarely as frequency of their travelling, 17% as rare travellers, 42% chose occasionally, 25% of them selected often, and 1% chose very often.

Regarding their experience with XR technology, 30% had never used any kind before, 38% had a very rare experience, 20% had used XR rarely, 6% had occasionally used them, and only 1% were frequent users, choosing often.

**Table 6.1. The profile of participants for Study 2**

|   | Number of Participant | Percent |
|---|-----------------------|---------|
| <b>Gender</b>   |                       |         |
| Male  | 34                    | 54%     |
| Female  | 29                    | 46%     |
| <b>Age</b>  |                       |         |
| 18-29   | 20                    | 31%     |
| 30-39   | 26                    | 41%     |
| 40-49   | 16                    | 25%     |
| Over 50   | 1                     | 1%      |
| <b>Education Level</b> (Achieved or currently studying) |                       |         |
| No academic education                                   | 1                     | 1%      |
| Undergraduate   | 7                     | 11%     |
| Graduate  | 9                     | 14%     |
| Postgraduate  | 46                    | 73%     |
| <b>Nationality</b>                                      |                       |         |
| New Zealander   | 24                    | 38%     |
| International   | 39                    | 61%     |
| <b>Frequency of Travelling</b>                          |                       |         |
| Very Often  | 1                     | 1%      |
| Often   | 16                    | 25%     |
| Occasionally  | 27                    | 42%     |

|  |    |     |
|--|----|-----|
| Rarely                                       | 11 | 17% |
| Very Rarely                                  | 8  | 12% |
| <b>Frequency of XR Technology Experience</b> |    |     |
| Very Often                                   | -  | -   |
| Often  | 1  | 1%  |
| Occasionally                                 | 6  | 9%  |
| Rarely                                       | 13 | 20% |
| Very Rarely                                  | 24 | 38% |
| Never  | 19 | 30% |
| Total  | 63 |     |

Table 6.1 shows an approximate equality of gender in the group. The majority of participants were young and almost all were less than 49 years old. This could reflect the interest of this generation compared to those more than 50-year-old. Also, the majority of the participants were educated and most of them were international individuals living in New Zealand. The second section of the pre-experience questionnaire is discussed in the following section.

### 6.2.2 Assessing the behavioural intentions before and after the tour

As noted, a section was included in the pre- experience questionnaire, with questions related to participants' intentions to visit Rome and to recommend it or state positive WOM about it. The goal was to compare these answers to the responses to similar questions after the VR tourism experience. This would help prevent confounding variables interfering in the results of the experience questionnaire, and also assisted in more accurately determining the effectiveness of the VR experience after the participants went through the tour to Rome. The following sections describe the results associated with these factors, before and after the tour.

#### 6.2.2.1 Behavioural intentions towards the destination before the VR experience

The second section of the pre-experience questionnaire comprised four items which are shown in Table 6.2.

**Table 6.2. Descriptive statistics of items related to behavioural intentions before the VR experience**

| N0. | Item   | Extremely agree | Strongly agree | Agree | Slightly agree | Neither agree or disagree | Slightly disagree | Disagree | Strongly disagree | Extremely disagree |
|-----|--|-----------------|----------------|-------|----------------|---------------------------|-------------------|----------|-------------------|--------------------|
| Q1  | As a tourist destination, I consider Rome as my top choice compared to other cities. | -               | 3%             | 12%   | 19%            | 23%                       | 20%               | 17%      | 3%                | -                  |
| Q2  | I have a strong intention to visit Rome in my future trip.                           | -               | 3%             | 14%   | 15%            | 27%                       | 12%               | 23%      | 3%                | -                  |
| Q3  | I would definitely recommend visiting Rome to others.                                | 1%              | 6%             | 19%   | 27%            | 17%                       | 4%                | 15%      | 7%                | -                  |
| Q4  | I would intend to visit Rome when the borders are reopened.                          | -               | -              | 7%    | 11%            | 23%                       | 14%               | 22%      | 20%               | -                  |

Descriptive statistics using SPSS was conducted to analyse this section of the questionnaire. This descriptive analysis of data showed that the majority of participants selected “Neither agree or disagree” or “Slightly disagreed” or more, when they were asked if they considered Rome as their top destination compared to other cities. Also, more than half did not show a strong intention to visit Rome. Regarding considering Rome as one of the top three of their future destinations, there were a wide range of answers: all scales were represented in the answers. However, the majority did not consider Rome as their top destination for when the borders open.

#### **6.2.2.2 Behavioural intentions towards the destination after the VR experience**

To evaluate the behavioural intentions of participants after the VR experience, the items in the experience questionnaire related to the behavioural intentions (including intention to visit the destination, and destination recommendation) were selected to be analysed using SPSS.

As noted before, these items were not the exact items used in the pre-experience questionnaire, as it was not feasible to obtain accurate results of participants' intentions using the same scales. However, descriptive analysis of this section shows the difference in their intentions before and after the experience (Table 6.3).

**Table 6.3. Descriptive statistics of items related to behavioural intentions after the VR experience**

| NO. | Item  | Extremely agree | Strongly agree | Agree | Slightly agree | Neither agree or disagree | Slightly disagree | Disagree | Strongly disagree | Extremely disagree |
|-----|---|-----------------|----------------|-------|----------------|---------------------------|-------------------|----------|-------------------|--------------------|
| Q1  | I felt quite inspired to go to Rome after this experience.          | 14%             | 46%            | 22%   | 10%            | 6%                        | -                 | 1.6%     | -                 | -                  |
| Q2  | This experience tempted me to visit this destination in the future. | 16%             | 48%            | 27%   | 6%             | 3%                        | -                 | -        | -                 | -                  |
| Q3  | I would recommend visiting this destination to friends and others.  | 22%             | 38%            | 22%   | 15%            | 1%                        | -                 | -        | -                 | -                  |
| Q4  | I would say positive words about this destination.                  | 17%             | 33%            | 31%   | 12%            | 1%                        | -                 | 3%       | -                 | -                  |

Descriptive analysis of these items, as shown in Table 6.3, found that there is a strong behavioural intention towards the destination after the VR tourism experience. Among 63 participants, only 3 participants selected “Neither agree or disagree”, and one disagreed that they felt quite inspired to go to Rome after this experience. Also, except for 3% of the participants, all the others were tempted to visit this destination in the future. Finally, the vast majority intend to recommend this destination and state positive WOM about it.

## **6.3 Experience questionnaire and post-experience questionnaire**

### **6.3.1 Data screening and preparation for SEM analysis**

Before conducting any analysis, it is crucial to examine and understand the data. Firstly, the data was checked for typical issues such as errors, non-response bias, and missing data. Also, the reverse coding of cleaned and negatively-worded scale items was performed. Then, a second check was performed on completed online surveys to ensure that there were no missing values or inconsistent responses from respondents. Frequency tables were also conducted by descriptive analysis and no missing values were found.

A data screening exercise was also conducted in order to determine how the data were distributed (J. Wilson et al., 2010). In parametric statistics, data is assumed to have originated from a probability distribution, and parameters are inferred from the distribution parameters. Specific assumptions tested for a normal distribution of the data sets related to the experience and post-experience questionnaire. Skewness and Kurtosis criteria were used to evaluate the normality of data distribution in SPSS. Skewness is a measure of the symmetry or asymmetry of a distribution function, and kurtosis is the height of a distribution. Skewness evaluates the asymmetry of a distribution, while Kurtosis investigates the degree to which scores cluster in tails of a distribution (Hair et al., 2009). The values for asymmetry and kurtosis between -2 and +2 are considered acceptable in order to prove normal univariate distribution (George, 2011). For example, the Skewness and Kurtosis of the Q1 item was equal to (0.844) and (-0.467), respectively, and because these values were in the range (2, -2), the Q1 variable was normal in terms of Skewness and Kurtosis, and its distribution was symmetric. In terms of elongation, the variable distribution of Q1 was normal. The same can be interpreted for other items. According to the aforementioned scholars, a data is set out to be normally distributed when the Skewness and Kurtosis ratings are within the +2 to -2 range. This analysis showed the normality of the data. For instance, the Skewness for Q1 was at -1.3 and the Kurtosis was at 0.27.

### **6.3.2 Common method variance**

Common method variance (CMV) is the correlation between two variables due to the fact that the variables are measured using the same method (Tehseen et al., 2017). CMV is “variance that is attributable to the measurement method rather than to the constructs the measures represent” (Podsakoff et al., 2003, p. 879). The CMV effect creates a false sense of internal consistency, i.e., a perceived correlation between variables that does not exist. In this case, if

respondents tend to answer survey questions consistently, self-report data can result in false correlations. It is therefore possible for common methods to generate both Type I and Type II errors by causing systematic measurement errors (Change et al., 2010).

CMV was addressed in several ways. First, the strategies were applied to stop the issues of self-reports data interfering the survey design. To avoid implying that one response is superior to another, the questionnaire was designed in such a way that it was used socially acceptable responses; avoided vague concepts; kept questions simple, specific, and concise; avoided double-barreled questions; decomposed questions that involve multiple options; and avoided complicated syntax.

Second, Harman's one factor test was used to assess CMV (Tehseen et al., 2017). In theory, this test assumes substantial common method bias accounts for the relationships between variables. Then, all the items should be analysed together in a factor analysis to determine that one factor accounts for most of the variance. Harman's one-factor test was conducted for all 25 items, and the results of the unrotated factor solution were assessed for both data sets. Each single factor had a variance of 30.330% and 28.989% for the experience and post-experience questionnaire respectively, which was not considered a potential threat because it was far less than the cutoff criteria of 50% (Hair, 2011).

### **6.3.3 Exploratory factor analysis (EFA) for the experience questionnaire**

As the first step for analysis of the experience questionnaire after data cleaning, EFA was applied. As noted, it was necessary to conduct EFA in order to make a series of decisions associated with the choice of the number of factors, regarding which variables to retain. EFA strives to reduce the number of underlying factors in the data, and variables that are redundant or irrelevant should be removed. This process shows which items have the reliability and validity for measuring a construct.

First, the Kaiser-Meyer-Olkin (KMO) measure and the Bartlett's test of sphericity were used to measure the appropriateness of each EFA. Then EFA using the Varimax rotation method was undertaken for each group of components to find how variables in each component group were categorised.

The factor analysis was conducted in order to 1. identify and describe underlying structures and 2. reduce the total number of items while maintaining as much of the overall factor structure as possible. To achieve these aims, Varimax rotation was selected as the specific

approach for these analyses. All combinations of principle component analysis, principal axis factoring, and maximum-likelihood factor analyses, each with Varimax and Oblimin rotations were used to test for fundamental differences in interpretations.

The results of principal component analysis, principal axis factoring, and maximum likelihood factoring with Varimax and Oblimin rotations were nearly equal, and specific factor loadings were the only differences. Next, the results regarding the principal component analysis with varimax rotation are presented.

From the results of Study 1, a total of eight variables were identified, including Authenticity (AU), Presence (PR), Awe (AWE), Place attachment (PA), Intention to visit the destination (IV), the destination recommendation (DR), Intention to use the technology (IUT), and the technology recommendation (TR). SPSS 23 statistical software was used to identify the dimensions of the eight main components groups.

In total, the data of 63 participants for 25 items was included. The KMO-test produced a score of 0.77 which indicates “merituous” adequacy for factor analysis (Kaiser, 1974). Bartlett’s test indicated a significance of  $<0.001$ , meaning the variables are not orthogonal and common factors are likely. It is recommended that the Kaiser-Meyer-Olkin Measure of Sampling Adequacy is equal to, or greater than, 0.70 (Hoelzle & Meyer, 2013; Lloret et al., 2017), with values less than .50 generally considered unacceptable (Hair, 2011). In this case, the sample used was adequate to proceed with EFA. Also, Bartlett’s test of sphericity is considered as significant ( $p < 0.05$ ).

The rotated component matrix was used to assess the factor loadings of the three items of authenticity which they were 0.78, 0.88, and 0.85. The rotated component matrix of the two items of presence was 0.54 and 0.66.

However, the rotated component matrix used to assess the factor loadings of the nine scales of awe showed that a number of the items were problematic. The awe-factor solutions had some factors that were ill-defined, had low loadings or few items, indicating that fewer factors may be more appropriate. All EFA results are shown in Appendix J: AWE5 (“I felt confused”) did not appear to be related to any of the components; AWE6 (“It was an awkward experience”) resulted in low loading on two components; AWE8 (“I felt fear”) seems to associate with a component other than awe; and AWE9 (“I felt challenged to understand the XR experience”) showed a negative value. This indicated that there was a need to eliminate some measurement

item when analysing factors. The items were eliminated one by one to see if deleting these items resolved the issues. Removing these items showed that the other five items of awe components are well-suited, in combination with acceptable loading.

The rotated component matrix of the scales of intention to visit were 0.77 and 0.64. The rotated component matrix of the scales of destination recommendation were 0.70 and 0.64. The rotated component matrix of scales of intention to use the technology were 0.58 and 0.61. The rotated component matrix of scales of destination recommendation were 0.64 and 0.69. Overall, 21 items for the experience questionnaire were selected to proceed with data analysis by applying CFA.

#### **6.3.4 Confirmatory factor analysis (CFA) for adjusted experience questionnaire**

The CFA process determines whether the hypothesised structure provides a good fit to the data, or in other words, that a relationship between the observed variables and their underlying latent, or unobserved, constructs exist (Child, 1990). CFA will also verify that all items are properly aligned with the correct components that are being measured. The assessment of CFA in Smart-PLS for each element proceeds as follows: 1. Factor Loading, 2. Validity, and 3. Reliability.

First, CFA was established to assess and test the reliability and validity. As the EFA and CFA could not be performed for the same set of data, the data from the post-experience questionnaire was applied for accomplishing the CFA.

##### **6.3.4.1 Factor loading**

The latent construct of a measurement item is stated to be unidimensional if all of the measuring items have acceptable factor loadings. The loadings should be 0.5 or higher (Kock, 2014). Factor loading illustrates how well an item represents the underlying construct. Also, the ideal number for factor loading is recommended to be over 0.70, although scholars frequently report weaker factor loadings ( $<0.70$ ) in social science studies (Vinzi et al., 2010).

It is recommended that the items with factor loading less than 0.3 should be deleted one by one. The factor loadings between 0.40 and 0.70 should be considered for removal only if the deletion leads to an increase in composite reliability and average variance extracted (AVE) is above the suggested threshold value (Hair, 2009). The factor loadings between 0.40 and 0.70 are satisfactory if removing these items does not result in an increase in the reliability of the model (Hair et al., 2011). As shown in Table 6.4, all the factor loadings for items exceeded 0.5, which is a recommended value for exploratory research according to Kock (2014).

**Table 6.4. Factor loading for items (CFA)**

|     | AU    | Awe   | DR    | IV | PA    | PR    | DR    | IUT   | TR    |
|-----|-------|-------|-------|----|-------|-------|-------|-------|-------|
| Q1  | 0.774 |       |       |    |       |       |       |       |       |
| Q2  | 0.889 |       |       |    |       |       |       |       |       |
| Q3  | 0.888 |       |       |    |       |       |       |       |       |
| Q4  |       |       |       |    |       | 0.888 |       |       |       |
| Q5  |       |       |       |    |       | 0.928 |       |       |       |
| Q6  |       | 0.687 |       |    |       |       |       |       |       |
| Q7  |       | 0.753 |       |    |       |       |       |       |       |
| Q8  |       | 0.593 |       |    |       |       |       |       |       |
| Q9  |       | 0.828 |       |    |       |       |       |       |       |
| Q12 |       | 0.575 |       |    |       |       |       |       |       |
| Q15 |       |       |       |    | 0.674 |       |       |       |       |
| Q16 |       |       |       |    | 0.910 |       |       |       |       |
| Q17 |       |       |       |    | 0.847 |       |       |       |       |
| Q18 |       |       | 0.953 |    |       |       |       |       |       |
| Q19 |       |       | 0.952 |    |       |       |       |       |       |
| Q20 |       |       |       |    |       |       | 0.953 |       |       |
| Q21 |       |       |       |    |       |       | 0.952 |       |       |
| Q22 |       |       |       |    |       |       |       | 0.945 |       |
| Q23 |       |       |       |    |       |       |       | 0.942 |       |
| Q24 |       |       |       |    |       |       |       |       | 0.958 |
| Q25 |       |       |       |    |       |       |       |       | 0.964 |

#### **6.3.4.2 Validity**

The next factor in CFA that should be assessed is validity. Latent construct validity involves an instrument's ability to measure what is intended to be measured. Two types of validity for each measurement were conducted including convergent and discriminant validity.

##### *Convergent Validity*

Convergent validity can be established when all items in a measurement model are statistically significant. It is also possible to verify convergent validity by computing the AVE for each construct. To achieve this validity, AVE should be at least 0.5. The Table shows that the AVE for all items was higher than 0.5. The values of AVE also exceed the value of 0.5 ( Hair et al., 2021). The results for AVE, shown in Table 6.5, are higher than 0.5, which confirms the convergent validity.

**Table 6.5. The reliability and validity factors**

| Construct  | Cronbach's Alpha | rho_A | AVE   | CR    |
|------------|------------------|-------|-------|-------|
| <b>AU</b>  | 0.808            | 0.839 | 0.729 | 0.885 |
| <b>AWE</b> | 0.747            | 0.811 | 0.589 | 0.825 |
| <b>PA</b>  | 0.748            | 0.818 | 0.663 | 0.854 |
| <b>PR</b>  | 0.782            | 0.805 | 0.819 | 0.901 |
| <b>IV</b>  | 0.881            | 0.953 | 0.891 | 0.942 |
| <b>DR</b>  | 0.874            | 0.875 | 0.888 | 0.941 |
| <b>IUT</b> | 0.865            | 0.866 | 0.881 | 0.937 |
| <b>TR</b>  | 0.908            | 0.913 | 0.915 | 0.956 |

*Discriminant validity*

The discriminant validity test was conducted to determine the distinction among all the constructs used in this study ( Anderson & Gerbing, 1988). The Heterotrait-monotrait (HTMT) ratio of correlations was used to test the discriminant validity of the constructs (Henseler et al., 2015). The HTMT criterion for assessing discriminant validity is considered a superior and

more conservative test. Table 6.6 shows the results of the discriminant validity. Based on Table 6.6, all the HTMT criterion values are less than 0.85, as per Kline's (2015) recommendations.

**Table 6.6. Discriminant Validity (HTMT)**

|     | AU    | AWE   | DR    | IUT   | IV    | PA    | PR    | TR |
|-----|-------|-------|-------|-------|-------|-------|-------|----|
| AU  | -     | -     | -     | -     | -     | -     | -     | -  |
| AWE | 0.468 | -     | -     | -     | -     | -     | -     | -  |
| DR  | 0.293 | 0.239 | -     | -     | -     | -     | -     | -  |
| IUT | 0.450 | 0.155 | 0.406 | -     | -     | -     | -     | -  |
| IV  | 0.409 | 0.294 | 0.710 | 0.469 | -     | -     | -     | -  |
| PA  | 0.537 | 0.518 | 0.651 | 0.723 | 0.686 | -     | -     | -  |
| PR  | 0.778 | 0.730 | 0.343 | 0.289 | 0.304 | 0.541 | -     | -  |
| TR  | 0.490 | 0.378 | 0.613 | 0.750 | 0.521 | 0.773 | 0.459 | -  |

The second criterion for assessing the discriminant validity was Fornell-Lacker criterion (Ab et al., 2017) (Table 6.7). The correlation between latent constructs and the square root of the average variance extracted is calculated in this method. Rather than explaining variance of another latent construct, a latent construct should explain variance of its own indicator. The square root of each construct's AVE should be higher than its correlation with other latent constructs (Leguina, 2015). Overall, discriminant validity was accepted for this measurement model and also supports the discriminant validity between the constructs.

**Table 6.7. Discriminant Validity (FL)**

|     | AU           | AWE          | DR           | IUT          | IV           | PA           | PR           | TR           |
|-----|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| AU  | <b>0.849</b> | -            | -            | -            | -            | -            | -            | -            |
| AWE | 0.416        | <b>0.699</b> | -            | -            | -            | -            | -            | -            |
| DR  | 0.263        | 0.245        | <b>0.942</b> | -            | -            | -            | -            | -            |
| IUT | 0.368        | 0.086        | 0.355        | <b>0.939</b> | -            | -            | -            | -            |
| IV  | 0.371        | 0.277        | 0.613        | 0.419        | <b>0.944</b> | -            | -            | -            |
| PA  | 0.47         | 0.466        | 0.547        | 0.579        | 0.618        | <b>0.814</b> | -            | -            |
| PR  | 0.622        | 0.613        | 0.287        | 0.248        | 0.278        | 0.456        | <b>0.905</b> | -            |
| TR  | 0.439        | 0.351        | 0.546        | 0.666        | 0.477        | 0.643        | 0.406        | <b>0.957</b> |

#### 6.3.4.3 Reliability

“Reliability is the internal consistency and stability over time of the measuring instrument” (Cavana et al., 2001, p. 461). The measurement model for reliability was evaluated through AVE, CR (Composite reliability), and CA (Cronbach alpha). As can be seen in Table , in the values of CR, CA, all variables are greater than their recommended values of 0.7, and the values of AVE also exceed the value of 0.5 ( Hair et al., 2021). The results are shown in Table . Also, rho\_A was reported to assess construct reliability. As recommended by Ngan & Khoi, (2019) rho\_A must be greater than 0.5: all the items were confirmed to be acceptable in this regard.

Overall, the results of CFA confirmed the reliability and validity of the questionnaire items. The following section (6.3.5) describes the measurement model for the experience questionnaire. The results of the measurement model were used to create a structural model in order to measure the strength of the theorised relationships for both the experience and post-experience questionnaire in Sections 6.3.6 and 6.3.7.

### 6.3.5 Measurement model assessment for the experience questionnaire

To complete the assessment of the structural model, it was necessary to test the reliability and validity of the latent variables that must be reported when using the PLS-SEM technique.

Accordingly, the outer model loadings, reliability and validity are reported in Table 6.8.

As can be seen in all the outer loadings four items exceeded the value of 0.5 recommended for exploratory research, according to Kock (2014). The only item less than this was Q8 which can be retained, according to Kock (2014).

The results for convergent and discriminant validity are reported to confirm the validity of the measurement model. The results for convergent validity included assessing the AVE which, was higher than 0.5 for all items.

The measurement model for reliability was evaluated through AVE, CR and CA. As can be seen in Table , for the values of CR and CA, all variables are greater than their recommended values of 0.7, and the values of AVE also exceed the value of 0.5 ( Hair et al., 2021). The only construct that has AVE less than 0.5 was awe. However, according to Lam (2012), as CR was greater than the acceptable level of 0.6, the internal reliability of the measurement items is acceptable.

**Table 6.8. The reliability and validity factors for the experience questionnaire**

| Construct | Items  | Outer Loading | Cronbach's Alpha | rho_A        | AVE          | CR           |
|-----------|--|---------------|------------------|--------------|--------------|--------------|
| AU        | The VR experience felt genuine.  | 0.790         | <b>0.796</b>     | <b>0.799</b> | <b>0.711</b> | <b>0.881</b> |
|           | The whole experience was very realistic.   | 0.885         |                  |              |              |              |
|           | The virtual objects felt very natural.   | 0.853         |                  |              |              |              |
| AWE       | I felt a sudden change in time and place.  | 0.748         | <b>0.742</b>     | <b>0.792</b> | <b>0.581</b> | <b>0.821</b> |
|           | I felt the presence of something bigger than me (e.g. Buildings)                                 | 0.728         |                  |              |              |              |
|           | I felt I was small.  | 0.590         |                  |              |              |              |
|           | I had the sense of being connected to everything and being one of those people standing in Rome. | 0.776         |                  |              |              |              |

|     |   |       |              |              |              |              |
|-----|---|-------|--------------|--------------|--------------|--------------|
|     | I felt surprised.   | 0.885 |              |              |              |              |
| PA  | I felt engaged with the content when experiencing this tour.                                    | 0.712 | <b>0.757</b> | <b>0.803</b> | <b>0.675</b> | <b>0.860</b> |
|     | Visiting Rome through this tour was inspiring.  | 0.917 |              |              |              |              |
|     | I felt attached to this destination.  | 0.819 |              |              |              |              |
| PR  | I felt like I was actually in Rome.   | 0.917 | <b>0.794</b> | <b>0.950</b> | <b>0.821</b> | <b>0.901</b> |
|     | In this computer-generated world, I had the feeling of “being there” in the destination.        | 0.819 |              |              |              |              |
| IV  | I felt quite inspired going to Rome after this experience.                                      | 0.964 | <b>0.895</b> | <b>0.860</b> | <b>0.903</b> | <b>0.949</b> |
|     | This experience tempted me to visit this destination in the near future.                        | 0.937 |              |              |              |              |
| DR  | I would say positive words about this destination.  | 0.947 | <b>0.867</b> | <b>0.877</b> | <b>0.882</b> | <b>0.938</b> |
|     | I would recommend visiting this destination to friends and others.                              | 0.931 |              |              |              |              |
| IUT | It's worth trying this kind of tour when planning a trip.                                       | 0.877 | <b>0.772</b> | <b>0.800</b> | <b>0.812</b> | <b>0.896</b> |
|     | I would definitely like to experience these kinds of tours before choosing my next destination. | 0.924 |              |              |              |              |
| TR  | I would say positive words about this technology.   | 0.938 | <b>0.872</b> | <b>0.874</b> | <b>0.887</b> | <b>0.940</b> |
|     | I would recommend experiencing these kinds of tours for choosing the future destination.        | 0.945 |              |              |              |              |

Table 6.9 shows the results of the discriminant validity. Based on this table, all the HTMT criterion values are less than 0.85, as per Kline’s (2015) recommendations, as in the previous questionnaire.

**Table 6.9. Discriminant Validity (HTMT)**

|    | PA | AU | AWE | DR | IUT | IV | PR | TR |
|----|----|----|-----|----|-----|----|----|----|
| PA | -  | -  | -   | -  | -   | -  | -  | -  |

|            |       |       |       |       |       |       |       |   |
|------------|-------|-------|-------|-------|-------|-------|-------|---|
| <b>AU</b>  | 0.707 | -     | -     | -     | -     | -     | -     | - |
| <b>AWE</b> | 0.678 | 0.669 | -     | -     | -     | -     | -     | - |
| <b>DR</b>  | 0.829 | 0.47  | 0.378 | -     | -     | -     | -     | - |
| <b>IUT</b> | 0.36  | 0.418 | 0.292 | 0.361 | -     | -     | -     | - |
| <b>IV</b>  | 0.803 | 0.599 | 0.551 | 0.627 | 0.418 | -     | -     | - |
| <b>PR</b>  | 0.524 | 0.746 | 0.645 | 0.225 | 0.138 | 0.384 | -     | - |
| <b>TR</b>  | 0.742 | 0.45  | 0.521 | 0.74  | 0.677 | 0.404 | 0.198 | - |

Also, Fornell-Lacker criterion was used to confirm the discriminant validity as shown in Table 6.10.

**Table 6.10. Discriminant Validity (FL)**

|            | <b>PA</b>    | <b>AU</b>    | <b>AWE</b>   | <b>DR</b>    | <b>IUT</b>   | <b>IV</b>    | <b>PR</b>    | <b>TR</b>    |
|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>PA</b>  | <b>0.821</b> | -            | -            | -            | -            | -            | -            | -            |
| <b>AU</b>  | 0.571        | <b>0.843</b> | -            | -            | -            | -            | -            | -            |
| <b>AWE</b> | 0.587        | 0.608        | <b>0.794</b> | -            | -            | -            | -            | -            |
| <b>DR</b>  | 0.672        | 0.387        | 0.350        | <b>0.939</b> | -            | -            | -            | -            |
| <b>IUT</b> | 0.284        | 0.330        | 0.240        | 0.297        | <b>0.901</b> | -            | -            | -            |
| <b>IV</b>  | 0.681        | 0.517        | 0.497        | 0.551        | 0.345        | <b>0.950</b> | -            | -            |
| <b>PR</b>  | 0.456        | 0.688        | 0.548        | 0.214        | 0.122        | 0.370        | <b>0.906</b> | -            |
| <b>TR</b>  | 0.611        | 0.377        | 0.442        | 0.644        | 0.556        | 0.360        | 0.185        | <b>0.942</b> |

### 6.3.6 Structural model assessment for the experience questionnaire

PLS-SEM is normally analysed and interpreted in two stages, which include the analysis of the measurement model, followed by the analysis of the structural model (Amora et al., 2016). CFA was applied to assess the measurement model and the results were described. The

structural model assessment includes assessing the strength and significance of the theorised relationships. This section provides the results of the assessment of the structural models using Goodness-of-fit indices, and also explains the results of hypotheses testing in Table 6.11.

The overall Goodness of fit of the structural model was examined before the hypothesised relationships were assessed. The model fit was assessed using standardised root mean square residual (SRMR) and RMSttheta measures (Henseler et al., 2016). The score of SRMR (RMSttheta) was 0.06 (0.11), which confirmed an adequate fit for PLS path models, as it was less than the recommended score of 0.08 (0.12).

To assess the effect size,  $F^2$  and  $R^2$  were conducted in SmartPLS. As Cohen (1992) recommends, the  $F^2$  value of 0.2 shows a small effect size, 0.15 shows a medium effect size, and 0.35 shows a large effect size. Using Cohen  $F^2$ , the effect of the predictor latent variables was assessed. According to the results, H1, H2, H19, H20, H21 and H22 had a large effect; H3, H8, H9, H14 and H18 had a medium effect; and H4, H5, H6, H7, H10, H11, H12, H13, H15, H16, and H17 had a small effect.

As per Falk & Miller's (1992) guideline,  $R^2$  values should be equal to, or greater than, 0.10. To be considered adequate, variance explained of an endogenous construct must be sufficiently large. The results of  $R^2$  showed that all values were more than 0.10, which can be regarded as adequate.

Then hypothetical relationships were also assessed using SmartPLS 3. Table shows the results of direct effects. The results show that Authenticity had a significant effect on Awe ( $\beta = 0.438$ ,  $t = 3.24$ ,  $p < 0.05$ ) and Authenticity significantly affected Presence ( $\beta = 0.000$ ,  $t = 12.7$ ,  $p < 0.05$ ). Therefore, H1 and H2 were supported. Also, Authenticity was statistically significant in its effect on place attachment ( $\beta = 0.324$ ,  $t = 1.98$ ,  $p < 0.05$ ). However, the hypotheses of H4, H5, H6, H7 were rejected, as the results show that the Authenticity does not affect the intention to visit the destination ( $\beta = 0.19$ ,  $t = 1.08$ ,  $p < 0.05$ ), intention to recommend the destination/WOM ( $\beta = 0.13$ ,  $t = 1.06$ ,  $p < 0.05$ ), intention to use the technology ( $\beta = 0.37$ ,  $t = 1.70$ ,  $p < 0.05$ ), and intention to recommend the technology/WOM ( $\beta = 0.12$ ,  $t = 0.81$ ,  $p < 0.05$ ).

The presence had a significant effect on Awe ( $\beta = 0.24$ ,  $t = 2.00$ ,  $p < 0.05$ ), indicating that H8 was also confirmed. However, presence did affect place attachment ( $\beta = 0.028$ ,  $t = 0.177$ ,  $p < 0.05$ ), the intention to visit the destination ( $\beta = -0.061$ ,  $t = 0.530$ ,  $p < 0.05$ ), intention to recommend the destination/WOM ( $\beta = -0.171$ ,  $t = 1.859$ ,  $p < 0.05$ ), intention to use the

technology ( $\beta = -0.231, t = 0.909, p < 0.05$ ), and intention to recommend the technology/WOM ( $\beta = -0.251, t = 1.092, p < 0.05$ ). Therefore, H9, H10, H1, H12, and H13 were rejected.

