School of Management and Marketing

The Influence of System Quality and User Personality on the Behavioural Intention towards Virtual Reality Usage in Tourism

Eko Harry Pratisto
0000-0001-8576-8980

This thesis is presented for the Degree of
Doctor of Philosophy
of
Curtin University

May 2022

Declaration

To the best of my knowledge and belief, this thesis contains no material previously published by any other person except where due acknowledgement has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any other university.

Human Ethics. The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated July 2018. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number HRE2019-0626.

Signature :

Date : 9 May 2022

Acknowledgement of Country

We acknowledge that Curtin University works across hundreds of traditional lands and custodial groups in Australia, and with First Nations people around the globe. We wish to pay our deepest respects to their ancestors and members of their communities, past, present, and to their emerging leaders. Our passion and commitment to work with all Australians and peoples from across the world, including our First Nations peoples are at the core of the work we do, reflective of our institutions' values and commitment to our role as leaders in the Reconciliation space in Australia.

Abstract

Virtual reality (VR) refers to a computer system that produces a virtual environment where the user feels of "being surrounded" and can interact within it in real time. VR provides benefits in many industries, especially tourism. It enables the user to experience the virtual environment and interact with surrounding objects from the comfort and safety of their own home. Despite increasing research focusing on VR in tourism in recent years, there has been limited attention in such studies given to the influence of VR system quality on behavioural intention. Similarly, little is known on the influence of user personality on VR usage in tourism. Based on a knowledge gap identified via literature review, this thesis aims to investigate the influences on VR usage from the system quality and user personality perspectives. To be more precise, the objectives of this thesis are to (1) develop a conceptual model applicable to the use of VR in tourism; (2) investigate whether the system quality of VR influences the user to use VR as a tourism decision support tool regarding actual visitation to the tourism destination; and (3) investigate whether a user's personality influences them to use VR as a tourism decision support tool regarding actual visitation to the tourism destination.

The first phase of this thesis involves reviewing the use of immersive technology in tourism-related research. The review includes VR, which is the primary focus technology in this research. The systematic review following the Preferred Reporting of Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines covers the state of the art of immersive technology in tourism research. Several studies integrate other technology with immersive technology to enhance the user experience. The findings also cover immersive technology in the tourism area, possible challenges and theories applied in previous studies. Research gaps identified in this phase become the focus of this research for further investigation. The thesis then identifies constructs related to the objectives, including the relationship between constructs based on existing theories. A research model is thus developed for evaluation.

The second phase of this study involves analysing the research model. A quantitative component consists of two studies involving research model testing. In Study 1, a computer-generated VR for a museum was used. The data collection occurred at an expo in Surakarta, Indonesia. Visitors were randomly approached to

participate in the study. Each participant experienced VR using a VR head-mounted display with a joystick for approximately 5 minutes. The participant was then asked to complete a questionnaire via the Qualtrics system. A total of 218 valid responses were used for the data analysis phase. Study 2 employed two non-immersive VR websites. The participant sample was collected randomly using invitations sent via social media groups. Each participant was asked to experience two VR websites and then complete a questionnaire via the Qualtrics system. There were 680 valid responses retrieved for Study 2. Data from the two studies were analysed in a similar process that included data screening, exploratory factor analysis, confirmatory factor analysis and hypothesis testing with a covariance-based structural equation modelling approach.

The findings are mixed; in particular, the findings from the two studies differ in regard to the role of system quality. In the first study, information quality and interactivity did not significantly influence usability. In addition, conscientiousness was found not to affect attitudes towards VR. A different result was achieved in the second study with the same research model. The analysis showed that only visual attractiveness among system quality had no significant relationship with usability. This thesis ends with a concluding section describing the implications of this study for research on VR in tourism, and future research directions.

Table of Contents

Declaration ii
Acknowledgement of Country iii
Abstract iv
Table of Contents vi
List of Figures xi
List of Tables xii
Abbreviations xiii
List of Publications xiv
Acknowledgements xv
Dedication xvii

Chapter 1. Introduction 1

1.1 Background of the research 1
1.2 Problem statement 5
1.3 Purpose of the research 5
1.4 Research significance 6
1.4.1 Theoretical significance 6
1.4.2 Practical significance 7
1.5 Thesis outline 7

Chapter 2. Literature Review 9

2.1 Overview 9
2.2 Immersive technologies 9
2.3 Virtual reality 12
2.3.1 Difference between augmented reality and virtual reality 15
2.3.2 State of the art 18
2.3.2.1 Head-mounted display (HMD) 18
2.3.2.2 Virtual reality accessories 20
2.3.2.3 360° technology 22
2.3.3 Broad applications 24
2.4 Tourism 25
2.5 Theoretical foundations 26
2.5.1 Theory of reasoned action 26
2.5.2 Theory of planned behaviour 28
2.5.3 Technology acceptance model 30
2.6 Summary 31

Chapter 3. Immersive Technologies for Tourism: A Systematic Review of State-of-the-Art and Challenges 32

3.1 Overview 32
3.2 Existing reviews 33
3.3 Methodology 37
3.3.1 Identifying the research questions 37
3.3.2 Defining search keywords 38
3.3.3 Study selection 39
3.4 Results and discussion 42
3.4.1 The current state of immersive technology usage in tourism research 44
3.4.1.1 Augmented reality features in tourism research 44
3.4.1.2 Virtual reality features in tourism research 47
3.4.2 Immersive technology applications within the tourism area 48
3.4.2.1 Immersive technology as a marketing tool 49
3.4.2.2 Immersive technology for heritage preservation 50
3.4.2.3 Immersive technology for education 52
3.4.2.4 Immersive technology as tour guidance 52
3.4.2.5 Immersive technology as a navigation device 55
3.4.2.6 Immersive technology adoption for other purposes 55
3.4.3 The potential challenge in using immersive technology in tourism 56
3.4.4 Immersive technology in user behaviour-related research 59
3.5 Conclusions and implications 64
3.5.1 Limitations of the study 65
3.5.2 Threats to validity 65
3.5.2.1 Study selection validity 66
3.5.2.2 Data validity 66
3.5.2.3 Research validity 67
3.5.3 Future work 67
3.5.3.1 Integrating immersive technology with other technology to enhance user experience 67
3.5.3.2 Immersive technology applications within the tourism area 68
3.5.3.3 Potential challenge in using immersive technology in tourism 69
3.5.3.4 Immersive technology in user behaviour-related studies 69
3.6 Proposed work 70
3.7 Summary 71

Chapter 4. Research Problem Definition 73

4.1 Overview 73
4.2 Problem definition 73
4.3 Key concepts used in this thesis 73
4.4 Research objectives 75
4.5 Research questions 75

4.6 Research design overview 76
4.7 Summary 78

Chapter 5. Theoretical Foundation, Hypotheses, and Research Model 79

5.1 Overview 79
5.2 Identifying constructs 79
5.3 Constructs 81
5.3.1 Behavioural intention 81
5.3.2 Attitude 82
5.3.3 Usability 82
5.3.4 Personality traits 83
5.3.5 Social influence 85
5.3.6 Visual attractiveness 85
5.3.7 Interactivity 86
5.3.8 Information quality 87
5.4 Hypotheses and research model 88
5.4.1 Relationship between system quality and usability 89
5.4.2 Relationship between usability and attitude 91
5.4.3 Relationship between user personality and attitude 92
5.4.4 Relationship between attitude and behavioural intention 93
5.4.5 Research model 94
5.5 Summary 95

Chapter 6. Research Methodology 96

6.1 Overview 96
6.2 Research approach 96
6.3 Ethical considerations 98
6.4 Questionnaire design 99
6.5 Methods of data analysis 107
6.5.1 Data screening 107
6.5.2 Multivariate analysis 108
6.5.3 Structural equation modelling (SEM) 108
6.6 Summary 109

Chapter 7. Study 1—Virtual Reality at a Prehistoric Museum: Exploring the Influence of System Quality and User Personality on the Behavioural Intention 110

7.1 Overview 110
7.2 Study design 110
7.3 Data screening 112
7.4 Analysis and results 112
7.4.1 Exploratory factor analysis 115
7.4.2 Confirmatory factor analysis 115

7.4.3 Structural model and hypothesis testing 116
7.4.4 Indirect effect analysis 117
7.5 Discussion 118
7.6 Summary 121

Chapter 8. Study 2—Virtual Reality and Tourism: Effects of System Quality and User Personality on Behavioural Intention 122

8.1 Overview 122
8.2 Study design 122
8.3 Data screening 125
8.4 Analysis and results 125
8.4.1 Exploratory factor analysis 129
8.4.2 Confirmatory factor analysis 129
8.4.3 Structural model and hypothesis testing 130
8.4.4 Indirect effect analysis 131
8.5 Discussion 132
8.6 Summary 134

Chapter 9. General Discussion and Conclusion 136

9.1 Overview 136
9.2 How does VR quality influence user behavioural intention? 136
9.3 How user personality influence user behavioural intention on VR tourism usage? 138
9.4 Usability, attitude and behavioural intention 139
9.5 Conclusion 139
9.5.1 Theoretical implications 141
9.5.2 Practical implications 141
9.5.3 Limitations and future research 142

References 146

APPENDICES 182

Appendix A. List of selected articles from systematic review 183

Appendix B. Research Ethic Approval 192

B.1 Ethics approval from Curtin human research ethics office 192
B.2 Curtin survey approval 196

Appendix C. Participant information sheet and consent form 197

C.1 Study 1 197
C.1.1 Participant information sheet (Bahasa Indonesia) 197

C.1.2 Consent form (Bahasa Indonesia) 203
C.2 Study 2 204
C.2.1 Participant information sheet (English) 204
C.2.2 Consent form (English) 207

Appendix D. Questionnaire 208

D.1 Questionnaire items in Bahasa Indonesia for Study 1 208
D.2 Questionnaire in English for Study 2 216

Appendix E. Analysis result for Study 1 225

E.1 Descriptive analysis 225
E.2 Communalities 227
E.3 Total variance explained 228
E.4 Exploratory factor analysis 229
E.5 Confirmatory factor analysis 231
E.6 Common method bias 232
E.7 Variable inflation factor (VIF) 233
E.8 Latent construct correlation matrix (Fornell-Larcker criterion) 237
E.9 Heterotrait-monotrait analysis 238
E.10 Structural model 239

Appendix F. Analysis result for Study 2 240

F.1 Descriptive analysis 240
F.2 Communalities 242
F.3 Total variance explained 243
F.4 Exploratory factor analysis 245
F.5 Confirmatory factor analysis 248
F.6 Common method bias 249
F.7 Latent construct correlation matrix (Fornell-Larcker criterion) 251
F.8 Heterotrait-monotrait analysis 252
F.9 Common method bias with specific bias 253
F.10 Structural model 254

Appendix G. Permission statement from the copyright owners 255

List of Figures

Figure 1.1. Map of international tourist arrivals (million) and tourism receipts (USD billion) 1
Figure 1.2. Observed dimensions 6
Figure 2.1. Reality–virtuality continuum. 9
Figure 2.2. Oculus Rift 13
Figure 2.3. Cave Automatic Virtual Environment. 14
Figure 2.4. Flight simulator. 14
Figure 2.5. Virtual tour developed by Matterport. 15
Figure 2.6. Example of marker-based augmented reality. 17
Figure 2.7. Pokemon Go. 18
Figure 2.8. Virtual reality head mounted device features 19
Figure 2.9. Oculus Quest controllers. 20
Figure 2.10. Virtual reality with treadmill. 21
Figure 2.11. Virtual Reality gloves. 22
Figure 2.12. Virtual reality with full-body suit. 22
Figure 2.13. Samsung Gear 360. 23
Figure 2.14. Theory of reasoned action model 27
Figure 2.15. Theory of planned behaviour 29
Figure 2.16. Technology acceptance model 30
Figure 3.1. Article selection based on the PRISMA flow diagram. 41
Figure 3.2. Published article distribution over time. 42
Figure 3.3. Immersive technology usage in various areas of tourism. 49
Figure 3.4. Challenges in immersive technology for tourism. 56
Figure 5.1. Constructs relating to behavioural intention. 80
Figure 5.2. Research model. 95
Figure 6.1. The research onion. 97
Figure 7.1. Sangiran museum VR app. 111
Figure 7.2. VR HMD for data collection. 111
Figure 7.3. Data collection at an Expo in Surakarta. 112
Figure 7.4. User responses variation 114
Figure 7.5. Study 1 structural model result. 117
Figure 8.1. The Mehu Tomb virtual reality website. 123
Figure 8.2. The Batu Villa virtual website. 124
Figure 8.3. User's response variation 128
Figure 8.4. Study 2 structural model result. 131