Awe was found to have a significant effect only on place attachment ( $\beta = 0.375, t = 2.40, p < 0.05$ ), confirming H14. This, however, means that H15, H16, H17, and H18 were rejected, as awe did not affect the intention to visit the destination ( $\beta = 0.095, t = 0.664, p < 0.05$ ), intention to recommend the destination/WOM ( $\beta = 0.095, t = 0.314, p < 0.05$ ), intention to use the technology ( $\beta = 0.056, t = 0.327, p < 0.05$ ), and intention to recommend the technology/WOM ( $\beta = 0.183, t = 1.251, p < 0.05$ ).

Overall, Place attachment was the only variable that was found to have a significant effect on the intention to visit the destination ( $\beta = 0.545, t = 3.213, p < 0.05$ ), intention to recommend the destination/WOM ( $\beta = 0.703, t = 8.237, p < 0.05$ ), intention to use the technology ( $\beta = 0.144, t = 3.776, p < 0.05$ ), and intention to recommend the technology/WOM ( $\beta = 0.546, t = 4.724, p < 0.05$ ). Therefore, the hypotheses of H19, H20, H21, and H22 were supported.

**Table 6.11. Structural model results (direct relationships) for the experience questionnaire**

|                | Hypothesised Paths              | Beta Coefficient | Standard Deviation (STDEV) | T-value | P-Values | Result        |
|----------------|---------------------------------|------------------|----------------------------|---------|----------|---------------|
| H <sub>1</sub> | Authenticity → Awe              | 0.438            | 0.135                      | 3.244   | 0.001    | Supported     |
| H <sub>2</sub> | Authenticity → Presence         | 0.688            | 0.055                      | 12.393  | 0.000    | Supported     |
| H <sub>3</sub> | Authenticity → Place attachment | 0.324            | 0.178                      | 1.98    | 0.001    | Supported     |
| H <sub>4</sub> | Authenticity → Int to visit     | 0.190            | 0.175                      | 1.083   | 0.335    | Not supported |
| H <sub>5</sub> | Authenticity → D recommendation | 0.135            | 0.127                      | 1.064   | 0.245    | Not supported |
| H <sub>6</sub> | Authenticity → Int to use       | 0.373            | 0.219                      | 1.705   | 0.092    | Not supported |
| H <sub>7</sub> | Authenticity → T recommendation | 0.127            | 0.158                      | 0.801   | 0.335    | Not supported |
| H <sub>8</sub> | Presence → Awe                  | 0.247            | 0.123                      | 2.002   | 0.050    | Supported     |

|                       |                                     |        |       |       |       |               |
|-----------------------|-------------------------------------|--------|-------|-------|-------|---------------|
|                       |                                     |        |       |       |       |               |
| <b>H<sub>9</sub></b>  | Presence → Place attachment         | 0.028  | 0.158 | 0.177 | 0.859 | Not supported |
| <b>H<sub>10</sub></b> | Presence → Int to visit             | -0.061 | 0.254 | 0.530 | 0.606 | Not supported |
| <b>H<sub>11</sub></b> | Presence → D recommendation         | -0.171 | 0.092 | 1.859 | 0.049 | Not supported |
| <b>H<sub>12</sub></b> | Presence → Int to use               | -0.231 | 0.254 | 0.909 | 0.336 | Not supported |
| <b>H<sub>13</sub></b> | Presence → T recommendation         | -0.251 | 0.230 | 1.092 | 0.28  | Not supported |
| <b>H<sub>14</sub></b> | Awe → Place attachment              | 0.375  | 0.159 | 2.401 | 0.010 | Supported     |
| <b>H<sub>15</sub></b> | Awe → Int to visit                  | 0.095  | 0.144 | 0.664 | 0.520 | Not supported |
| <b>H<sub>16</sub></b> | Awe → D recommendation              | -0.051 | 0.162 | 0.314 | 0.746 | Not supported |
| <b>H<sub>17</sub></b> | Awe → Int to use                    | 0.056  | 0.171 | 0.327 | 0.756 | Not supported |
| <b>H<sub>18</sub></b> | Awe → T recommendation              | 0.183  | 0.146 | 1.251 | 0.221 | Not supported |
| <b>H<sub>19</sub></b> | Place attachment → Int to visit     | 0.545  | 0.170 | 3.213 | 0.000 | Supported     |
| <b>H<sub>20</sub></b> | Place attachment → D recommendation | 0.703  | 0.085 | 8.237 | 0.004 | Supported     |
| <b>H<sub>21</sub></b> | Place attachment → Int to use       | 0.144  | 0.185 | 3.776 | 0.001 | Supported     |
| <b>H<sub>22</sub></b> | Place attachment → T recommendation | 0.546  | 0.115 | 4.724 | 0.000 | Supported     |

After the data for the post-experience questionnaire was analysed, the same procedure for the post-experience questionnaire after one week was used to analyse the data.

### 6.3.7 Structural model assessment for the post-experience questionnaire

Results from the measurement model were applied to conduct the structural model that tested the strength and significance of the theorised relationships. This section provides the results of the assessment of the structural models using Goodness-of-fit indices and also explains the results of hypotheses testing in Table 6.12.

The overall Goodness of fit of the structural model was examined before the hypothesised relationships were assessed. The model fit was assessed using standardised root mean square residual (SRMR) and RMSttheta measures (Henseler et al., 2016). It was the same model as the previous one, and the score of SRMR (RMSttheta) was 0.06 (0.11), which confirmed an adequate fit for PLS path models, as it was less than the recommended score of 0.08 (0.12).

Like the previous questionnaire, to assess the effect size  $F^2$  and  $R^2$  were conducted in SmartPLS. As per Falk & Miller's (1992) guideline,  $R^2$  values should be equal to, or greater than 0.10, to be considered adequate, variance explained of an endogenous construct must be sufficiently large. The results of  $R^2$  showed that all of values were more than 0.10, which can be regarded as adequate.

The results for  $F^2$  and  $R^2$  were similar to the previous questionnaire. As Cohen (1992) recommends, the  $F^2$  value of 0.2 shows a small effect size, 0.15 shows a medium effect size, and 0.35 shows a large effect size. Using Cohen  $F^2$ , the effect of the predictor latent variables was assessed. According to the results, which were exactly as in the previous questionnaire, H1, H2, H19, H20, H21, and H22 had a large effect, H3, H8, H9, H14, and H18 had a medium effect, and H4, H5, H6, H7, H10, H11, H12, H13, H15, H16, and H17 had a small effect.

Then hypothetical relationships were also assessed using SmartPLS. Table shows the results of direct effects. The results show that Authenticity had a significant effect on Awe ( $\beta = 0.43$ ,  $t = 2.23$ ,  $p < 0.05$ ), and Authenticity significantly affected Presence ( $\beta = 0.62$ ,  $t = 7.17$ ,  $p < 0.05$ ). Therefore, H1 and H2 were supported. Also, Authenticity was statistically significant in its effect on place attachment ( $\beta = 0.30$ ,  $t = 1.96$ ,  $p < 0.05$ ). However, all the hypotheses of H4, H5, H6, and H7 were rejected as the results show that Authenticity does not affect the intention to visit the destination ( $\beta = 0.11$ ,  $t = 0.37$ ,  $p < 0.05$ ), intention to recommend the

destination/WOM ( $\beta = 0.03, t = 0.87, p < 0.05$ ), intention to use the technology ( $\beta = 0.16, t = 0.31, p < 0.05$ ), and intention to recommend the technology/WOM ( $\beta = 0.14, t = 0.39, p < 0.05$ ).

The presence had a significant effect on Awe ( $\beta = 0.59, t = 3.89, p < 0.05$ ), indicating that H8 was also confirmed. However, Presence didn't affect the Place attachment ( $\beta = 0.08, t = 0.65, p < 0.05$ ), and the intention to visit the destination ( $\beta = -0.05, t = 0.64, p < 0.05$ ). Therefore, H9, H10 were not supported. The presence did not have a significant effect on intention to recommend the destination/WOM ( $\beta = -0.10, t = 0.54, p < 0.05$ ), and H11 was not confirmed. Also, effectiveness of presence on intention to use the technology ( $\beta = -0.23, t = 0.33, p < 0.05$ ), and intention to recommend the technology/WOM ( $\beta = -0.07, t = 0.60, p < 0.05$ ) was not supported. Therefore, H12 and H13 were rejected.

Awe was found to have a significant effect only on place attachment ( $\beta = 0.28, t = 2.16, p < 0.05$ ), confirming H14. This, however, means that H15, H16, H17, and H18 were rejected as Awe had a negative effect on the intention to visit the destination ( $\beta = 0.03, t = 0.74, p < 0.05$ ), intention to recommend the destination/WOM ( $\beta = 0.06, t = 0.33, p < 0.05$ ), intention to use the technology ( $\beta = 0.03, t = 0.05, p < 0.05$ ), and intention to recommend the technology/WOM ( $\beta = 0.18, t = 0.04, p < 0.05$ ).

Overall, Place attachment was the only variable found to have a significant effect on the intention to visit the destination ( $\beta = 0.61, t = 6.79, p < 0.05$ ), intention to recommend the destination/WOM ( $\beta = 0.55, t = 4.19, p < 0.05$ ), intention to use the technology ( $\beta = 0.62, t = 4.90, p < 0.05$ ), and intention to recommend the technology/WOM ( $\beta = 0.53, t = 5.05, p < 0.05$ ). Therefore, the hypotheses of H19, H20, H21, and H22 were supported (Table 6.12).

**Table 6.12. Structural model results (direct relationships) for the post-experience questionnaire**

|                | Hypothesised Paths              | Beta Coefficient | Standard Deviation (STDEV) | T-value | P- Values | Result    |
|----------------|---------------------------------|------------------|----------------------------|---------|-----------|-----------|
| H <sub>1</sub> | Authenticity → Awe              | 0.438            | 0.139                      | 2.233   | 0.001     | Supported |
| H <sub>2</sub> | Authenticity → Presence         | 0.625            | 0.087                      | 7.172   | 0.000     | Supported |
| H <sub>3</sub> | Authenticity → Place attachment | 0.309            | 0.157                      | 1.976   | 0.049     | Supported |

|                       |                                     |        |       |       |       |                  |
|-----------------------|-------------------------------------|--------|-------|-------|-------|------------------|
| <b>H<sub>4</sub></b>  | Authenticity → Int to visit         | 0.112  | 0.125 | 0.892 | 0.373 | Not supported    |
| <b>H<sub>5</sub></b>  | Authenticity → D recommendation     | 0.039  | 0.142 | 0.275 | 0.783 | Not supported    |
| <b>H<sub>6</sub></b>  | Authenticity → Int to use           | 0.167  | 0.165 | 1.01  | 0.313 | Not supported    |
| <b>H<sub>7</sub></b>  | Authenticity → T recommendation     | 0.149  | 0.175 | 0.850 | 0.395 | Not supported    |
| <b>H<sub>8</sub></b>  | Presence → Awe                      | 0.597  | 0.153 | 3.899 | 0.000 | <b>Supported</b> |
| <b>H<sub>9</sub></b>  | Presence → Place attachment         | 0.087  | 0.195 | 0.447 | 0.655 | Not supported    |
| <b>H<sub>10</sub></b> | Presence → Int to visit             | -0.058 | 0.126 | 0.464 | 0.643 | Not supported    |
| <b>H<sub>11</sub></b> | Presence → D recommendation         | 0.102  | 0.167 | 0.608 | 0.543 | Not supported    |
| <b>H<sub>12</sub></b> | Presence → Int to use               | -0.231 | 0.24  | 0.963 | 0.336 | Not supported    |
| <b>H<sub>13</sub></b> | Presence → T recommendation         | 0.071  | 0.138 | 0.511 | 0.609 | Not supported    |
| <b>H<sub>14</sub></b> | Awe → Place attachment              | 0.285  | 0.132 | 2.163 | 0.031 | <b>Supported</b> |
| <b>H<sub>15</sub></b> | Awe → Int to visit                  | -0.037 | 0.111 | 0.330 | 0.742 | Not supported    |
| <b>H<sub>16</sub></b> | Awe → D recommendation              | -0.067 | 0.18  | 0.417 | 0.677 | Not supported    |
| <b>H<sub>17</sub></b> | Awe → Int to use                    | 0.036  | 0.157 | 0.051 | 0.058 | Not supported    |
| <b>H<sub>18</sub></b> | Awe → T recommendation              | 0.183  | 0.153 | 0.044 | 0.965 | Not supported    |
| <b>H<sub>19</sub></b> | Place attachment → Int to visit     | 0.617  | 0.091 | 6.792 | 0.000 | <b>Supported</b> |
| <b>H<sub>20</sub></b> | Place attachment → D recommendation | 0.554  | 0.132 | 4.191 | 0.000 | <b>Supported</b> |
| <b>H<sub>21</sub></b> | Place attachment → Int to use       | 0.621  | 0.127 | 4.900 | 0.000 | <b>Supported</b> |

|            |                                     |       |       |       |       |                  |
|------------|-------------------------------------|-------|-------|-------|-------|------------------|
| <b>H22</b> | Place attachment → T recommendation | 0.536 | 0.113 | 5.056 | 0.000 | <b>Supported</b> |
|------------|-------------------------------------|-------|-------|-------|-------|------------------|

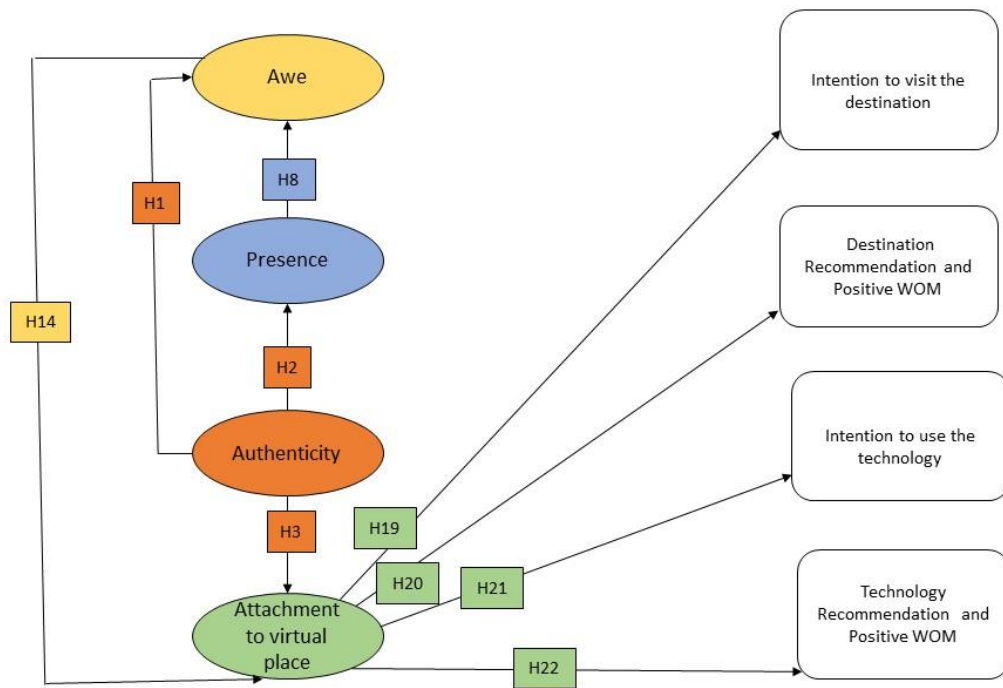
## 6.4 Conclusion

This chapter included the detailed descriptions of the data analysis of Study 2. The results and finding were provided for testing the three research instruments, including the pre-experience questionnaire, experience questionnaire, and post-experience questionnaire.

First, the whole data was imported to SPSS. The descriptive analysis was conducted for the pre-experience questionnaire. Then, the factors related to the behavioural intentions in the experience questionnaire were analysed to be compared to the same factors in the pre-experience questionnaire. This comparison helped in finding the effectiveness of the technology experience on behavioural intentions of participants towards the destination.

Subsequently, data screening and cleaning for both sets of data related to the experience and post-experience questionnaires were conducted before any analysis. Then, EFA and CFA were conducted. The EFA was conducted for the data from experience questionnaire and CFA was performed for the data from the post-experience questionnaire. Finally, SEM analyses were conducted in a two-step analysis of the measurement and structural models for the experience and post-experience questionnaires.

In total, among 22 hypotheses, nine were supported. The results for the structural model related to both the experience and post-experience questionnaires were the same. Figure 6.2 shows the hypotheses that were confirmed, based on the results testing the hypotheses for both the experience and post-experience questionnaires. The analysis of the data in this chapter answered the second sub-question of this research (SQ2), explaining how the VR tourism experience affects the behavioural intentions of tourists. The next chapter discusses the findings related to the results of Study 1 and 2.



**Figure 6.2. VR experience framework for the experience and post-experience questionnaires**

## **7. Discussion of findings**

### **7.1 Introduction**

The present research consisted of two studies to address the research questions and aims. The overall goal of this study was to define a framework for the VR tourism experience. The purpose of this research was accomplished through a sequential exploratory mixed method study designed to address the following guiding research question:

1. What is a framework for the VR tourism experience? (RQ)

To answer this question as the main research problem, two studies were conducted to answer these sub-questions:

2. What are the dimensions and process of the VR tourism experience? (SQ1)
3. How does the VR experience influence behavioural intentions of tourists? (SQ2)

This research was conducted in two phases to provide the basis for answering the main research question. Study results from the first phase directly influenced the variables that were measured during the second phase of the study, as this was a large study with two phases of data collection. This chapter presents and summarises the major findings of this research. The overall discussion of findings results in defining a final VR experience framework which is proposed.

### **7.2 The dimensions and process of the VR tourism experience**

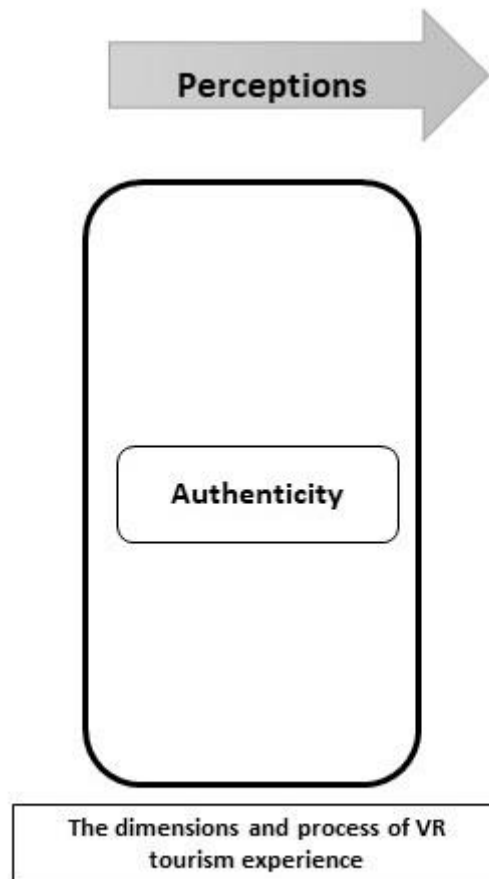
To investigate the dimensions and process of the VR tourism experience, the first phase of this study found eight key concepts known as dimensions of the VR tourism experience. These were identified and included in four categories as the process of this experience: the perceptions, feelings, emotions, and behavioural intentions. Resulting in discovering these dimensions and process based on interviews with a group of participants, a primary conceptual framework was developed. Table 7.1 shows these dimensions and the process.

**Table 7.1. The dimensions and process of the VR tourism experience**

| Perceptions  | Feelings  | Emotions  | Behavioural intentions   |
|--|---|---|--|
| <ul style="list-style-type: none"><li>• Authenticity</li></ul> | <ul style="list-style-type: none"><li>• Place attachment</li><li>• Presence</li></ul> | <ul style="list-style-type: none"><li>• Awe</li></ul> | <ul style="list-style-type: none"><li>• Intention to visit the destination</li><li>• Intention to recommend the destination/</li><li>• positive WOM</li><li>• Intention to use the technology</li><li>• Intention to recommend the technology/positive WOM</li></ul> |

### 7.2.1 Perceptions

The authenticity was found as a perception of the VR tourism experience. Perceptions are different from feelings and emotions, as perceptions are meaning-making; they help us interpret experience and this interpretation is related to how users evaluate the VR experience and think of that experience. The perceptions were the first aspects in the process of the VR tourism experience (Figure 7.1).



**Figure 7.1 The perceptions**

For almost all the tourists, *authenticity* was one of the key concepts and one of the main dimensions of experiencing the VR tour. A level of authenticity is generally considered to refer to what is “real” or “genuine” (Lehman et al., 2019). This concept was strongly evident in the results of Study 1, confirming that perceiving the virtual objects, virtual place, and virtual people as real were the most significant perceptions of tourists experience the VR tour. This raises questions about the different components of the VR tourism experience including the place, virtual objects, or virtual people. The finding showed that referring to the perceived authenticity, some tourists pointed out the destination/VR place. However, some indicated the VR people or objects that were included in the tour. With these results, the spatial components of the VR tourism experience seem to refer to engagement with a place/destination, whereas emotional components of this experience are described by engagement with people or objects.

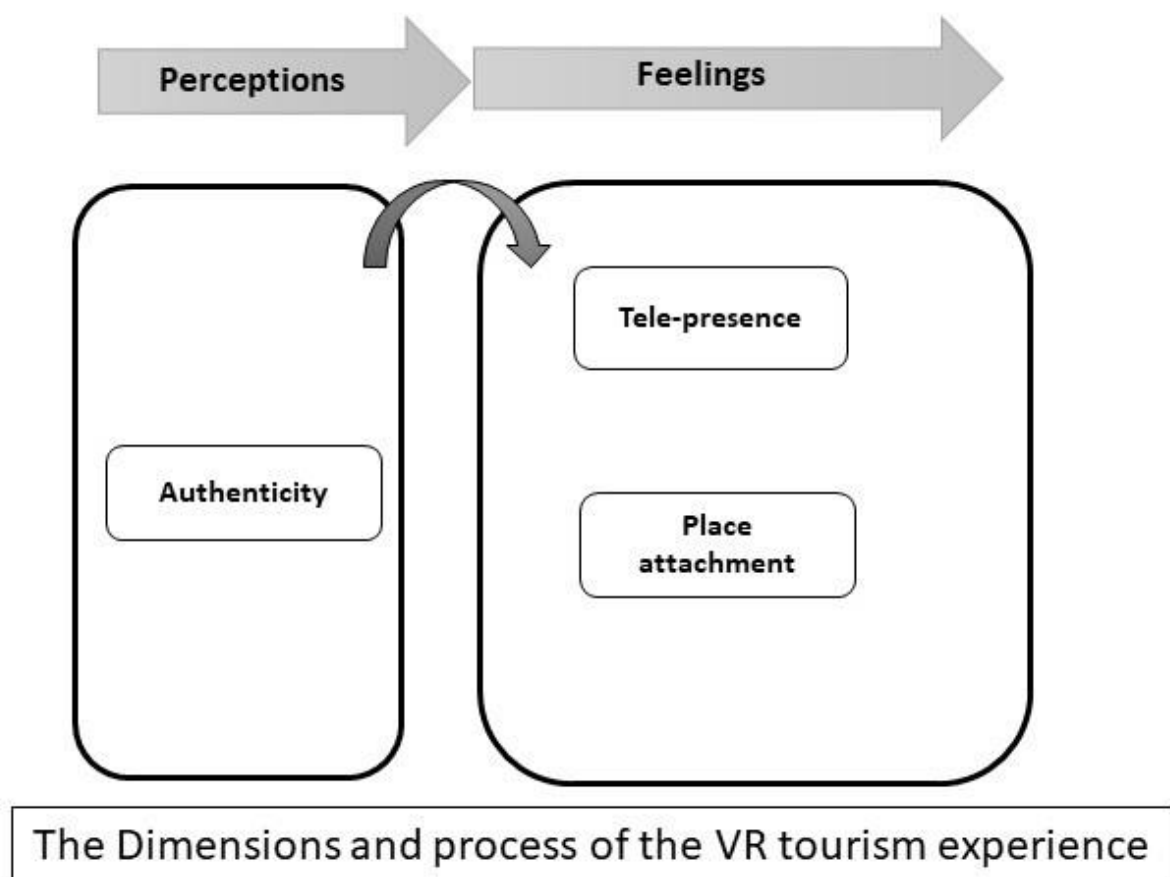
Another interesting finding related to this dimension was its connection to tourists' technology experience. The more tourists had experience with working with technology, the less they perceived the VR tourism experience as real. The findings show that this dimension is much stronger when it comes to early users of technology. Interestingly, this could be related to the sensorial parts of the VR tourism experience and the effects of immersion on perceived authenticity. The current virtual tourism experiences could only provide the stimulation of two senses, including sight and hearing. The participants who had experience with working with these technologies, perceived the VR tourism experience as incapable of providing more realistic multisensorial experiences such as taste and smell. Although tourist experiences have been described extensively from a visual point of view in the tourism literature, the findings of this research show that tourism experiences involve more than just viewing the objects present during a tour. Instead, travellers use all of their senses to experience places while travelling. In this regard, the sensorial aspects of the VR tourism experience related to the sense of immersion can strongly affect the perceived authenticity.

Tourists in the interviews viewed the concept of authenticity as one of the most important factors involved in the VR tourism experience, specifically the way it affected other components of this experience. One interesting finding was that the level of authenticity had a significant impact on almost every aspect of the VR experience. In other words, the level of authenticity seems to strongly affect the level of other dimensions. These results also indicate that the importance of perceived authenticity on behavioural intentions is recognised via the mediating effects of feelings and emotions. The more real participants evaluate the virtual place, object, and people, the more significantly their feelings, emotions, and behavioural intentions were affected. This was found in the pilot study of the qualitative phase (see Section 3.4.4.1) where one aim was to discover the best research tool. Trying different kinds of XR technologies in this pilot study revealed that they induce different levels of authenticity, and this level of authenticity was the predictor for other factors involved in the VR experience, such as the feeling of presence. A mixed reality glass that combines the virtual and real environment was found to induce a reduced level of authenticity, and subsequently did not have much effect on the emotions, feelings and behavioural intentions, compared to a virtual reality headset that provides a completely virtual environment. Therefore, this finding implies the significance of authenticity for the VR tourism experience. Kronqvist et al. (2016) highlight that immersive virtual environments can provide a unique experience if they are realistic enough. The concept

of authenticity has been found as a core concept in several studies investigating virtual tours (Kim et al., 2020; Kronqvist et al., 2016; Mura et al., 2017).

### 7.2.2 Feelings

Two main dimensions of presence and place attachment were found as feelings related to the VR tourism experience (Figure 7.2). As discussed in Chapter 2, Feelings are different from emotions. A feeling is a cognitive response to an emotion and improves the experience, whereas emotions respond to external stimuli in an immediate way. Feelings were discovered to be related to the perceptions of tourists.



**Figure 7.2 The feelings**

One of the significant concepts describing feelings derived from the VR experience, was the “feeling of being there” or the sense of *Presence*. The feeling of being there in the destination,

was discovered as one of the significant dimensions of the VR tourism experience. Interestingly, this feeling was reported by only the tourists that did perceive the VR tourism experience as authentic. This finding highlights the strong association between presence and authenticity. The qualitative analysis revealed that presence and authenticity were influenced by characteristics of the tourists such as their technology experience. Experienced technology users not only perceived the experience as less real, but also felt less of the experience of being in the destination.

There is widespread agreement that presence is the psychological feeling of “being there” specifically in the case of VR and VE (Beck et al., 2019; Tussyadiah et al., 2017; Tussyadiah et al., 2018). As mentioned in the literature, some studies refer to this sense generally, as presence (Yung et al., 2019), some label it tele-presence (Choi et al., 2016), or spatial presence (Hruby et al., 2020). All these concepts mean the user starts experiencing the VE as an actual, physical place and they forget that it is being viewed through a computer device or immersive technology, so they consider it a place (Nicovich, 2017). However, the results of this study indicate that tele-presence is the most appropriate label for this context. According to Rauschnabel et al. (2022a), adding the prefix “tele” highlights the distinction between this kind of presence in the VR experience, from other kinds of presence. Applying presence seems to be a broad term, as it involves several kinds of presence. Also, spatial presence refers to the spatial relationship between the physical and virtual locations in which the user exists. However, telepresence, in this context, refers to the experience of being present via a fully virtual environment (Mantovani & Riva, 1999), which is the best term to describe this feeling in the VR tourism experience. Therefore, the finding of this research expands the knowledge on the terminology of this feeling in this area. In the case of this research, what distinguishes tele-presence from other kinds of presence, is that during this subjective state, tourists experienced a virtual environment that differs from the real world. This is also accompanied by the perception that these are physically existing objects mediating the environment. However, a note of caution is due here since this finding should be investigated in depth due to the complexity of the feeling of presence and its related concepts in literature.

The sense of presence found in this study is defined as a subjective and internal feeling elicited by perceptions. Although there has been confusion between the use of the term immersion and presence in similar studies, the qualitative finding of this study demonstrated that this sense of presence is different from immersion. Immersion to VR systems mainly depends on sensory immersion, which is defined as “*the degree which the range of sensory channel is engaged by*

*the virtual simulation*” ( Kim & Biocca, 2018, p. 95). In contrast to other fields of research (e.g. media communication), this study found that immersion relates to what the technology presents in all sensory and tracking modalities, and that it can be objectively assessed. In contrast, presence describes a subjective state. Therefore, the present study suggests differentiating between these concepts and how they can be assessed. However, findings related to the authenticity and presence imply that immersion and sensorial components of the VR tourism experience significantly affect the factors that were studied in this experience.

When applying and testing different kinds of technologies with various level of immersion at the beginning of Study 1, it was found that the level of immersion influences the feeling of presence (Skarbez et al., 2017). As stated in the finding related to the pilot study, various XR technologies provide different sensory and tracking modalities related to immersion, that affect the perceptions such as authenticity and feelings such as presence. Although the present study focused on subjective dimensions related to the VR experience, some of the issues emerging from this finding relate specifically to the objective perspective of technology experience such as immersion. While immersion was found to refer to “the objective capacity of the technology to deliver sensorial stimulations and movement tracking” (Cadet & Chainay, 2020), it was found to be closely interconnected to the feeling of presence as a subjective reaction to immersion.

As another feeling, ***Place attachment*** was also identified as a dimension of the VR tourism experience. This concept was found to be multi-dimensional, as the attachment was related to both destination and the VR technology. Overlaps between attachment to VR and place revealed that these concepts were indistinguishable in the context of the VR tourism experience.

Only a limited number of studies have investigated the concept of place attachment in a technological context ( Wu & Cheng, 2018). Nevertheless, there is agreement that the concept of place attachment refers to the emotional attachment individuals form to specific places and environments (Eisenhauer et al., 2000; Hidalgo & Hernandez, 2001). Also, scholars highlight that place attachment is defined as “the extent to which an individual values and identifies with a particular environmental setting” (Moore & Graefe, 1994, p. 17).

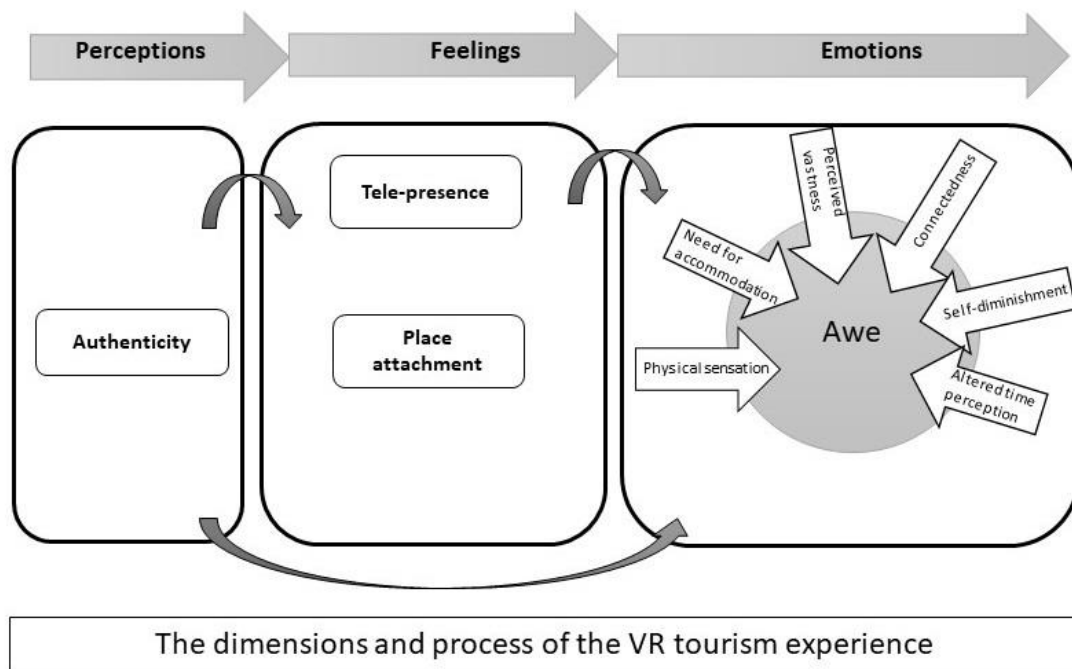
Unlike the significant amount of literature focused on natural places in terms of destination attachment ( Chen et al., 2016; Ram et al., 2016), this study found the significance of this concept in relation to virtual touristic places. This factor was found to be related to the level of

realism or authenticity that the virtual place provides. Furthermore, this VR experience could make tourists more aware of the place, creating a deeper relationship to it. This finding may help us to understand the concept of place attachment in relation to virtual destinations and assist researchers in exploring the tourist's experience in the destination.

Whilst previous studies on VR and place attachment found the relation of this concept with authenticity and intention to visit the destination, the present study expands knowledge of the other fundamental factors to which place attachment is connected. For instance, Farnham et al. (2009) found that the standardised measures of place attachment profoundly forecast the probability of technology adoption and usage in a café. Moreover, the importance of the relationship between technology and place attachment has been indicated by Wu & Cheng (2018), who notes that connecting dimensions of place attachment and technology attachment can assist smart hotel management in developing and implementing market-oriented service strategies to increase the dimensions of technology attachment. The findings of the present study, though, raise intriguing questions about the distinction between the place and attachment in this context, as the qualitative phase of this research found overlaps and a tight correlation between these two concepts.

### **7.2.3 Emotions**

Another process in VR tourism experience was found to be related to the emotions and Awe was discovered as another dimension of this experience (Figure 7.3).



**Figure 7.3 The emotions**

The analysis of qualitative results also found a series of perceptions, feelings and emotions that were considered negative or positive. Few previous studies indicate that technology usage can lead to both positive and negative emotions such as Shank, (2014). These include *Altered time perception (Change in time and place)*, *Perceived vastness* and *Being hyper-realistic* as evaluation and perceptions of tourists of the VR experience. *Self-diminishment (Feeling of being small)* and *Connectedness (Feeling connected)* were found as feelings towards VR experience, and *Need for accommodation (Confusion, Fear and Surprise)* as emotions derived by this experience. These eight concepts were found to be related to a complex emotion labelled *Awe*. Surprisingly, the research findings reveal that some of the perceptions, emotions and feelings can combine to describe one complex emotion, awe.

#### *Perceptions related to awe*

First, it was found that participants felt a sudden change in terms of time and place while experiencing the VR tour. This altered time perception was found as a component of awe in the research of Yaden et al. (2019). The authors describe this concept as the sense of self and time being altered. They use “*I felt my sense of time change*”, or “*the time was expanded*” as

scales for measuring altered time perception. This statement and similar ones were stated in relation to this perception by tourists. According to Yaden et al. (2019), these perceived alterations indicate a distinction between awe and other emotions as, in the literature on emotion, there is no evidence of such fundamental faculties of consciousness. One surprising aspect of this finding was that this concept was discovered as time appeared to pass more slowly than in reality, according to the tourists. However, previous studies in the context of VR, have argued that people who experience flow, experience time distortions, losing sense of time after undergoing an experience and perceiving it as passing quickly (Fang & Huang, 2021). Unlike previous studies, this research found that the VR experience can generate the perception of time passing more slowly, rather than more quickly. This finding could expand our knowledge on the difference between perceived time alterations as components of awe and flow, that make users feel that time passes quickly ( Kim et al., 2020).

Second, as another component of awe, perceived vastness was found, as participants reported evaluating virtual objects as huge. This concept was found in the study of Keltner & Haidt (2003), referring to anything that is experienced as being larger than the self. The scholars state that this aspect of awe arises when one faces something spectacularly vast in size, scope or complexity (Shiota et al., 2006). In the field of VE, this dimension of awe was also explored (Chirico et al., 2017). The findings suggest that the concept of self-diminishment and perceived vastness could be strongly correlated, as feeling of being small may increase the perception of the virtual object vaster and more gigantic than in reality.

Third, the aspect of being hyper-realistic was found as another perception associated with elements of awe in previous studies ( Yaden et al., 2016). This feature has been found among other features related to awe (Alzahrani, 2020). The distinction between this concept and perceived authenticity seems to be complex: this concept could be associated with combining perceived realism with a logical evaluation of the mind that reminds the users that these objects are virtual. It is important to recognise that being hyper-realistic and authenticity seem to be separate factors: first, the fact that tourists perceive virtual objects as real was conventional and normal to them, however, these virtual objects being hyper-realistic, caused confusion regarding how to distinguish virtual objects from real ones. The impacts of perceived authenticity were found to predominantly positive, such as the feeling of being there, and connectedness. However, the effects of perceiving the experience and virtual contents as hyper-realistic, led to negative aspects of the experience such as confusion and fear.

### *Feelings related to awe*

Fourth, self-diminishment or the feeling of being small was found as feelings derived from the VR tourism experience. Previous literature notes that at the level of the bodily self, awe can reduce the sense of one's own body size (van Elk et al., 2016). Scales found in this study align with those used in previous studies to measure items such as 'I feel small or insignificant' (Piff et al., 2015). As stated, this concept was associated with perceived vastness, as perceiving virtual objects as large can prompt users to feel small. The findings showed that these two concepts were strongly interconnected in the context of the VR tourism experience. This affected the perception of self's body, making tourists feel smaller than they actually are, and resulting in perceiving the VR connects as vast and complex.

Connectedness was also found as another component of awe. This feeling has been established as associated with the VR experience and an increased feeling of connectedness (Stepanova et al., 2019b). This construct is also a difficult cognitive construct to objectively measure (Stepanova et al., 2019b). Feelings of connection to other people and the environment beyond oneself are a feature in experiences of awe (Stellar et al., 2018). These feeling of connectedness are found to strongly associated with perceived authenticity; the more tourists evaluated the VR experience and its components as real, the greater they felt connected to them. Although this concept seems to overlap with place attachment and distinctions between some sub-themes are not generally sharp, this study showed that, despite the close connection of these two concepts, they are distinct. Connectedness was found in the extent to which tourists felt themselves a part of the virtual people in the tour, however, place attachment was associated with the emotional bond between the tourist and that destination.

### *Emotions related to awe*

Last, three emotions were found in study 1: Confusion, Fear and Surprise were found to be components of the need for accommodation (Figure 5.3). This refers to various emotions raised by people such as disorientation, fear, humility and confusion (Alzahrani, 2020). The concept of fear specifically was related to the part of the VR experience that participants experienced in an air balloon above the city. A possible explanation for this might be related to their fear of height, and the perceived authenticity that can prompt increased fear. However, this finding raises the question as to how much this fear could be associated with an acrophobia. The potential reason for this acrophobia may be linked to perceived hyperrealism and the negative aspects of that.

The concept of confusion was related to participants' mental evaluation of the complexity of this experience. This factor possibly also comprises a variety of other negative emotions. This confusion was, however, found to be low in those that had more experience with the technology, compared to participants who were experiencing it for the first time. This difference could be attributed to their level of technology experience. The confusion was also found to be associated with perceived authenticity or being hyper-realistic, as this made users feel confused about distinguishing between reality and virtuality.

There were a wide range of causes for the emotion of surprise. It was mainly related to the expectations of the tourists experiencing this VR tour. The present study, though, suggests that tourists do differentiate between the level of surprise, depending on their perception of authenticity. It means that the more they perceive virtual objects, people and place as real, the higher their level of surprise was. Also, it was discovered to be related to other components of awe such as being hyper-realistic and perceived time alteration. There are likely other causes for this emotion that can be related to the level of presence. Although it is difficult to explain the predictors for surprise, it was most likely related to authenticity. Interestingly this emotion was much more intense when experienced by early users of the technology. In other words, frequent users of these technologies did not find the VR tourism experience or its components to be surprising.

These findings all accord with our earlier observations, that showed that vastness and accommodation are found as the fundamental factors associated with awe-inspiring stimuli (Alzahrani, 2020). At the cognitive level, the component of need for accommodation has been related to surprise in previous research (Keltner & Haidt, 2003). Specifically, it may be possible to identify a link between the need for accommodation, and specific concepts of surprise (Lorini & Castelfranchi, 2007). Keltner and Haidt (2003) also suggest that accommodation often includes confusion and vagueness; and for Pearsall (2007) fear is described as components of the complex emotion of awe.

Awe, as an understudied positive emotion (Agate, 2010), is found to be conceptually challenging to describe, for many, including scholars (Hicks, 2018). Hicks (2018) confirms this ambiguity by finding 108 numerous overlapping terms associated with awe in literature.

However, Chirico & Yaden (2018), emphasise that, although awe is considered an emotion with fuzzy boundaries, there are some stable central core dimensions related to this emotion. First, awe often involves both positive and negative concepts (Gordon et al., 2017). In the

current findings of this study, positive concepts such as perceived vastness were found in conjunction with the negative concepts such as confusion and fear.

Second, awe has significant potential to be placed as a border between an emotional state and an altered state of consciousness, as it can change the senses of time, space, and self. For example, the sense of self has been empirically shown to diminish the experience of awe, while the sense of connectedness increases it (Piff et al., 2015). This alteration in time and place was also found in the findings.

Additionally, this study found vastness and the need for accommodation as the concepts related to awe. Scholars refer to the first as a dimension associated with the perception of stimuli as perceptually or conceptually vast. The second factor also refers to altering mental schemas according to new incoming information. Elements of novelty and surprise are also involved in this dimension (Chirico & Yaden, 2018).

Compared to other stimulus, VR has been revealed as a new method that is effectively able to induce the multifaceted and intense emotional experience of awe, even in a highly controlled laboratory (Chirico & Yaden, 2018). One of the reasons for this effect could be related to VR enhancing the intensity of emotional states through a peculiar experience of the sense of presence or feeling of being there in a virtual or real environment, alongside the ability to engage personal intentions within it (Waterworth et al., 2015).

The potential of immersive technology to induce complex emotions has been explored in other perspectives (Kitson, Prpa, & Riecke, 2018), despite not being addressed in the VR tourism experience research. Previous studies in the psychology context have found that VR technology is able to provide individuals with an exceptional medium to design for and study awe-inspiring experiences (Chirico et al., 2016). Scholars have also found that experiencing immersive VR technology can produce the emotion of awe, as this profound emotion can lead to a restructuring of one's worldview, and an increased feeling of connectedness (Stepanova et al., 2019b).

Overall, the present study suggests that awe and its components are found as dimensions of the VR experience. Although there are some similarities between awe components and other available concepts in literature, the main concepts that were found in this study are substantially associated with the emotion of awe. This is one of the main findings of this research. The interesting finding related to this emotion is that it embraces some of the perceptions, emotions,

and feelings. Although these concepts can be defined separately as other dimensions of the VR tourism experience, they may be combined to form this complex emotion. Also, this study appears to be the first to acknowledge the connection between this emotion and tourists' behavioural intentions in relation to the VR tourism experience.

To connect this complex emotion to other dimensions of the VR experience, the research findings reveal a connection between components of awe and behavioural intentions. Generally, awe is considered as a positive emotion of particular relevance for tourism, however literature on its behavioural outcomes is rare (Wang & Lyu, 2019). Nevertheless, awe is found to positively impact consumers' purchasing decisions (Alzahrani, 2020), and the travel experience of tourists (Coghlan et al., 2012), and increase tourist satisfaction (Powell et al., 2012).

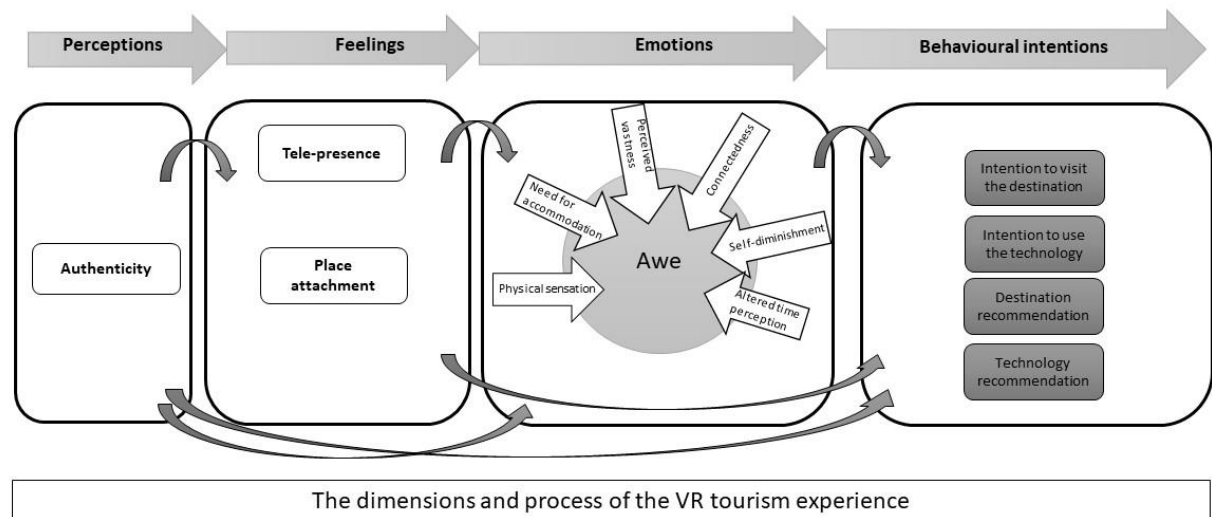
Also, the findings suggest an association between presence and components of awe. Although there is no study available confirming this connection, previous research found a causal relationship of presence and fear responses. The results of this study revealed the higher presence ratings in the height situation compared to the neutral control situation, the more fearful participants were. Presence, as a psychological construct that refers to the sense of being there in a virtual environment, is widely agreed to significantly influence the strength of elicited fear responses, however, causality is still debatable (Gromer et al., 2019). Also, this combination of findings related to awe provides some support for the conceptual premise that aforementioned components (including authenticity and place attachment) were connected to other dimensions of the VR tourism experience. The emotions of surprise and fear, feelings of self-diminishment, and connectedness, were interestingly found to be connected to perceived authenticity. The fact that tourists perceived the VR experience and its components as real, led to the mentioned emotions and feelings related to awe. Also, the components of awe such as connectedness were closely associated with place attachment. However, this finding also raises questions about the similarity between these concepts (connectedness and place attachment). The sub-themes related to these aspects were found to be similar, which raises this question. The complexity of awe and its components was one of the main findings involved in the VR tourism experience. This factor is not explicitly mentioned in any of the other frameworks related to the VR tourism experience and appears to be discovered as a new concept in this study.

#### 7.2.4 Behavioural intentions

The last dimension of the VR experience found in Study 1 relates to *behavioural intentions* (Figure 7.4). This dimension of the VR experience has been found in previous research. This study found four factors related to behavioural intentions, including intention to visit the destination, intention to recommend the destination or state positive WOM, intention to use the technology, and intention to recommend the technology or state positive WOM. A recent VR study confirmed these relationships (Kim et al., 2020). The qualitative data found the association of authenticity, awe and presence and place attachment to the behavioural intentions of tourists. However, it also raised the question that every one of these are connected to which factors of behavioural intentions. Also, according to the findings, it was identified that the VR tourism experience is capable of changing behavioural intentions of tourists, as noted by participants conveying their intentions to visit the destination, before and after the tour.

The most interesting findings related to the association between behavioural intentions and tourists' characteristics. Those categorised as 'professional travellers' did not intend to use the technology for travel planning, as they believed that some physical travel experiences cannot be replaced or experienced using such technologies. They identified some limitations of the VR trips, such as the lack of sensorial factors such as sense of smell. These findings imply that the progress in technologies that provide VR tourism experiences will enable to change the behaviour of tourists.

Also, most of the tourists were interested to use this tour as a short experience related to the destination. Although some of them noted the application of these technologies during the pandemic, it was also noted that some participants preferred corporeal travel over virtual forms of tourism, even when technology develops and is able to offer complex sensory experiences.



**Figure 7.4 Behavioural intentions**

Additionally, tourists did not consider these technologies as a viable replacement for real travel. The findings also suggest that the intention to use these technologies decreased dramatically among the professional travellers. Although the main negative emotions were found to be related to the physical limitations of the technology, including the physical discomfort also found in other technology studies (Murauer et al., 2018), two other negative points were related to the travel experience and the technology experience. The present study suggests that the VR tourism experience, does not significantly affect behavioural intentions of tourists classed as frequent travellers, or those with experience using XR technologies.

Furthermore, this study expands the knowledge related to other bodies of literature including education and learning, consumer behaviour, and psychology. Within the realm of education, this study highlighted the exponential growth in the adoption of VR technologies over the past twelve years. This surge, driven in part by the integration of wearable devices, has shown great promise in enhancing learning experiences. However, it also revealed a notable gap in the swift implementation and customisation of these technologies for educational purposes. This VR technology experience increasingly integrated into the learning process (Shevchuk & Oinas-Kukkonen 2020), offering tourists immersive and interactive experiences that bridge the gap

between theory and practice. The findings showed that integration of VR technology experience in education holds transformative potential, empowering tourists to understand complex subjects more effectively. For instance, the findings confirmed the results of previous studies which identified the hyperreal appearance of VR experience in the context of experiential education (Schott & Marshall, 2021). Specifically, the interactive VR experiences was found to enable service providers to create diverse learning opportunities, from virtual trips to sophisticated simulations, fostering engagement and facilitating the learning process of tourists. These findings expand our knowledge on effectiveness of VR in presenting numerous opportunities to enhance learning experiences (Y. Tan et al., 2022).

In the realm of marketing and consumer behaviour, this study highlighted the promising prospects of VR in delivering satisfactory consumer experiences. Consumer behaviour, a complex field encompassing a wide range of decisions and actions, was explored, emphasising the role of technology, particularly in the tourism sector. The finding confirms the significant role of technology in various consumption-related tasks, and the review shed light on the evolving patterns of consumer behaviour, including factors such as motivation, decision-making, preferences, and satisfaction (Alcañiz et al., 2019). Despite being a well-researched domain, the findings also pointed out a scarcity of comprehensive reviews on consumer behaviour in the tourism field. This highlighted the need for further research in areas such as group decision-making, under-studied consumer segments, cross-cultural considerations, emotions, and instances of consumer misbehaviour.

Finally, the finding of this research expands the knowledge on the intersection of technology and psychology. It emphasised the advantages of employing virtual environments (VEs) in psychology, where VR stands as a prominent subfield within immersive technologies. Specifically, the psychological reactions to the VR tourism experience and its potential impact on human interaction and behaviour, travel motivation, decision-making, choice preferences, destination image, and satisfaction, both before and after travel were the significant psychological factors which were confirmed (Li & Cao, 2022).

In summary, the comprehensive literature review presented in this discussion chapter served as a foundation for understanding the evolving landscape of technology applications in education, consumer behaviour, and psychology. These insights provided a crucial backdrop for the subsequent analysis and discussions regarding the implications and future directions of these technologies in this study.

Overall, the present study has identified the dimensions of the VR tourism experience and the process that distinguished the steps involved in this experience. The first dimension of the VR experience focuses on perceptions; this part focuses on different evaluations that may contribute to users' experience of VR. The second part includes the feelings and emotions that arise due to the VR tourism experience, and the last part includes different behavioural intentions towards the destination and the technology. The next step in defining a framework for the VR experience focuses on the connections of all of these concepts to explain the influence of the VR experience. Previous studies found some of these factors, however, this new framework provides a basis for potentially all relevant concepts that other models do not consider. Moreover, it has a strong structure connecting these different factors.

This VR experience framework had two key characteristics that further support its use in this field of study. First, it was based on, and developed via entirely empirical basis, rather than relying on the preconceptions of the researcher. This provides a strong groundwork for further empirically informed adjustments, to ensure that the framework represents factors that are relevant to this experience, and for research on the effects of the VR experience on tourists' behaviour. Second, the factors found in this study attempted to consider all relevant aspects.

Together, these factors make this framework a promising new tool to distinguish and describe how the VR experience affects tourists' behaviour, and to understand their different experiences. Using this framework may help to enhance the comparability and robustness of research findings, and to better understand the impacts of the VR tourism experience.

There are two main uncertainties remaining regarding this framework. First, there are concepts regarding the negative and positive perceptions, emotions and feelings which were combined to represent the complex emotion of awe. These factors were tied to the specific items in the questionnaire, and the subsequent quantitative measurement and analysis was necessary to test these. The concepts of behavioural intentions were generally found in this study, however the indicators that connect the factors of perceptions, emotions and feelings to behavioural intentions remain unclear. Therefore, the factor structure adopted for the framework in this study needs to be confirmed or modified in further research.

Overall, by investigating the dimensions and process of the VR tourism experience, this study found the key concepts and steps involved in this experience. This finding, while preliminary, suggests new surprising concepts such as awe and its components, changes our understanding

about some concepts in the literature (such as place attachment), and expands the knowledge on some correlations between concepts such as feelings and emotions.

In summary, the dimensions and process of the VR tourism experience were identified. Specifically, authenticity, awe, presence, place attachment, intention to visit the destination, destination recommendation, intention to use the technology, and technology recommendation were found as the main concepts. The associations between these concepts were the next step of this research which answers the next sub-questions of this research (SQ2). The questionnaire should be a particular focus in order to discover these associations. The current VR experience framework needs to be quantitatively tested to determine relationships between the perceptions, feeling, emotions, and behavioural intentions. Furthermore, some of the items associated with awe were necessary to be tested using a larger sample.

### **7.3 The impacts of the VR tourism experience on behavioural intentions**

The second broad aim of this research was to investigate the relationship between the dimensions, to describe how the VR experience changes the behavioural intentions of tourists, and to test the preliminary VR experience framework. To do this, a longitudinal study was conducted, in which participants completed instruments measuring the perceptions, feeling, emotions and behavioural intentions towards the VR tourism experience. There were a variety of findings that fall into four categories: authenticity, presence, awe and place attachment are core concepts linked to behavioural intentions of tourists. To enable a more accurate understanding of the relationships between these concepts to the behavioural intentions of tourists, and find the impacts of the VR tourism experience, three questionnaires were included:

#### *Pre-experience questionnaire*

- Part 1 involved measuring the behavioural intentions of tourists towards the destination, before and after the VR experience. The findings helped in assessing the behavioural intentions, using technology intervention to find the effectiveness of the VR tourism experience.

#### *Experience questionnaire*

- Part 2 included testing the whole VR experience framework.

#### *Post-experience questionnaire*

- Part 3 involved testing the same framework after one week to measure the durability of perceptions, feelings, emotions, and behavioural intentions.

To answer the second sub-question and main question of the research, and to conclude the thesis, the next section revisits the major research findings regarding these three parts.

### 7.3.1 Part 1 – Testing the behavioural intentions before and after the VR experience

The pre-experience questionnaire in the quantitative phase of this research included items investigating the behavioural intentions of tourists towards the destination *before* the VR experience. The main objective for this part was to be compared to responses regarding the behavioural intentions of tourists towards the destination *after* the VR experience.

Interesting, this comparison revealed a drastic rise in the behavioural intentions of tourists after the VR tourism experience. Behavioural intentions of tourists were found to strongly increase compared to before the VR experience. The findings regarding this change in the behaviour of tourists experiencing VR were new, however the power of immersive interactive technologies to serve in the role of mediator for positive behavioural change in users has been emphasised previously (Kitson et al., 2018; Martins et al., 2017; Tom Dieck & Jung, 2018). However, the present study is the first to compare the effects on behavioural intentions of tourists before and after the intervention of the VR technology experience.

The change in behavioural intentions of tourists to visit the destination was the most significant element assessed when comparing the findings of part 1 and part 2 of this phase of the study. As described in Section 2.3, three decades of research attempted to explore the impacts of technologies on behavioural intentions, using different Technology Acceptance Models (TAM) methods. This research identified various factors affecting the behavioural intentions of tourists in relation to the technology. These models showed that technology can change the attitudes and behavioural intentions of tourists towards the destination (Lagiewski & Kesgin, 2017). However, these studies were not able to demonstrate an accurate effect of technology intervention, as this study found by applying experimental design. This is because they primarily assessed the impacts of technology on behavioural intentions of tourists, without considering actual experience such as VR.

A possible explanation to explain why the behavioural intentions of tourists altered after the VR tourism experience relates to the dimensions of this experience. Linking back to the

dimensions in previous sections, the fact that tourists perceived virtual objects as real (Authenticity), and experienced the feeling of being there in the destination (Tele-presence) were found to be the most significant dimensions of the VR tourism experience. Kronqvist et al. (2016) also define the different levels of authenticity as the significant factor that impact the effect of different technologies. Alternatively, some research suggests that VR provides a better sense of presence than other immersive technologies, leading to increasing destination image formation (Yung et al., 2019), and visit intention (Tussyadiah et al., 2018). These could explain why scholars highlight that VR in tourism can create opportunities to promote destinations (Adachi et al., 2020; Lin et al., 2020). Therefore, a note of caution is needed, as the finding of this study raises questions regarding the reasons behind this behavioural change after the VR tourism experience. Overall, more details on this finding could be explored as an important issue in future research.

### **7.3.2 Part 2 – Testing the primary framework for the VR tourism experience**

After assessing the behavioural intentions of tourists before and after the VR tourism experience, the dimensions found in qualitative findings (Section 7.2), and also their relationships, were investigated. The second aim of this research was to investigate the relationships between the key concepts of perceptions, feelings, emotions, and behavioural intentions of tourists after the VR tourism experience. These dimensions, and the process of the VR tourism experience that were found, created a preliminary framework that was tested at this stage. There were a variety of findings that fall into these categories: authenticity, awe, presence, place attachment, intention to visit the destination, destination recommendation, intention to use the technology, and technology recommendation.

Authenticity, as the most significant perception of the VR tourism experience, was strongly associated with the emotion of awe. This confirms the qualitative finding the uncovered the connection of authenticity with components of awe. It also explained the reasons for the positive relationship between authenticity and awe components. For instance, the qualitative finding showed that authenticity was the predictor for most of the components of awe, including altered time perception, connectedness, and need for accommodation. This means that the level that tourists evaluated the virtual objects as real appears to be the reason for affecting components of awe. This perception affected tourists perceiving a change in time and place, and feeling connected to the destination, and also made them surprised. This finding is in line with observations from the last part of this research. However, as this study appears the

first to find these associations between authenticity and awe, questions arise as to which components of awe were more influential in this association with authenticity. According to the qualitative findings, these components included the need for accommodation (confusion, fear, surprise), connectedness, and self-diminishment.

Authenticity was also strongly connected to the feeling of presence. Along with the similar findings in the qualitative phase, this association between authenticity and presence has been found extensively in previous research (Aitamurto et al., 2022; Weber et al., 2021a). Perceiving the virtual objects as real has been the main reason for the users of VR to feel present in the virtual environment. The more immersive the experience, the more users feel the sense of presence. Scholars highlight that an integral condition for successful VR is a high sense of presence – a feeling of being there in the virtual scenario (Lorenz et al., 2018). Weber et al. (2021a) also emphasise the importance of authenticity for measuring the sense of presence or feeling of being there. Splitting the sample and testing different technologies in the pilot study also revealed further relationships between authenticity and presence. Possibly the most important and consistently found interactions in the quantitative phase were positive correlations between these two concepts. The relationship between authenticity and tele-presence is not particularly surprising, because of the strong association between them in qualitative findings and also in the literature (Kronqvist et al., 2016).

Authenticity was directly associated with place attachment and this observation is further evidence of the positive relationships between authenticity and place attachment. The qualitative findings also found this connection between authenticity and place attachment as perception of realism was discovered to be a predictor for feeling attached to the destination. Additionally, scholars have highlighted that the high degree of perceived authenticity of VR tourism exceeds the physical boundaries of corporeal travel (Yung & Khoo-Lattimore, 2019) and that perceived authenticity leads to the attachment to the virtual destination. This finding matches previous research findings that confirm authenticity as the predictor for place attachment (Kim et al., 2020). Although the previous research found that authenticity can influence tourists' future travel intentions and alter local perceptions of tourism destinations (Gao et al., 2022), the present study under discussion did not find a direct and significant relationship between authenticity and the factors of behavioural intentions. However, this association was found in place attachment. This is a strong indicator that perceived authenticity does not substantially contribute to broader behavioural intentions but does so through

increasing the feeling of attachment to the destination. This is a major new contribution to this field of research.

While there were some significant correlations in the quantitative findings, presence was only weakly associated with place attachment. The feeling of being there did not directly result in VR users feeling attached to the destination. Although the qualitative findings showed the possibility of a connection between presence and place attachment, the quantitative results did not confirm this. These weak correlations suggest that there are potentially a multitude of other variables that influence presence. The association between presence and awe was much more substantial. This could imply that the feeling of being there affects attachment to the destination, but this influence would be through emotions, including awe. This could be related to positive components of awe such as connectedness. Presence, or the feeling of being there, could positively affect the sense of connectedness to virtual objects, virtual people, and place and combined, these components result in individuals feeling attached to the destination. Overall, the association between presence and awe aligns with previous research that highlights that VR cultivates a sense of presence and allows people to pursue personal goals in a virtual or real environment, with potential to enhance the intensity of emotional states (Waterworth et al., 2015).

Although awe components found in the qualitative phase align with the research of Yaden et al. (2019), the quantitative findings did not confirm some of these components. The components of awe found in the qualitative phase were as follows: Perceived time alteration, being hyper realistic, Self-diminishment/ Feeling of being small, Perceived vastness, Connectedness, Confusion, Fear, and Surprise. Referring to previous research ( Yaden et al., 2019), scales that measure awe include altered time perception (F1); self-diminishment (F2); connectedness (F3); perceived vastness (F4); physical sensations (F5); and need for accommodation (F6).

Interestingly, quantitative findings confirmed the Perceived time alteration, Self-diminishment/ Feeling of being small, Perceived vastness, Connectedness, and Surprise as components of awe. However, Confusion and Fear were not associated with awe. Fear, confusion, and surprise were regarded as components of the need for accommodation. Only surprise, as the need for accommodation component (Chirico et al., 2017), was found and fear and confusion were not.

The reasons for the fear found in qualitative findings were associated with parts of the VR experience where participants experienced a sense of elevated height. Chirico & Yaden (2018)

state that when individuals encounter something perceived as dangerous, a fear component can be added to awe. Based on the number of fear responses found in the interviews, it is crucial to understand each participant's background and experiences. Participants with acrophobia reported feelings of fear when they experienced standing in an air balloon above the city. In previous studies applying VR-based environments, scholars used simulated versions of frightening stimuli to assess phobic responses, also finding this association (Diemer et al., 2015). Also, users who were familiar with VR and had experienced it before, did not report this feeling of fear. Previous studies also found that participants' personal background and familiarity with the environment were factors in whether fear was experienced (Stepanova et al., 2019b).

Scholars have found confusion and surprise as components of the need for accommodation, as in when an individual faces an experience beyond their expectations, or that is difficult to understand (D. Lu et al., 2017). However, this research did not confirm confusion as one of these components. This could be due to the adoption and understanding of the technology. Participants did not feel confused during the experience, or working with technology, and did not find the VR experience difficult to understand. As previous studies found an association between technology familiarity on technology adoption (Idemudia & Raisinghani, 2014), this could be related to the individuals' familiarity with new technologies.

However, surprise was found as a significant and strong component of the need for accommodation in both the qualitative and quantitative results. Furthermore, this finding aligns with several other studies (Chirico & Yaden, 2018; Lu & Tian, 2015).