List of Tables

Table 3.1. Summary of review articles on immersive technology in tourism. 34
Table 3.2. The search query for databases. 39
Table 3.3. Inclusion and exclusion criteria for study selection. 40
Table 3.4. Search results from 10 databases. 40
Table 3.5. Type of study from the selected articles. 43
Table 3.6. Country distribution of 47 empirical articles based on the research location. 43
Table 3.7. Augmented reality devices used in the empirical studies. 45
Table 3.8. Type of augmented reality trigger used in the empirical studies. 45
Table 3.9. Virtual reality devices used in the empirical studies. 48
Table 3.10. Type of virtual reality content used in the empirical studies. 48
Table 3.11. Summary of articles using theory/model. 61
Table 6.1. Questionnaire items in Bahasa Indonesia for Study 1. 100
Table 6.2. Questionnaire items in English for Study 2. 104
Table 7.1. Background profile of participants. 113
Table 7.2. Descriptive statistics. 114
Table 7.3. Indirect effect analysis. 118
Table 8.1. Social desirability items for common method bias 124
Table 8.2. Background profile of participants. 126
Table 8.3. Participant's country of origin. 127
Table 8.4. Descriptive statistics. 128
Table 8.5. Effect size. 131
Table 8.6. Indirect effect analysis. 132
Table 9.1. SEM analysis result from two studies. 136
Table 9.2. Methods to answer research questions. 140

Abbreviations

AR	Augmented reality
AV	Augmented virtuality
AVE	Average variance extracted
CAVE	Cave automatic virtual environments
CMB	Common method bias
EFA	Exploratory factor analysis
CFA	Confirmatory factor analysis
CR	Composite reliability
DoF	Degree of freedom
GPS	Global positioning system
HMD	Head-mounted display
HTMT	Heterotrait–monotrait
KMO	Kaiser–Meyer–Olkin
MR	Mixed reality
PC	Personal computer
PICO	Problem, intervention/exposure, comparison and outcome
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SEM	Structural equation modelling
SLR	Systematic literature review
TAM	Technology acceptance model
TPB	Theory of planned behaviour
TRA	Theory of reasoned actioned
UTAUT	Unified theory of acceptance and use of technology

List of Publications

1. Pratisto, E.H., Thompson, N. & Potdar, V. Immersive technologies for tourism: a systematic review. Inf Technol Tourism 24, 181–219 (2022). https://doi.org/10.1007/s40558-022-00228-7
   Extracted from Chapter 3
2. Virtual Reality at a Prehistoric Museum: Exploring the Influence of System Quality and Personality on User Intentions. (In Review)
   Extracted from Chapter 7
3. Virtual Reality and Tourism: Effects of System Quality and User Personality on Behavioural Intention. (Final Draft)
   Extracted from Chapter 8

Acknowledgements

In the name of Allah, the most beneficent, the most merciful.

I want to thank all the people who supported my academic journey over the last few years. My PhD study would not have been possible without them.

Firstly, I want to express my gratitude to my supervisors Associate Professor Nik Thompson and Associate Professor Vidyasagar Potdar. They provided me with much academic support, patience, motivation and immense knowledge. Nik mentored me to be a good researcher. Every doubt, concern and question I had in my mind before entering his office was always replaced with new hopes, inspiration, ideas and motivation. I enjoyed every discussion we had. Vidy's numerous experiences in both academia and industry always resulted in an innovative solution and helped me work efficiently. Without doubt, both my supervisors are extraordinary mentors.

Secondly, I want to acknowledge the financial, academic and technical support from Curtin University, Australia and Sebelas Maret University, Indonesia. This research was supported by an Australian Government Research Training Program Scholarship and Sebelas Maret University. This PhD could not have been undertaken without those essential supports.

I would like to extend my thanks to my fellow doctoral student Arezoo Pourfarhad, Abubakar Mohammed, Ahmed Ali Y. Majrashi, Lara Gittings, Majedul Islam and Zahra Daneshfar, for a wonderful and time during our academic journey. A special thanks to Mehree Iqbal who always kind and support. I hope all the best for you and may Allah protect you all.

Finally, I would also like to acknowledge the help and support of my work colleagues at Sebelas Maret University, particularly in the Informatics Engineering department of Vocational School. Special thanks to Fendi Aji Purnomo, who helped me through the study process.

This thesis was edited by Elite Editing, and editorial intervention was restricted to Standards D and E of the *Australian Standards for Editing Practice*.

'It's not that I'm so smart, it's just that I stay with problems longer.'

Albert Einstein

Dedication

I devote this thesis to my wonderful family.

I give my highest gratitude to my wife, Vinci Mizranita. We pursued our PhD journey together and went through all the joys and sorrows while raising our beautiful children. To our beloved children Aldan Harvianno, Fadya Dzakira Harviaputri and Sophie Aisha Harviaputri, thank you for understanding, support, silliness and all the noise over the past years. I enjoyed every little time I watched you grow up to become extraordinary and healthy kids. I did not want to miss a single moment of your life. I hope what I have achieved can be an example for your life journey ahead and inspire you to surpass me. Allah knows what is best for us. I am looking forward to spending every moment of my life with you. To my family, I love you all.

I also dedicate this thesis to my parents and my parents in law. Thank you for all your tireless support mentally, financially and spiritually. Thank you for your endless encouragement, sacrifice and always including me and my family in your prayers. Thank you for always believing in me and being there when I need you. Again, thank you for everything.

It is to them that I owe my all.

Alhamdulillah

Chapter 1. Introduction

1.1 Background of the research

This PhD thesis is principally concerned with the understanding of the relationship between system quality of virtual reality (VR) and the user's personality, and their influence on the behavioural intention. System quality includes information quality, visual attractiveness and interactivity. On the other hand, user's personality covers how the social circle influences the user's perceptions (social influence) with two dimensions from the five-factor model (hereinafter the 'Big Five' model) (McCrae and Costa Jr 1997) personality traits (openness to experience and conscientiousness). Behavioural intention covers the intention to visit a tourism destination and the intention to use VR to support travel decision. This thesis addresses the calls from researchers (Errichiello et al. 2019; Huang et al. 2013; Jung et al. 2016) to study the influence of individual characteristics, technology features, and the social circle when evaluating a state-of-the-art technology like VR in tourism.

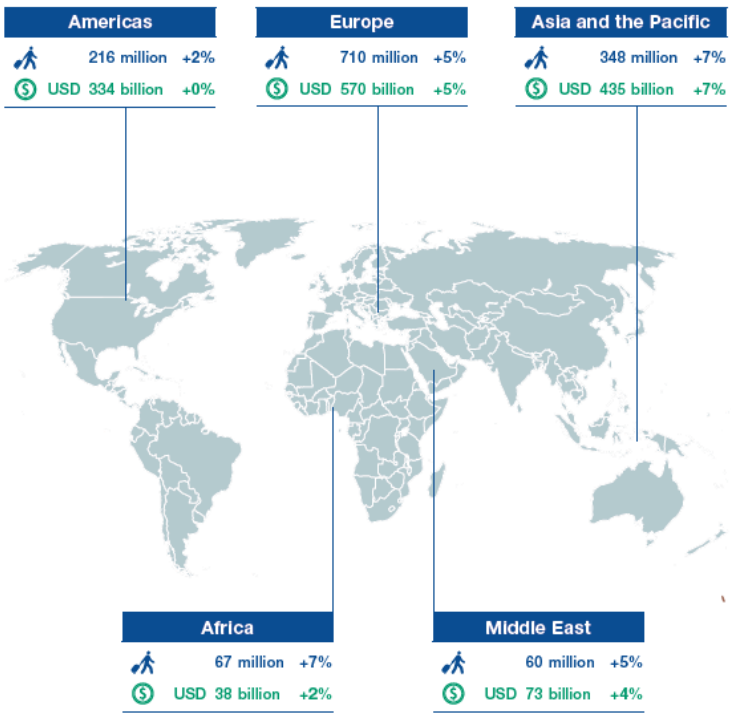


Figure 1.1. Map of international tourist arrivals (million) and tourism receipts (USD billion)

Source*: Figure reproduced from the United Nations World Tourism Organization (UNWTO)(2019, 3) © UNWTO, 92844/04/22.*

The tourism industry is one of the fastest-growing economic sectors globally, especially in the Asia Pacific, which recorded the highest growth percentage change of international tourist arrival during 2018, followed closely by Africa during 2019 (see Figure 1.1). Glaesser (2006, 1) noted that tourism is 'arguably one of the most important sources of income and foreign exchange and is growing rapidly'. This thesis is concerned with how VR technology might influence a potential tourist to visit a tourism destination, by investigating the technical quality aspects of VR combined with the user's personality characteristics. VR as recent technology has gained popularity in many industries (Alsop 2020). VR has significant potential to support tourism, especially given the challenging situation since the beginning of 2020 that has seen most countries set travel bans because of a global pandemic (COVID-19). Most countries' visitor numbers fell drastically as a result (Tourism Research Australia n.d.).

Tourism involves spending time far away from home to pursue leisure, relaxation and happiness, either unassisted or via commercial service provision. Goeldner and Ritchie (2012, 4) defined *tourism* as 'the processes, activities, and outcomes arising from the relationships and the interactions among tourists, tourism suppliers, host governments, host communities, and surrounding environments that are involved in the attracting and hosting of visitors.' Tinsley and Lynch (2001) stated that most studies tend to describe tourism destination as a 'system containing a number of components such as accommodation, transport, and other services and infrastructure'. Countries are actively promoting their tourism to generate national income and drive economic growth. One way to promote tourism is to use technology.

Information and communication technology (ICT) influences many business sectors, particularly the tourism industry. It changes how products and services are managed and promoted, affecting how travellers plan, book and experience travel. More new tourism destinations are introduced and become popular with ICT usage. It is now easy for potential tourists to obtain information about tourism destinations or attractions directly from tourism provider websites or other people who have already visited. Many websites provide information regarding tourism destinations around the world, providing insights about a tourism destination from previous travellers. Another way to promote a tourism destination is to use ICT to deliver a near-actual experience during the pre-visit, actual visitation or post-visitation period.

One kind of technology that can bring benefits to tourism is VR. VR is an interactive computer-generated simulation where the user gains a sense of immersion in a virtual environment (Mihelj, Novak and Beguš 2014). While using VR, the user is not physically present but can sense their presence in the new environment and become immersed through multiple sensory stimulations. As a result, the user can virtually interact with virtual objects as in the real world. A head-mounted display (HMD) with an additional stimulation device (e.g. gloves, vest, treadmill) is one way to experience VR. A computing device built into a HMD, computer or smartphone simulates the VR environment and displays it on the HMD screen.

VR is widely used in fields such as health (Henderson, Korner-Bitensky and Levin 2007), education (Merchant et al. 2014) and tourism (Yung and Khoo-Lattimore 2019). VR has many applications and might influence the tourism industry's future directions. This research employed VR to show a tourism destination to potential tourists. The use of VR pre-visit helps potential tourists experience a particular tourism destination before their actual visit to the destination and engage with rich information. People with access to this kind of technology can obtain more tourism information because of the richness of the information and more realistic expectations regarding their future journey. VR leads to tourist satisfaction during a tourism trip and makes tourism destinations more popular. Thomas and Carey (2005) stated that a virtual tour could increase interest in a destination.

VR technology may be a solution to travel barriers. It allows a user to virtually travel to their desired destination without leaving home if they are hampered by travel restrictions or a physical condition. It could be argued that VR substitutes for a real trip to a specific destination. However, undertaking a real trip is irreplaceable. VR cannot replace socialising with others such as family, friends or local people at the destination, whether the travel is to visit family or friends, or for business or leisure purposes. Despite these limitations, VR may replace actual visitation in some situations, especially in cases of physical travelling limitations.

This thesis investigates how VR usage influences the user to visit tourism destinations and employ VR as a tool for tourism travelling decisions. A research model representing the relationship between variables is proposed following identification of

variables during the literature review process. Hypotheses are tested using structural equation modelling (SEM).

This thesis utilises information quality, interactivity and visual attractiveness as independent variables from a system quality perspective. Information quality refers to the quality of the information that the system can deliver. Interactivity is one example of system quality measurement and is considered suitable for this study as VR can provide a virtual environment with which the user can interact. Visual attractiveness refers to the visual aesthetic of the VR.