Awe was strongly connected to place attachment. Other than authenticity, awe was the only concept directly connected to place attachment. This observation is further evidence contributing to the understanding of the effects of emotions on destination attachment. Although qualitative findings seemed to show a connection between awe and other concepts such as presence, the quantitative findings showed that awe was the only component to connect the feeling of presence to place attachment. Components of awe such as connectedness could be the predictor for this attachment. Connectedness is described as a feeling that begins with a connection to a place, and gradually extends to the rest of the world from there (Stepanova et al., 2019b). Furthermore, scholars have found that awe helps in increasing connectedness to places in nature, highlighting the significance of connectedness in explaining how inducing this emotion contributes to knowledge about individuals' behaviour (Yang et al., 2018). What

makes that link more explicit is that emotions such as awe stress the emotional dimension of place attachment. In particular, individuals' awe in natural places, and their expressed connection to those places, illustrates these emotional bonds (Kajan, 2014). Lu & Tian (2015) found that the emotion of awe was the mediator between the perceived value of the destination and emotional bonding towards a touristic place. An important emotion of "awe/wonderment" is often present at special places (e.g., nature) (Viviers, 2019), inspiring destination attachment.

Regarding the relation of awe and place attachment in the tourism context, researchers have highlighted how tourists' awe emotion is induced when they visit places such as sacred mountains (Lu et al., 2017), and scenic areas (L. Wang & Lyu, 2019). Some recent scholars have also found that visiting a virtual reality environment may elicit awe (Stepanova et al., 2019b).

In the technology context, awe is also found to be a probable emotion. In a recent technology-oriented study, it was found that experiencing VE made users feel awe (Stepanova et al., 2019b). It has also been highlighted by previous studies that the emotional experience of awe should be investigated in places other than natural settings, such as high-tech tourism sites (Wang & Lyu, 2019). However, none of the previous studies in the same context have considered the role of awe in place bonding or place attachment.

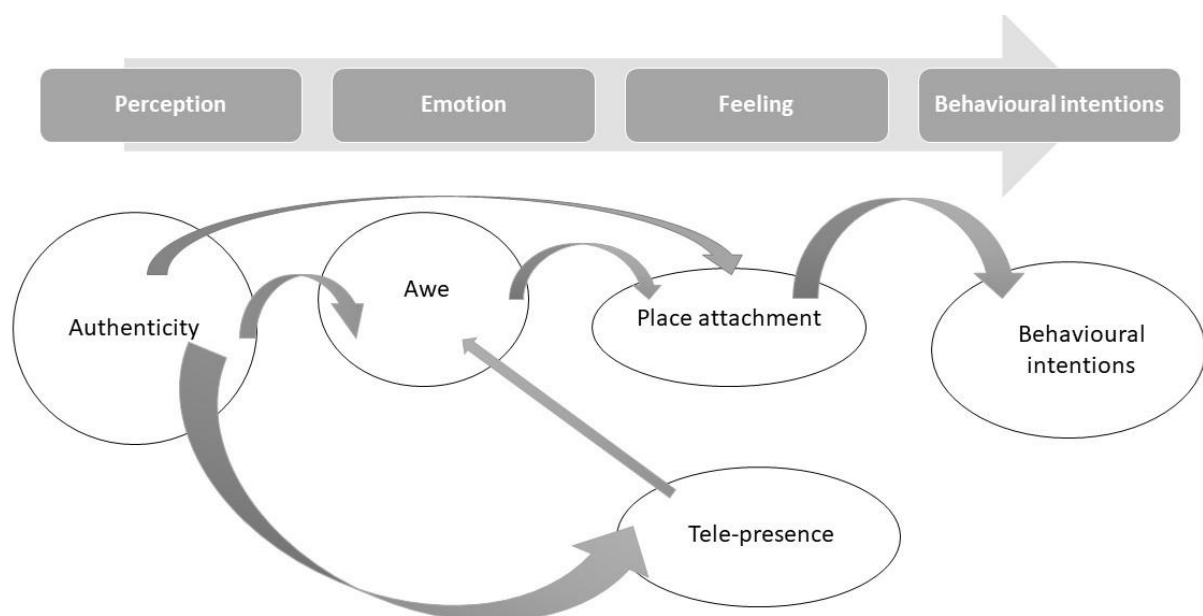
Place attachment was the only concept related to all the factors of behavioural intention, including intention to visit the destination, destination recommendation, intention to use the technology, and technology recommendation. Contrary to expectations, one of the most surprising findings of Study 2 was that, with the exception of place attachment, other concepts were not directly connected to the behavioural intentions of tourists. This observation is evidence of the significance of place attachment in the VR tourism experience.

Possibly the most important and consistently found interactions were the positive association of place attachment to all of the concepts of behavioural intentions. This is a major new contribution to this field of research, as it shows the significant role of place attachment in affecting tourists' intentions to visit a destination, recommend it, or state positive WOM, to use the technology and recommend it, or state positive WOM about it.

Dick and Basu (1994) highlighted that "consumers are more likely to engage in word of mouth when they experience notable emotional experiences" (P. 142). Loureiro (2014) contends that place attachment can be connected to tourists' engagement, meaning that place attachment

leads to emotional bonds and engagement to the destination. For instance, when tourists were emotionally attached to a museum or another attraction, they were more enthusiastic to engage with the place ( Park et al., 2010). Tourists who visit the destination may engage in powerful emotional interactions, positive attitude, and behaviour with the place (Loureiro & Sarmento, 2019). These emotional attachments to the environment allow people to perceive places as “ideal” for their activities. This perception has significant implications, both for success in the tourism industry, and the promotion of active decisions to “stay” (Schilar & Keskitalo, 2018).

Overall, the framework for the VR tourism experience developed in Section 5.4 was partly supported. Significant interactions were found between authenticity and awe, presence, and place attachment. Against the VR framework, presence was not substantially associated with place attachment; however, it was connected to place attachment. Also, direct correlation was found between awe and place attachment. Interestingly, no concepts except for place attachment made a significant contribution to the intention to visit the destination, destination recommendation, intention to use the technology, and technology recommendation. Place attachment was the only aspect of the VR tourism experience directly tied to all factors of behavioural intentions. These interactions are depicted in Figure 7.5.



**Figure 7.5. A Final framework for the VR tourism experience**

### **7.3.3 Part 3 - Testing the primary framework for the VR tourism experience over time**

The last part of the quantitative findings related to the post-experience questionnaire, which was answered one week after the VR tourism experience. The objective for this part was to measure the durability of tourists' perceptions, feelings, emotions, and their behavioural intentions. The same post-experience questionnaire as in part 2 was used as a tool to assess these same factors one week later.

The post-experience questionnaire resulted in the same findings as for the experience questionnaire. This is one of the most interesting findings of this research, as it demonstrates the effectiveness of the VR tourism experience. Authenticity was found to be connected to awe, presence, and place attachment. Presence was associated with awe, and awe was positively associated with place attachment. Finally, place attachment was the only concept found to be directly related to all factors of behavioural intentions, including intention to visit the destination, destination recommendation, intention to use the technology, and technology recommendation. These correlations prove that tourists may react the same to given circumstances during the time.

These similar findings showed the durability of emotions, feelings, and behavioural intentions of tourists towards the technology and the destination. These findings confirm the effectiveness of technology over time. This VR tourism experience was able to arouse the same perceptions, feelings, and emotions as right after the VR tourism experience, and finally affect behavioural intentions of tourists to visit the destination. This is also one of the major contributions of this research, understanding the effectiveness of the VR experience during time.

## **7.4 Conclusion**

This chapter outlined the main findings of this research. The dimensions of the VR tourism experience were described as authenticity, tele-presence, place attachment, awe, intention to visit the destination and use the technology, and recommend them. The process for this experience was identified as perceptions, feelings, emotions, and behavioural intentions. Moreover, the insights regarding the association between these dimensions and process were identified to explain the impacts of the VR tourism experience on the behavioural intentions of tourists. Additionally, these connections were assessed not only before and after the VR tourism experience, but also over time, to illustrate other factors that may influence the levels of effectiveness of the technology experience. Although previous research has provided insights into some of the key concepts of the VR tourism experience, this research is a step

forward in delivering a more comprehensive overview of factors involved in this experience. Also, considering the associations between them, a framework for the VR tourism experience was identified. The implications of the research are discussed further in the next chapter.

## **8. Conclusions**

### **8.1 Introduction**

The first chapter of this thesis included the background and context of the study and set out the research questions. It was argued that experiencing VR technologies in the tourism industry affects the behavioural intentions of tourists. This argument included the importance of defining a framework for the VR tourism experience. Next, in Chapter 2, a review of the literature indicated that although there is extensive existing research in this field, most studies have focused on single factors involved in the VR tourism experience. Therefore, the literature was not able to find the key concepts and their relationships, to create a framework. A dearth of research on the dimensions and process of the VR tourism experience, and their influence on the behavioural intentions of tourists, was identified as the research gap that this research intended to address. The research methodology was described in Chapter 3, including the overall paradigm and exploratory sequential mixed method design, the sampling, data collection, and analysis related to the qualitative and quantitative design. Then Chapter 4 covered the findings and results related to study 1, as the exploratory qualitative phase of this research. Building upon the qualitative results, Chapter 5 created related variables, hypotheses,

and a preliminary framework to be tested. Chapter 6 included the findings and results related to Study 2, as the quantitative phase of this research. The previous chapter (Chapter 7) discussed the qualitative and quantitative findings: building on the findings, this chapter concludes the thesis in Section 8.2. Then it highlights the methodological and the theoretical contributions of the research 8.38.4. Finally, the limitations of the study and opportunities for future research are outlined in Section 8.5. This is the last chapter of this thesis and concludes the dissertation.

## **8.2 Conclusion**

The overarching aim of the present thesis was to contribute to the understanding of the VR tourism experience. To this end, an exploratory sequential project with three aims was designed. The first aim was to define the dimensions and process of the VR tourism experience. The second was to examine the associations between dimensions of this experience to discover how these affect the behavioural intentions of tourists. This helped in achieving the main and last aim of this research, which was developing a framework for the VR tourism experience. The aims were approached through two studies and a connective point between these two, the first using in-depth interviews, the connective point that provides a link between two studies, and the second study comprising three longitudinal surveys.

To achieve the first goal of this research, the dimensions of the VR tourism experience were categorised in four steps of perceptions, emotions, feelings, and behavioural intentions. Analysing the qualitative data resulted in the following:

### **Perceptions:**

- Being real
- Change in time and place
- Greatness
- Being hyper-realistic

### **Feelings:**

- Feeling of being small
- Feeling of being there
- Feeling connected

Feeling attached

**Emotions:**

Fear

Confusion

Surprise

**Behavioural intentions:**

Intention to visit the destination

Destination recommendation

Intention to use the technology

Technology recommendation

The connective point, as a link between the two studies, identified the variables and a preliminary framework for the VR experience to be tested. The qualitative study helped construct related variables and hypotheses to be tested. The related variables were included as follow:

- Authenticity as perception,
- Awe as emotion,
- Presence, and place attachment as feelings,
- Intention to visit the destination, destination recommendations, intention to use the technology and technology recommendations, as behavioural intentions of tourists.

Therefore, eight variables were found and according to the relationships of these variables, 22 hypotheses were developed to be tested. Finally, in pursuing the second aim, a quantitative approach examined associations between the key concepts: authenticity was found to be connected to awe, presence, and place attachment. Presence was associated with awe, and awe with place attachment. Interestingly, place attachment was the only concept directly connected to all factors of behavioural intentions.

Ultimately, to explore the third and last aim, an empirically based VR tourism experience framework comprising eight aspects was developed. This framework of VR tourism experience was also tested over time and the same findings were achieved. Overall, these findings contribute

in several ways to knowledge on the VR tourism experience. These contributions are described in the following sections.

### **8.3 Theoretical contributions**

This study theoretically contributes to the current literature by providing meaningful insights into the application of the VR experience for the tourism industry and affecting the behavioural intentions of tourists. The present findings and interpretations have several implications for understanding the VR tourism experience, its key concepts and their relationships and the steps which are involved in this experience. A previous neglected aspect in technology and tourists' experience, this is examined in depth in this study as a way of contributing to existing knowledge.

This research is one of the first studies to critically examine the dimensions and process of the VR tourism experience. The first part of the study is based on identifying the key concepts and steps involved in this experience. While the majority of the previous research focuses on single dimensions of the VR tourism experience (Azarby & Rice, 2022; Gao et al., 2022), through an exploratory qualitative approach, this study identified unique constructs (e.g., being hyper-realistic, change in time and place), which added new knowledge about the dimensions of the VR tourism experience.

This research is the first study to explore the emotion of awe and its components as a dimension of the VR tourism experience, and through an exploratory qualitative approach. Additionally, every component which was discovered, was validated via several phases. Furthermore, one of the strongest contributions of this research is to understand the differences between the components of this emotion and other emotions, for instance the distinction between this emotion and flow. Also, the findings of this study contribute in several ways to an understanding of place attachment and provide a basis for acknowledging the significance of this dimension in the VR tourism experience.

Additionally, this study fills gaps in the existing literature, by adding the knowledge concerning the process of the VR tourism experience. Building on previous studies, or on limitations within them, the current research defines the steps involved in the VR tourism experience. This theoretical contribution is derived from the context of this study within broader literature. In particular, the study contributes the first empirical literature on defining the perceptions, feelings, emotions, and behavioural intentions as steps included in the VR tourism experience.

Moreover, this study provides initial insights into the distinction between these steps; specifically, the findings of this study, using multiple phases, offer meaningful insights into distinguishing the literature on emotions and feelings that were interchangeably used in the literature. In addition, this study highlights a number of potential future research areas through the identification of these steps; for instance, the distinctions between the concepts related to the different phases of technology experience, such as the acceptance phase and the actual experience of that.

The other contribution of this research occurs through seeking to understand and explain why the behavioural intentions of tourists are changed by the VR tourism experience. Some studies to date have aimed to connect the VR experience and behavioural intentions of tourists (Kim et al., 2020; Yung et al., 2019), without considering mediating dimensions. Support for such an approach can be found in the present study. However, this study makes an important contribution in finding further promising aspects and their associations (e.g. awe, place attachment and their connection). These findings involved expanding the knowledge on associations between the dimensions and process of this experience that have not been tested in the current literature. For instance, as there are few studies available on finding authenticity as the perception of the VR experience, the present study expands knowledge on the association of this perception to the feeling and emotions found in this research (awe and presence). Accordingly, another contribution of this research is an understanding of the associations between these concepts, with implications for developing a VR tourism framework.

Furthermore, through robust empirical findings, this is the first research to develop and fully test an integrative framework for the VR tourism experience. The contribution of this framework is very significant in various ways. First, the vast majority of previous studies are limited in focus, such as those that address only the acceptance phase of technology (Guo et al., 2022; Iftikhar et al., 2022), or else the only available frameworks were built upon the literature review (Godovykh et al., 2022). Answering the call of the literature, this study focuses on finding concepts related to the actual experience of technology. Second, the measures related to every concept in this framework were pre-tested to confirm they suited the current context of the study. Therefore, this study developed and validated a survey to increase the reliability of the related concepts, their association, and a framework. Third, a VR tourism framework was developed and revised, including the multiple factors related to this experience. This framework highlights the significance of feelings and emotions as mediating concepts involved in this experience. It highlights that certain dimensions such as place attachment are

more significant than others, which should assist researchers in focusing on these concepts. It also highlights the differences between feelings and emotions in relation to the VR tourism experience. Finally, by assessing the behavioural intentions of tourists before the VR tourism experience and comparing to after this experience, this framework provides a more accurate assessment of the effectiveness of the technology experience. Also, this framework was tested during the time to increase the reliability the findings. Therefore, the results of this study add to the rapidly expanding field of the durability of emotion, feeling, and behavioural intentions of tourists who experienced the destination through VR technology.

Subsequently, based on this framework, complex constructs such as awe were found to be significantly involved in tourists' technology experiences. Also, this study adds further new knowledge to identify the components of awe as a complex emotion. For instance, EFA allowed the exploratory nature of the concepts to be confirmed and grouped, so that they could be empirically validated. Through EFA, awe, which was newly established in this study, makes a theoretically meaningful contribution to the current literature because it was found to have a significant effect on other dimensions of the VR tourism experience. Therefore, this framework for the VR tourism experience is a significant and an initial step for future technology and tourism studies.

Overall, an appropriate methodological tool was one of the most significant factors to attain rigour in this study. Choosing a multi-method design, the *exploratory sequential mixed method*, supported an exploration of all key factors related to the research questions. This method involved three sequential phases of qualitative research, followed by a connective point that built the connection between the qualitative phase and the quantitative one. Through a qualitative approach, this study may be the first to identify unique constructs such as awe in the VR tourism experience. This construct, which was newly established in this study, offers a theoretically meaningful contribution to the current literature because it was found to have a significant effect on other components of the VR tourism experience. Looking at the conceptual framework of this study, the connection of awe and place attachment has a pivotal role expanding our knowledge of the area. Furthermore, it can lead to an exploration of the benefits of these induced emotions for a tourism destination, by providing a basis for tourists' feelings towards the destination.

The academic rigour and creativity of this research lies in this research using one of the most recent technologies predicted to be one of the most used for the future. Therefore, the results

of this study in multiple phases offer meaningful insights into the application of these technologies in tourism. This research expands the knowledge on the future of tourism, which seems to be heavily involved with XR technologies and VR.

By providing a meaningful insight on the convergence of immersive technologies, tourism and consumer behaviour, this research has potential to be considered a pioneering investigation into the whole process of the VR technology experience in the tourism context. Therefore, the excellence and originality in this research lies in investigating the whole key concepts involved in the VR tourism experience, including related perceptions, emotions, feelings, and behavioural intentions, in order to reveal how these, connect to increase the intentions of tourists to visit a destination/attraction. Therefore, by exploring these key concepts, this research defines a framework for the VR tourism experience as excellence of this research.

## **8.4 Practical Contributions**

Practically, the findings of this research will be of value to different key stakeholders, including those in the public and private sectors, in various fields such as tourism, technology, marketing, consumer experience, and behaviour, etc.

As for the economic impacts on tourism, the information gained from this research provides tourism marketers with an enormous amount of valuable knowledge concerning how tourists behave after experiencing these technologies. The present study sets out the significant advantages for both tourism companies and potential tourists as customers. Specifically, there are promising implications for destination marketing, tourism providers, and visitors with the introduction of destinations through the VR tourism experience. First, for existing and emerging destinations, VR tours can be used to trial new marketing campaigns, policies, and programs. Second, VR tourism experiences can provide a chance for promoting less famous destination, in order to release the tourist impact on overcrowded destinations.

Furthermore, VR tours can vastly benefit destinations marketers and tourists during and after crisis such as travel-limiting pandemics. For instance, due to the COVID-19 pandemic, XR technologies have become a more popular trend in, not only destination marketing, but also on-

site experiences (Godovykh, Baker, & Fyall, 2022). Using the VR tourism experience during pandemics is a potential tool allowing tourists to travel to destinations while sitting on their couch (Schiopu et al., 2021). Also, after the pandemic, tourism marketers to maintain the attractiveness of their destinations and recover from the COVID-19 pandemic (Leung et al., 2022). Last, according to Sigala (2020,) disasters and challenges like Covid-19 can spark paradigm shifts and rethinking in industries and in academic work, providing a “transformative opportunity”. Therefore, the immersive technology experience in the tourism industry may lead to a new transformation in this industry for the future period beyond pandemics. Therefore, the findings of this research shed light on the level of effectiveness of these technologies to replace real travel during crises, to maintain the attractiveness of destinations during pandemics, to attract tourists to destinations in the post-pandemic world, and to transform the future of the tourism industry.

Furthermore, with the introduction of the metaverse (Kim, 2021) in which XR technologies such as VR will play a significant role, the future of every industry is linked to these immersive technologies. Therefore, the benefit of the current research is associated with stakeholders and policy makers in relation to technology and tourism.

Additionally, VR tourism experiences provide opportunities for individuals that are unable to travel to real destinations, due to issues such as disabilities (Iftikhar et al., 2022), or elderly people (Tom Dieck et al., 2019a). These technologies have the potential to make travelling accessible to everyone. These VR tourism experiences can also decrease access inequality by making it possible for low-income people to experience destinations they may otherwise never be able to visit (Godovykh et al., 2022).

Also, the tourism industry, as a major contributor to the Aotearoa New Zealand economy, can explore whether these technologies are effective in motivating tourists to visit the country and its attractions. One of the richness of Māori culture is the highlights of international visitors’ time in New Zealand (Tourism New Zealand, 2019): VR technologies can be used to connect people with Māori culture (McLennan, 2020) as an appropriate medium for sharing Māori stories to create engaging and immersive experiences for tourists (Harvey, 2021). However, due to the area of this research, its practical contribution can benefit the global economies and also in situation of political instabilities and economic challenges (Christensen et al., 2017). Subsequently, as a wider stakeholder community, the results of this research could be used in fields other than tourism. Technology marketers and companies in the private and public sectors decide what kinds of XR technologies to support or utilise. The information gained from this research may enable them to consider strategic programmes for creating the most

effective ones to be popular in future. Marketers in behavioural science and technology could also use the findings of this research for marketing strategies. Governments and policy makers can also benefit from the findings of this research when assigning policies related to the application of these technology experiences in tourism and other fields. For instance, the findings from this study show that the effectiveness of the experience appeared to reduce, depending on people's prior engagement with it. Specifically, the frequent users of technology were not greatly influenced by this tourism VR experience. This outcome shed lights on the importance of developing more immersive and affective technologies in the tourism field for technology developers and tourism investors.

### **8.5 Limitations of the research and directions for future research**

While this research contributes greatly to an understanding of the VR tourism experience and its dimensions, it is not without its limitations. These limitations provide opportunities and recommendations for studies and directions for future research.

First, a substantive limitation of the present study is the low number of participants in the quantitative phase of the study (Study 2). As recommended by Creswell & Clark (2017), the second phase of exploratory sequential mixed method design as a quantitative study, should use a large sample in order to generalise the results of the qualitative phase. However, two reasons limited the size of the sample for the quantitative phase of the present study. One was technology disruptions and errors that stopped the experiments. The Holotour was originally designed for the MR HoloLens, and this caused some troubles when using the HP headset. The new device also needed special settings and set-ups, necessary to perform the experiments in the limited location of a university room. Another reason was the experimental approach of Study 2 which needed samples to experience the VR tour and answer three questionnaires. Although the number of participants were found to be adequate for the current study (see Section 3.5.4), future studies similar to this one should test this VR experience framework using larger samples.

The sampling method of this study also had some limitations. While the convenience and snowball sampling were considered helpful in recruiting participants in Study 2, these were also limitations. Due to the location where this study was primarily conducted, the majority of the participants were less than 49 years old and were educated, limiting the diversity of the sample. While Study 2 was intended to generalise the findings of Study 1, the samples in the quantitative phase were primarily staff and students at the university, limiting the inclusion of

older generations. Therefore, future research would benefit from the inclusion of older generations in relation to this area.

Another significant limitation of this study relates to the applied technology and the setting for experiments. As the device was not portable, the experiments had to be performed in a university to set up the device. This brought several limitations to the current study as it was less convenient for some individuals such as differently-abled and people with physical limitations who were interested in participation. This makes these findings less generalisable. Although Study 2 expanded the sample to participants other than students, the location of the experiments limited the sample, as they were mostly students at the university. Thus, the generalisability of results of the study is limited. Future studies need to be carried out in order to validate the results of this study among older generations, and more research could also be conducted to determine the effectiveness of the VR experience among differently-abled participants. Last, the device caused many errors and issues during the experiments.: future studies could apply different XR technologies to find the most suitable and robust ones.

Another main limitation of the present study, especially in the further time points of the longitudinal stage, is the diversity of the sample. For instance, the location of the experiments was less accessible to differently-abled people that may have wanted to take part in this study. The same issues limited the sample, which did not include older generations. Thus, the VR experience framework used in the longitudinal study needs to be confirmed with more diverse samples.

Also, to choose the best XR technology for the experiments, in the pilot study of the qualitative phase, two technologies were tested including the MR HoloLens glass and the HP VR headset. Although the HP headset was selected as the research tool, this research has thrown up many questions in need of further investigation by comparing these technologies. Further experiments could employ a broader range of XR technologies, to measure the effectiveness of various types of XR technology experiences on tourists' emotions, feelings, and behavioural intentions.

Furthermore, this exploratory research offers a qualitative approach to data collection, which is highly complex. As the instrument, the quantitative phase was developed using the data from the qualitative phase, and it was challenging to decide which data to use from the qualitative phase to build the quantitative instrument. It was also challenging to determine how to use these data to generate quantitative measures (Creswell & Clark, 2017), and to address the

complications involved in ensuring that the scales developed on the instrument were reliable. Future studies could specifically measure the new constructs and scales developed in this study. Also, this study is among limited research assessing the dimensions and process of the VR tourism experience using a qualitative approach. As there is a dearth of qualitative research in this area, future research could extend these findings targeted to qualitative methodology.

Additionally, this research attempted to define the differences between feelings and emotions in tourism and technology. However, as described in Chapter 2, these concepts related to the emotions and feelings have previously been used interchangeably, representing a lack of research that differentiates these concepts. Therefore, more research on emotions and feelings and their distinction is necessary: this could be a focus of future research.

Furthermore, findings from this study and the resulting VR tourism experience framework lead to recommendations for studies that will add to literature concerning key concepts related to this experience. Some significant dimensions of the VR tourism experience found in this study include different sub-components. First, perceived authenticity varied depending on participants' evaluation of the virtual place, people, or objects. Specifically, perceived authenticity was related to the spatial components of the VR tourism experience such as place or emotional components such as people or objects within the experience. However, this issue has not been extensively addressed in this study, offering opportunity for further research concerning how these sub-components are differentiated and whether they impact on other aspects of the VR tourism experience. Second, this study suggested tele-presence as the most proper term as the "feeling of being there" in the VR destination. However, existing literature includes other terms to describe this feeling of presence. For instance, Skarbez et al. (2017) use "*the spatial presence*" to define the feeling of being there. The variety of terms used offer opportunity for further research to investigate the definitions, measures, and models of presence in the future.

Also, the distinction between immersion and presence was found and described in this study. However, this difference is not consistently accepted in existing research, offering possibilities for further study. Although this study found immersion as an objective characteristic of the technology, and presence as a subjective reaction to immersion, there is disagreement in the literature concerning this differentiation. Therefore, by conducting similar research, further studies could specifically focus on the distinctions between these aspects of the VR tourism experience and their association to perceived authenticity.

Also, this study found that is a significant dimension of the VR tourism experience, further studies could work to understand the sub-components of this dimension as a multidimensional concept. For instance, Jiang et al. (2017) identify that place attachment includes place dependence, place identity, place affection and place social bonding: these sub-components indicate the range of feelings involved when an individual is presented with a particular setting. Further research is necessary to more closely examine these aspects and their links in the context of the VR tourism experience.

This study appears to be the first to find complex emotions such as awe in relation to the VR tourism experience. This would be a fruitful area for further work. Prior to this study, awe remained a seldom-discussed concept, with very little empirical research conducted on it (Coghlan et al., 2012) in a tourism context: instead, this emotion was studied in relation to natural sources such as mountains and rivers (Powell et al., 2012), or religion (Pearce et al., 2017). Furthermore, the awe in tourism context has still not been clearly defined (Su et al., 2020), and more research is needed to describe this complex emotion. Awe is considered as a meaning-making emotion and awe-eliciting stimuli are not fully understood (Ihm et al., 2019). The present study uses an exploratory approach to offer new insight into studying awe in the VR tourism experience. If the debate is to progress, further understanding of awe needs to be developed in future studies.

Another limitation of this study was using an experimental setting to explore awe, which has been highlighted as a constraint as experimental studies which found the induced awe in lab setting, they elicit a low intensity version of awe (Chirico et al., 2016). If possible, future research could conduct the same research using a setting other than an experimental one. Moreover, a further study on awe could assess physical sensations. Yaden et al. (2019) developed awe measurement scales, using physical sensations such as goose bumps and chills as scales for assessing awe. Although the present study considered relevant aspects such as facial and verbal expressions, measuring physical sensations requires physiological measurement equipment, rather than relying on self-report measures. This aspect of the user experience could be usefully explored in further research.

Notably, relationships between some of the dimensions of the VR tourism experience were tested in this study for the first time (e.g., awe and presence). Therefore, measuring whether the found associations in fact represent direct causal relationships, which would be one of the most important contributions to this field, will require further research.

Finally, this study provided a new framework for the VR tourism experience and provided insights on the associations between tourists' perceptions, feelings, emotions, and behavioural intentions. Concepts such as place attachment were found to be determining concepts of this framework, arousing the intention to visit the destination. These findings provide significant insights for future research, to test these concepts and the framework for further validation and generalisability. Furthermore, this study initiated findings of not only new concepts but also some new associations between the key concepts of the VR tourism experience. This provided several directions for testing these aspects and these relationships. Also, a potential limitation of this study, relates to testing the post-experience questionnaire after one week. This brings another opportunity for further research to test whether the intentions 'stick' over a much longer period of time.

## References

- Ab Hamid, M., Sami, W., & Sidek, M. M. (2017). *Discriminant validity assessment: Use of Fornell & Larcker criterion versus HTMT criterion*. Paper presented at the Journal of Physics: Conference Series.
- Abd Majid, F., & Mohd Shamsudin, N. (2019). Identifying factors affecting acceptance of virtual reality in classrooms based on Technology Acceptance Model (TAM). *Asian Journal of University Education*, 15(2), 1-10.
- Adachi, R., Cramer, E. M., & Song, H. (2020). Using virtual reality for tourism marketing: A mediating role of self-presence. *The Social Science Journal*, 1-14.
- Adams, E. (2016). Most virtual reality is not virtual reality. Here's why. *Gearpatrol. com*.
- Adapa, A., Nah, F. F.-H., Hall, R. H., Siau, K., & Smith, S. N. (2018). Factors influencing the adoption of smart wearable devices. *International Journal of Human-Computer Interaction*, 34(5), 399-409.
- Adom, D., Yeboah, A., & Ankrah, A. K. (2016). Constructivism philosophical paradigm: Implication for research, teaching and learning. *Global journal of arts humanities and social sciences*, 4(10), 1-9.
- Afonso, A. F. d. A. L. (2019). *How can tourist experience and perceive authenticity impact behavioral intentions and perceived value by tourist?* ,
- Agate, J. R. (2010). *Inspiring awe in the outdoors: A mechanistic and functional analysis*. Clemson University,
- Agrawal, S., Simon, A., Bech, S., Bæntsen, K., & Forchhammer, S. (2020). Defining immersion: Literature review and implications for research on audiovisual experiences. *Journal of the Audio Engineering Society*, 68(6), 404-417.