This thesis also encompasses how the user's personality influences VR behavioural intention, by using openness to experience, conscientiousness and social influence as independent variables. Openness to experience and conscientiousness are two dimensions of the Big Five personality trait taxonomy known to measure individual characteristics. Hirschfeld et al. (2008) stated that the Big Five model contains five dimensions: agreeableness, conscientiousness, extraversion, openness to experience and neuroticism. As this study explores the use of VR and its effect on user behavioural intention, the openness to experience and conscientiousness dimensions are relevant to the study's context and are incorporated into the research model. Conscientiousness is a personality trait that reflects a person's willingness to follow a group's norms, organisational policies and rules (Smithikrai 2008). A person with a high score in this dimension is considered organised, to plan skilfully and rely on tasks that require achievement, rather than being sloppy, careless and negligent (van Lieshout 2000).

An individual who is creative, unconventional and broadminded is classified as someone with high openness to experience (Smith and Canger 2004) , receptiveness to new ideas, preference for varied sensations and intellectual curiosity (Grehan, Flanagan and Malgady 2011). Social influence is also measured in this thesis as it represents individual decision making based on other people's perceptions.

1.2 Problem statement

The literature suggests that VR is suitable for evaluating tourism facilities or as a tool for destination promotion (Gibson and O'Rawe 2018; Chang and Chiang 2022). VR offers a method of transporting the user, through the user's perception, from the real environment into a virtual environment. Another consideration is the tourist's preferences regarding tourism destinations to enable marketing using VR (Chang and Chiang 2022).

Despite vast knowledge around VR in tourism, researchers have pointed out that many aspects need further exploration. While the benefits of VR are well described in the literature, little is known on how the quality of VR may relate to the user's behavioural intention. Contemporary scholars urge researchers to study the user's personality using personality traits (Kim, Lee and Jung 2020; Flavián, Ibáñez-Sánchez and Orús 2019b)—especially openness to experience new things (Li and Chen 2019)—that might influence the user's intention towards a tourism destination.

1.3 Purpose of the research

The purpose of this study is to empirically examine the influence of the use of VR in terms of perceived quality, along with the user's personality in the tourism context, and their relationship with the user's behavioural intention. Ten variables are employed in this study. The independent variables are information quality, interactivity, visual aesthetics, openness to experience, conscientiousness and social influence. Usability and attitude are used as mediating variables. Behavioural intention as the dependant variable includes the intention to visit a tourism destination and the intention to use VR as tourism trip decision support tool.

To summarise, this thesis investigates the influence of VR usage on the behavioural intention to visit a tourism destination and to use VR as a tourism trip decision tool, from system quality and user personality perspective. Figure 1.2 illustrates the dimensions covered throughout this thesis.

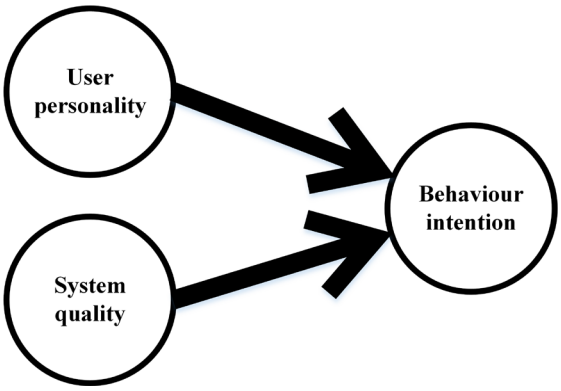


Figure 1.2. Observed dimensions

1.4 Research significance

1.4.1 Theoretical significance

As stated in Section 1.3, this thesis contributes to knowledge on how VR usage in tourism influences user behaviour. Aside from responding to calls in previous studies for further research, this thesis provides a new perspective on how the quality of VR and the user's personality might affect the user's intention to visit a tourism destination. Further, there is an opportunity to use VR to help the user make a decision regarding future travel.

In summary, this thesis identifies the potential constructs that might influence a user's behavioural intention based on previous studies. The proposed model contributes to the study area of both technical and psychological aspects of VR usage, especially the user's behaviour regarding VR usage in tourism. The two studies reported in this thesis also provide insight into the causal relationship based on the proposed research model.

The quality perspective of VR in tourism has not previously been explored. VR as tourism promotion media should deliver information that persuades the user to undertake actual visitation. This thesis seeks to explain how sufficient and meaningful information might affect a user's attitude towards VR usage leading to them visiting the tourism destination. Both studies in this thesis were designed to gain an understanding of VR in terms of visual appearance and interactivity, based on the proposed model with different types of VR.

The findings of this thesis extend the literature on personality and the influence of others. This study helps fill the knowledge gap of how a user's personality can influence their motivation to use VR to support their travel decisions.

1.4.2 Practical significance

Relevant results from this study can help tourism stakeholders enhance VR usage to promote the tourism industry and travel options. Specifically, this thesis will benefit the following:

Tourism providers. This study spreads awareness for tourism providers on promoting tourism destinations via VR technology. The technology can deliver rich information to persuade the user to develop an intention to visit the tourism destination.

VR designers. VR designers will benefit from this study as its findings cover the quality aspect of VR. The appropriate visual design, sufficient information and how the user interacts within the virtual environment can satisfy the user's need to enjoy the VR experience.

Prospective travellers. This study covers how VR can help the user support their decisions on travel planning. The findings may encourage prospective travellers to consider VR to obtain sufficient information in advance about a tourism destination. Moreover, the results of this study provide evidence on how VR can be an option for visiting a tourism destination virtually, either because of global pandemic travel restrictions or physical limitations regarding travel.

1.5 Thesis outline

This thesis contains nine chapters. Chapter 1 provides a general background of the research, followed by the problem statement, research purpose and research significance. The rest of thesis is organised as follows.

Chapter 2 presents a literature review providing broader knowledge such as immersive technology for more specific VR usage in tourism. The chapter gives an overview of the current study along with the state of the art of immersive technology, specifically VR.

Chapter 3 presents a systematic review on immersive technology in tourism research. The chapter also covers VR typology, state of the art and VR-related tourism research on behavioural intention.

Chapter 4 presents the problem definition, key concepts, research objectives, research questions and general overview of the research design.

Chapter 5 describes the constructs used in this study and the relationship between them. The chapter includes the formulated hypotheses and the proposed model tested in the two studies described in the thesis.

Chapter 6 describes the research methodology used in this thesis to answer the formulated research questions. The chapter details the selected research approach to conduct the study, including ethical considerations, questionnaire design and data analysis methods.

Chapter 7 and Chapter 8 report the two studies covered in this thesis. Each chapter covers the study design, data analysis and specific discussion based on the findings.

Last, Chapter 9 concludes the thesis via a general discussion and outline of the research limitations and suggested future research, as well as the research summary.

Chapter 2. Literature Review

2.1 Overview

This chapter provides a birds-eye view of concepts covered in this thesis. First, 'immersive technology' as the umbrella term for VR and other technologies is discussed, emphasising differences between each technology within it. Next, a section focuses on VR and its differences from augmented reality (AR), state of the art and general applications. As the thesis focuses on the tourism context, this chapter also reviews tourism from a general perspective. Following that, a section is devoted to discussing the theory that relates to behavioural intention. The concepts described in this chapter provide a general theoretical basis upon which the studies presented later are developed.

2.2 Immersive technologies

Milgram and Kishino (1994) introduced the reality–virtuality continuum (see Figure 2.1) to classify the environment based on a mixture of objects from the real and synthetic worlds. On the left end of the continuum lies the real-world environment or existing world, and on the other end is the virtual environment or synthetic world. A computer generates the virtual object or environment. The space between these extremes is a combination of the real world and the virtual environment, referred to as mixed reality (MR) (Milgram and Kishino 1994). The concept of the reality–virtuality continuum relies on how a virtual object seem from a first-person viewpoint on a display device (e.g. computer monitor, phone, HMD, big screen) and the amount of virtual object and real-world view. As the point on the continuum slightly moves away from the real environment, the virtual environment increases. In contrast, the real object or image is decreased and viewed indirectly by the human eye.

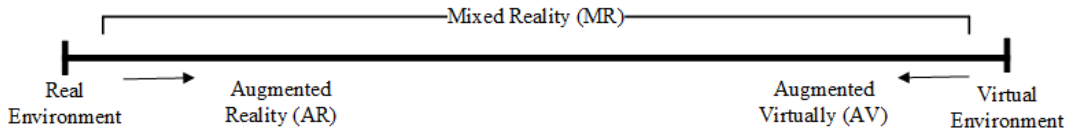


Figure 2.1. Reality–virtuality continuum.
Source*: Figure reproduced from Milgram and Kishino (1994) with permission.*

The dictionary (Lexico 2019a) definition of immersive is 'generating a three-dimensional image which appears to surround the user'. Witmer and Singer (1998) argued that immersion is an individual experience, defined as the 'psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experiences. A similar definition is provided by Sherman and Craig (2018) under the term mental immersion. Factors affecting immersion include user isolation from the physical environment, perception of the virtual environment, how natural the interaction and control are, and perception of movement in the virtual environment (Witmer and Singer 1998). Slater et al. (1996) stated that immersion is quantified by what the technology provides. The greater the extent to which the user can modify the virtual environment, the higher the degree of immersion the system can provide. These authors further distinguished the term immersion with presence. As immersion is perceived from the technology side, presence represents the state of consciousness of a person, in the sense of being in an environment.

Presence can also be defined as the psychological state in which the user feels immersed and physically 'present' in a virtual environment (Schubert, Friedmann and Regenbrecht 2001; Slater and Steed 2000; Slater and Usoh 1993; Steuer 1992; Slater and Wilbur 1997). In addition, Lee (2006, 38) stated that presence is the 'psychological similarities between virtual and actual objects when people experience-perceive, manipulate, or interact with virtual objects. The sense of presence needs to be maintained even after passing through the barrier (Slater and Wilbur 1997).

One property of the display output produced by a system that induces a sense of presence is vividness. Vividness deals with display quality, including its richness in information quality and resolution (Slater et al. 1996). Based on the explanation above, immersive technology can be defined as technology that can produce a computer-generated simulation that blurs the boundary between a real-object in the physical world and the virtual environment (Suh and Prophet 2018). As shown in the reality–virtually continuum in Figure 2.1, three terminologies are included in immersive technology: AR, augmented virtuality (AV), and VR. In AR, the real environment is augmented with the virtual object. Conversely, AV produces a virtual environment

with the addition of real objects, creating a sense of a 'window of the real world'. Finally, VR fully covers the field of view with a computer-generated environment.

The other dimension that might relate to immersive technology is interactivity. Interactivity does not always refer to the user's freedom to navigate the virtual environment but also the user's ability to modify the virtual environment (Ryan 1999). Steuer (1992) also underlined that the degree of interactivity itself relies on three factors: the system's response to user input in real time (speed); any possible action during a given time (range); and the system's ability to adapt its control based on any given changes that are natural and expected possible (mapping).

The ability of technology to create a sense of presence in a virtual environment is defined as telepresence (Steuer 1992). While presence refers to human perception as the sense of being in the real world, telepresence is a sense of presence in a mediated environment such as a virtual environment (Steuer 1992). Thus, the concept of presence from the human experience is essential, unlike technological hardware, when discussing immersive technology. Industries have adopted immersive technology to meet numerous needs (Berg and Vance 2017). Although gaming is an area that enjoys a significant advantage from immersive technology, other areas also achieve the same advantage, including entertainment, manufacturing (Azuma 1997), healthcare, training, education, strategic communication (Zyda 2005), product and human-focused design (Pontonnier et al. 2014), and architecture (Thomas 2012; Portman, Natapov and Fisher-Gewirtzman 2015)

AR is more suitable for exploring tourism destinations onsite based on its operating characteristics. It requires the user to travel and might not be preferable to trigger the intention to visit. AV comprises real world content superimposed on the virtual environment (Flavián, Ibáñez-Sánchez and Orús 2019a). The technology might bring benefits to promote tourism destinations, although little is known about AV usage in the tourism area. As this thesis focuses on the user's behavioural intention—precisely their intention to visit—VR is considered a more appropriate technology. Therefore, this thesis focuses on VR usage in tourism.

2.3 Virtual reality

In general, the term virtual relates to computer simulation processes to transform a digital representation into a perceptible experience (visual, acoustical, mechanical). VR is a well-known technology offering users an interactive, simulated environment (Kounavis, Kasimati and Zamani 2012). Since its early recognition, VR has been described as a computer-simulated environment that enables people to interact with the environment (Diemer et al. 2015; Schuemie et al. 2001). Terminology around VR has been understood since the early 1990s to mean the following:

> as artificial reality that applies only to systems implemented with goggles and gloves, the special peripherals that enable the user of VR to perceive the virtual world and to interact with it. (Krueger 1991, cited in Barker 1993)
>
> The computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors. (Lexico 2019b)
>
> the use of computer technology to create the effect of an interactive three-dimensional world in which the objects have a sense of spatial presence. (Bryson n.d.)
>
> the use of a computer-generated 3D environment – called a 'virtual environment' (VE) – that one can navigate and possibly interact with, resulting in real-time simulation of one or more of the user's five senses. (Guttentag 2010)

Some key terms can be extracted from the above definitions: computer, interactive, virtual environment/artificial reality, input (gloves), presence and effect. Although VR can produce a feeling of 'being surrounded' or immersed, Bryson (n.d.) stated that VR could be experienced without having any sense of immersion. As a result, interaction between the user and virtual environment is not necessary using a particular input like gloves (Krueger 1991, cited in Barker 1993). The interaction can be based on a conventional computer keyboard or mouse (Robertson, Card and Mackinlay 1993). Therefore, this thesis defines VR as use of a computer system to produce a virtual environment where the user can interact in real time. VR has been used in various sectors including archaeology, cultural heritage sites, military, visualisation entertainment, manufacturing, education, tourism, employee training and medicine

(Ghadban et al. 2013). Cranford (1996) described VR as bringing down the walls that separate our home from the world so we can enter into the world from our home. This analogy creates the perception that leads to 'being transported' to the virtual environment (Lombard and Ditton 1997; Schuemie et al. 2001; Zahorik and Jenison 1998). The virtual environment is synchronised in real time, following the user's reactions and motions captured by devices, allowing the users to interact with and be immersed within the virtual environment (Wirth et al. 2007).

Commonly, VR involves total immersion where the virtual environment entirely blocks the user's visual field. As mentioned earlier, it is possible to experience VR without having a sense of immersion. Thus, there are three categories of VR based on the level of immersion: fully immersive, semi-immersive, and non-immersive VR (Akbaş et al. 2019; Beck, Rainoldi and Egger 2019).

Full-immersive VR, the highest level of immersion, isolates the user's visuals entirely from the real world and provides a complete virtual environment using a headset. The headset itself ranges from a low-budget item such as VR goggles with a smartphone, to a high-end HMD like Oculus Rift (see Figure 2.2). The VR can be equipped with more advanced peripherals such as headphones, gloves or treadmills to enhance the virtual experience through the human senses. A Cave Automatic Virtual Environment (CAVE) is also considered fully immersive VR. This virtual environment is projected onto at least three of the surfaces within a room-sized cube (see Figure 2.3) (i.e. walls, floor and ceiling) using a joystick or gloves as the input device (Creagh 2003; Browning et al. 1993).

Figure 2.2. Oculus Rift

Source: "2013 young boy wearing the Oculus Rift" by Skydeas is licensed under the CC BY 3.0.

Figure 2.3. Cave Automatic Virtual Environment.

Source: "A virtual reality cave installation at EVL, University of Illinois in Chicago" by Gcsnow is licensed under the CC BY-SA 4.0.

The medium level of immersion is called semi-immersive VR. The users experience a virtual environment on a large-screen monitor, multiple monitors or large-screen projected system. The users are still aware of their existence in the real world outside the virtual environment. A flight simulator (see Figure 2.4) is an example of this.

Figure 2.4. Flight simulator.

Source: Reproduced from Hippopx, licensed under CC0 1.0.

Non-immersive VR is considered the lowest immersion level. The virtual environment is displayed on one or more computer screens without sensory output feedback to the

user. Virtual model developed by Matterport (2021) (see Figure 2.5) is an example of non-immersive VR. The users explore the virtual environment using a desktop computer, or a laptop with a keyboard and mouse for navigation.

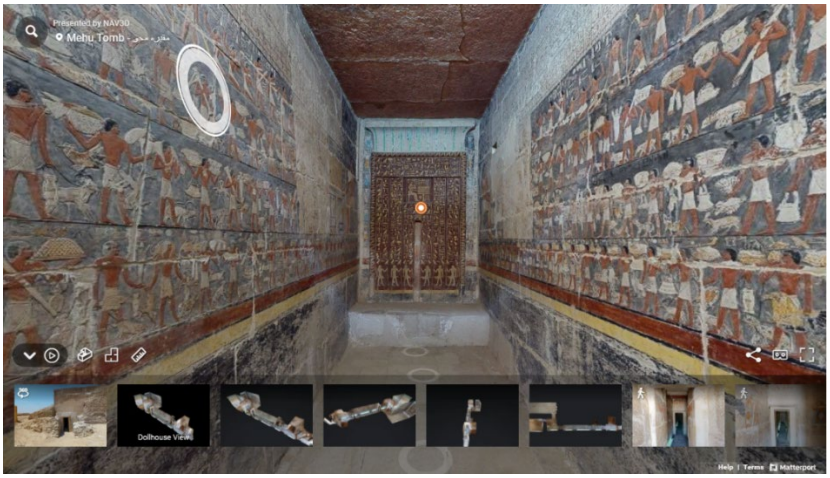


Figure 2.5. Virtual tour developed by Matterport.
Source: Reproduced from Matterport (2020b)

One downside of using VR is that it isolates the user from the real world (Kounavis, Kasimati and Zamani 2012). In addition, VR users sometimes experience *sopite syndrome*, a simulation sickness that may occur when using a low-resolution HMD display. Symptoms are similar to motion sickness and include chronic fatigue, lethargy, headache, eyestrain, light-headedness, dizziness and nausea (Pierce and Aguinis 1997). Regan and Price (1994) stated that 61% of their 146 participants reported experiencing headache, eyestrain and nausea in the first 20-minute immersion period; another 5% withdrew from the experiment because of nausea or dizziness. A more recent study by Kourtesis et al. (2019) suggested that VR with HMD usage duration should be restricted to 55–70 minutes to avoid negative VR-induced effects (e.g. nausea, dizziness, disorientation, fatigue and instability). The authors also suggested that use of VR with deeper immersion, better image quality and helpful instruction may reduce VR side effect intensity.

2.3.1 Difference between augmented reality and virtual reality

Another term used in many studies is augmented reality (AR). AR technologies have been implemented in a professional context such as the military for more than 50 years; it was only recently that AR applications have allowed cameras, Global Positioning

System (GPS) and Internet access on smartphones to overlay the real-world view with dynamic and interactive digital content (Sommerauer and Müller 2014; Tussyadiah et al. 2018). Instead of providing the user with a full virtual environment on the device display, AR overlays virtual elements such as images, objects or audio onto the real world in real time (Clini et al. 2014). It combines multimedia information with a real view using visualisation techniques (Kounavis, Kasimati and Zamani 2012; Sommerauer and Müller 2014). According to Azuma (1997), AR has three characteristics: (1) combining the real world and virtual object, (2) allowing real-time interaction, and (3) aligning real objects or places and digital information in three dimensions. Hence, the main difference between AR and VR is the degree of real-world view on the display screen. While the user sees a full virtual environment on VR, they can still see the real-world view on AR.

The other difference between AR and VR lies in how the virtual environment or virtual object is initiated on the screen. In AR there are two distinct tracking modes to activate the digital content to overlay on the screen; these are known as marker and markerless. Modern AR utilises one or more sensors from the device, such as a camera, GPS, Bluetooth, gyroscopes or radio-frequency identification.

Based on the trigger type, AR falls into two types: marker-based and location based. There is no formal definition for marker-based and markerless AR (Pombo and Marques 2017). Their literal meanings imply that marker-based AR uses a marker as a trigger, while markerless AR does not require a marker to trigger the virtual object's appearance. The hardware required for marker-based AR (see Figure 2.6) is relatively minimal, such as a smartphone, computer or laptop with a camera combined with an AR framework (Vuforia, EasyAR or Kudan). A marker is required to register the virtual object's position on the display (Cheng and Tsai 2013). A marker should have different elements placed in the environment to be easily distinguished from the environment (Johnston et al. 2005). The marker can be in the form of quick response (QR) code (Lee, Lim and Chun 2013) or a unique image that needs to be registered into the application. Siltanen (2012) argued that marker-based AR is easy to detect with computer vision techniques and is ideal for indoor applications.

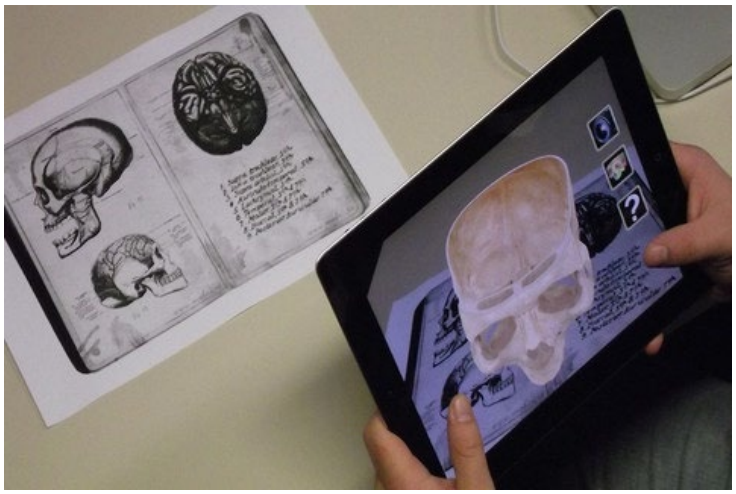


Figure 2.6. Example of marker-based augmented reality.
Source: "App iSkull, an augmented human skull" by Hagustin is licensed under the CC BY-SA 3.0.

In contrast, markerless AR does not require markers. This kind of AR is considered more flexible compared to marker-based AR as it does not require marker installation and more natural in interacting with the real world (Xiang, Wang and Feng 2021). Some studies have used camera tracking for AR involving natural features such as points (Chia, Cheok and Prince 2002), lines (Jiang, Neumann and You 2004) or higher-level geometric structures such as planes (Bostanci, Kanwal and Clark 2012). A high-end device like Microsoft HoloLens can overlay the virtual object based on spatial mapping of the user's surrounding environment. Another method of markerless AR uses the device's location; an example of this is Pokémon Go (see Figure 2.7). A location-based mobile AR application requires the user's device location and direction. The device must have a gyroscope sensor and a GPS (Kounavis, Kasimati and Zamani 2012).

However, many studies have found that AR may cause users to pay too much attention to the content (i.e. the virtual information) and ignore their surrounding physical environment (Billinghurst et al. 2003). Lack of interoperability across mobile platforms is another challenge for application developers and content aggregators (Kounavis, Kasimati and Zamani 2012). Further, AR using mobile devices sometimes requires mobile networks to support computation in real-time. Current mobile networks are not capable enough due to limited data rate and delay (Qiao et al. 2019).

Figure 2.7. Pokemon Go.

Source: "Pokemon Go" by Albert Hsieh is licensed under the CC BY-NC 2.0.

2.3.2 State of the art

VR technology today has evolved rapidly compared with the technology commercially available in the 1990s. Historically, the VR experience relied on large, unfashionable HMDs, expensive computers and complicated hardware. This is very different nowadays, as VR technology comes with the better, more affordable and more powerful hardware available in the market. This section reviews the VR state of the art from the hardware and content perspective.

2.3.2.1 Head-mounted display (HMD)

One way to experience fully immersive VR is by wearing a HMD. While using a VR HMD, the user's visual on viewing the real world is blocked completely. In exchange, the user views the virtual environment on the display screen via the HMD. This is not to be confused with an AR HMD, where the user can still see the real world via the HMD display, and the virtual objects are overlayed on the real-world view. Depending on the computing hardware, there are three kinds of VR HMD (Angelov et al. 2020): tethered, standalone and phone-based VR HMD. Figure 2.8 illustrates VR HMD features.

A tethered VR HMD might be considered a high-end VR headset. It requires a connection to a high-end computer with VR capable graphic card. The headset is typically connected to a computer by cable but is also possible with a wireless

connection. A tethered VR HMD has a higher image quality than the others. For example, the HTC VIVE Pro 2 has 2,448 × 2,448 pixels per eye or 4,896 × 2,448 pixels combined. Other tethered VR HMDs fall into this category: Oculus Rift, Sony PlayStation VR and Lenovo Explorer.