- Aitamurto, T., Aymerich-Franch, L., Saldivar, J., Kircos, C., Sadeghi, Y., & Sakshuwong, S. (2022). Examining augmented reality in journalism: Presence, knowledge gain, and perceived visual authenticity. *New media & society*, 24(6), 1281-1302.
- Al-Ansi, A. M., Jaboob, M., Garad, A., & Al-Ansi, A. (2023). Analyzing augmented reality (AR) and virtual reality (VR) recent development in education. *Social Sciences & Humanities Open*, 8(1), 100532.
- Alcañiz, M., Bigné, E., & Guixeres, J. (2019). Virtual reality in marketing: a framework, review, and research agenda. *Frontiers in psychology*, 10, 1530.
- Alcañiz, M., Guixeres, J., & Bigne, E. (2019). Virtual reality in marketing: a framework, review and research agenda. *Frontiers in psychology*, 10, 1530.
- Alzahrani, H. (2020). *The Impact of Awe-inspiring and Non-awe-inspiring Ambient Music on Shoppers' Purchase Intentions Toward Luxury and Non-luxury Goods*. Auckland University of Technology,
- Amatriain, X., Höllerer, T., Kuchera-Morin, J., & Pope, S. T. (2007). *Immersive audio and music in the allosphere*. Paper presented at the ICMC.
- Amora, J., Ochoco, M., & Anicete, R. (2016). Student engagement and college experience as the mediators of the relationship between institutional support and academic performance. *Digital Journal of Lasallian Research*, 12, 15-30.
- Anderson, J., & Rainie, L. (2022). The metaverse in 2040. *Pew Research Center*.
- Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological bulletin*, 103(3), 411.
- Atembe, R., & Abdalla, F. (2015). *The use of smart technology in tourism: evidence from wearable devices*. Paper presented at the ISCONTOUR 2015-tourism research perspectives: proceedings of the international student conference in tourism research.
- Aymerich-Franch, L., Karutz, C., & Bailenson, J. N. (2012). *Effects of facial and voice similarity on presence in a public speaking virtual environment*. Paper presented at the Proceedings of the International Society for Presence Research Annual Conference.
- Azarby, S., & Rice, A. (2022). Understanding the Effects of Virtual Reality System Usage on Spatial Perception: The Potential Impacts of Immersive Virtual Reality on Spatial Design Decisions. *Sustainability*, 14(16), 10326.
- Bailenson, J. N., Yee, N., Blascovich, J., Beall, A. C., Lundblad, N., & Jin, M. (2008). The use of immersive virtual reality in the learning sciences: Digital transformations of teachers, students, and social context. *The Journal of the Learning Sciences*, 17(1), 102-141.
- Bălău, M. (2018). Exploring the link between intention and behavior in consumer research. *EIRP Proceedings*, 13, 134-141.
- Bastiaansen, M., Lub, X. D., Mitas, O., Jung, T. H., Ascensão, M. P., Han, D.-I., . . . Strijbosch, W. (2019). Emotions as core building blocks of an experience. *International Journal of Contemporary Hospitality Management*.
- Beck, J., & Egger, R. (2018). Emotionalise me: Self-reporting and arousal measurements in virtual tourism environments. In *Information and communication technologies in tourism 2018* (pp. 3-15): Springer.
- Beck, J., Rainoldi, M., & Egger, R. (2019). Virtual reality in tourism: A state-of-the-art review. *Tourism Review*.
- Beerends, S., & Aydin, C. (2021). Negotiating Authenticity in Technological Environments. *Philosophy & Technology*, 34(4), 1665-1685.
- Bernard, H. R. (2017). *Research methods in anthropology: Qualitative and quantitative approaches*: Rowman & Littlefield.
- Biocca, F. (1997). The cyborg's dilemma: Progressive embodiment in virtual environments. *Journal of computer-mediated communication*, 3(2), JCMC324.

- Bockelman, P., Reinerman-Jones, L., & Gallagher, S. (2013). Methodological lessons in neurophenomenology: review of a baseline study and recommendations for research approaches. *Frontiers in human neuroscience*, 7, 608.
- Bodford, J. E., Kwan, V. S., & Sobota, D. S. (2017). Fatal attractions: attachment to smartphones predicts anthropomorphic beliefs and dangerous behaviors. *Cyberpsychology, Behavior, and Social Networking*, 20(5), 320-326.
- Bogicevic, V., Seo, S., Kandampully, J. A., Liu, S. Q., & Rudd, N. A. (2019). Virtual reality presence as a preamble of tourism experience: The role of mental imagery. *Tourism management*, 74, 55-64.
- Boonekamp, R., Schaap, T., & van den Berg, H. (2022). Examining immersion in a game-based experiment to study extreme behavior: Analysis of behavior in extreme and unfamiliar circumstances. *International Journal of Serious Games*, 9(1), 43-58.
- Bowen, J., & Whalen, E. (2017). Trends that are changing travel and tourism. *Worldwide Hospitality and Tourism Themes*.
- Bowlby, J. (1973). Attachment and loss: Volume II: Separation, anxiety and anger. In *Attachment and loss: Volume II: Separation, anxiety and anger* (pp. 1-429): London: The Hogarth press and the institute of psycho-analysis.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Bricker, K. S., & Kerstetter, D. L. (2000). Level of specialization and place attachment: An exploratory study of whitewater recreationists. *Leisure sciences*, 22(4), 233-257.
- Bucea-Manea-Țoniș, R., Bucea-Manea-Țoniș, R., Simion, V. E., Ilic, D., Braicu, C., & Manea, N. (2020). Sustainability in Higher Education: The Relationship between Work-Life Balance and XR E-Learning Facilities. *Sustainability*, 12(14), 5872.
- Buhalis, D., Costa, C., & Ford, F. (2006). *Tourism business frontiers*: Routledge.
- Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of eTourism research. *Tourism management*, 29(4), 609-623.
- Bystrom, K.-E., Barfield, W., & Hendrix, C. (1999). A conceptual model of the sense of presence in virtual environments. *Presence: Teleoperators & Virtual Environments*, 8(2), 241-244.
- Caber, M., & Albayrak, T. (2016). Push or pull? Identifying rock climbing tourists' motivations. *Tourism management*, 55, 74-84.
- Cadet, L. B., & Chainay, H. (2020). Memory of virtual experiences: Role of immersion, emotion and sense of presence. *International journal of human-computer studies*, 144, 102506.
- Calabuig-Moreno, F., González-Serrano, M. H., Fombona, J., & García-Tascón, M. (2020). The emergence of technology in physical education: A general bibliometric analysis with a focus on virtual and augmented reality. *Sustainability*, 12(7), 2728.
- Carrington, M. J., Neville, B. A., & Whitwell, G. J. (2010). Why ethical consumers don't walk their talk: Towards a framework for understanding the gap between the ethical purchase intentions and actual buying behaviour of ethically minded consumers. *Journal of business ethics*, 97(1), 139-158.
- Chang, C.-L., McAleer, M., & Ramos, V. (2020). A charter for sustainable tourism after COVID-19. In (Vol. 12, pp. 3671): Multidisciplinary Digital Publishing Institute.
- Change, S., Witteloostuijn, A., & Eden, L. (2010). From the editors: Common method variance in international research. *Journal of International Business Studies*, 41, 178-184.
- Chen, C.-C., Petrick, J. F., & Shahvali, M. (2016). Tourism experiences as a stress reliever: Examining the effects of tourism recovery experiences on life satisfaction. *Journal of Travel Research*, 55(2), 150-160.

- Chen, N., & Dwyer, L. (2018). Residents' place satisfaction and place attachment on destination brand-building behaviors: Conceptual and empirical differentiation. *Journal of Travel Research*, 57(8), 1026-1041.
- Chen, N., Dwyer, L., & Firth, T. (2014). Effect of dimensions of place attachment on residents' word-of-mouth behavior. *Tourism Geographies*, 16(5), 826-843.
- Chi, X., Lee, S. K., Ahn, Y.-j., & Kiatkawsin, K. (2020). Tourist-perceived quality and loyalty intentions towards rural tourism in China. *Sustainability*, 12(9), 3614.
- Chirico, A., Cipresso, P., Yaden, D. B., Biassoni, F., Riva, G., & Gaggioli, A. (2017). Effectiveness of immersive videos in inducing awe: an experimental study. *Scientific reports*, 7(1), 1-11.
- Chirico, A., Ferrise, F., Cordella, L., & Gaggioli, A. (2018). Designing awe in virtual reality: An experimental study. *Frontiers in psychology*, 8, 2351.
- Chirico, A., & Yaden, D. B. (2018). Awe: a self-transcendent and sometimes transformative emotion. In *The function of emotions* (pp. 221-233): Springer.
- Chirico, A., Yaden, D. B., Riva, G., & Gaggioli, A. (2016). The potential of virtual reality for the investigation of awe. *Frontiers in psychology*, 7, 1766.
- Chitturi, R., Raghunathan, R., & Mahajan, V. (2008). Delight by design: The role of hedonic versus utilitarian benefits. *Journal of marketing*, 72(3), 48-63.
- Chmielewski, D. C. (2017). Apple's Tim Cook says augmented reality will "change everything". In: Deadline.
- Choi, J., Ok, C., & Choi, S. (2016). Outcomes of destination marketing organization website navigation: The role of telepresence. *Journal of Travel & Tourism Marketing*, 33(1), 46-62.
- Choi, S., Jung, K., & Noh, S. D. (2015). Virtual reality applications in manufacturing industries: Past research, present findings, and future directions. *Concurrent Engineering*, 23(1), 40-63.
- Cohen, S. A., Prayag, G., & Moital, M. (2014). Consumer behaviour in tourism: Concepts, influences and opportunities. *Current Issues in Tourism*, 17(10), 872-909.
- Christ, T. W. (2013). The worldview matrix as a strategy when designing mixed methods research. *International Journal of Multiple Research Approaches*, 7(1), 110-118.
- Christensen, L., Marcik, W., Rafert, G., & Wong, C. (2017). The Global Economic Impacts Associated with Virtual and Augmented Reality, Analysis Group. In.
- Chuah, S. H.-W. (2019). Wearable XR-technology: literature review, conceptual framework and future research directions. *International Journal of Technology Marketing*, 13(3-4), 205-259.
- Chung, N., Han, H., & Joun, Y. (2015). Tourists' intention to visit a destination: The role of augmented reality (AR) application for a heritage site. *Computers in Human Behavior*, 50, 588-599.
- Coghlan, A., Buckley, R., & Weaver, D. (2012). A framework for analysing awe in tourism experiences. *Annals of Tourism Research*, 39(3), 1710-1714.
- Cohen, J. (1992). Statistical power analysis. *Current directions in psychological science*, 1(3), 98-101.
- Collins, M. D., & Millar, M. (2021). Tourists' perceptions of destination image, safety, and aggressive street behavior. *International Journal of Hospitality & Tourism Administration*, 22(3), 251-268.
- Conner, M., & Norman, P. (2022). Understanding the intention-behavior gap: The role of intention strength. *Frontiers in psychology*, 4249.
- Cozzens, S. (2019). *The impact of rapid technological change on sustainable development* Paper presented at the United Nation Conference on Trade and Development [https://unctad.org/system/files/official-document/dtlstict2019d10\\_en.pdf](https://unctad.org/system/files/official-document/dtlstict2019d10_en.pdf)

- Cramer, D., & Howitt, D. L. (2004). *The Sage dictionary of statistics: a practical resource for students in the social sciences*: Sage.
- Cranmer, E. E. (2019). Designing Valuable Augmented Reality Tourism Application Experiences. In *Augmented Reality and Virtual Reality* (pp. 73-87): Springer.
- Cranmer, E. E., tom Dieck, M. C., & Jung, T. (2018). How can tourist attractions profit from augmented reality? In *Augmented reality and virtual reality* (pp. 21-32): Springer.
- Cranmer, E. E., Urquhart, C., tom Dieck, M. C., & Jung, T. (2021). Developing augmented reality business models for SMEs in tourism. *Information & Management*, 58(8), 103551.
- Cresswell, J. W., & Plano Clark, V. L. (2011). Designing and conducting mixed methods research.
- Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative* (Vol. 7): Prentice Hall Upper Saddle River, NJ.
- Creswell, J. W. (2008). The selection of a research design. *Research Design-Qualitative, Quantitative, and Mixed Method Approaches-*, 3-22.
- Creswell, J. W. (2021). *A concise introduction to mixed methods research*: SAGE publications.
- Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*: Sage publications.
- Creswell, J. W., Hanson, W. E., Clark Plano, V. L., & Morales, A. (2007). Qualitative research designs: Selection and implementation. *The counseling psychologist*, 35(2), 236-264.
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*: Sage publications.
- Croson, R. (2007). The use of students as participants in experimental research. *University of Texas at Dallas*.
- Csikszentmihalyi, M., & Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience* (Vol. 1990): Harper & Row New York.
- Damasio, A. (2001). Fundamental feelings. *Nature*, 413(6858), 781-781.
- Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-methods research: A discussion on its types, challenges, and criticisms. *Journal of Practical Studies in Education*, 2(2), 25-36.
- De Bernardi, C. (2019). A critical realist appraisal of authenticity in tourism: the case of the Sámi. *Journal of Critical Realism*, 18(4), 437-452.
- DeJonckheere, M., & Vaughn, L. M. (2019). Semistructured interviewing in primary care research: a balance of relationship and rigour. *Family medicine and community health*, 7(2).
- del Bosque, I. R., & San Martín, H. (2008). Tourist satisfaction a cognitive-affective model. *Annals of Tourism Research*, 35(2), 551-573.
- Deng, L., Turner, D. E., Gehling, R., & Prince, B. (2010). User experience, satisfaction, and continual usage intention of IT. *European Journal of Information Systems*, 19(1), 60-75.
- Denzin, N. K., & Lincoln, Y. S. (2008). Introduction: The discipline and practice of qualitative research.
- DeVellis, R. F., & Thorpe, C. T. (2021). *Scale development: Theory and applications*: Sage publications.
- Diemer, J., Alpers, G. W., Peperkorn, H. M., Shibani, Y., & Mühlberger, A. (2015). The impact of perception and presence on emotional reactions: a review of research in virtual reality. *Frontiers in psychology*, 6, 26.
- Disztinger, P., Schlögl, S., & Groth, A. (2017). Technology acceptance of virtual reality for travel planning. In *Information and communication technologies in tourism 2017* (pp. 255-268): Springer.

- Draper, J. V., Kaber, D. B., & Usher, J. M. (1998). Telepresence. *Human factors*, 40(3), 354-375.
- Dura, M. T. (2006). The phenomenology of the music-listening experience. *Arts Education Policy Review*, 107(3), 25-32.
- Dwivedi, Y. K., Hughes, L., Baabdullah, A. M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M. M., . . . Cheung, C. M. (2022). Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 66, 102542.
- Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2019). Re-examining the unified theory of acceptance and use of technology (UTAUT): Towards a revised theoretical model. *Information Systems Frontiers*, 21(3), 719-734.
- Dźwigoł, H. (2020). Pilot study in the research procedure. *Organizacja i Zarządzanie: kwartalnik naukowy*.
- Eda, A. (2021). IMMERSIVE REALITY TECHNOLOGIES AND THE FUTURE OF TOURISM INDUSTRY. *Dijital Gelecek Dijital Dönüşüm-2*, 91.
- Eisenhauer, B. W., Krannich, R. S., & Blahna, D. J. (2000). Attachments to special places on public lands: An analysis of activities, reason for attachments, and community connections. *Society & Natural Resources*, 13(5), 421-441.
- Ekman, P., & Friesen, W. V. (2003). *Unmasking the face: A guide to recognizing emotions from facial clues* (Vol. 10): Ishk.
- El-Said, O., & Aziz, H. (2022). Virtual tours a means to an end: An analysis of virtual tours' role in tourism recovery post COVID-19. *Journal of Travel Research*, 61(3), 528-548.
- Elgammal, I., Ferretti, M., Risitano, M., & Sorrentino, A. (2020). Does digital technology improve the visitor experience? A comparative study in the museum context. *International Journal of Tourism Policy*, 10(1), 47-67.
- Elmusharaf, K. (2012). Qualitative sampling techniques. *Training Course in Sexual and Reproductive Health Research*.
- Engel, J. F., & Roger, D. (1995). Blackwell, and Paul W. Miniard, Consumer Behavior. In: Fort Worth, TX: Dryden Press.
- Fabrigar, L. R., & Wegener, D. T. (2011). *Exploratory factor analysis*: Oxford University Press.
- Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*: University of Akron Press.
- Fang, Y.-M., & Huang, Y.-J. (2021). Comparison of the usability and flow experience of an exercise promotion virtual reality programme for different age groups. *Behaviour & Information Technology*, 40(12), 1250-1264.
- Farnham, S. D., McCarthy, J. F., Patel, Y., Ahuja, S., Norman, D., Hazlewood, W. R., & Lind, J. (2009). *Measuring the impact of third place attachment on the adoption of a place-based community technology*. Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.
- Farshid, M., Paschen, J., Eriksson, T., & Kietzmann, J. (2018). Go boldly!: Explore augmented reality (AR), virtual reality (VR), and mixed reality (MR) for business. *Business Horizons*, 61(5), 657-663.
- Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs—principles and practices. *Health services research*, 48(6pt2), 2134-2156.
- Finstad, K. (2010). Response interpolation and scale sensitivity: Evidence against 5-point scales. *Journal of usability studies*, 5(3), 104-110.
- Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019). The impact of virtual, augmented and mixed reality technologies on the customer experience. *Journal of Business Research*, 100, 547-560.

- Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2021). Impacts of technological embodiment through virtual reality on potential guests' emotions and engagement. *Journal of Hospitality Marketing & Management*, 30(1), 1-20.
- Fleming, J. S. (2003). Computing measures of simplicity of fit for loadings in factor-analytically derived scales. *Behavior research methods, instruments, & computers*, 35(4), 520-524.
- Foreman, N. (2010). Virtual reality in psychology. *Themes in Science and Technology Education*, 2(1-2), 225-252.
- Friedman, D., Pizarro, R., Or-Berkers, K., Neyret, S., Pan, X., & Slater, M. (2014). A method for generating an illusion of backwards time travel using immersive virtual reality—an exploratory study. *Frontiers in psychology*, 5, 943.
- Friedrich, B. (2016). Smitten with Technology—An Attachment Theory Approach.
- Freina, L., & Ott, M. (2015). A literature review on immersive virtual reality in education: state of the art and perspectives. Paper presented at the The international scientific conference elearning and software for education.
- Fukukawa, K. (2003). A theoretical review of business and consumer ethics research: Normative and descriptive approaches. *The Marketing Review*, 3(4), 381-401.
- Fussell, S. G., & Truong, D. (2022). Using virtual reality for dynamic learning: an extended technology acceptance model. *Virtual Reality*, 26(1), 249-267.
- Gallagher, S., Janz, B., Reinerman, L., Trempler, J., & Bockelman, P. (2015). *A neurophenomenology of awe and wonder: Towards a non-reductionist cognitive science*: Springer.
- Gamlen, A., & McIntyre, C. (2018). Mixing methods to explain emigration policies: A post-positivist perspective. *Journal of Mixed Methods Research*, 12(4), 374-393.
- Gao, B. W., Zhu, C., Song, H., & Dempsey, I. M. B. (2022). Interpreting the perceptions of authenticity in virtual reality tourism through postmodernist approach. *Information Technology & Tourism*, 24(1), 31-55.
- Garrett, B., Taverner, T., Gromala, D., Tao, G., Cordingley, E., & Sun, C. (2018). Virtual reality clinical research: promises and challenges. *JMIR serious games*, 6(4), e10839.
- Geng, L., Li, Y., Zhang, Y., Jiang, Z., & Xue, Y. (2023). Advancing tourism recovery through virtual tourism marketing: an integrated approach of uses and gratifications theory and attachment to VR. *Current Issues in Tourism*, 1-17.
- George, D. (2011). *SPSS for windows step by step: A simple study guide and reference*, 17.0 update, 10/e: Pearson Education India.
- Ghapanchi, A. H., & Talaie-Khoei, A. (2018). Rethinking technology acceptance: towards a theory of technology utilization.
- Gharibi, N. (2020). The evolution of predictive models and tourism. *Journal of Tourism Futures*.
- Gibson, A., & O'Rawe, M. (2018). Virtual reality as a travel promotional tool: Insights from a consumer travel fair. In *Augmented reality and virtual reality* (pp. 93-107): Springer.
- Gilbert, S. B. (2016a). Perceived realism of virtual environments depends on authenticity. *Presence*, 25(4), 322-324.
- Gilbert, S. B. (2016b). Perceived realism of virtual environments depends on authenticity. *Presence: Teleoperators and Virtual Environments*, 24(4), 322-324.
- Glegg, S. M., Holsti, L., Stanton, S., Hanna, S., Velikonja, D., Ansley, B., . . . Brum, C. (2017). Evaluating change in virtual reality adoption for brain injury rehabilitation following knowledge translation. *Disability and Rehabilitation: Assistive Technology*, 12(3), 217-226.

- Godovykh, M., Baker, C., & Fyall, A. (2022). VR in tourism: A New Call for Virtual Tourism Experience amid and after the COVID-19 Pandemic. *Tourism and Hospitality*, 3(1), 265-275.
- Godovykh, M., & Tasci, A. D. (2020). Customer experience in tourism: A review of definitions, components, and measurements. *Tourism management perspectives*, 35, 100694.
- Godovykh, M., & Tasci, A. D. (2021). Emotions, feelings, and moods in tourism and hospitality research: Conceptual and methodological differences. *Tourism and Hospitality Research*, 14673584211039867.
- González-Rodríguez, M. R., Díaz-Fernández, M. C., & Pino-Mejías, M. Á. (2020). The impact of virtual reality technology on tourists' experience: A textual data analysis. *Soft Computing*, 1-14.
- Goossens, C. (2000). Tourism information and pleasure motivation. *Annals of Tourism Research*, 27(2), 301-321.
- Gordon, A. M., Stellar, J. E., Anderson, C. L., McNeil, G. D., Loew, D., & Keltner, D. (2017). The dark side of the sublime: Distinguishing a threat-based variant of awe. *Journal of personality and social psychology*, 113(2), 310.
- Gössling, S., Scott, D., & Hall, C. M. (2020). Pandemics, tourism and global change: a rapid assessment of COVID-19. *Journal of Sustainable Tourism*, 1-20.
- Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational evaluation and policy analysis*, 11(3), 255-274.
- Griffin, T., Giberson, J., Lee, S. H. M., Guttentag, D., Kandaurova, M., Sergueeva, K., & Dimanche, F. (2017). Virtual reality and implications for destination marketing.
- Gromer, D., Reinke, M., Christner, I., & Pauli, P. (2019). Causal interactive links between presence and fear in virtual reality height exposure. *Frontiers in psychology*, 10, 141.
- Gross, M. J., & Brown, G. (2006). Tourism experiences in a lifestyle destination setting: The roles of involvement and place attachment. *Journal of business research*, 59(6), 696-700.
- Guo, Q., Zhu, D., Li, F., Wang, X., & Shu, Y. (2022). Tourists' Adoption of Extended Reality Technologies: A MetaAnalytical Structural Equation Modeling. *Journal of Hospitality & Tourism Research*, 10963480221108906.
- Guo, S., Jiang, L., Huang, R., Ye, W., & Zhou, X. (2018). Inspiring awe in consumers: Relevance, triggers, and consequences. *Asian Journal of Social Psychology*, 21(3), 129-142.
- Guttentag, D. A. (2010). Virtual reality: Applications and implications for tourism. *Tourism Management*, 31(5), 637-651.
- Hair, J. F. (2009). Multivariate data analysis.
- Hair, J. F. (2011). Multivariate data analysis: An overview. *International encyclopedia of statistical science*, 904-907.
- Hair, J. F., Black, W., Babin, B., & Anderson, R. (2009). Multivariate Data 1112 Analysis. 7th (Seventh) edition. In: New Jersey: Prentice Hall.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice*, 19(2), 139-152.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24.
- Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)*: Sage publications.

- Hair Jr, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European business review*.
- Hakim, A., & Hammad, S. (2022). *Use of Virtual Reality in Psychology*. Paper presented at the Conference on Multimedia, Interaction, Design and Innovation.
- Hamad, A. (2021). *Two Wheelistic: Development of a High-Fidelity Virtual Reality Cycling Simulator for Transportation Safety Research*.
- Hamad, A., & Jia, B. (2022). How Virtual Reality Technology Has Changed Our Lives: An Overview of the Current and Potential Applications and Limitations. *International Journal of Environmental Research and Public Health*, 19(18), 11278.
- Hammit, W. E., Backlund, E. A., & Bixler, R. D. (2006). Place bonding for recreation places: Conceptual and empirical development. *Leisure Studies*, 25(1), 17-41.
- Han, D.-I., Jung, T., & Gibson, A. (2013). Dublin AR: implementing augmented reality in tourism. In *Information and communication technologies in tourism 2014* (pp. 511-523): Springer.
- Han, D.-I. D., Bergs, Y., & Moorhouse, N. (2022). Virtual reality consumer experience escapes: preparing for the metaverse. *Virtual reality*, 26(4), 1443-1458.
- Hanna, M. G., Ahmed, I., Nine, J., Prajapati, S., & Pantanowitz, L. (2018). Augmented reality technology using Microsoft HoloLens in anatomic pathology. *Archives of pathology & laboratory medicine*, 142(5), 638-644.
- Hansen, A. H., & Mossberg, L. (2013). Consumer immersion: A key to extraordinary experiences. In *Handbook on the experience economy*: Edward Elgar Publishing.
- Harrison, I. B. (1975). On the maternal origins of awe. *The psychoanalytic study of the child*, 30(1), 181-195.
- Harvey, J. (2021). *Augmented Reality Supporting Sustainable Māori Tourism Development in Tāmaki Makaurau*. Auckland University of Technology,
- Hassan, L., Jylhä, H., Sjöblom, M., & Hamari, J. (2020). Flow in VR: a study on the relationships between preconditions, experience and continued use.
- Hassenzahl, M., Diefenbach, S., & Göritz, A. (2010). Needs, affect, and interactive products—Facets of user experience. *Interacting with computers*, 22(5), 353-362.
- Hein, D. W., & Rauschnabel, P. A. (2016). Augmented reality smart glasses and knowledge management: A conceptual framework for enterprise social networks. In *Enterprise social networks* (pp. 83-109): Springer.
- Hennink, M., Hutter, I., & Bailey, A. (2020). *Qualitative research methods*: Sage.
- Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: updated guidelines. *Industrial management & data systems*.
- Hertlein, K. M., & Twist, M. L. (2018). Attachment to technology: The missing link. *Journal of Couple & Relationship Therapy*, 17(1), 2-6.
- Herz, M., & Rauschnabel, P. A. (2019). Understanding the diffusion of virtual reality glasses: The role of media, fashion and technology. *Technological Forecasting and Social Change*, 138, 228-242.
- Hicks, J. (2018). Exploring the relationship between awe and leisure: A conceptual argument. *Journal of leisure research*, 49(3-5), 258-276.
- Hidalgo, M. C., & Hernandez, B. (2001). Place attachment: Conceptual and empirical questions. *Journal of environmental psychology*, 21(3), 273-281.
- Hoelzle, J. B., & Meyer, G. J. (2013). Exploratory factor analysis: Basics and beyond.
- Holsapple, C. W., & Wu, J. (2007). User acceptance of virtual worlds: The hedonic framework. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, 38(4), 86-89.

- Honebein, P. C. (1996). Seven goals for the design of constructivist learning environments. *Constructivist learning environments: Case studies in instructional design*, 11-24.
- Hong, E. (2021). *Understanding the Antecedents of Perceived Authenticity to Predict Cultural Tourists' Behavioral Intention: The Case of Cambodia's Angkor Wat*. Ohio University.
- Hopkins, C. D., Raymond, M. A., & Mitra, A. (2004). Consumer responses to perceived telepresence in the online advertising environment: the moderating role of involvement. *Marketing Theory*, 4(1-2), 137-162.
- Horesh, D., Kohavi, S., Shilony-Nalaboff, L., Rudich, N., Greenman, D., Feuerstein, J. S., & Abbasi, M. R. (2022). *Virtual Reality Combined with Artificial Intelligence (VR-AI) Reduces Hot Flashes and Improves Psychological Well-Being in Women with Breast and Ovarian Cancer: A Pilot Study*. Paper presented at the Healthcare.
- Hosany, S., Buzova, D., & Sanz-Blas, S. (2020). The influence of place attachment, ad-evoked positive affect, and motivation on intention to visit: Imagination proclivity as a moderator. *Journal of Travel Research*, 59(3), 477-495.
- Hosany, S., Prayag, G., Van Der Veen, R., Huang, S., & Deesilatham, S. (2017). Mediating effects of place attachment and satisfaction on the relationship between tourists' emotions and intention to recommend. *Journal of Travel Research*, 56(8), 1079-1093.
- Hoyer, W. D., Kroschke, M., Schmitt, B., Kraume, K., & Shankar, V. (2020). Transforming the customer experience through new technologies. *Journal of Interactive Marketing*, 51(1), 57-71.
- Hruby, F., Sánchez, L. F. Á., Ressler, R., & Escobar-Briones, E. G. (2020). An empirical study on spatial presence in immersive geo-environments. *PFG—Journal of Photogrammetry, Remote Sensing and Geoinformation Science*, 88(2), 155-163.
- Huang, T.-L., & Liao, S. (2015). A model of acceptance of augmented-reality interactive technology: the moderating role of cognitive innovativeness. *Electronic Commerce Research*, 15(2), 269-295.
- Huang, Y.-C., Backman, S. J., Backman, K. F., & Moore, D. (2013). Exploring user acceptance of 3D virtual worlds in travel and tourism marketing. *Tourism management*, 36, 490-501.
- Huang, Y. C., Backman, K. F., Backman, S. J., & Chang, L. L. (2016). Exploring the implications of virtual reality technology in tourism marketing: An integrated research framework. *International Journal of Tourism Research*, 18(2), 116-128.
- Huang, Y. C., Backman, S. J., & Backman, K. F. (2012). Exploring the impacts of involvement and flow experiences in Second Life on people's travel intentions. *Journal of hospitality and tourism technology*.
- Hudson, S., Matson-Barkat, S., Pallamin, N., & Jegou, G. (2019). With or without you? Interaction and immersion in a virtual reality experience. *Journal of business research*, 100, 459-468.
- Hyun, M. Y., & O'Keefe, R. M. (2012). Virtual destination image: Testing a telepresence model. *Journal of Business Research*, 65(1), 29-35.
- Idemudia, E. C., & Raisinghani, M. S. (2014). The influence of cognitive trust and familiarity on adoption and continued use of smartphones: An empirical analysis. *Journal of International Technology and Information Management*, 23(2), 6.
- Iftikhar, R., Khan, M. S., & Pasanchay, K. (2022). Virtual reality tourism and technology acceptance: a disability perspective. *Leisure Studies*, 1-17.
- Ihm, E. D., Paloutzian, R. F., van Elk, M., & Schooler, J. W. (2019). Awe as a meaning-making emotion: On the evolution of awe and the origin of religions. In *The Evolution of Religion, Religiosity and Theology* (pp. 138-153): Routledge.
- Ijsselstein, W., & Riva, G. (2003). Being there: The experience of presence in mediated environments.

- Ilic, I., & Nikolic, A. (2018). Implications of modern technology development for the tourism sector of the republic of Serbia. *Ekonomika, Journal for Economic Theory and Practice and Social Issues*, 64(1350-2019-2782), 37-52.
- Ismail, N., Hasan, M. H., & Mustapha, E. (2018). Technology use, emotional connection and their relationship: A literature review. *Journal of Theoretical and Applied Information Technology*, 96(1), 127-139.
- Ismail, N., Kinchin, G., & Edwards, J.-A. (2018). Pilot study, Does it really matter? Learning lessons from conducting a pilot study for a qualitative PhD thesis. *International Journal of Social Science Research*, 6(1), 1-17.
- James, W. (1985). The varieties of (religious) experience. Cambridge, MA. In: Harvard University Press. (Original work published 1902).
- Jangra, R., Kaushik, S., & Saini, S. S. (2021). An analysis of tourist's perceptions toward tourism development: Study of cold desert destination, India. *Geography and Sustainability*, 2(1), 48-58.
- Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. (2008). Measuring and defining the experience of immersion in games. *International journal of human-computer studies*, 66(9), 641-661.
- Jeong, M., & Shin, H. H. (2020). Tourists' experiences with smart tourism technology at smart destinations and their behavior intentions. *Journal of Travel Research*, 59(8), 1464-1477.
- Jeong, Y., Yu, A., & Kim, S.-K. (2020). The antecedents of tourists' behavioral intentions at sporting events: The case of South Korea. *Sustainability*, 12(1), 333.
- Jiang, Y., Ramkissoon, H., Mavondo, F. T., & Feng, S. (2017). Authenticity: The link between destination image and place attachment. *Journal of Hospitality Marketing & Management*, 26(2), 105-124.
- Jiang, X., Qin, J., Gao, J., & Gossage, M. G. (2022). How Tourists' Perception Affects Travel Intention: Mechanism Pathways and Boundary Conditions. *Frontiers in psychology*, 13, 821364.
- Jingen Liang, L., & Elliot, S. (2020). A systematic review of augmented reality tourism research: What is now and what is next? *Tourism and Hospitality Research*, 1467358420941913.
- Jung, & tom Dieck, M. C. (2017). Augmented reality, virtual reality and 3D printing for the co-creation of value for the visitor experience at cultural heritage places. *Journal of Place Management and Development*.
- Jung, T., Chung, N., & Leue, M. C. (2015). The determinants of recommendations to use augmented reality technologies: The case of a Korean theme park. *Tourism management*, 49, 75-86.
- Jung, T., Dieck, M., Lee, H., & Chung, N. (2016). Effects of virtual reality and augmented reality on visitor experiences in museum. In *Information and communication technologies in tourism 2016* (pp. 621-635): Springer.
- Jung, T., Lee, H., & Chung, N. (2022). Social Presence and Experience Economy: The Effects of Augmented and Virtual Reality in Museums. *International Journal of Mobile Communications*.
- Jung, T., & Michopoulou, E. (2019). Experiencing virtual reality in heritage attractions: Perceptions of elderly users. In *Augmented Reality and Virtual Reality* (pp. 89-98): Springer.
- Jung, T., Tom Dieck, M. C., Lee, H., & Chung, N. (2020). Moderating role of long-term orientation on augmented reality adoption. *International Journal of Human-Computer Interaction*, 36(3), 239-250.