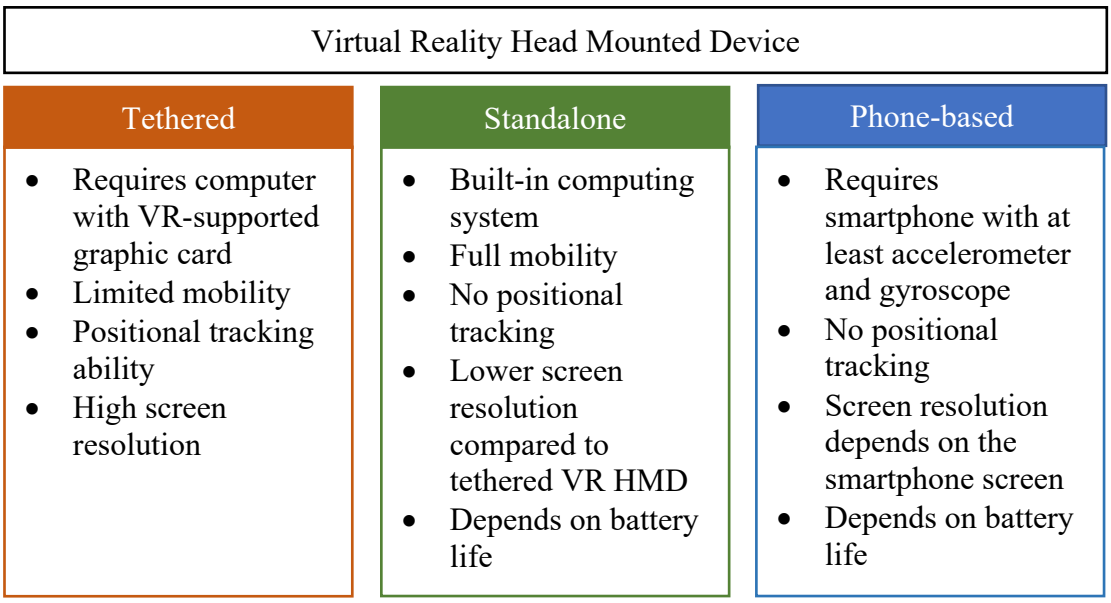


Figure 2.8. Virtual reality head mounted device features

The second type of VR is a standalone VR HMD or all-in-one HMD. A standalone VR HMD has a battery, sensors and built-in processing system, so it does not require a connection to a computer or smartphone. Generally, the HMD generates lower image quality and refresh rates compared to a tethered VR HMD. This category might be dominant in the future as it is more affordable and flexible to use. Some examples of standalone VR HMDs are Oculus Quest, HTC VIVE Focus and Mi VR.

The last type of VR HMD is smartphone-based or handheld VR HMD. As the name indicates, the VR HMD is equipped with lenses, to create a sense of depth or a VR experience, along with a smartphone holder. Some handheld VR HMD also have a built-in earphone to connect with a smartphone via Bluetooth connection. As the HMD does not have a built-in processing unit, the VR content relies on smartphone quality. HMD VR varies according to the smartphone size that can be held (average screen size 4–7 inches). The display resolution depends on the pixel density (measured as pixels per inch) of the smartphone display. Minimum smartphone sensors that should be used are gyroscope, accelerometer and magnetometer sensors. VR content can be accessed

either through a web browser or native application. Some examples of handheld VR HMD are Google Cardboard, Google Daydream and BoboVR. These allow the user to navigate and interact with the virtual environment using an additional control connected to a smartphone.

As a VR HMD can deliver a fully immersive VR experience, this kind of device is suitable for research such as this reported in this thesis. More specifically, a smartphone-based VR HMD is sufficiently powerful to deliver a VR experience that takes into account portability and cost. Smartphones are also typically used in daily life, and many VR applications are available through application stores or websites.

2.3.2.2 Virtual reality accessories

Complete immersion in the VR experience can be enhanced by capturing the user's body senses and movement. Non-immersive VR might only require a keyboard or mouse as the input, but as the immersive level increases, some supporting devices are needed to increase the VR experience. Together with VR HMD, there are VR accessories that improve navigation and interaction within the virtual environment.

Input devices enable the user to navigate and interact with the virtual environment. Examples of input devices are motion trackers, eyes tracking, joysticks, gloves, treadmills and even full bodysuits. These devices capture user movement and position as an input for the VR system. A game controller or joystick is usually sufficient for VR. Most high-end VR HMD—for example, Oculus Quest—come with a pair of special controllers (see Figure 2.9) to interact with the virtual environment and even represent a digital hand.

Figure 2.9. Oculus Quest controllers.

Another element that enhances VR experience is capturing the user's movement. Full-body capture movement creates a seamless connection between real objects and the virtual experience. A tracker attached to part of the user's body can transform their movement as an input for movement in the virtual environment, as if the tracker were part of the user's body. User navigation in a virtual environment is also possible using a VR treadmill (see Figure 2.10). The treadmill enables the user to move in an omnidirectional fashion, which synchronises with their movement in the virtual environment.

Figure 2.10. Virtual reality with treadmill.
Source: "View of Virtuix Omni" by Virtuix is licensed under the CC BY-SA 3.0.

As discussed in the earlier section, VR stimulates human senses to give a sense of presence in the virtual environment. Although the sense of smell and taste might be still unachievable using current VR technology, this is different for the sense of touch. Recent VR technology can simulate virtual object features such as softness and any impact because of virtual object interaction. One example of additional input for VR is a special designed gloves (see Figure 2.11) that uses haptic feedback technology to allow the user to manipulate the hardness or softness of virtual objects with a human-like touch. Another accessory enabling the user to feel the output from a VR system is a full-body suit. A VR-supported full-body suit (see Figure 2.12) integrates human

body motion capture and provided feedback from the virtual environment using haptic technology.

Figure 2.11. Virtual Reality gloves.

Source: "The Manus VR glove development kit" by Manus VR is licensed under the CC BY-SA 4.0.

Figure 2.12. Virtual reality with full-body suit.

Source: "NullSpace VR Mark 2 Suit" by Minswho is licensed under the CC BY-SA 4.0.

2.3.2.3 360° technology

Another option for users to experience the situation of a specific location is through use of 360° video or panorama images. Nowadays, VR terminology is used to refer to the experience of 360° panorama images or video. Native applications are available in any application store, or can be accessed from YouTube or Google Street. Syal (2017) argued that 360° photos or videos is not equal to VR. The 360° video or images is considered a photography technique.

Moving in three-dimensional space depends on which axes or motion along the axes are called the degree of freedom (DoF) (Mechatech n.d.). The three DoF is the concept of the headset ability to track rotational movement such as looking left or right, up or down, and pivoting left and right. Six DoF refers to the headset ability to track user movement along three axes in addition to three DoF. Unlike fully immersive VR, which allows the user to experience the virtual environment up to six DoF, VR with 360° content can only provide three DoF. This is because of the predefined location in which the video or image was captured. A 360° content creator uses a specialised camera—for example, Samsung Gear 360 (see Figure 2.13)—to capture the environment. While a 360° video provides video playback, a 360° panorama provides a still image of the surroundings. This technology uses the same HMD as VR, but the environment is captured from the real world rather than being digitally constructed (Wagler and Hanus 2018).

Although many researchers consider the 360° technology a form of VR, its main difference from computer-generated content is interactivity. In the 360° technology, the user is likened to a car passenger, and the content creator is the driver (Ward 2017). Users cannot freely move within the virtual environment or interact with objects surrounding them. In a 360° panorama image, the content creator can add interaction points, such as object descriptions via text, audio or video. An interaction point can also be used to move to other locations if the user moves within the virtual environment. As a 360° panorama image can have interactivity within it, it comes close to meeting the VR definition.

Figure 2.13. Samsung Gear 360.

Source: "Samsung Gear 360" by KKPCW is licensed under the CC BY-SA 4.0.

2.3.3 Broad applications

VR has become part of human life in entertainment, exhibition, training simulation and research areas. One area that takes maximum advantage of VR is the entertainment industry. The first such application that comes to mind is, of course, the games industry. VR brings the gaming experience to the next level, where the player feels more immersed in the game. One popular gaming console manufacturer, Sony PlayStation, released PlayStation VR (PlayStation n.d.) in 2016, enabling Sony PlayStation 4 owners to play VR games by connecting PlayStation VR to their gaming console. Sony reported that PlayStation VR sales had reached five million units by 2020 (Sony Interactive Entertainment 2020). PlayStation VR is considered an affordable way to play VR games with quality approaching that of other tethered VR HMDs with a computer (Pino 2021). As an alternative, a high-end VR HMD (e.g., Oculus Rift, HTC VIVE, Valve Index) offers a high-quality VR gaming experience, as it utilises the performance of a capable computer with VR ability.

With VR, users can attend shows or enjoy adventures thousands of kilometres away from their home. A VR application like National Geographic Explore VR (Force Field Entertainment B.V. n.d.) lets the user undertake an interactive expedition in Machu Picchu, or to kayak and observe penguins in Antarctica. Recently, the term VR has also been used for 360° content. Many videos in 360° format can be found on YouTube, where users can enjoy VR experiences like musician performances or riding roller coasters at well-known theme parks. Another implementation of VR for entertainment is a VR theme park in Guizhou, China (Graham 2019).

Although VR is mainly known for its use in games or entertainment, its use is also emerging in interdisciplinary research. VR technology is used in research about psychology, health, marketing, education or VR technology itself. In a health study, Rose et al. (2021) interviewed hospital-based caregivers regarding VR HMD interventions for people with dementia. The authors suggested that VR HMD is feasible for people with mild to moderate–severe dementia. Other areas for investigation include personalisation of the virtual environment to access the potential therapeutic benefits of VR HMD. Lee et al. (2020) investigated VR usage for participants with upper extremity weakness caused by stroke. Each participant used HTC VIVE to perform upper extremity rehabilitation programs such as hammering,

catching a ball, pouring into a cup, touching bubbles and playing a xylophone. Nine of the 12 participants reported significant improvement in upper extremity function.

Another VR research application is simulation practice. Isleyen and Duzgun (2019) developed VR simulation to improve roof fall hazard and its risk mitigation. The VR system included an Oculus Rift headset, controller and camera for motion tracking. The study included application testing by volunteer domain experts. Joshi et al. (2021) developed a VR module for safety protocol training in the concrete industry. The authors focused on analysing the module in terms of simulation sickness, system usability and user experience. Responses from professionals were optimistic as the VR module helped new employees to obtain more information and reduce their accident risk in the precast concrete industry.

Various studies in education have demonstrated the advantage of using VR. For example, Kwon (2019) investigated the possibility of experiential learning using a VR HMD. A total of 42 students from Grade 4 were asked to use HTC VIVE HMD to play an educational game. The findings revealed that vividness and interactivity from the VR enhance experiential learning within a virtual environment. In another study, Makransky, Petersen, and Klingenberg (2020) investigated the use of VR for science education. Two studies with middle and high school students as participants used Samsung Gear VR with a supported smartphone. Results indicated that VR usage increases students' self-efficacy and interest in science-related topics. Further, the authors suggested that an appropriate instructional VR design might help to blur gender differences in science aspirations within science education.

2.4 Tourism

Tourism is considered the world's most rapidly growing industry, generating economic opportunities, especially for developing countries. Tourism uses a combination of a range of tangible and non-tangible products. The concept of tourism has been defined in many ways. According to Walker and Walker (2013, 351), it is a

> dynamic, evolving, consumer-driven force and is the world's largest industry, or collection of industries, when all its interrelated components are placed under one umbrella: tourism, travel; lodging; conventions, expositions, meetings, and events; restaurants and managed services; assembly, destination, and event management; and recreation.

The United Nations World Travel Organization (UNWTO)(2019) defined tourism as 'an activity of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business or other purposes not related to the exercise of an activity remunerated from within the place visited'. The UNWTO (2021) reported approximately 1,481 million international tourist arrivals during 2019 around the world. Europe recorded the highest number of international arrivals, followed by the Asia and Pacific region. This indicates that tourism is one of the largest industry sectors in the world. Unfortunately, the tourism industry has since suffered great impacts from the global COVID-19 pandemic. The number of international tourist arrivals dropped by 73% in 2020 compared with the previous year (Tourism Research Australia n.d.). The pandemic impacts are continuing in 2021 and changing how people live, especially in the tourism industry.

2.5 Theoretical foundations

Understanding human behaviour and its complexity is a challenging task (Ajzen 1991). Existing theories regarding human behaviour and acceptance and use of technology identify and explain factors that influence the user to either accept or reject a technology for adoption. These theories and models are used in a range of areas such as information systems, psychology, tourism and hospitality, and computer science. Researchers from various disciplines have implemented or extended models to fit many situations and contexts. As this thesis investigates VR's influence on the user's behavioural intention, the foundation of the research model developed for this thesis arises from the theory of reasoned action (TRA), theory of planned behaviour (TPB) and technology acceptance model (TAM). These theories and models are explained in the following sections.

2.5.1 Theory of reasoned action

Fishbein and Ajzen (1975) presented the TRA conceptual framework (see Figure 2.14) with the intention of it being applicable in any research focused on attitude. The authors argued that humans use rational thinking and systematically process available information. The theory explains the causal link between a person's belief, attitude, intention and behaviour based on available information. The resulted behaviour performance might provide a person's belief with new information and the causal link

can start all over again with that new information. The TRA has been applied in much technology-related research, such as that focusing on green information technology acceptance among information technology practitioners (Mishra, Akman and Mishra 2014), mobile learning usage in schools (Buabeng-Andoh 2018), cloud technology-based educational platforms (Ebardo, Padagas and Tuazon 2021) and mobile health adoption (Zhang et al. 2014).

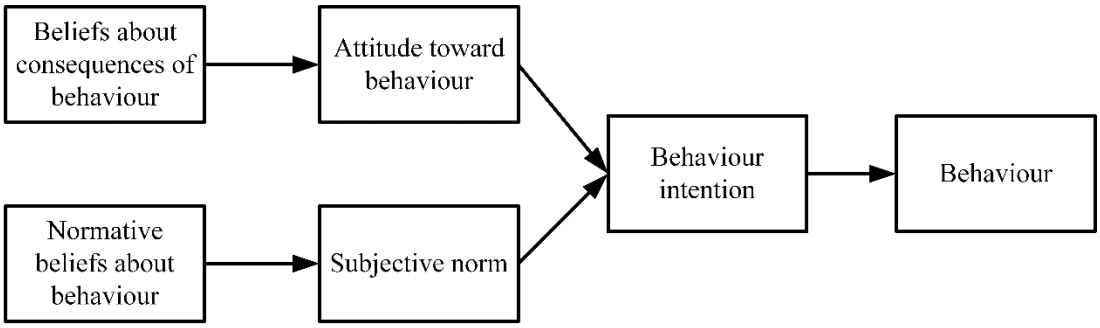


Figure 2.14. Theory of reasoned action model

Source*: Figure reproduced from Fishbein and Ajzen (1975, 16) with permission.*

Fishbein and Ajzen (1975, 381) stated that the intention to perform a behaviour is the best predictor of a person's behaviour. The behaviour itself can be measured according to behavioural criteria: single-act, repeated observation and multiple-act. A behavioural intention measure should correspond specifically to the predicted behaviour on single-act criteria. Repeated observation criteria represent behaviour measures across different variables such as targets, situation or time (Ajzen 2012). For example, a person's intention to visit an event in a year should include measurements such as 'How many times a year do you intend to attend this event?". In multiple-act criteria, measures across different behaviours can be achieved through a more general measure of intention. For example, several sports behaviours (e.g. hours of volunteering, amount of money contributed) might be predicted through the following intention measurement: 'I intend/do not intend to support soccer club activities'. An appropriate behavioural intention measure will demonstrate accurate behaviour prediction.

Fishbein and Ajzen (1975, 12) referred to behavioural intention as 'a person's intentions to perform various behaviours. The strength of an intention is indicated by the likelihood of the person performing a behaviour. The authors stated that the person's intention to perform a given behaviour is built on attitudinal and normative

components. The attitudinal component refers to the person's attitude towards a given behaviour. The normative component—specifically subjective norm—refers to the person's beliefs regarding what other people close to them think about whether or not they should perform the behaviour. Thus, the formation of behavioural intention depends on both attitude towards the behaviour and subjective norm.

Attitude is referred to as 'a person's favourable and unfavourable evaluation of an object' (Fishbein and Ajzen 1975, 12). In general, a person tends to have a favourable attitude towards an object related to good things. In contrast, a person can acquire unfavourable feelings towards an object related to bad things. Someone acquires an attitude towards new objects when they learn about their association with other objects. For example, a person who learns how to ride a bike may have a favourable attitude towards riding a bike. The evaluation of the bike then contributes to the development of attitude towards other objects associated with the bike (e.g. motorcycle or scooter). Hence, a person might hold certain prior beliefs about a particular object in question. These beliefs represent information about the object, which later determines the attitude towards objects, events or actions.

The other component that relates to behavioural intention is the subjective norm. Subjective norm refers to 'the person's perception that most people who are important to him think he should or should not perform the behaviour in question' (Fishbein and Ajzen 1975, 302). Fishbein and Ajzen (1975) stated that normative belief determines subjective norms. Normative belief refers to 'the perceived expectation of specific referent individuals or groups. The potential referents vary with the behavioural situation. Family or friends are considered the most relevant for influencing behavioural intention, but there might be other cases influenced by work supervisors or society in a broader context. In addition, expectations from referents need to be supported with motivation from individuals to meet those expectations.

2.5.2 Theory of planned behaviour

Ajzen (1991) proposed the TPB to improve TRA (Fishbein and Ajzen 1975). Under the TPB, an individual's behavioural intention remains the central factor, as in TRA. The difference between the TRA and TPB lies in the addition of perceived behavioural control in TPB. The authors argued that perceived behavioural control plays an

essential part in the theory as it dictates the behaviour's likelihood. The combination of perceived behavioural control and behavioural intention can also be used to directly predict behavioural achievement. TPB has been adopted as the foundational theory in a wide range of technology-related research such as WhatsApp adoption in student academic activities (Nyasulu and Dominic Chawinga 2019), Internet ethical behaviour (Wang, Wang and Wang 2020) and electronic commerce adoption (Herrero Crespo and Rodríguez del Bosque 2008).

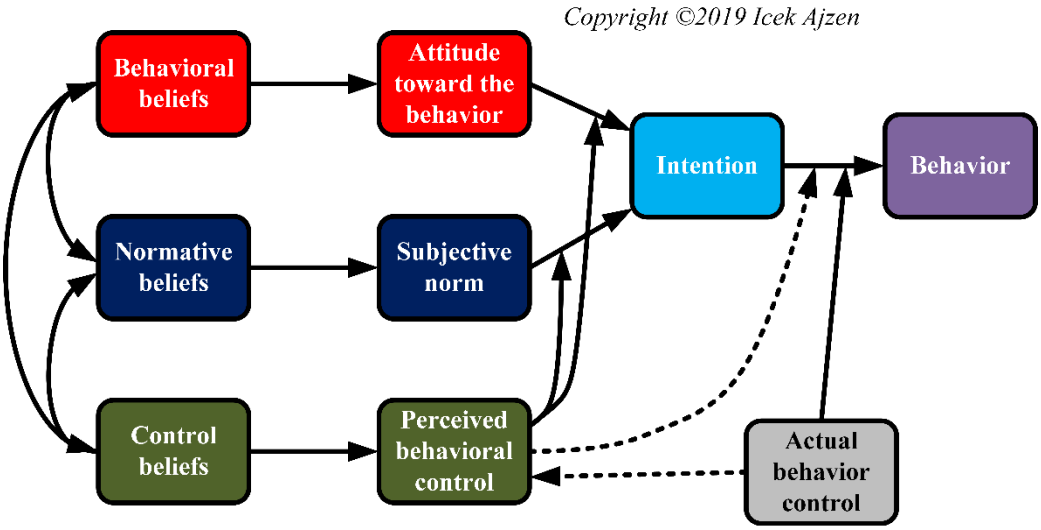


Figure 2.15. Theory of planned behaviour
Source: *Figure reproduced from Ajzen (2019) with permission.*

In this theory, Ajzen (1991) stated that perceived behavioural control, together with attitudes and subjective norms, are related to behaviour. The author referred to perceived behavioural control as 'people's perception of the ease or difficulty of performing the behaviour of interest'. Perceived behavioural control can vary across conditions and actions, leading to different behavioural outcomes. An example from the author is where a person believes that their behaviour determines the outcome of them seeking to become a commercial aeroplane pilot. At the same time, they believe that the chance of becoming a pilot is either very low (low perceived behavioural control) or very high (high perceived behavioural control). Perceived behavioural control and behavioural intention can also predict behavioural outcomes. An example of this is where two people can have the same strong intention to learn how to roller skate and put strong effort into it, even though one is confident they can master the skill while the other doubts their ability.

2.5.3 Technology acceptance model

Davis (1985) introduced the TAM (see Figure 2.16) as an adaptation of the TRA that specifically models new technology acceptance (Israel, Tscheulin and Zerres 2019) in the field of information systems. The primary purpose of the TAM is to provide a causal link explanation of an external factor's impact on a person's internal beliefs, attitudes and intentions to use a particular technology. The author posited that perceived usefulness and perceived ease of use are linked to explain computer acceptance behaviour. Further, the author stated that technology usage is determined by behavioural intention. Unlike under the TRA, a person's attitude and perception of the usefulness of a technology jointly determine their behavioural intention. The TAM was later expanded to TAM 2 (Venkatesh and Davis 2000) and TAM 3 (Venkatesh and Bala 2008). TAM 2 extended TAM with the addition of social influences and cognitive instrumental processes. TAM 3 is used in the electronic commerce context, and includes trust in and perceived risk of a system's use. Some examples of TAM adoption in research are mobile library application usage (Rafique et al. 2020), telemedicine services acceptance (Kamal, Shafiq and Kakria 2020), web-based resources for laboratory training (Estriegana, Medina-Merodio and Barchino 2019) and big data analytic adoption (Verma, Bhattacharyya and Kumar 2018).

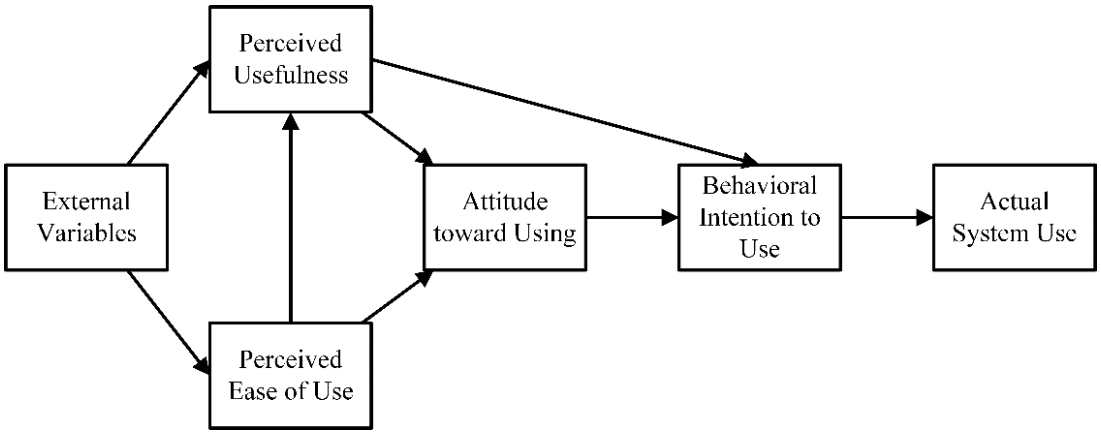


Figure 2.16. Technology acceptance model

Source*: Figure reproduced from Davis (1993, 476) with permission from Elsevier.*

The primary purpose of the TAM is to explain the impact of external factors on internal beliefs, attitudes and behavioural intention. Two particular beliefs—perceived usefulness and ease of use—are considered to have primary relevance for related technology acceptance behaviour. Perceived usefulness is defined as 'the prospective

user's subjective probability that using a specific application system will increase his or her job performance within an organizational context'. Perceived ease of use refers to 'the degree to which the prospective user expects the target system to be free of effort'. Unlike under the TRA, perceived usefulness and attitude towards using a system jointly determine behavioural intention. In addition, external variables (e.g. system features, user characteristics) influence perceived ease of use and perceived usefulness.

2.6 Summary

This chapter has reviewed the general concepts covered in this thesis. Each concept relevant to the thesis was reviewed from a broad perspective to provide a foundation for the rest of this thesis.