- Jung, T. H., & tom Dieck, M. C. (2017). Augmented reality, virtual reality and 3D printing for the co-creation of value for the visitor experience at cultural heritage places. *Journal of Place Management and Development*.
- Juvan, E., Omerzel, D. G., & Maravić, M. U. (2017). *Tourist behaviour: An overview of models to date*. Paper presented at the Management International Conference.
- Kaiser, H. F. (1974). An index of factorial simplicity. *psychometrika*, 39(1), 31-36.
- Kautish, P., Purohit, S., Filieri, R., & Dwivedi, Y. K. (2023). Examining the role of consumer motivations to use voice assistants for fashion shopping: The mediating role of awe experience and eWOM. *Technological Forecasting and Social Change*, 190, 122407.
- Kajan, E. (2014). Community perceptions to place attachment and tourism development in Finnish Lapland. *Tourism Geographies*, 16(3), 490-511.
- Kakilla, C. (2021). Strengths and Weaknesses of Semi-Structured Interviews in Qualitative Research: A Critical Essay.
- Kalantari, M., & Rauschnabel, P. (2018). Exploring the early adopters of augmented reality smart glasses: The case of Microsoft HoloLens. In *Augmented reality and virtual reality* (pp. 229-245): Springer.
- Kang, S., Dove, S., Ebright, H., Morales, S., & Kim, H. (2021). Does virtual reality affect behavioral intention? Testing engagement processes in a K-Pop video on YouTube. *Computers in Human Behavior*, 123, 106875.
- Kaur, S., & Kaur, M. (2020). Behavioral intentions of heritage tourists: Influential variables on recommendations to visit. *Journal of Heritage Tourism*, 15(5), 511-532.
- Kazmi, S. H. A., Ahmed, R. R., Soomro, K. A., Hashem E, A. R., Akhtar, H., & Parmar, V. (2021). Role of Augmented Reality in Changing Consumer Behavior and Decision Making: Case of Pakistan. *Sustainability*, 13(24), 14064.
- Keltner, D., & Haidt, J. (2003). Approaching awe, a moral, spiritual, and aesthetic emotion. *Cognition and emotion*, 17(2), 297-314.
- Kerawalla, L., Luckin, R., Seljeflot, S., & Woolard, A. (2006). "Making it real": exploring the potential of augmented reality for teaching primary school science. *Virtual reality*, 10(3), 163-174.
- Khoo-Lattimore, C., & Sitruk, J. Casual Dining on the French Riviera: Examining the Relationship between Visitors' Perceived Quality, Positive Emotions and Behavioral Intentions.
- Kim, G., & Biocca, F. (2018). *Immersion in virtual reality can increase exercise motivation and physical performance*. Paper presented at the International conference on virtual, augmented and mixed reality.
- Kim, H., So, K. K. F., Mihalik, B. J., & Lopes, A. P. (2021). Millennials' virtual reality experiences pre-and post-COVID-19. *Journal of Hospitality and Tourism Management*, 48, 200-209.
- Kim, J. (2021). Advertising in the metaverse: Research agenda. *Journal of Interactive Advertising*, 21(3), 141-144.
- Kim, M. J., Chung, N., Lee, C.-K., & Preis, M. W. (2016). Dual-route of persuasive communications in mobile tourism shopping. *Telematics and Informatics*, 33(2), 293-308.
- Kim, M. J., & Hall, C. M. (2019). A hedonic motivation model in virtual reality tourism: Comparing visitors and non-visitors. *International Journal of Information Management*, 46, 236-249.
- Kim, M. J., Lee, C.-K., & Bonn, M. (2017). Obtaining a better understanding about travel-related purchase intentions among senior users of mobile social network sites. *International Journal of Information Management*, 37(5), 484-496.

- Kim, M. J., Lee, C.-K., & Jung, T. (2020). Exploring consumer behavior in virtual reality tourism using an extended stimulus-organism-response model. *Journal of Travel Research*, 59(1), 69-89.
- Kirillova, K., Lehto, X. Y., & Cai, L. (2017). Existential authenticity and anxiety as outcomes: The tourist in the experience economy. *International Journal of Tourism Research*, 19(1), 13-26.
- Kitson, A., Prpa, M., & Riecke, B. E. (2018). Immersive interactive technologies for positive change: a scoping review and design considerations. *Frontiers in psychology*, 9, 1354.
- Kivunja, C., & Kuyini, A. B. (2017). Understanding and applying research paradigms in educational contexts. *International Journal of higher education*, 6(5), 26-41.
- Kline, R. B. (2015). *Principles and practice of structural equation modeling*: Guilford publications.
- Kobak, R. R., Cole, H. E., Ferenz-Gillies, R., Fleming, W. S., & Gamble, W. (1993). Attachment and emotion regulation during mother-teen problem solving: A control theory analysis. *Child development*, 64(1), 231-245.
- Kock, N. (2014). Advanced mediating effects tests, multi-group analyses, and measurement model assessments in PLS-based SEM. *International Journal of e-Collaboration (IJeC)*, 10(1), 1-13.
- Koivisto, J., & Hamari, J. (2019). The rise of motivational information systems: A review of gamification research. *International Journal of Information Management*, 45, 191-210.
- Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development*: FT press.
- Kourouthanassis, P. E., Boletsis, C., & Lekakos, G. (2015). Demystifying the design of mobile augmented reality applications. *Multimedia Tools and Applications*, 74(3), 1045-1066.
- Krassmann, A. L., Melo, M., Pinto, D., Peixoto, B., Bessa, M., & Bercht, M. (2022). What is the relationship between the sense of presence and learning in virtual reality? A 24 years systematic literature review. *PRESENCE: Virtual and Augmented Reality*, 1-99.
- Krause, N., & Hayward, R. D. (2015). Assessing whether practical wisdom and awe of God are associated with life satisfaction. *Psychology of Religion and Spirituality*, 7(1), 51.
- Kronqvist, A., Jokinen, J., & Rousi, R. (2016). Evaluating the authenticity of virtual environments: Comparison of three devices. *Advances in Human-Computer Interaction*, 2016.
- Kuleto, V., Stanescu, M., Ranković, M., Šević, N. P., Păun, D., & Teodorescu, S. (2021). Extended Reality in Higher Education, a Responsible Innovation Approach for Generation Y and Generation Z. *Sustainability*, 13(21), 11814.
- Kwok, A. O., & Koh, S. G. (2020). COVID-19 and Extended Reality (XR). *Current Issues in Tourism*, 1-6.
- Kwok, A. O., & Koh, S. G. (2021). COVID-19 and extended reality (XR). *Current Issues in Tourism*, 24(14), 1935-1940.
- Lagiewski, R., & Kesgin, M. (2017). Designing and implementing digital visitor experiences in New York State: The case of the Finger Lakes Interactive Play (FLIP) project. *Journal of Destination Marketing & Management*, 6(2), 118-126.
- Lam, L. W. (2012). Impact of competitiveness on salespeople's commitment and performance. *Journal of business research*, 65(9), 1328-1334.
- Lan, Y.-J., & Liao, C.-Y. (2018). The effects of 3D immersion on CSL students' listening comprehension. *Innovation in Language Learning and Teaching*, 12(1), 35-46.
- Laros, F. J., & Steenkamp, J.-B. E. (2005). Emotions in consumer behavior: a hierarchical approach. *Journal of Business Research*, 58(10), 1437-1445.
- Lee, K. M. (2004). Presence, explicated. *Communication theory*, 14(1), 27-50.

- Lee, M., Lee, S. A., Jeong, M., & Oh, H. (2020). Quality of virtual reality and its impacts on behavioral intention. *International Journal of Hospitality Management*, 90, 102595.
- Lee, P., Arkenberg, C., Stanton, B., & Cook, A. (2023). Will VR go from niche to mainstream? It all depends on compelling VR content. *Technology, Media, and Telecommunications Predictions 2023*.
- Lee, W.-j., & Kim, Y. H. (2021). Does VR tourism enhance users' experience? *Sustainability*, 13(2), 806.
- Lee, Y.-K., Lee, C.-K., Lee, S.-K., & Babin, B. J. (2008). Festivalscapes and patrons' emotions, satisfaction, and loyalty. *Journal of business research*, 61(1), 56-64.
- Leguina, A. (2015). A primer on partial least squares structural equation modeling (PLS-SEM). In: Taylor & Francis.
- Lehman, D. W., O'Connor, K., Kovács, B., & Newman, G. E. (2019). Authenticity. *Academy of Management Annals*, 13(1), 1-42.
- Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of marketing*, 80(6), 69-96.
- Lerner, J. S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of personality and social psychology*, 81(1), 146.
- Lerner, J. S., Li, Y., Valdesolo, P., & Kassam, K. S. (2015). Emotion and decision making. *Annual review of psychology*, 66, 799-823.
- Leue, M., & Jung, T. (2014). A theoretical model of augmented reality acceptance. *E-review of Tourism Research*, 5.
- Leung, W. K., Chang, M. K., Cheung, M. L., & Shi, S. (2022). VR tourism experiences and tourist behavior intention in COVID-19: an experience economy and mood management perspective. *Information Technology & People*(ahead-of-print).
- Leung, X. Y., Lyu, J., & Bai, B. (2020). A fad or the future? Examining the effectiveness of virtual reality advertising in the hotel industry. *International Journal of Hospitality Management*, 88, 102391.
- Li, D., Browne, G. J., & Chau, P. Y. (2006). An empirical investigation of web site use using a commitment-based model. *Decision Sciences*, 37(3), 427-444.
- Li, J., & Cao, B. (2022). Study on tourism consumer behavior and countermeasures based on big data. *Computational Intelligence and Neuroscience*, 2022.
- Li, F., Shang, Y., & Su, Q. (2023). The influence of immersion on tourists' satisfaction via perceived attractiveness and happiness. *Tourism Review*, 78(1), 122-141.
- Li, S., Walters, G., Packer, J., & Scott, N. (2018). Using skin conductance and facial electromyography to measure emotional responses to tourism advertising. *Current Issues in Tourism*, 21(15), 1761-1783.
- Li, X., Shen, H., & Wen, H. (2016). A study on tourists perceived authenticity towards experience quality and behavior intention of cultural heritage in Macao. *International Journal of Marketing Studies*, 8(4), 117-123.
- Lin, C.-C., & Lockwood, M. (2014). Forms and sources of place attachment: Evidence from two protected areas. *Geoforum*, 53, 74-81.
- Lin, C.-H., & Wang, W.-C. (2012). Effects of authenticity perception, hedonics, and perceived value on ceramic souvenir-repurchasing intention. *Journal of Travel & Tourism Marketing*, 29(8), 779-795.
- Lin, F., Fofanah, S. S., & Liang, D. (2011). Assessing citizen adoption of e-Government initiatives in Gambia: A validation of the technology acceptance model in information systems success. *Government Information Quarterly*, 28(2), 271-279.
- Lin, J. S. C., & Liang, H. Y. (2011). The influence of service environments on customer emotion and service outcomes. *Managing Service Quality: An International Journal*.
- Lin, L.-P. L., Huang, S.-C. L., & Ho, Y.-C. (2020). Could virtual reality effectively market slow travel in a heritage destination? *Tourism Management*, 78, 104027.

- Lincoln, Y., Lynham, S., & Guba, E. (2018). Part II Paradigms and Perspectives in Contention: 5 Paradigmatic Controversies, Contradictions and Emerging Confluences, Revisited. In: *The SAGE Handbook of Qualitative Research*.
- Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). Paradigmatic controversies, contradictions, and emerging confluences, revisited. *The Sage handbook of qualitative research*, 4(2), 97-128.
- Lindberg, F., Hansen, A. H., & Eide, D. (2014). A multirelational approach for understanding consumer experiences within tourism. *Journal of Hospitality Marketing & Management*, 23(5), 487-512.
- Lipp, N., Sterna, R., Dużmańska-Misiarczyk, N., Strojny, A., Poeschl-Guenther, S., & Strojny, P. (2021). VR Realism Scale—Revalidation of contemporary VR headsets on a Polish sample. *PloS one*, 16(12), e0261507.
- Lloret, S., Ferreres, A., Hernández, A., & Tomás, I. (2017). The exploratory factor analysis of items: guided analysis based on empirical data and software. *Anales de psicología*, 33(2), 417-432.
- Lo, W. H., & Cheng, K. L. B. (2020). Does virtual reality attract visitors? The mediating effect of presence on consumer response in virtual reality tourism advertising. *Information technology & tourism*, 22(4), 537-562.
- Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. *Journal of computer-mediated communication*, 3(2), JCMC321.
- Loomis, J. M., Blascovich, J. J., & Beall, A. C. (1999). Immersive virtual environment technology as a basic research tool in psychology. *Behavior research methods, instruments, & computers*, 31(4), 557-564.
- Lorenz, M., Brade, J., Diamond, L., Sjölie, D., Busch, M., Tscheligi, M., . . . Hammer, N. (2018). Presence and user experience in a virtual environment under the influence of ethanol: an explorative study. *Scientific reports*, 8(1), 1-16.
- Lorini, E., & Castelfranchi, C. (2007). The cognitive structure of surprise: looking for basic principles. *Topoi*, 26(1), 133-149.
- Loureiro, S. M. C. (2014). The role of the rural tourism experience economy in place attachment and behavioral intentions. *International Journal of Hospitality Management*, 40, 1-9.
- Loureiro, S. M. C., Bilro, R. G., & de Aires Angelino, F. J. (2020). Virtual reality and gamification in marketing higher education: a review and research agenda. *Spanish Journal of Marketing-ESIC*.
- Loureiro, S. M. C., Guerreiro, J., & Ali, F. (2020). 20 years of research on virtual reality and augmented reality in tourism context: A text-mining approach. *Tourism management*, 77, 104028.
- Loureiro, S. M. C., & Sarmiento, E. M. (2019). Place attachment and tourist engagement of major visitor attractions in Lisbon. *Tourism and Hospitality Research*, 19(3), 368-381.
- Lu, D., Liu, Y., Lai, I., & Yang, L. (2017). Awe: An important emotional experience in sustainable tourism. *Sustainability*, 9(12), 2189.
- Lu, D., & Tian, Y. (2015). The Emotion of Awe and Perception of Destination to Influence Tourists' Satisfaction.
- Lu, J., Xiao, X., Xu, Z., Wang, C., Zhang, M., & Zhou, Y. (2022). The potential of virtual tourism in the recovery of tourism industry during the COVID-19 pandemic. *Current Issues in Tourism*, 25(3), 441-457.
- Lunardo, R., & Ponsignon, F. (2020). Achieving immersion in the tourism experience: the role of autonomy, temporal dissociation, and reactance. *Journal of Travel Research*, 59(7), 1151-1167.

- Ma, X. (2022). Application of Virtual Reality Technology in Art Design: A Systematic Approach. *Mobile Information Systems*.
- Malterud, K. (2001). Qualitative research: standards, challenges, and guidelines. *The lancet*, 358(9280), 483-488.
- Mamman, M., Ogunbado, A. F., & Abu-Bakr, A. S. (2016). Factors influencing customer's behavioral intention to adopt Islamic banking in Northern Nigeria: A proposed framework. *IOSR Journal of Economics and Finance (IOSR-JEF)*, 7(1), 51-55.
- Mann, S., Furness, T., Yuan, Y., Iorio, J., & Wang, Z. (2018). All reality: Virtual, augmented, mixed (x), mediated (x, y), and multimediated reality. *arXiv preprint arXiv:1804.08386*.
- Mantovani, G., & Riva, G. (1999). "Real" presence: how different ontologies generate different criteria for presence, telepresence, and virtual presence. *Presence*, 8(5), 540-550.
- Marasco, A., Buonincontri, P., van Niekerk, M., Orłowski, M., & Okumus, F. (2018). Exploring the role of next-generation virtual technologies in destination marketing. *Journal of destination marketing & management*, 9, 138-148.
- Marougkas, A., Troussas, C., Krouska, A., & Sgouropoulou, C. (2023). Virtual reality in education: a review of learning theories, approaches and methodologies for the last decade. *Electronics*, 12(13), 2832.
- Martínez-Molés, V., Jung, T. H., Pérez-Cabañero, C., & Cervera-Taulet, A. (2021). Gathering pre-purchase information for a cruise vacation with virtual reality: the effects of media technology and gender. *International Journal of Contemporary Hospitality Management*.
- Martins, J., Gonçalves, R., Branco, F., Barbosa, L., Melo, M., & Bessa, M. (2017). A multisensory virtual experience model for thematic tourism: A Port wine tourism application proposal. *Journal of Destination Marketing & Management*, 6(2), 103-109.
- Mathew, R. K., Mushtaq, F., & Collaboration, I. H. (2021). Three principles for the progress of immersive technologies in healthcare training and education. *BMJ Simulation & Technology Enhanced Learning*, 7(5), 459.
- Maxfield, M. G., & Babbie, E. R. (2017). *Research methods for criminal justice and criminology*: Cengage Learning.
- Mazuryk, T., & Gervautz, M. (1996). Virtual reality-history, applications, technology and future.
- Meng, B., & Choi, K. (2016). Extending the theory of planned behaviour: Testing the effects of authentic perception and environmental concerns on the slow-tourist decision-making process. *Current Issues in Tourism*, 19(6), 528-544.
- Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*: John Wiley & Sons.
- Mertens, D. M. (2019). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods*: Sage publications.
- Meschtscherjakov, A., Wilfinger, D., & Tscheligi, M. (2014). *Mobile attachment causes and consequences for emotional bonding with mobile phones*. Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.
- Mihas, P., & Institute, O. (2019). *Learn to Use an Exploratory Sequential Mixed Method Design for Instrument Development*: SAGE Publications, Limited.
- Mikulincer, M., & Shaver, P. R. (2013). Attachment orientations and meaning in life. In *The experience of meaning in life* (pp. 287-304): Springer.
- Mikulincer, M., Shaver, P. R., & Pereg, D. (2003). Attachment theory and affect regulation: The dynamics, development, and cognitive consequences of attachment-related strategies. *Motivation and emotion*, 27(2), 77-102.

- Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. *IEICE TRANSACTIONS on Information and Systems*, 77(12), 1321-1329.
- Milgram, P., Takemura, H., Utsumi, A., & Kishino, F. (1995). Augmented reality: A class of displays on the reality-virtuality continuum. Paper presented at the Telemanipulator and telepresence technologies.
- Milicevic, S., Podovac, M., & Sekulic, D. ULOGA I ZNAČAJ INFORMACIONIH TEHNOLOGIJA ZA RAZVOJ TURIZMA SRBIJE.
- Mills, A. J., Durepos, G., & Wiebe, E. (2009). *Encyclopedia of case study research*: Sage Publications.
- Mirza Ali Khan, F., & GUNNARSSON, F. (2020). The Effects of VR on Consumer Attitudes—Lessons from Implementing VR Technologies in Real Estate Marketing. In.
- Mohanty, P., Hassan, A., & Ekis, E. (2020). Augmented reality for relaunching tourism post-COVID-19: socially distant, virtually connected. *Worldwide Hospitality and Tourism Themes*.
- Moore, R. L., & Graefe, A. R. (1994). Attachments to recreation settings: The case of rail-trail users. *Leisure sciences*, 16(1), 17-31.
- Morimoto, T., Kobayashi, T., Hirata, H., Otani, K., Sugimoto, M., Tsukamoto, M., . . . Mawatari, M. (2022). XR (extended reality: virtual reality, augmented reality, mixed reality) technology in spine medicine: status quo and quo vadis. *Journal of Clinical Medicine*, 11(2), 470.
- Mulder, K. (2013). Impact of new technologies: how to assess the intended and unintended effects of new technologies. *Handb. Sustain. Eng.(2013)*.
- Mura, P., Tavakoli, R., & Pahlevan Sharif, S. (2017). ‘Authentic but not too much’: exploring perceptions of authenticity of virtual tourism. *Information Technology & Tourism*, 17(2), 145-159.
- Mura, P., Tavakoli, R., & Sharif, S. P. (2017). ‘Authentic but not too much’: exploring perceptions of authenticity of virtual tourism. *Information Technology & Tourism*, 17(2), 145-159.
- Murauer, N., Müller, F., Günther, S., Schön, D., Pflanz, N., & Funk, M. (2018). *An analysis of language impact on augmented reality order picking training*. Paper presented at the Proceedings of the 11th Pervasive Technologies Related to Assistive Environments Conference.
- Mutz, M., & Müller, J. (2016). Mental health benefits of outdoor adventures: Results from two pilot studies. *Journal of adolescence*, 49, 105-114.
- Mystakidis, S. (2019). Motivation enhanced deep and meaningful learning with social virtual reality. *JYU dissertations*.
- Mystakidis, S. (2022). Metaverse. *Encyclopedia*, 2(1), 486-497.
- Nadrljanski, D., Nadrljanski, M., & Domitrovic, V. (2018). The importance of information technology education for the future. *Economic and Social Development: Book of Proceedings*, 323-328.
- Nash, E. B., Edwards, G. W., Thompson, J. A., & Barfield, W. (2000). A review of presence and performance in virtual environments. *International Journal of human-computer Interaction*, 12(1), 1-41.
- Nazar, W., Leszkowicz, J., Pieńkowska, A., Brzeziński, M., Szlagatys-Sidorkiewicz, A., & Plata-Nazar, K. (2020). Before-and-after online community survey on knowledge and perception of COVID-19 pandemic. *BMC infectious diseases*, 20(1), 1-14.
- Nelson, B., & Rawlings, D. (2009). How does it feel? The development of the experience of creativity questionnaire. *Creativity Research Journal*, 21(1), 43-53.
- Ngan, N. T., & Khoi, B. H. (2019). Empirical study on intention to use bike-sharing in Vietnam. *IIOAB*, 10(Suppl 1), 1-6.

- Nicovich, S. (2017). Presence as a sense of place in a computer mediated communication environment.
- Nilsson, N. C., Nordahl, R., & Serafin, S. (2016). IMMERSION REVISITED: A REVIEW OF EXISTING DEFINITIONS OF IMMERSION AND THEIR RELATION TO DIFFERENT THEORIES OF PRESENCE. *Human Technology*, 12(2).
- Nurkka, P., Kujala, S., & Kempainen, K. (2009). Capturing users' perceptions of valuable experience and meaning. *Journal of Engineering Design*, 20(5), 449-465.
- Oleksy, T., & Wnuk, A. (2017). Catch them all and increase your place attachment! The role of location-based augmented reality games in changing people-place relations. *Computers in Human Behavior*, 76, 3-8.
- Oncioiu, I., & Priescu, I. (2022). The Use of Virtual Reality in Tourism Destinations as a Tool to Develop Tourist Behavior Perspective. *Sustainability*, 14(7), 4191.
- Onwuegbuzie, A. J., & Combs, J. P. (2010). Emergent data analysis techniques in mixed methods research: A synthesis. *Handbook of mixed methods in social and behavioral research*, 2, 398.
- Oz, B. (2014). Examining place attachment from a foursquare perspective. *Unpublished master's thesis. Ankara, Turkey: Middle East Technical University.*
- Pallavicini, F., Orena, E., Achille, F., Cassa, M., Vuolato, C., Stefanini, S., . . . Ranieri, P. (2022). Psychoeducation on Stress and Anxiety Using Virtual Reality: A Mixed-Methods Study. *Applied Sciences*, 12(18), 9110.
- Pallavicini, F., Pepe, A., & Minissi, M. E. (2019). Gaming in virtual reality: What changes in terms of usability, emotional response and sense of presence compared to non-immersive video games? *Simulation & Gaming*, 50(2), 136-159.
- Pantelidis, C. (2019). Exploring VR experiences of tourists' attachment to a rural destination. *International Journal of Technology Marketing*, 13(3-4), 376-400.
- Pantelidis, C., Jung, T., & Miller, A. (2018). Exploring tourist experiences of virtual reality in a rural destination: a place attachment theory perspective. *E-review of Tourism Research*, 8(Resear).
- Pantelidis, C., tom Diek, M. C., Jung, T., & Miller, A. (2018). Exploring tourist experiences of virtual reality in a rural destination: a place attachment theory perspective. *E-review of Tourism Research*.
- Park, C. W., MacInnis, D. J., Priester, J., Eisingerich, A. B., & Iacobucci, D. (2010). Brand attachment and brand attitude strength: Conceptual and empirical differentiation of two critical brand equity drivers. *Journal of marketing*, 74(6), 1-17.
- Park, Y. S., Konge, L., & Artino, A. R. (2020). The positivism paradigm of research. *Academic Medicine*, 95(5), 690-694.
- Patton, M. Q. (2014). *Qualitative research & evaluation methods: Integrating theory and practice*: Sage publications.
- Pearce, J., Strickland-Munro, J., & Moore, S. A. (2017). What fosters awe-inspiring experiences in nature-based tourism destinations? *Journal of sustainable tourism*, 25(3), 362-378.
- Pearsall, P. (2007). *Awe: The delights and dangers of our eleventh emotion*: Health Communications, Inc.
- Pestana, M. H., Parreira, A., & Moutinho, L. (2020). Motivations, emotions and satisfaction: The keys to a tourism destination choice. *Journal of Destination Marketing & Management*, 16, 100332.
- Phillips, D. C., Phillips, D. C., & Burbules, N. C. (2000). *Postpositivism and educational research*: Rowman & Littlefield.
- Pieters, D. (2022). Metaverse, new hype or Second Life fatigue?

- Pietschmann, D., Valtin, G., & Ohler, P. (2012). The effect of authentic input devices on computer game immersion. In *Computer games and new media cultures* (pp. 279-292): Springer.
- Piff, P. K., Dietze, P., Feinberg, M., Stancato, D. M., & Keltner, D. (2015). Awe, the small self, and prosocial behavior. *Journal of personality and social psychology*, 108(6), 883.
- Pine, B. J., Pine, J., & Gilmore, J. H. (1999). *The experience economy: work is theatre & every business a stage*: Harvard Business Press.
- Pitt, B. (2019). The study of how XR technologies impact the retail industry, now and in the future.
- Plunkett, D. (2011). On place attachments in virtual worlds. *World Leisure Journal*, 53(3), 168-178.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology*, 88(5), 879.
- Pohlmeyer, A., & Blessing, L. (2011). *A conjoint analysis of attributes affecting the likelihood of technology use. Design, user experience, and usability. theory, methods, tools and practice*. Paper presented at the Proceedings First International Conference, DUXU.
- Pomerantz, J. (2019). XR for Teaching and Learning: Year 2 of the EDUCAUSE/HP Campus of the Future Project. In: Educause.
- Ponsignon, F., & Derbaix, M. (2020). The impact of interactive technologies on the social experience: An empirical study in a cultural tourism context. *Tourism management perspectives*, 35, 100723.
- Popper, K. (2014). *Conjectures and refutations: The growth of scientific knowledge*: routledge.
- Powell, R. B., Brownlee, M. T., Kellert, S. R., & Ham, S. H. (2012). From awe to satisfaction: Immediate affective responses to the Antarctic tourism experience. *The Polar Record*, 48(2), 145.
- Poushneh, A., & Vasquez-Parraga, A. Z. (2017). Discernible impact of augmented reality on retail customer's experience, satisfaction and willingness to buy. *Journal of Retailing and Consumer Services*, 34, 229-234.
- Prayag, G., Hosany, S., Muskat, B., & Del Chiappa, G. (2017). Understanding the relationships between tourists' emotional experiences, perceived overall image, satisfaction, and intention to recommend. *Journal of Travel Research*, 56(1), 41-54.
- Prayag, G., Hosany, S., & Odeh, K. (2013). The role of tourists' emotional experiences and satisfaction in understanding behavioral intentions. *Journal of Destination Marketing & Management*, 2(2), 118-127.
- Prayag, G., Khoo-Lattimore, C., & Sitruk, J. (2015). Casual dining on the French Riviera: Examining the relationship between visitors' perceived quality, positive emotions, and behavioral intentions. *Journal of Hospitality Marketing & Management*, 24(1), 24-46.
- Price, S., Jewitt, C., Chubinidze, D., Barker, N., & Yiannoutsou, N. (2021). Taking an Extended Embodied Perspective of Touch: Connection-Disconnection in iVR. *Frontiers in Virtual Reality*, 2, 41.
- PwC. (2019). Seeing is believing: How virtual reality and augmented reality are transforming business and the economy. from PwC <https://www.pwc.com/gx/en/technology/publications/assets/how-virtual-reality-and-augmented-reality.pdf>
- Qian, X., & Zhong, X. (2019). Optimal individualized multimedia tourism route planning based on ant colony algorithms and large data hidden mining. *Multimedia Tools and Applications*, 78(15), 22099-22108.
- Quesnel, D., & Riecke, B. E. (2018). Are you awed yet? How virtual reality gives us awe and goose bumps. *Frontiers in psychology*, 9, 2158.

- Rahaman, T. (2022). Into the metaverse—perspectives on a new reality. *Medical Reference Services Quarterly*, 41(3), 330-337.
- Rahimizhian, S., Oztüren, A., & Ilkan, M. (2020). Emerging realm of 360-degree technology to promote tourism destination. *Technology in Society*, 63, 101411.
- Rainoldi, M., Driescher, V., Lisnevskaya, A., Zvereva, D., Stavinska, A., Relota, J., & Egger, R. (2018). Virtual reality: an innovative tool in destinations' marketing. *The Gaze: Journal of Tourism and Hospitality*, 9, 53-68.
- Ram, Y., Björk, P., & Weidenfeld, A. (2016). Authenticity and place attachment of major visitor attractions. *Tourism management*, 52, 110-122.
- Raska, K., & Richter, T. (2017). Influence of augmented reality on purchase intention: The IKEA case. In.
- Rauhoeft, G., Leyrer, M., Thompson, W. B., Stefanucci, J. K., Klatzky, R. L., & Mohler, B. J. (2015). *Evoking and assessing vastness in virtual environments*. Paper presented at the Proceedings of the ACM SIGGRAPH Symposium on Applied Perception.
- Rauschnabel, P. A. (2018). Virtually enhancing the real world with holograms: An exploration of expected gratifications of using augmented reality smart glasses. *Psychology & Marketing*, 35(8), 557-572.
- Rauschnabel, P. A. (2022). XR in Tourism Marketing. In *Encyclopedia of Tourism Management and Marketing*: Edward Elgar Publishing.
- Rauschnabel, P. A., Brem, A., & Ivens, B. S. (2015). Who will buy smart glasses? Empirical results of two pre-market-entry studies on the role of personality in individual awareness and intended adoption of Google Glass wearables. *Computers in Human Behavior*, 49, 635-647.
- Rauschnabel, P. A., Felix, R., Hinsch, C., Shahab, H., & Alt, F. (2022a). What is XR? Towards a framework for augmented and virtual reality. *Computers in Human Behavior*, 133, 107289.
- Rauschnabel, P. A., Felix, R., Hinsch, C., Shahab, H., & Alt, F. (2022b). What is XR? Towards a framework for Augmented and Virtual Reality. *Computers in Human Behavior*, 107289.
- Rauschnabel, P. A., Rossmann, A., & tom Dieck, M. C. (2017). An adoption framework for mobile augmented reality games: The case of Pokémon Go. *Computers in Human Behavior*, 76, 276-286.
- Raykov, T., & Marcoulides, G. A. (2011). *Introduction to psychometric theory*: Routledge.
- Reichenbach, D. J. (2017). Losing Time and Space: Experiencing Immersion. In *Space, Time and the Limits of Human Understanding* (pp. 503-512): Springer.
- Reisoğlu, I., Topu, B., Yılmaz, R., Karakuş Yılmaz, T., & Göktaş, Y. (2017). 3D virtual learning environments in education: A meta-review. *Asia Pacific Education Review*, 18(1), 81-100.
- Rejón-Guardia, F., García-Sastre, M. A., Orfila-Sintes, F., & Garau-Vadell, J. B. (2020). Virtual reality in tourism: Centennials acceptance. *Tourism Analysis*, 25(2-3), 335-344.
- Riva, G., Davide, F., & IJsselstein, W. A. (2003). Being there: The experience of presence in mediated environments. *Being there: Concepts, effects and measurement of user presence in synthetic environments*, 5.
- Riva, G., Mantovani, F., Capideville, C. S., Preziosa, A., Morganti, F., Villani, D., . . . Alcañiz, M. (2007). Affective interactions using virtual reality: the link between presence and emotions. *Cyberpsychology & behavior*, 10(1), 45-56.
- Riva, G., Waterworth, J., & Murray, D. (2014). 1 Extending the Self through the Tools and the Others: a General Framework for Presence and Social Presence in Mediated Interactions. In *Interacting with Presence* (pp. 9-31): De Gruyter Open Poland.