Typically, customers prefer to purchase an experience rather than just a product. Similarly, potential visitors generally gather a substantial amount of information before deciding to make an actual visit. They might require reading descriptions, viewing images or videos, or reading opinions and reviews from previous visitors. VR effectively allows tourism providers to present potential visitors with a glimpse of what they can expect to experience during a visit. The immersion experience on VR enables tourism providers to offer those potential visitors a try-before-you-visit option.

As indicated previously, this thesis focuses on the use of VR in tourism and its relationship with users' behaviour intention. Furthermore, this chapter covers the theoretical foundation that supports the research model. The two dimensions in this thesis are system quality and user personality. The theoretical foundation supports empirical validation as the research model is based on well-known, established theories. The relationships between the dimensions are represented as a research model, which will later be tested in two studies.

The following chapter reviews the concepts more deeply as part of a systematic literature review conducted to understand the current state of immersive technology in tourism, including its application in the tourism area, potential challenges and its use in studies applying behavioural intention-related theory. In addition, the systematic review helps to identify a knowledge gap from prior studies that is later underpinning this thesis.

Chapter 3. Immersive Technologies for Tourism: A Systematic Review of State-of-the-Art and Challenges

3.1 Overview

Some general concepts about immersive technology were introduced in the previous chapter. There is a need to investigate what is known about immersive technology—particularly VR—in tourism. This chapter presents a systematic review following relevant guidelines to uncover studies on immersive technology in tourism. In general, the article selection process included defining research questions, formulating keywords, gathering results from selected databases, and filtering records based on inclusion and exclusion criteria. The subsequent discussion section answers the proposed research questions based on findings in the eligible articles. The results of the systematic review also identify research gaps that become the foundation of this thesis.

The VR industry is growing, with a projected increase in market size from $6.2 billion in 2019 to more than $16 billion in 2022 (Alsop 2020). This is in stark contrast to the tourism industry. The UNWTO (n.d.) reported approximately 180 million fewer international arrivals between January and March 2021 than in the first quarter of 2020. Specifically, the number of international tourist arrivals worldwide in 2020 declined by 73% compared with 2019, and another 83% in 2021 compared with 2020. Immersive technology remains viable despite the fact that the tourism industry in many regions was put on hold in 2020 because of COVID-19 travel restrictions. For example, in Australia, the number of visitor arrivals declined in February 2020 when the Australian Government first introduced travel restrictions. International arrivals fell by 99.6% compared with the previous year (Tourism Australia n.d.). As the global pandemic continues, there is a greater chance for immersive technology to become an alternative way of travelling. To explore this timely area of technological development and research, this systematic review presents the current state of research into the use of immersive technology in tourism.

3.2 Existing reviews

This review identified four review articles in the area of immersive technology in tourism (see Table 3.1). One review considered AR, (Baker, Bakar and Zulkifli 2017) focussing on mobile AR for hard-of-hearing visitors. A second review (Beck, Rainoldi, and Egger (2019) focused on VR, classifying it based on the immersive level. Finally, two reviews (Yung and Khoo-Lattimore 2019; Wei 2019) addressed how both AR and VR are used in the tourism context in general. This section discusses each of these review's scopes, to highlight the difference between them.

These four reviews employed similar methodologies, including searching articles on selected databases, screening the articles using inclusion and exclusion criteria, and reporting findings. ScienceDirect was the most used database, in three reviews (Baker, Bakar and Zulkifli 2017; Beck, Rainoldi and Egger 2019; Wei 2019), followed by Emerald and EBSCOhost. The studies by Wei (2019) and Yung and Khoo-Lattimore (2019) included only peer-reviewed journal articles; in contrast with Beck, Rainoldi, and Egger (2019), who also included peer-reviewed conference papers. Baker, Bakar, and Zulkifli (2017) did not state which type of articles were included.

The reviews revealed interesting findings regarding immersive technology implementation in tourism. For example, Baker, Bakar, and Zulkifli (2017) identified 11 major elements required to provide a mobile AR system for hard-of-hearing visitors. Those elements might be useful to ensure that the targeted user receives the correct information from the AR system. Two other studies were concerned with the terminology surrounding the technology. Yung and Khoo-Lattimore (2019) pointed out AR- and VR-related terminology issues: several terms (virtual environment, VR, and virtual world) were used inconsistently.

Similarly, Beck, Rainoldi, and Egger (2019) specifically focused on VR classification, including non-immersive, semi-immersive, and fully immersive VR in tourism. Further, the authors argued that VR should deliver high-quality images to help users avoid motion sickness and encourage them to visit the destination in real life. Wei (2019) examined AR and VR research development in hospitality and tourism. The author identified major dimensions and classified them using the stimuli–dimension–consequence framework.

Table 3.1. Summary of review articles on immersive technology in tourism.

Reference	Scope	Protocol	Database/type of literature included	Keywords	No of articles included	Timespan	Key findings
Baker, Bakar, and Zulkifli (2017)	Mobile AR applications for deaf and hard-of-hearing visitors	• Systematic literature review • Expert opinion	• IEEE, SpringerLink, World Scientific and ScienceDirect • AR-related to hearing impaired	mobile augmented reality engagement	11	Not mentioned	Eleven elements to trigger engagement with mobile AR for hard-of-hearing visitors at museums and galleries
Beck, Rainoldi, and Egger (2019)	A comprehensive review of VR and its classification based on the immersive level (non-immersive, semi-immersive, full immersive)	State-of-the-art review	• ScienceDirect and Google Scholar • Peer-reviewed conference proceedings and journal articles	VR tourism, VR technology in tourism, immersive tourism, 360° tourism, virtual tourism, and virtual environment in tourism	27	2000-2018	• VR classification based on the immersive level including its definition. • VR challenges in tourism. • Potential use of VR during pre-travel phase and on-site.
Wei (2019)	AR and VR in tourism and hospitality	Literature review	• Sage, ScienceDirect,	virtual reality, augmented reality,	60	2000-2018	• Key constructs within a framework (stimuli, dimensions,

Reference	Scope	Protocol	Database/type of literature included	Keywords	No of articles included	Timespan	Key findings
			Emerald and EBSCOhost • Peer-reviewed journal articles	hospitality, tourism			consequences) on VR/AR application in tourism and hospitality. • Theoretical development in AR and VR studies. • Research methodology development in AR and VR studies.
Yung and Khoo-Lattimore (2019)	AR and VR application in the tourism sector	Systematic quantitative review	• Scopus, EBSCO, Elsevier, ProQuest, and Emerald • Peer-reviewed journal articles	'augmented realit*', 'virtual realit*', 'virtual world*', 'virtual environ*'	46	Up to 2016	• AR and VR in marketing, education, experience enhancement, food and beverage; and meetings, incentives, conventions and exhibitions

Reference	Scope	Protocol	Database/type of literature included	Keywords	No of articles included	Timespan	Key findings
							• Theory-based VR and AR tourism research

Some suggestions for future research can be derived from these reviews. There is a need for research focusing on technical aspects such as content, design and interactivity (Beck, Rainoldi and Egger 2019), along with cross-cultural approaches (Wei 2019) to understand how users' perceptions of immersive technology vary. There is also the possibility for a comparison study on the use of immersive technology such as AR, VR and MR in tourism. Finally, Yung and Khoo-Lattimore (2019) suggested that future research identify the impact of having AR or VR booths in travel agencies and information centres and the possible applications of VR images or videos produced from 360° cameras.

Based on the scopes of these published reviews, the current review identified distinct contributions and compared them. First, this review complements the findings on VR and AR presented in Wei (2019) and Yung and Khoo-Lattimore (2019) and the use of this technology in tourism sectors, including VR with 360° technology. Second, this review covers all immersive technology applications in tourism research, rather than focusing solely on either AR (Baker, Bakar and Zulkifli 2017) or VR (Beck, Rainoldi and Egger 2019). Finally, this review considers the characteristics of immersive technology and its integration with other technologies.

3.3 Methodology

This study utilised a systematic literature review to answer three research questions related to immersive technology in tourism. The study aimed to summarise research findings to obtain a comprehensive view of the state-of-the-art use of immersive technology, and identify potential issues for future research. This section details the systematic literature review process by implementing a guideline proposed by Okoli (2015).

3.3.1 Identifying the research questions

Section 3.2 distinguished this review's contributions from that of published review articles. This review aimed to focus on state-of-the-art immersive technology in tourism and to answer several research questions. The review followed the problem, intervention/exposure, comparison and outcome (PICO) framework (Pollock and

Berge 2018) to develop research questions based on the aims of the review. These research questions were as follows:

Research question 1 (RQ1): What characteristics of immersive technology are used in tourism research?

Research question 2 (RQ2): To what extent does immersive technology play a role in tourism?

Research question 3 (RQ3): What are the potential challenges of developing immersive technology for the tourism domain?

Research question 4 (RQ4): To what extent are behaviour theories or models adopted in immersive technology-related studies?

3.3.2 Defining search keywords

Given the objective of this study, keywords needed to be defined to obtain relevant articles from databases. The article search strategy included all published articles related to AR, VR and MR, since those terms are within the domain of immersive technology. The keywords 'augmented reality', 'virtual reality', 'mixed reality', '360 video', '360 panoramic' and '360 degree' were included as these were also used in existing reviews. The query also included the keywords 'tourist', 'tourism' and 'visitor' to keep the focus on tourism. The searching technique consisted of combined keywords and Boolean operators such as 'AND' and 'OR' to narrow down the results. The review included articles published from 2012 to 2020, to obtain an insight into the use of state-of-the-art immersive technology in tourism. The review included only articles published in peer-reviewed journals in English. Articles from proceedings, conferences, magazines and books were excluded.

The search query was executed on 10 electronic databases—ACM Digital Library, EBSCOhost, Emerald Insight, IEEE Xplore, ProQuest, SAGE, ScienceDirect, Taylor and Francis, Web of Science and Scopus—with consideration given to the boundaries of the various definitions of immersive technology; the time range; keywords; and types of articles. The review used 10 databases to ensure that the process did not miss any relevant articles. Emerald Insight, Web of Science and Scopus use a slightly different syntax, so the search query had to be adjusted slightly to suit these databases'

characteristics. The search query developed to guide the literature search is outlined in Table 3.2. The search query was applied to titles, abstracts, and keywords in selected databases.

Table 3.2. The search query for databases.

Database	Search query
Emerald Insight	(content-type:article) **AND** (abstract:"augmented reality" OR (abstract:"virtual reality") OR (abstract:"mixed reality") OR (abstract:"AR") OR (abstract:"VR") OR (abstract:"MR") OR (abstract:"360 video") OR (abstract:"360 panoramic") OR (abstract:"360 degree")) **AND** (abstract:"touris*" OR (abstract:"visit*"))
Scopus	TITLE-ABS-KEY ("virtual reality" OR "augmented reality" OR "mixed reality" OR "AR" OR "VR" OR "MR" OR "360 video" OR "360 panoramic" OR "360 degree") **AND** TITLE-ABS-KEY (touris* OR visit*) **AND** (LIMIT-TO (PUBSTAGE, "final")) **AND** (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "re")) **AND** (LIMIT-TO (LANGUAGE, "English")) **AND** PUBYEAR > 2011 AND PUBYEAR < 2021
Web of Science	TS=("virtual reality" OR "augmented reality" OR "mixed reality" OR "AR" OR "VR" OR "MR" "360 video" OR "360 panoramic" OR "360 degree") **AND** TS=(touris* OR visit*)
Other databases	("virtual reality" OR "augmented reality" OR "mixed reality" OR "AR" OR "VR" OR "MR" OR "360 video" OR "360 panoramic" OR "360 degree") **AND** (touris* OR visit*)

3.3.3 Study selection

As part of the study selection stage, inclusion and exclusion criteria needed to be defined to refine the findings to those relevant to the research questions. The review excluded inappropriate terms such as 'non-immersive VR', as is often applied during the article evaluation process. For example, the reviewed articles included only those that use applications with a first-person perspective. Articles using applications with a third-person perspective, such as Second Life (Linden Research n.d.), were excluded. Articles that discuss VR technology and cover almost all of the user's range of vision through—for example—image or video projection on the surrounding walls (Ghadban et al. 2013) were included in the study. Regarding VR content, 360° images and video

are common types of content found in the selected articles. Such content is preferable for promoting tourism destinations, as it gives the potential tourist a view of the prospective destination that is most similar to that of real life. The computer-generated virtual environment might be suitable for reconstructing a specific situation or learning context.

Table 3.3 presents the full list of inclusion and exclusion criteria for the screening process of selected articles. The database search query generated 1,017 articles (see Appendix A) from the 10 databases.

Table 3.3. Inclusion and exclusion criteria for study selection.