- Roy, S., Ponnamp, A., & Mandal, S. (2017). Comprehending technology attachment in the case of smart phone-applications: An empirical study. *Journal of Electronic Commerce in Organizations (JECO)*, 15(1), 23-43.
- Rudd, M., Vohs, K. D., & Aaker, J. (2012). Awe expands people's perception of time, alters decision making, and enhances well-being. *Psychological science*, 23(10), 1130-1136.
- Saeed, N., Yang, Y., & Sinnappan, S. (2009). Emerging web technologies in higher education: A case of incorporating blogs, podcasts and social bookmarks in a web programming course based on students' learning styles and technology preferences. *Journal of Educational Technology & Society*, 12(4), 98-109.
- Sagnier, C., Loup-Escande, E., Lourdeaux, D., Thouvenin, I., & Valléry, G. (2020). User acceptance of virtual reality: an extended technology acceptance model. *International Journal of Human-Computer Interaction*, 36(11), 993-1007.
- Santos, V., Ramos, P., Sousa, B., Almeida, N., & Valeri, M. (2022). Factors influencing touristic consumer behaviour. *Journal of Organizational Change Management*, 35(3), 409-429.
- Sarkady, D., Neuburger, L., & Egger, R. (2021). Virtual reality as a travel substitution tool during COVID-19. In *Information and communication technologies in tourism 2021* (pp. 452-463): Springer.
- Sarmiento, R., & Costa, V. (2017). *Comparative approaches to using R and Python for statistical data analysis*: IGI Global.
- Saxena, N., Kyaw, B. M., Vseteckova, J., Dev, P., Paul, P., Lim, K. T. K., . . . Nikolaou, C. K. (2018). Virtual reality environments for health professional education. *The Cochrane Database of Systematic Reviews*, 2018(10).
- Schaffer, V. (2017). Enhancing learning to diverse cohorts via immersive visualization. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 21, 46-54.
- Scherer, K. R. (2005). What are emotions? And how can they be measured? *Social science information*, 44(4), 695-729.
- Schiffman, L., O'Cass, A., Paladino, A., & Carlson, J. (2013). *Consumer behaviour*: Pearson Higher Education AU.
- Schilar, H., & Keskitalo, E. C. H. (2018). Tourism activity as an expression of place attachment-place perceptions among tourism actors in the Jukkasjärvi area of northern Sweden. *Scandinavian Journal of Hospitality and Tourism*, 18(sup1), S42-S59.
- Schiopu, A. F., Hornoio, R. I., Padurean, M. A., & Nica, A.-M. (2021). Virus tinged? Exploring the facets of virtual reality use in tourism as a result of the COVID-19 pandemic. *Telematics and Informatics*, 60, 101575.
- Schore, J. R., & Schore, A. N. (2008). Modern attachment theory: The central role of affect regulation in development and treatment. *Clinical social work journal*, 36(1), 9-20.
- Schott, C. (2017). Virtual fieldtrips and climate change education for tourism students. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 21, 13-22.
- Schott, C., & Marshall, S. (2021). Virtual reality for experiential education: a user experience exploration. *Australasian Journal of Educational Technology*, 37(1), 96-110.
- Schubert, T., Friedmann, F., & Regenbrecht, H. (2001). The experience of presence: Factor analytic insights. *Presence: Teleoperators & Virtual Environments*, 10(3), 266-281.
- Schurtz, D. R., Blincoe, S., Smith, R. H., Powell, C. A., Combs, D. J., & Kim, S. H. (2012). Exploring the social aspects of goose bumps and their role in awe and envy. *Motivation and Emotion*, 36(2), 205-217.
- Selvam, A., Yap, T. T.-V., Ng, H., Tong, H.-L., & Ho, C.-C. (2016). Augmented reality for information retrieval aimed at museum exhibitions using smartphones. *Journal of Engineering and Applied Sciences*, 100(3), 635-639.

- Serra-Cantallops, A., Ramon-Cardona, J., & Salvi, F. (2018). The impact of positive emotional experiences on eWOM generation and loyalty. *Spanish Journal of Marketing-ESIC*.
- Serrano-Puche, J. (2015). Emotions and digital technologies: Mapping the field of research in media studies.
- Shank, D. B. (2014). Technology and emotions. In *Handbook of the Sociology of Emotions: Volume II* (pp. 511-528): Springer.
- Sharples, L. (2019). Research note: customer experience management in cruise pre-consumption. *International Journal of Culture, Tourism and Hospitality Research*.
- Sheikh, K. (2016). Beyond gaming: 10 other fascinating uses for virtual-reality tech. *Live Science*, 2.
- Shevchuk, N., & Oinas-Kukkonen, H. (2020). *VR or non-VR? investigating influence of the virtual environment medium on persuasive gamification outcomes*. Paper presented at the Proceedings of the 23rd International Conference on Academic Mindtrek.
- Shi, H., Liu, Y., Kumail, T., & Pan, L. (2022). Tourism destination brand equity, brand authenticity and revisit intention: the mediating role of tourist satisfaction and the moderating role of destination familiarity. *Tourism Review*, 77(3), 751-779.
- Shiota, M. N., Campos, B., & Keltner, D. (2003). The faces of positive emotion: Prototype displays of awe, amusement, and pride. *Annals of the New York Academy of Sciences*, 1000(1), 296-299.
- Shiota, M. N., Keltner, D., & John, O. P. (2006). Positive emotion dispositions differentially associated with Big Five personality and attachment style. *The journal of positive psychology*, 1(2), 61-71.
- Shiota, M. N., Keltner, D., & Mossman, A. (2007). The nature of awe: Elicitors, appraisals, and effects on self-concept. *Cognition and emotion*, 21(5), 944-963.
- Sigala, M. (2020). Tourism and COVID-19: Impacts and implications for advancing and resetting industry and research. *Journal of business research*, 117, 312-321.
- Silva, R. P. A., de Macêdo, L. C. B., & da Silva, I. L. R. (2013). *Avaliação das características psicométricas dos questionários utilizados nos periódicos da área contábil: um estudo longitudinal compreendido no período 2003-2012*. Paper presented at the Anais do Congresso Brasileiro de Custos-ABC.
- Simoni, M., Sorrentino, A., Leone, D., & Caporuscio, A. (2021). Boosting the pre-purchase experience through virtual reality. Insights from the cruise industry. *Journal of hospitality and tourism technology*.
- Singh, A. (2021). An introduction to experimental and exploratory research. *Available at SSRN* 3789360.
- Skarbez, R., Brooks, J., Frederick P, & Whitton, M. C. (2017). A survey of presence and related concepts. *ACM Computing Surveys (CSUR)*, 50(6), 1-39.
- Skard, S., Knudsen, E. S., Sjøstad, H., & Thorbjørnsen, H. (2021). How virtual reality influences travel intentions: The role of mental imagery and happiness forecasting. *Tourism Management*, 87, 104360.
- Slater, M. (2003). A note on presence terminology. *Presence connect*, 3(3), 1-5.
- Slater, M., & Sanchez-Vives, M. V. (2016). Enhancing our lives with immersive virtual reality. *Frontiers in Robotics and AI*, 3, 74.
- Slater, M., & Wilbur, S. (1997). A framework for immersive virtual environments (FIVE): Speculations on the role of presence in virtual environments. *Presence: Teleoperators & Virtual Environments*, 6(6), 603-616.
- Soliman, M., Peetz, J., & Davydenko, M. (2017). The impact of immersive technology on nature relatedness and pro-environmental behavior. *Journal of Media Psychology*.
- Sommer, L. (2011). The theory of planned behaviour and the impact of past behaviour.

- Solomon, M. R., Dahl, D. W., White, K., Zaichkowsky, J. L., & Polegato, R. (2014). Consumer behavior: Buying, having, and being (Vol. 10): *Pearson London. International Business & Economics Research Journal (IBER)*, 10(1).
- Son, H., Ross, A., Mendoza-Tirado, E., & Lee, L. J. (2022). Virtual Reality in Clinical Practice and Research: Viewpoint on Novel Applications for Nursing. *JMIR nursing*, 5(1), e34036.
- Spielmann, N., & Orth, U. R. (2021). Can advertisers overcome consumer qualms with virtual reality?: Increasing operational transparency through self-guided 360-degree tours. *Journal of Advertising Research*, 61(2), 147-163.
- Stebbins, R. A. (2001). *Exploratory research in the social sciences* (Vol. 48): Sage.
- Steinert, S., & Roeser, S. (2020). Emotions, values and technology: Illuminating the blind spots. *Journal of Responsible Innovation*, 7(3), 298-319.
- Stellar, J. E., Gordon, A., Anderson, C. L., Piff, P. K., McNeil, G. D., & Keltner, D. (2018). Awe and humility. *Journal of personality and social psychology*, 114(2), 258.
- Stepanova, E. R., Quesnel, D., & Riecke, B. E. (2019a). Space—a virtual frontier: how to design and evaluate a virtual reality experience of the overview effect. *Frontiers in Digital Humanities*, 7.
- Stepanova, E. R., Quesnel, D., & Riecke, B. E. (2019b). Understanding AWE: Can a virtual journey, inspired by the overview effect, lead to an increased sense of interconnectedness? *Frontiers in Digital Humanities*, 6, 9.
- Steuer, J. (1992). Defining virtual reality: Dimensions determining telepresence. *Journal of communication*, 42(4), 73-93.
- Stone, M. J. (2016). Deciding not to choose: Delegation to social surrogates in tourism decisions. *Tourism management*, 57, 168-179.
- Stuckey, H. L. (2014). The first step in data analysis: Transcribing and managing qualitative research data. *Journal of Social Health and Diabetes*, 2(01), 006-008.
- Su, X., Li, X., Wang, Y., Zheng, Z., & Huang, Y. (2020). Awe of Intangible Cultural Heritage: The Perspective of ICH Tourists. *SAGE Open*, 10(3), 2158244020941467.
- Suanpang, P., Niamsorn, C., Pothipassa, P., Chunhapataragul, T., Netwong, T., & Jermisittiparsert, K. (2022). Extensible Metaverse Implication for a Smart Tourism City. *Sustainability*, 14(21), 14027.
- Sue, V. M., & Ritter, L. A. (2012). *Conducting online surveys*: Sage.
- Suh, A., & Prophet, J. (2018). The state of immersive technology research: A literature analysis. *Computers in Human Behavior*, 86, 77-90.
- Suh, K.-S., Kim, H., & Suh, E. K. (2011). What if your avatar looks like you? Dual-congruity perspectives for avatar use. *MIS quarterly*, 711-729.
- Susindar, S., Sadeghi, M., Huntington, L., Singer, A., & Ferris, T. K. (2019). *The feeling is real: Emotion elicitation in virtual reality*. Paper presented at the Proceedings of the Human Factors and Ergonomics Society Annual Meeting.
- Syed-Abdul, S., Malwade, S., Nursetyo, A. A., Sood, M., Bhatia, M., Barsasella, D., . . . Li, Y.-C. J. (2019). Virtual reality among the elderly: a usefulness and acceptance study from Taiwan. *BMC geriatrics*, 19(1), 1-10.
- Tabacchi, M. E., Caci, B., Cardaci, M., & Perticone, V. (2017). Early usage of Pokémon Go and its personality correlates. *Computers in Human Behavior*, 72, 163-169.
- Tan, C. T., Leong, T. W., Shen, S., Dubravs, C., & Si, C. (2015). *Exploring gameplay experiences on the Oculus Rift*. Paper presented at the Proceedings of the 2015 annual symposium on computer-human interaction in play.
- Tan, Y.-C., Chandukala, S. R., & Reddy, S. K. (2022). Augmented reality in retail and its impact on sales. *Journal of marketing*, 86(1), 48-66.

- Tan, Y., Xu, W., Li, S., & Chen, K. (2022). Augmented and Virtual Reality (AR/VR) for Education and Training in the AEC Industry: A Systematic Review of Research and Applications. *Buildings*, 12(10), 1529.
- Tarka, P., & Łobiński, M. (2014). Decision Making in Reference to Model of Marketing Predictive Analytics—Theory and Practice. *Management and Business Administration. Central Europe*, 22(1), 60-69.
- Tashakkori, A., Teddlie, C., & Teddlie, C. B. (1998). *Mixed methodology: Combining qualitative and quantitative approaches* (Vol. 46): sage.
- Tehseen, S., Ramayah, T., & Sajilan, S. (2017). Testing and controlling for common method variance: A review of available methods. *Journal of management sciences*, 4(2), 142-168.
- Thompson, B. (2004). Exploratory and confirmatory factor analysis: Understanding concepts and applications. *Washington, DC*, 10694(000).
- Thompson, M. M., Wang, A., Roy, D., & Klopfer, E. (2018). Authenticity, interactivity, and collaboration in VR learning games. *Frontiers in Robotics and AI*, 133.
- tom Dieck, D., tom Dieck, M. C., Jung, T., & Moorhouse, N. (2018). Tourists' virtual reality adoption: an exploratory study from Lake District National Park. *Leisure Studies*, 37(4), 371-383.
- Tom Dieck, M. C., & Han, D.-i. D. (2022). The role of immersive technology in Customer Experience Management. *Journal of Marketing theory and Practice*, 30(1), 108-119.
- tom Dieck, M. C., & Jung, T. (2018). A theoretical model of mobile augmented reality acceptance in urban heritage tourism. *Current Issues in Tourism*, 21(2), 154-174.
- tom Dieck, M. C., Jung, T., & Michopoulou, E. (2019a). Experiencing virtual reality in heritage attractions: Perceptions of elderly users. *Augmented reality and virtual reality: The power of AR and VR for business*, 89-98.
- tom Dieck, M. C., Jung, T., & Michopoulou, E. (2019b). Experiencing virtual reality in heritage attractions: Perceptions of elderly users. In *Augmented reality and virtual reality* (pp. 89-98): Springer.
- tom Dieck, M. C., & Jung, T. H. (2017). Value of augmented reality at cultural heritage sites: A stakeholder approach. *Journal of destination marketing & management*, 6(2), 110-117.
- Tonteri, T., Holopainen, J., Lumivalo, J., Tuunanen, T., Parvinen, P., & Laukkanen, T. (2023). Immersive Virtual Reality in Experiential Learning: A Value Co-creation and Co-destruction Approach. Paper presented at the Proceedings of the Annual Hawaii International Conference on System Sciences.
- Tredinnick, L. (2018). Virtual realities in the business world. *Business Information Review*, 35(1), 39-42.
- Troisi, O., Fenza, G., Grimaldi, M., & Loia, F. (2022). Covid-19 sentiments in smart cities: The role of technology anxiety before and during the pandemic. *Computers in Human Behavior*, 126, 106986.
- Trunfio, M., & Campana, S. (2020). A visitors' experience model for mixed reality in the museum. *Current Issues in Tourism*, 23(9), 1053-1058.
- Trunfio, M., Jung, T., & Campana, S. (2022). Mixed reality experiences in museums: Exploring the impact of functional elements of the devices on visitors' immersive experiences and post-experience behaviours. *Information & Management*, 59(8), 103698.
- Tsai, C.-Y. (2010). An analysis of usage intentions for mobile travel guide systems. *African Journal of Business Management*, 4(14), 2962-2970.

- Tussyadiah, I. P., Wang, D., & Jia, C. H. (2017). Virtual reality and attitudes toward tourism destinations. In *Information and communication technologies in tourism 2017* (pp. 229-239): Springer.
- Tussyadiah, I. P., Wang, D., Jung, T. H., & Tom Dieck, M. C. (2018). Virtual reality, presence, and attitude change: Empirical evidence from tourism. *Tourism Management*, 66, 140-154.
- van Brakel, V., Barreda-Ángeles, M., & Hartmann, T. (2023). Feelings of presence and perceived social support in social virtual reality platforms. *Computers in Human Behavior*, 139, 107523.
- Van Cappellen, P., & Saroglou, V. (2012). Awe activates religious and spiritual feelings and behavioral intentions. *Psychology of Religion and Spirituality*, 4(3), 223.
- van Elk, M., Karinen, A., Specker, E., Stamkou, E., & Baas, M. (2016). 'Standing in awe': The effects of awe on body perception and the relation with absorption. *Collabra*, 2(1).
- Vaz, R. I. F., Fernandes, P. O., & Veiga, A. C. R. (2018). Interactive technologies in museums: How digital installations and media are enhancing the visitors' experience. In *Handbook of Research on Technological Developments for Cultural Heritage and eTourism Applications* (pp. 30-53): IGI Global.
- Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information systems research*, 11(4), 342-365.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.
- Verma, S., Warriar, L., Bolia, B., & Mehta, S. (2022). Past, present, and future of virtual tourism-a literature review. *International Journal of Information Management Data Insights*, 2(2), 100085.
- Vinzi, V. E., Chin, W. W., Henseler, J., & Wang, H. (2010). *Handbook of partial least squares* (Vol. 201): Springer.
- Viviers, H. (2019). The Psychology of Place Attachment and Psalm 128. *Old Testament Essays*, 32(2), 426-443.
- Wallach, H. S., Safir, M. P., & Almog, I. (2009). Attachment and sense of presence in a virtual environment. *Virtual Reality*, 13(3), 205-217.
- Wang, F., Huang, S., Morrison, A. M., & Wu, B. (2022). The effects of virtual reality tourism involvement on place attachment and behavioral intentions: virtual reality tourism of the Yellow Crane Tower in Wuhan. *Asia Pacific Journal of Tourism Research*, 27(3), 274-289.
- Wang, H.-Y. (2017). Determinants hindering the intention of tourists to visit disaster-hit destinations. *Current Issues in Tourism*, 20(5), 459-479.
- Wang, L., & Lyu, J. (2019). Inspiring awe through tourism and its consequence. *Annals of Tourism Research*, 77, 106-116.
- Wang, N. (1999). Rethinking authenticity in tourism experience. *Annals of Tourism Research*, 26(2), 349-370.
- Waterworth, J. A., Waterworth, E. L., Riva, G., & Mantovani, F. (2015). Presence: Form, content and consciousness. In *Immersed in media* (pp. 35-58): Springer.
- Weber-Sabil, J., & Han, D.-I. D. (2021). Immersive Tourism-State of the Art of Immersive Tourism Realities through XR Technology.
- Weber, S., Weibel, D., & Mast, F. W. (2021a). How to get there when you are there already? Defining presence in virtual reality and the importance of perceived realism. *Frontiers in psychology*, 1538.

- Weber, S., Weibel, D., & Mast, F. W. (2021b). How to get there when you are there already? Defining presence in virtual reality and the importance of perceived realism. *Frontiers in psychology*, 12.
- Wedel, M., Bigné, E., & Zhang, J. (2020). Virtual and augmented reality: Advancing research in consumer marketing. *International Journal of Research in Marketing*, 37(3), 443-465.
- Wei, W. (2019). Research progress on virtual reality (VR) and augmented reality (AR) in tourism and hospitality: A critical review of publications from 2000 to 2018. *Journal of Hospitality and Tourism Technology*.
- Wei, W., Qi, R., & Zhang, L. (2019). Effects of virtual reality on theme park visitors' experience and behaviors: A presence perspective. *Tourism Management*, 71, 282-293.
- Wen, J., Kozak, M., Yang, S., & Liu, F. (2020). COVID-19: potential effects on Chinese citizens' lifestyle and travel. *Tourism Review*.
- Werner, C., & Schermelleh-Engel, K. (2009). Structural equation modeling: Advantages, challenges, and problems. *Introduction to Structural Equation Modeling with LISREL*.
- Wienrich, C., Döllinger, N., & Hein, R. (2021). Behavioral Framework of Immersive Technologies (BehaveFIT): How and why virtual reality can support behavioral change processes. *Frontiers in Virtual Reality*, 2.
- Wienrich, C., Döllinger, N. I., & Hein, R. (2020). Mind the Gap: A Framework (BehaveFIT) Guiding The Use of Immersive Technologies in Behavior Change Processes. *arXiv preprint arXiv:2012.10912*.
- Williams, D. R., Patterson, M. E., Roggenbuck, J. W., & Watson, A. E. (1992). Beyond the commodity metaphor: Examining emotional and symbolic attachment to place. *Leisure sciences*, 14(1), 29-46.
- Williams, P. (2014). Emotions and consumer behavior. *Journal of consumer research*, 40(5), viii-xi.
- Wilson, J. A., Onorati, K., Mishkind, M., Reger, M. A., & Gahm, G. A. (2008). Soldier attitudes about technology-based approaches to mental health care. *CyberPsychology & Behavior*, 11(6), 767-769.
- Wilson, C. J., & Soranzo, A. (2015). The use of virtual reality in psychology: A case study in visual perception. *Computational and mathematical methods in medicine*, 2015.
- Wilson, J., Hair, C., Knight, R., Catto-Smith, A., Bell, S., Kamm, M., . . . Connell, W. (2010). High incidence of inflammatory bowel disease in Australia: a prospective population-based Australian incidence study. *Inflammatory bowel diseases*, 16(9), 1550-1556.
- Wirth, W., Hofer, M., & Schramm, H. (2012). The role of emotional involvement and trait absorption in the formation of spatial presence. *Media Psychology*, 15(1), 19-43.
- Witmer, B. G., & Singer, M. J. (1998). Measuring presence in virtual environments: A presence questionnaire. *Presence*, 7(3), 225-240.
- Wu, H.-C., & Cheng, C.-C. (2018). Relationships between technology attachment, experiential relationship quality, experiential risk and experiential sharing intentions in a smart hotel. *Journal of Hospitality and Tourism Management*, 37, 42-58.
- Wu, H.-C., Cheng, C.-C., & Ai, C.-H. (2018). A study of experiential quality, experiential value, trust, corporate reputation, experiential satisfaction and behavioral intentions for cruise tourists: The case of Hong Kong. *Tourism management*, 66, 200-220.
- Wu, P. F. (2009). *User acceptance of emergency alert technology: A case study*. Paper presented at the Proceedings of the 6th International ISCRAM Conference.
- Xi, N., Bampouni, E., & Hamari, J. (2022). *How Does Extended Reality Influence Consumer Decision Making? The Empirical Evidence from A Laboratory Experiment*. Paper presented at the Proceedings of the 55th Hawaii International Conference on System Sciences.

- Xu, Z., Zhang, H., Zhang, C., Xu, M., & Dong, N. (2019). Exploring the role of emotion in the relationship between museum image and tourists' behavioral intention: The case of three museums in Xi'an. *Sustainability*, 11(3), 559.
- Yachin, J. M. (2018). The 'customer journey': Learning from customers in tourism experience encounters. *Tourism management perspectives*, 28, 201-210.
- Yaden, D. B., Haidt, J., Hood Jr, R. W., Vago, D. R., & Newberg, A. B. (2017). The varieties of self-transcendent experience. *Review of general psychology*, 21(2), 143-160.
- Yaden, D. B., Iwry, J., Slack, K. J., Eichstaedt, J. C., Zhao, Y., Vaillant, G. E., & Newberg, A. B. (2016). The overview effect: awe and self-transcendent experience in space flight. *Psychology of Consciousness: Theory, Research, and Practice*, 3(1), 1.
- Yaden, D. B., Kaufman, S. B., Hyde, E., Chirico, A., Gaggioli, A., Zhang, J. W., & Keltner, D. (2019). The development of the Awe Experience Scale (AWE-S): A multifactorial measure for a complex emotion. *The journal of positive psychology*, 14(4), 474-488.
- Yang, S., Mohd Isa, S., & Ramayah, T. (2020). A Theoretical Framework to Explain the Impact of Destination Personality, Self-Congruity, and Tourists' Emotional Experience on Behavioral Intention. *SAGE Open*, 10(4), 2158244020983313.
- Yang, Y., Hu, J., Jing, F., & Nguyen, B. (2018). From awe to ecological behavior: The mediating role of connectedness to nature. *Sustainability*, 10(7), 2477.
- Yeo, N., White, M., Alcock, I., Garside, R., Dean, S., Smalley, A., & Gatersleben, B. (2020). What is the best way of delivering virtual nature for improving mood? An experimental comparison of high definition TV, 360 video, and computer generated virtual reality. *Journal of environmental psychology*, 72, 101500.
- Yilmaz, R. M. (2016). Educational magic toys developed with augmented reality technology for early childhood education. *Computers in Human Behavior*, 54, 240-248.
- Yim, M. Y.-C., Chu, S.-C., & Sauer, P. L. (2017). Is augmented reality technology an effective tool for e-commerce? An interactivity and vividness perspective. *Journal of Interactive Marketing*, 39, 89-103.
- Yovcheva, Z., Buhalis, D., & Gatzidis, C. (2013). Engineering augmented tourism experiences. In *Information and communication technologies in tourism 2013* (pp. 24-35): Springer.
- Young, G. W., Stehle, S., Walsh, B. Y., & Tiri, E. (2020). Exploring virtual reality in the higher education classroom: Using VR to build knowledge and understanding. *Journal of Universal Computer Science*(8), 904-928.
- Yung, R., & Khoo-Lattimore, C. (2019). New realities: a systematic literature review on virtual reality and augmented reality in tourism research. *Current Issues in Tourism*, 22(17), 2056-2081.
- Yung, R., Khoo-Lattimore, C., & Potter, L. E. (2019). VR the World: Investigating the Effectiveness of Virtual Reality for Destination Marketing through Presence, Emotion, and Intention. *E-review of Tourism Research*, 17(3).
- Yung, R., Khoo-Lattimore, C., & Potter, L. E. (2021a). Virtual reality and tourism marketing: conceptualizing a framework on presence, emotion, and intention. *Current Issues in Tourism*, 24(11), 1505-1525.
- Yung, R., Khoo-Lattimore, C., & Potter, L. E. (2021b). VR the world: Experimenting with emotion and presence for tourism marketing. *Journal of Hospitality and Tourism Management*, 46, 160-171.
- Zanger, V., Meißner, M., & Rauschnabel, P. A. (2022). Beyond the gimmick: How affective responses drive brand attitudes and intentions in augmented reality marketing. *Psychology & Marketing*.
- Zealand, T. N. (2019). Optimising Tourism New Zealand's future role and contribution to New Zealand. Retrieved April, 2, 2021.

- Zhang, Y., Liang, B., Chen, B., Torrens, P. M., Atashzar, S. F., Lin, D., & Sun, Q. (2022). Force-aware interface via electromyography for natural VR/AR interaction. *ACM Transactions on Graphics (TOG)*, 41(6), 1-18.
- Zheng, C., Chen, Z., Zhang, Y., & Guo, Y. (2021). Does Vivid Imagination Deter Visitation? The Role of Mental Imagery Processing in Virtual Tourism on Tourists' Behavior. *Journal of Travel Research*, 00472875211042671.
- Zhou, X., Tang, C., Lv, X., & Xing, B. (2020). Visitor Engagement, Relationship Quality, and Environmentally Responsible Behavior. *International Journal of Environmental Research and Public Health*, 17(4), 1151.

## **Appendices**

- Appendix A:** Interview guidelines
- Appendix B:** Invitation flyer for study 1 – Qualitative phase
- Appendix C:** Semi-structured interviews – Consent from and information sheet and safety protocols
- Appendix D:** Invitation flyer for study 2 – Quantitative phase
- Appendix E:** Pre- experience, Experience and post-experience questionnaire  
- Consent from and information sheet
- Appendix F:** Scales for quantitative instrument
- Appendix G:** Pre-experience questionnaire
- Appendix H:** Experience questionnaire
- Appendix I:** Power analysis results
- Appendix J:** Component rotated matrix for the factor analysis of the original questionnaire

## **Appendix A**

### Interview guidelines



## **Interview guidelines**

### **Interview Questions**

- How do you feel as a result of this experience? Could you please describe how do you feel about this experience?
  - What feeling was new to you about Rome when experiencing this tour?
  - Is there something that stood out to you? (attract your attention)
  - Is there something that surprised you?
  - Which part of this experience you think is the highlight of this tour? What part was your most favorite? How about your least favorite?
  - How natural and genuine this experience was to you?
  - Is there any particular feature(s) in this experience that you find distinct or striking? Any feature you like or dislike?
- 
- How do you feel about this place? (Rome) Do you feel bonded or engaged?
  - Could you give me 3 words as characteristics of this place that are particularly important to you?
- 
- How do you feel about using this technology? Any negative or positive point?
  - How did you feel experiencing this tour by this technology?
  - How do you feel about experiencing this kind of tours before going to holidays?
  - Do you intend to use this technology in pre-trip stage? Why/why not?
  - What would you say about this technology to others?
  - How would you compare this technology to other technologies?
- 
- How do feel about visiting this destination?
  - what would you say about this destination to others?
  - How do you describe this experience to others, about this destination or the technology?
  - Considering this experience, are you more likely or less likely to visit Rome?
  - Is there anything you would like to add?

## **Appendix B**

Invitation flyer for study 1 – Qualitative phase

## Tourism Research on Impacts of Technology on Emotions and Behavioural Intentions

### Would You Like to Travel to Rome??



Seeking participants who:

- 1) Currently enrolled at VUW.
- 2) Have not travelled to Rome.
- 3) Have not experienced the **Windows Mixed Reality Headset (HP Headset)**.
- 4) Have no pre-existing medical condition.
- 5) Are over 18.



**Part 1:** 15-minute tour of Rome by a **Mixed Reality Headset**

**Part 2:** 15 min Interview about your experience

**Part 3:** Receive a **\$10 NW Voucher**.

For more info , please send an email or  
[naji.gharibi@vuw.ac.nz](mailto:naji.gharibi@vuw.ac.nz) or scan this QR  
code

**Naji Gharibi**

PhD Candidate in Tourism Management



## **Appendix C**

Semi-structured interviews – Consent form and information sheet and safety protocols

***An eye on future: Impacts of VR technology experience on tourists' behavioural intentions***

**INFORMATION SHEET FOR PARTICIPANTS [for Interviews]**

You are invited to take part in this research. Please read this information before deciding whether or not to take part. If you decide to participate, thank you. If you decide not to participate, thank you for considering this request.

**Who am I?**

My name is *Naji Gharibi* and I am a Doctoral student in *Tourism Management* at Victoria University of Wellington. This research project is work towards my thesis.

**What is the aim of the project?**

This project aims to explore the impacts of VR technology experience on tourists' behavioural intentions. Your participation will support this research by *discussing your feelings, emotions and behavioural intentions about the destination and technology after experiencing a tour to Rome by using a mixed reality glass*. This research has been approved by the Victoria University of Wellington Human Ethics Committee [Research Master application reference number: 0000029198].

**How can you help?**

You have been invited to participate because *as you are able to assist me with your knowledge and familiarity with technology*. If you agree to take part, I will interview you *in Kelburn Campus of Victoria University of Wellington*. I will ask you questions about *your emotions towards the destination and technology before and after experiencing a tour to Rome by using a Mixed Reality Headset*. The interview will take *30 minutes including a 15-minute tour to Rome*. I will audio record the interview with your permission and write it up later. You can choose to not answer any question or stop the interview at any time, without giving a reason. You can withdraw from the study by contacting me at any time before *experiencing the tour by XR technology*. If you withdraw, the information you provided will be destroyed or returned to you.

**What will happen to the information you give?**

This research is confidential\*. This means that the researcher named below will be aware of your identity, but the research data will be combined, and your identity will not be revealed in any reports, presentations, or public documentation. It means that you be referred by your demographic characteristics.

Only my supervisors and I, will read the notes or transcript of the interview. The interview transcripts, summaries and any recordings will be kept securely.

The identified data will be destroyed by 30/11/2022

**What will the project produce?**

The information from my research will be used in my PhD dissertation and academic publications and conferences. It may be also published in a media or tourism newsletters.

**If you accept this invitation, what are your rights as a research participant?**

You do not have to accept this invitation if you don't want to. If you do decide to participate, you have the right to:

- Set the MR headset by yourself and not to be observed while having the tour;
- choose not to answer any question;
- ask for the recorder to be turned off at any time during the interview;
- withdraw from the study before 01/12/2021;
- ask any questions about the study at any time;
- receive a copy of summary of research results by 30/11/2022.
- You will be observed by me as the researcher, while you will be experiencing this tour by the MR glass. If you have any issues with that, this part can be deleted from the research, and you can be left alone in the room when having the tour. But to be sure about your safety, you could bring a support person or friend in the room with you instead to watch out for your

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\* Confidentiality will be preserved except where you disclose something that causes me to be concerned about a risk of harm to yourself and/or others.

physical safety. I will also keep the support person informed on how to escalate for assistance if needed.

- A safety protocol has been provided for you. Please read that and if you have any issues let me know.
- To be sure about your safety, the experiment runs during the health centre operating hours. I have also notified the health centre to advise them that I am relying on their service in case there is an issue/emergency as advised.

**If you have any questions or problems, who can you contact?**

If you have any questions, either now or in the future, please feel free to contact either:

**Student: Naji Gharibi**

**Supervisors: Ian Yeoman**

Name:

**Ina Reichenberger**

University email

address: Name: Ian Yeoman

naji.gharibi@vuw.ac.nz

Role: Associate Professor

School: Management

Phone: +64211319384

Ian.yeoman@vuw.ac.nz

**Human Ethics Committee information**

If you have any concerns about the ethical conduct of the research, you may contact the Victoria University of Wellington HEC Convenor: Associate Professor Judith Loveridge. Email [hec@vuw.ac.nz](mailto:hec@vuw.ac.nz) or telephone +64-4-463 6028.



*An eye on future: Impacts of VR technology experience on tourists' behavioural intentions*

### **CONSENT TO INTERVIEW**

This consent form will be held for *a minimum of five* years.

Researcher: *Naji Gharibi, School of Management, Victoria University of Wellington.*

- I have read the Information Sheet and the project has been explained to me. My questions have been answered to my satisfaction. I understand that I can ask further questions at any time.
- I agree to take part in an audio recorded interview.

I understand that:

- I may withdraw from this study at any point before 30/12/2021, and any information that I have provided will be returned to me or destroyed.
- The identifiable information I have provided will be destroyed on 30/11/2022.
- Any information I provide will be kept confidential to the researcher and the supervisors Ian Yeoman and Ina Reichenberger.
- I understand that the findings may be used for a PhD dissertation and academic publications or presented to conferences.
- I understand that the recordings will be kept confidential to the researcher and the supervisors Ian Yeoman and Ina Reichenberger.
- I understand that Victoria University of Wellington will be named in any of the reports.
- My name will not be used in reports and utmost care will be taken not to disclose any information that would identify me.

|   |  |                                 |                                |
|---|--|---------------------------------|--------------------------------|
| • | <i>I have read the safety protocol regarding participation in this research, and I consent to all of that.</i> | Yes<br><input type="checkbox"/> | No<br><input type="checkbox"/> |
| • | I would like to receive a summary of the research results by 30/11/2022:                                       | Yes<br><input type="checkbox"/> | No<br><input type="checkbox"/> |
| • | I have no problem with being observed by the researcher while having the tour.                                 | Yes<br><input type="checkbox"/> | No<br><input type="checkbox"/> |

Signature of participant: \_\_\_\_\_

Name of participant: \_\_\_\_\_

Date: \_\_\_\_\_

Contact details: \_\_\_\_\_

## Observation Protocol

**Who and when will be Observed:**

As participants' observation will be a part a data collection, you as a participant will be observed by me, as the researcher while you are having the 15-minute tour to Rome.

**what I will observe:**

As I am trying to achieve data through your verbal and nonverbal expression of feelings and emotions while having the tour, I will record these as part of the data collection.

**But if you don't intend to be observed while having the tour:**

I will leave you alone in the room and I will not record the verbal expression of emotions during the tour experience.

**Safety Protocol for the participants**

You will experience a tour to Rome which lasts 15 minutes by using a mixed reality glass. To be sure about your safety:

**1. General protocols**

- The MR glass will be cleaned before and after the use.
- Because you will be able to move around during the tour and to enhance sensory immersion, the experiment will be performed in an empty room in Victoria University of Wellington. This experience will not block the participants' view of your actual surroundings.

- I will set the mixed reality glass for you to make it as most as comfortable. I will ensure that the MR glass is secured comfortably on the head and that a single, clear image is seen by the user.
- In any case of motion sickness while moving, the experiment will be stopped. If you experience any of the following symptoms, let me know and I will immediately stop using the MR glass: seizures; loss of awareness; eye strain; blurred, or double vision; dizziness; disorientation; impaired balance; discomfort or pain in the head or eyes; drowsiness; fatigue; or any symptoms similar to motion sickness.

Then:

- Water and chocolates will be available in case of any physical discomfort. You could have a rest and help yourself.

Finally

- If you still feeling unwell, Victoria University Health Centre will be available in case of any problem, and I will have a first aid trained person present.

## **2. Cultural Protocols**

- Although MR glass can better be fixed by the help of me, all cultural issues will be considered and in any case of not being comfortable, you will fix the device by yourself as it is quite an easy job.

## **3. Protocols due to the COVID-19**

- In case of Wellington being in Level 2, the participant fitting themselves with the headset (in order to maintain social distancing)
- The Mixed reality glass will be sanitized before and after each participant using that.
- Wiping down all other accessories between participants with alcohol wipes.
- making sure to send participants an information sheet which clearly instructs them not to attend the session if they are feeling unwell.
- all experimenters wearing masks and keeping their distance.
- In case of Wellington moving to Level 3 and 4, the in-person experiments will be stopped and by using an online video, interviews will be held on zoom and questionnaires will be sent by email to be filled out.

## **Appendix D**

Invitation flyers for study 2 – Quantitative phase

All Invited

## Tourism Research on Impacts of Technology on Emotions and Behavioural Intentions

### Would You Like to Travel Overseas??

Seeking participants/all people who:

- 1) Have **not** travelled to Rome.
- 2) Are over 18 (Students or not students) .
- 3) Have not experienced the **Windows Mixed Reality Headset (HP Headset)**.
- 4) Have no pre-existing medical condition.



**Part 1:** Answer a pre-experience questionnaire

**Part 2:** 15-minute tour of Rome by a **Mixed Reality Headset**

**Part 3:** Answer 2 post-experience questionnaires.

**Part 4:** Receive a **Newworld \$20 Voucher** as a gift.

For more info , please send an email or  
[naji.gharibi@vuw.ac.nz](mailto:naji.gharibi@vuw.ac.nz) or scan this QR  
code

**Naji Gharibi**

PhD Candidate in Tourism Management



## **Appendix E**

Pre- experience, Experience and Post-experience questionnaire - Consent form and information sheet

*An eye on future: Impacts of VR technology on tourists' behavioural intentions*

**INFORMATION SHEET FOR PARTICIPANTS who experience the HP headset [for  
*Pre-Experience, Experience and Post-Experience Questionnaire*]**

You are invited to take part in this research. Please read this information before deciding whether or not to take part. If you decide to participate, thank you. If you decide not to participate, thank you for considering this request.

**Who am I?**

My name is *Naji Gharibi* and I am a Doctoral student in *Tourism Management* at Victoria University of Wellington. This research project is work towards my thesis.

**What is the aim of the project?**

This project aims to explore the impacts of VR technologies on tourists' emotions and behavioural intentions. Your participation will support this research by *discussing your emotions and behavioural intentions about the destination and technology after experiencing a tour to Rome by using an HP headset*. This research has been approved by the Victoria University of Wellington Human Ethics Committee [*Research Master application reference number: 0000029198*].

**How can you help?**

You have been invited to participate because *as you are able to assist me with your knowledge and familiarity with technology*. If you agree to take part, I will meet you *in Kelburn campus, Victoria University of Wellington*. I will ask you to fill out 3 questionnaires about *your emotions towards the destination and technology by experiencing a tour to Rome by using a Mixed Reality headset, one questionnaire will be before the tour, one after that and the last one will be one week after the experiment which will be sent by email*. This will take approximately 30

*minutes including a 15-minute tour to Rome.* You can choose to not answer any question or stop the experiment at any time, without giving a reason. You can withdraw from the study by contacting me at any time before our meeting. If you withdraw, the information you provided will be destroyed or returned to you.



### **What will happen to the information you give?**

This research is confidential\*. This means that the researcher named below will be aware of your identity, but the research data will be combined, and your identity will not be revealed in any reports, presentations, or public documentation. It means that you be referred by your demographic characteristics.

Only my supervisors and I, will read your answers. The files will be kept securely. The identified data will be destroyed by 30/11/2022

### **What will the project produce?**

The information from my research will be used in my PhD dissertation and academic publications and conferences. It may be also published in a media or tourism newsletters.

### **If you accept this invitation, what are your rights as a research participant?**

You do not have to accept this invitation if you don't want to. If you do decide to participate, you have the right to:

- Set the MR glass by yourself and not to be observed while having the tour.
- choose not to answer any question;

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\* Confidentiality will be preserved except where you disclose something that causes me to be concerned about a risk of harm to yourself and/or others.

- withdraw from the study before 30/02/2022;
- ask any questions about the study at any time;
- receive a copy of summary of research results by 30/11/2022.
- You will be observed by me as the researcher, while you will be experiencing this tour by the website. If you have any issues with that, this part can be deleted from the research, and you can be left alone in the room when having the tour. But to be sure about your safety, you could bring a support person or friend in the room with you instead to watch out for your physical safety. I will also keep the support person informed on how to escalate for assistance if needed.
- To be sure about your safety, the experiment runs during the health centre operating hours. I have also notified the health centre to advise them that I am relying on their service in case there is an issue/emergency as advised.



**If you have any questions or problems, who can you contact?**

If you have any questions, either now or in the future, please feel free to contact [either/me]:

**Student: Naji Gharibi**

**Supervisors: Ian Yeoman**

Name:

**Ina Reichenberger**

University email

address: Name: Ian Yeoman

naji.gharibi@vuw.ac.nz

Role: Associate Professor

School: Management

Phone: +64211319384

Ian.yeoman@vuw.ac.nz

### **Human Ethics Committee information**

If you have any concerns about the ethical conduct of the research you may contact the Victoria University of Wellington HEC Convenor: Associate Professor Judith Loveridge. Email [hec@vuw.ac.nz](mailto:hec@vuw.ac.nz) or telephone +64-4-463 6028.



*An eye on future: Impacts of VR technologies on tourists' behavioural intentions*

### **CONSENT TO answer the *Pre-Experience, Post- Experience and 1-week Post-Experience Questionnaire***

This consent form will be held for *a minimum of five years*.

Researcher: *Naji Gharibi, School of Management, Victoria University of Wellington.*

- I have read the Information Sheet and the project has been explained to me. My questions have been answered to my satisfaction. I understand that I can ask further questions at any time.
- I agree to take part in this experiment.

I understand that:

- I will answer three questionnaires and I may withdraw at any point in any stage of the experiment.
- I may withdraw from this study at any point before 30/2/2022, and any information that I have provided will be returned to me or destroyed.
- The identifiable information I have provided will be destroyed on 30/11/2022.
- Any information I provide will be kept confidential to the researcher and the supervisors Ian Yeoman and Ina Reichenberger.
- I understand that the findings may be used for a PhD dissertation and academic publications or presented to conferences.
- I understand that the answer sheet will be kept confidential to the researcher and the supervisors Ian Yeoman and Ina Reichenberger.
- I understand that Victoria University of Wellington will be named in any of the reports.
- My name will not be used in reports and utmost care will be taken not to disclose any information that would identify me.

- |   |
|---|
| <ul style="list-style-type: none"><li>• <i>I have read the safety protocol regarding participation in this research and I consent to all of that.</i></li></ul> |
|---|

|   |
|---|
| <div>Yes      No <input type="checkbox"/></div> <div><input type="checkbox"/></div> |
|---|

|   |  |                          |    |                          |
|---|--|--------------------------|----|--------------------------|
| • | I would like to receive a summary of the research results by 30/11/2022.       | Yes                      | No | <input type="checkbox"/> |
|   |  | <input type="checkbox"/> |    |                          |
|   | I have no problem with being observed by the researcher while having the tour. |                          | No | <input type="checkbox"/> |
|   |  | Yes                      |    |                          |
|   |  | <input type="checkbox"/> |    |                          |

Signature of participant: \_\_\_\_\_

Name of participant: \_\_\_\_\_

Date: \_\_\_\_\_

Contact details: \_\_\_\_\_



## **Appendix F**

Scales for the quantitative instrument

| Variable         | Item   | Likert scale                |
|------------------|--|-----------------------------|
| Authenticity     | Q1- AU1: The XR experience felt genuine.   |                             |
|                  | Q2- AU2: The whole experience was very realistic.  | Extremely agree=9           |
|                  | Q3- AU3: The virtual objects felt very natural.  | Strongly agree=8            |
| Presence         |  | Agree=7                     |
|                  | Q4- P1: I felt like I was actually in Rome.  | Slightly agree=6            |
|                  | Q5- P2: In this computer-generated world, I had the feeling of “being there” in the destination.           | Neither agree or disagree=5 |
| Awe              |  | Slightly disagree=4         |
|                  | Q6- Awe1: I felt a sudden change in time and place.  | Disagree=3                  |
|                  | Q7- Awe2: I felt the presence of something bigger than me. (e.g. Buildings)                                | Strongly disagree=2         |
|                  | Q8- Awe3: I felt I was small.  | Extremely disagree=1        |
|                  | Q9- Awe4: I had the sense of being connected to everything and being one of those people standing in Rome. |                             |
|                  | Q10- Awe5: I felt confused.  |                             |
|                  | Q11- Awe6: It was an awkward experience.   |                             |
|                  | Q12- Awe7: I felt surprised.   |                             |
| Place Attachment | Q13- Awe8: I felt fear.  |                             |
|                  | Q14- Awe9: I felt challenged to understand the XR experience.  |                             |
|                  | Q15-PA1: I felt engaged with the content when experiencing this tour.                                      |                             |
|                  | Q16- PA2: Visiting Rome through this tour was inspiring.   |                             |
|                  | Q17- PA3: I felt attached to this destination.   |                             |

|  |  |
|--|--|
| <b>Intention to visit</b>              | <b>Q18- IV1:</b> I felt quite inspired going to Rome after this experience.  |
|  | <b>Q19- IV2:</b> This experience tempted me to visit this destination in the future.                                   |
|  | <b>Q20- DR1:</b> I would say positive words about this destination.  |
| <b>Destination recommendation</b>      | <b>Q21- DR2:</b> I would recommend visiting this destination to friends and others.                                    |
| <b>Intention to use the technology</b> | <b>Q22- IUT1:</b> It's worth trying this kind of tour when planning a trip.  |
|  | <b>Q23- IUT2:</b> I would definitely like to experience these kinds of tours before choosing my next destination.      |
|  | <b>Q24- TR1:</b> I would say positive words about this technology.   |
| <b>Technology recommendation</b>       | <b>Q25- TR2:</b> I would recommend experiencing these kinds of tour by technology for choosing the future destination. |

## **Appendix G**

### Pre-experience questionnaire

## **Pre- experience Questionnaire**

Dear Respondent,

This questionnaire measures your demographic characteristics and also your behavioural intentions towards Rome as a tourism destination.

**Please indicate your gender**

- Male
- Female
- Other

**Please select the category that include your age**

- 18–29
- 30–39
- 40–49
- Over 50

**What best describe your education Level?**

- No Academic education
- Undergraduate
- Graduates
- Post-Graduate

**Nationality**

- New Zealander
- International

Please rate each item as to the extent/desire.

**Instruction:** For each statement please check whether Very often, Often, Occasionally, Rarely, Very rarely, Never.

| Question  | Very often               | Often                    | Occasionally         | Rarely            | Very Rarely | Never |
|---|--------------------------|--------------------------|----------------------|-------------------|-------------|-------|
|   | more than 5 times a year | More than 4 times a year | three times a year   | 2 times per year  | 1 time      | -     |
| How often do you regularly travel as a leisure?<br>(Domestic/International)                 |                          |                          |                      |                   |             |       |
|   | every month              | every couple of months   | At least three times | a couple of times | 1 time      | -     |
| How often have experienced XR (Virtual Reality, Augmented Reality or Mixed Reality) before? |                          |                          |                      |                   |             |       |

**Instruction:** For each statement, please check whether Extremely agree, Strongly agree, Slightly agree, Neither agree or disagree, Agree, Disagree, Slightly disagree, Strongly disagree or Extremely disagree.

| Statement | Extremely agree | Strongly agree | Agree | Slightly agree | Neither Agree or disagree | Slightly disagree | Disagree | Strongly disagree | Extremely Disagree |
|-----------|-----------------|----------------|-------|----------------|---------------------------|-------------------|----------|-------------------|--------------------|
|           |                 |                |       |                |                           |                   |          |                   |                    |

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
| As a tourist destination, I consider Rome as my top choice compared to other cities. |  |  |  |  |  |  |  |  |  |
| I have a strong intention to visit Rome in my future trip.                           |  |  |  |  |  |  |  |  |  |
| I would definitely recommend visiting Rome to others.                                |  |  |  |  |  |  |  |  |  |
| I would intend to visit Rome when the borders are reopened.                          |  |  |  |  |  |  |  |  |  |

## **Appendix H**

The experience questionnaire

## Post- experience Questionnaire

Dear Respondent,

Please rate each item as to the extent/desire after this tour. This questionnaire measures any differences between what you felt before and after the VR experience.

**Instruction: Instruction:** For each statement, please check whether extremely agree, Strongly agree, Slightly agree, Neither agree or disagree, Agree, Disagree, Slightly disagree, Strongly disagree or Extremely disagree.

| Statement                                | Extremely agree | Strongly agree | Agree | Slightly agree | Neither agree or disagree | Slightly disagree | Disagree | Strongly disagree | Extremely disagree |
|--|-----------------|----------------|-------|----------------|---------------------------|-------------------|----------|-------------------|--------------------|
| The VR experience felt genuine.          |                 |                |       |                |                           |                   |          |                   |                    |
| The whole experience was very realistic. |                 |                |       |                |                           |                   |          |                   |                    |
| The virtual objects felt very natural.   |                 |                |       |                |                           |                   |          |                   |                    |
| I felt like I was actually in Rome.      |                 |                |       |                |                           |                   |          |                   |                    |

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
| In this computer-generated world, I had the feeling of “being there” in the destination.         |  |  |  |  |  |  |  |  |  |
| I felt a sudden change in time and place.  |  |  |  |  |  |  |  |  |  |
| I felt the presence of something bigger than me. (e.g. Buildings)                                |  |  |  |  |  |  |  |  |  |
| I felt I was small.  |  |  |  |  |  |  |  |  |  |
| I had the sense of being connected to everything and being one of those people standing in Rome. |  |  |  |  |  |  |  |  |  |

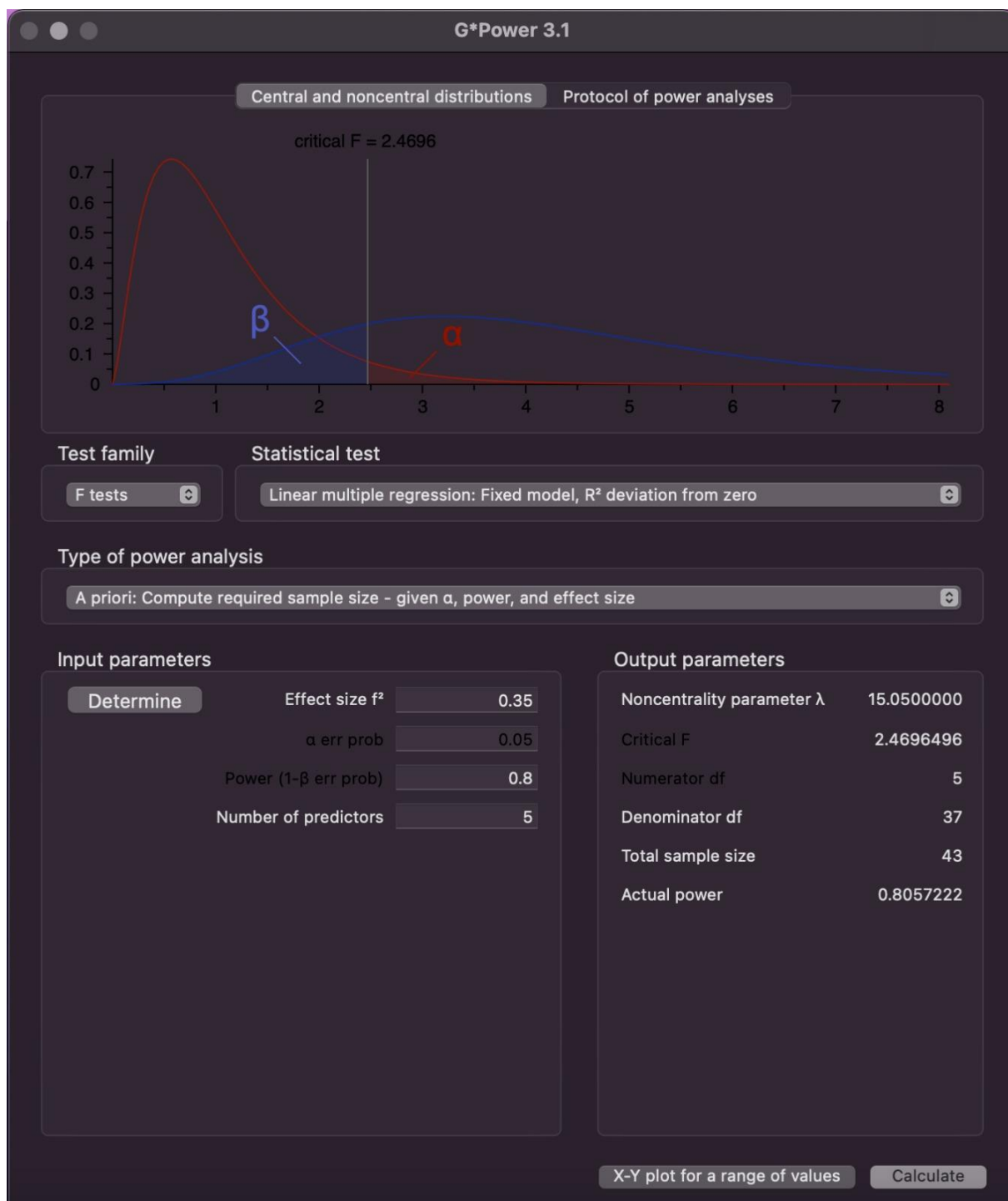
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
| I felt confused.   |  |  |  |  |  |  |  |  |  |
| It was an awkward experience.                                |  |  |  |  |  |  |  |  |  |
| I felt surprised.  |  |  |  |  |  |  |  |  |  |
| I felt fear.   |  |  |  |  |  |  |  |  |  |
| I felt challenged to understand the VR experience.           |  |  |  |  |  |  |  |  |  |
| I felt engaged with the content when experiencing this tour. |  |  |  |  |  |  |  |  |  |
| Visiting Rome through this tour was inspiring.               |  |  |  |  |  |  |  |  |  |
| I felt attached to   |  |  |  |  |  |  |  |  |  |

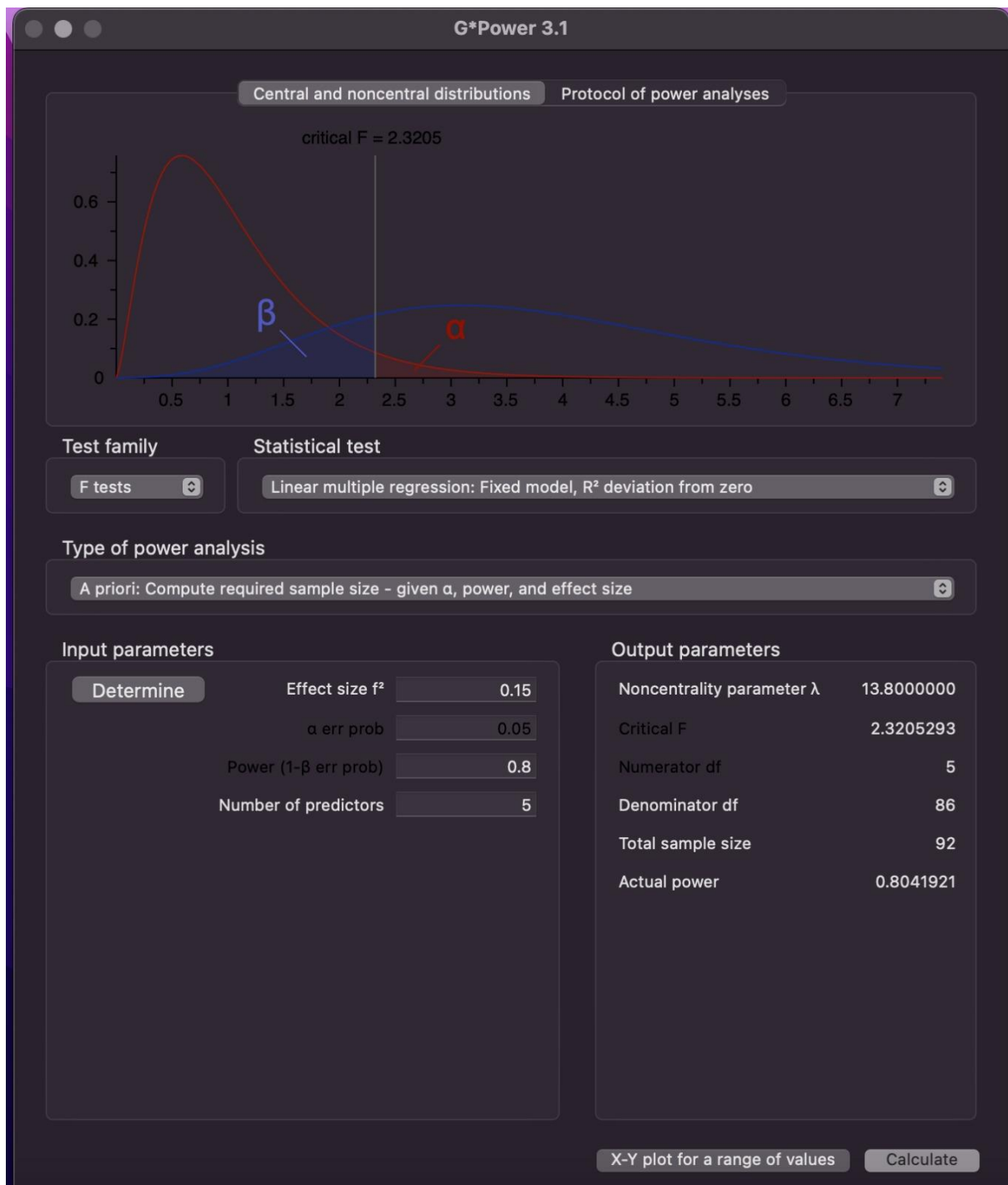
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
| this destination.  |  |  |  |  |  |  |  |  |  |
| I felt quite inspired to go to Rome after this experience.           |  |  |  |  |  |  |  |  |  |
| This experience tempted me to visit this destination in near future. |  |  |  |  |  |  |  |  |  |
| I would say positive words about this destination.                   |  |  |  |  |  |  |  |  |  |
| I would recommend visiting this destination to friends and others.   |  |  |  |  |  |  |  |  |  |
| It's worth trying this kind of tour                                  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
| when<br>planning a<br>trip.  |  |  |  |  |  |  |  |  |  |
| I would<br>definitely<br>like to<br>experience<br>these kinds<br>of tours<br>before<br>choosing my<br>next<br>destination. |  |  |  |  |  |  |  |  |  |
| I would say<br>positive<br>words about<br>this<br>technology.  |  |  |  |  |  |  |  |  |  |
| I would<br>recommend<br>experiencing<br>these kind of<br>tours for<br>choosing the<br>future<br>destination.               |  |  |  |  |  |  |  |  |  |

## **Appendix I**

### Power analysis results





## **Appendix J**

Varimax rotated component matrix for the factor analysis of the original questionnaire

| Items  | Components |      |       |      |   |   |   |      |
|--|------------|------|-------|------|---|---|---|------|
|  | 1          | 2    | 3     | 4    | 5 | 6 | 7 | 8    |
| The XR experience felt genuine.  | 0.78       |      |       |      |   |   |   |      |
| The whole experience was very realistic.   | 0.88       |      |       |      |   |   |   |      |
| The virtual objects felt very natural.   | 0.85       |      |       |      |   |   |   |      |
| I felt like I was actually in Rome.  |            | 0.54 |       |      |   |   |   |      |
| In this computer-generated world, I had the feeling of “being there” in the destination.         |            | 0.66 |       |      |   |   |   |      |
| I felt a sudden change in time and place.  |            |      | 0.87  |      |   |   |   |      |
| I felt the presence of something bigger than me. (e.g. Buildings)                                |            |      | 0.64  |      |   |   |   |      |
| I felt I was small.  |            |      | 0.32  |      |   |   |   |      |
| I had the sense of being connected to everything and being one of those people standing in Rome. |            |      | 0.51  |      |   |   |   |      |
| I felt confused.   |            |      |       |      |   |   |   |      |
| It was an awkward experience.  |            |      | 0.38  |      |   |   |   | 0.55 |
| I felt surprised.  |            |      | 0.76  |      |   |   |   |      |
| I felt fear.   |            |      |       |      |   |   |   |      |
| I felt challenged to understand the XR experience.   |            |      |       |      |   |   |   | 0.46 |
| I felt engaged with the content when experiencing this tour.                                     |            |      | -0.50 |      |   |   |   |      |
| Visiting Rome through this tour was inspiring.   |            |      |       | 0.53 |   |   |   |      |
| I felt attached to this destination.   |            |      |       |      |   |   |   |      |

|   |  |  |      |      |  |      |      |  |
|---|--|--|------|------|--|------|------|--|
| I felt quite inspired going to Rome after this experience.  |  |  | 0.85 |      |  |      |      |  |
| This experience tempted me to visit this destination in the future.                                   |  |  | 0.70 |      |  |      |      |  |
| I would say positive words about this destination.  |  |  |      | 0.77 |  |      |      |  |
| I would recommend visiting this destination to friends and others.                                    |  |  | 0.64 |      |  |      |      |  |
| It's worth trying this kind of tour when planning a trip.   |  |  |      | 0.70 |  |      |      |  |
| I would definitely like to experience these kinds of tours before choosing my next destination.       |  |  |      | 0.64 |  |      |      |  |
| I would say positive words about this technology.   |  |  |      |      |  | 0.58 |      |  |
| I would recommend experiencing these kinds of tour by technology for choosing the future destination. |  |  |      |      |  | 0.61 |      |  |
|   |  |  |      |      |  |      | 0.64 |  |
|   |  |  |      |      |  |      | 0.69 |  |

*Note.* Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy = 0.77. Bartlett's Test of Sphericity = 993.19 (120 df,  $p < 0.0001$ ); Total variance explained = 73.62%.