	Criteria
Inclusion	Articles published 2012 - 2020
	Journal article
	Full-text article
	Peer-reviewed
	Empirical (qualitative, quantitative, mixed-methods, design science) and conceptual articles related to the use of AR, VR or MR in tourism
	VR using 360° video or 360° images
Exclusion	Papers written in a language other than English
	Articles related to reconstruction or software/hardware optimisation
	Third-person point of view of non-immersive VR application
	Articles from proceedings, conferences, magazines, and books

Table 3.4. Search results from 10 databases.

Database	No. articles
ACM Digital Library (https://dl.acm.org/)	25
EBSCOhost (https://search.ebscohost.com/)	35
Emerald (https://www.emerald.com/insight/)	56
IEEE Xplore (https://ieeexplore.ieee.org/)	11
ProQuest (https://search.proquest.com/)	51
Sage (https://journals.sagepub.com/)	23
ScienceDirect (https://www.sciencedirect.com/)	74
Scopus (https://www.scopus.com/)	432
Taylor and Francis (https://www.tandfonline.com/)	27
Web of Science (https://www.webofknowledge.com/)	283
Total	1,017

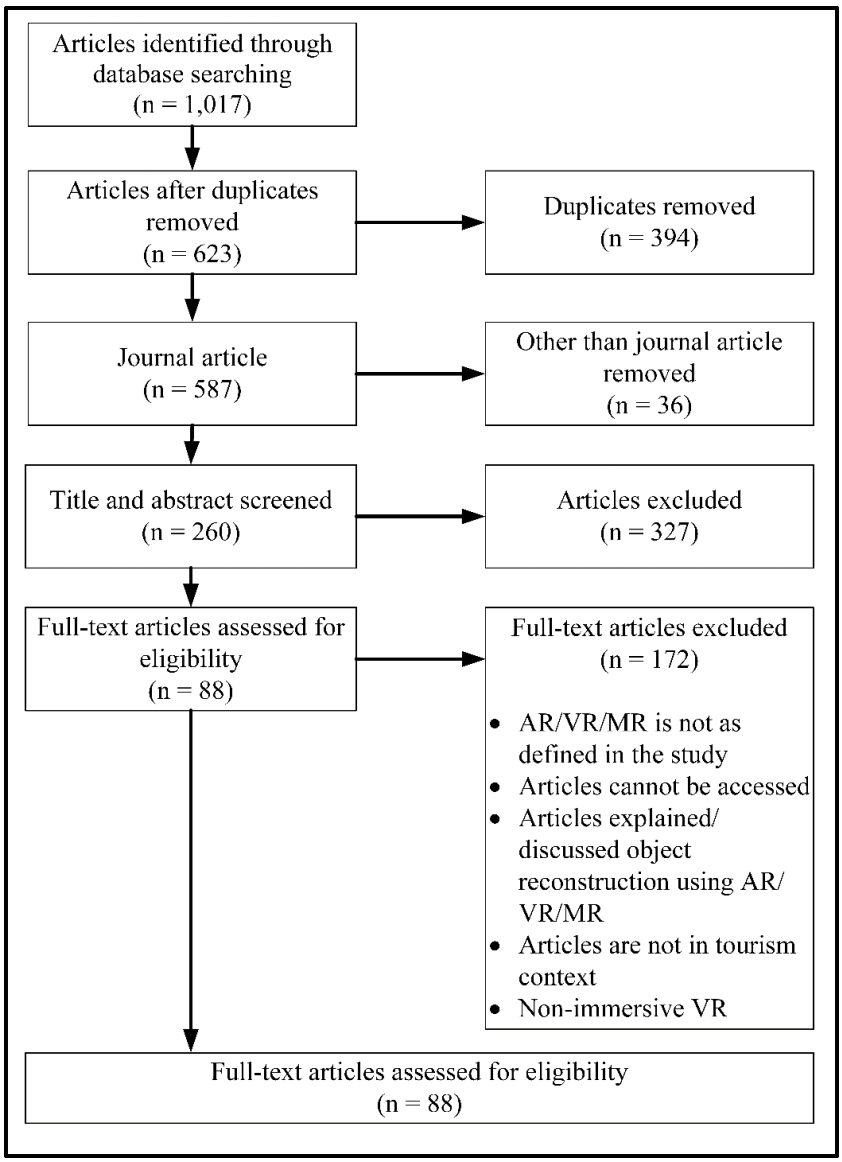


Figure 3.1. Article selection based on the PRISMA flow diagram.

All articles identified in the search results were imported to an EndNote X9 Bibliographic database (Clarivative Analytics n.d.). The screening process followed the Preferred Reporting of Items for Systematic Reviews and Meta-Analysis (PRISMA) flow diagram (Moher et al. 2009), as illustrated in Figure 3.1. The articles were then subjected to a three-level screening process. The first level filtered studies to eliminate any (1) duplication, (2) anonymous studies, and (3) studies not published in a peer-reviewed journal as an original article. This reduced the number of articles from 1,017 to 587. In the second level, the titles and abstracts were sorted through to

identify articles that discuss AR, VR or MR in tourism. At this stage, 260 articles were deemed relevant to this study and needed to be identified and assessed by reading the full text. The third screening level involved full-text review to ensure that each article met the criteria, as listed in Table 3.3. This synthesis resulted in 88 relevant articles. The information from these articles was extracted and coded in Microsoft Excel before being reviewed and examined iteratively.

3.4 Results and discussion

This study aimed to illuminate some exciting aspects of immersive technology in the tourism research domain. Immersive technology offers enormous potential in tourism research. Application of the specified inclusion and exclusion criteria revealed 88 peer-reviewed articles (see Appendix A) published over the course of nine years that were relevant to the research topic. This review categorised the immersive technology from the selected articles as AR or VR based on the technology's characteristics. Referring to Figure 2.1, the technology used in several studies (Kasinathan et al. 2017; Nisi et al. 2018; Raptis, Fidas and Avouris 2018; Hammady et al. 2020) might qualify as AR, despite being referred to as MR. As seen in Figure 3-2, AR has been a common immersive technology used in tourism research. In 2018, 15 articles on tourism research using AR were published—the most articles published in the field in a single year. In 2019, articles on VR usage in tourism research reached a peak with 10 articles published.

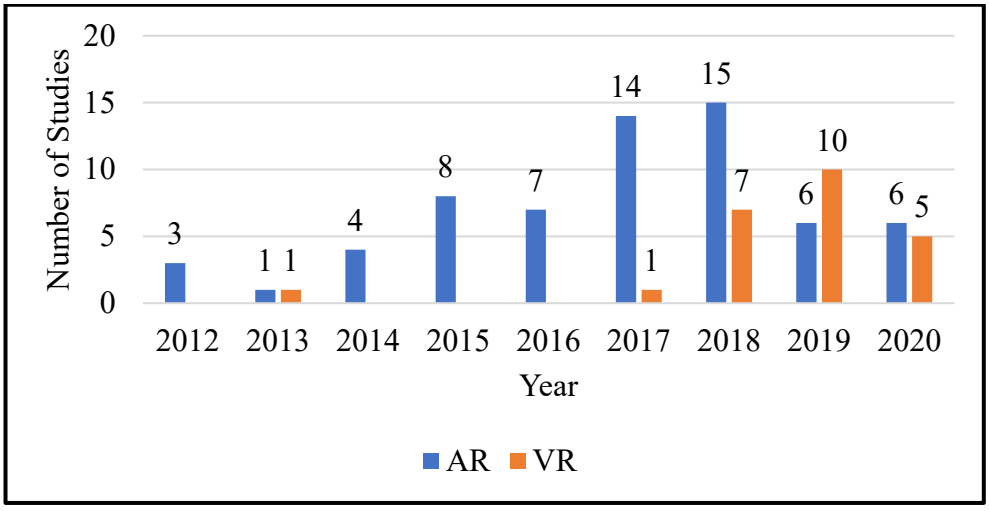


Figure 3.2. Published article distribution over time.

Table 3.5. Type of study from the selected articles.

Type of study	AR	VR	Total	%
Design research	32	4	36	40.9
Quantitative	17	19	36	40.9
Qualitative	6	1	7	8.0
Conceptual	5	-	5	5.7
Mixed method	4	-	4	4.5
Total	64	24	88	100.0

Table 3.6. Country distribution of 47 empirical articles based on the research location.

Country	AR	VR	Total	%
Single country				
Taiwan	4	3	7	14.9
United Kingdom	4	2	6	12.8
United States	2	3	5	10.6
China	1	2	3	6.4
South Korea	3	-	3	6.4
Germany	1	1	2	4.3
Ireland	2	-	2	4.3
Italy	-	2	2	4.3
Portugal	2	-	2	4.3
England	1	-	1	2.1
Greece	1	-	1	2.1
Liechtenstein	1	-	1	2.1
Malaysia	1	-	1	2.1
Switzerland	-	1	1	2.1
Thailand	1	-	1	2.1
Not mentioned	1	4	5	10.6
Multi-country				
China & Taiwan	-	1	1	2.1
Hong Kong & United Kingdom	-	1	1	2.1
South Korea & Ireland	2	-	2	4.3
Total	27	20	47	100.0

Table 3.5 shows the nature of the study reported in each of the selected articles. Design research and qualitative studies were dominant, at 40.9%. A quantitative method, studies proceeded by experiences in immersive technology, was the most common data collection approach used to capture participants' experiences with, and perceptions of, the technology. The remaining articles were qualitative (8.0%), conceptual (5.7%) or mixed method (4.5%). The remaining articles were qualitative (8.0%), conceptual (5.7%), and mixed method (4.5%).

Table 3.6 focuses on the research locations in the 47 empirical studies. Most research on immersive technology in tourism during the time defined in this study took place in Taiwan (14.9%), followed by the United Kingdom (12.8%) and the United States (10.6%). Further, 4 of the 47 empirical studies compared immersive technology usage across countries.

This review subjected the selected articles to the review process to better understand immersive technology in tourism and in turn discover potential areas for future research. The following sections elaborate on the selected articles' findings to answer the proposed research questions.

3.4.1 The current state of immersive technology usage in tourism research

This section details the state-of-the-art of immersive technology adoption in tourism and answers the following research question:

RQ1: What characteristics of immersive technology are used in tourism research?

3.4.1.1 Augmented reality features in tourism research

Table 3.7 summarises the devices used in the selected AR-related studies. Mobile devices (smartphone or tablet PC) were the most common device used (76.3%). This is not surprising given that mobile devices are convenient to carry during travel and inexpensive compared with other AR devices such as Microsoft HoloLens, Google Glass or Meta One glasses.

AR combines a virtual object with the real environment in real time. The user can interact with a virtual object that blends the real world in a three-dimensional perspective (Azuma 1997). The AR system works in the presence of a trigger, which is a stimulus that initiates the AR system to begin virtual object augmentation on the device screen (Edwards-Stewart, Hoyt and Reger 2016). Triggers can be a QR code printed on paper, an image, a real object or a device location. Location-based AR was dominant, being used in 37.3% of studies (see Table 3.8), while a trigger using a camera sensor—either markerless or marker based—was used in 18.6% and 13.6% of studies, respectively. Four studies (6.8%) utilised AR with camera and location sensors as the trigger.

Table 3.7. Augmented reality devices used in the empirical studies.

Devices used in AR study	No. studies	%
Mobile device	35	59.3
Wearable device	10	16.9
Other	2	3.5
Not mentioned	12	20.3
Total	59	100.0

Table 3.8. Type of augmented reality trigger used in the empirical studies.

Trigger type	No. studies	%
Location based	22	37.3
Markerless	13	22.0
Marker based	7	11.9
Spatial marking	4	6.8
Combination of marker based & location based	3	5.0
Combination of markerless & location based	1	1.7
Not mentioned	9	15.3
Total	59	100.0

Some reviewed studies built on an AR system's capability to improve the user's experience while exploring a location or an object. Object recognition (markerless or marker based) with the addition of geolocation is one such example. The combined use of object recognition and geolocation provides spatial information for tour route decisions (Chu, Lin and Chang 2012), improves an AR system's accuracy, and makes

it easier for the user to correctly recognise the object or place of interest and use that information in the future (Santos et al. 2017). Location-based AR uses GPS or a beacon as the trigger. However, a beacon is preferable for indoor situations, as building structures might block the signal used by GPS (Neumann et al. 1999). The combined AR trigger helps users explore a particular cultural site (Nisi et al. 2018; Gimeno et al. 2017) or city (Han, tom Dieck and Jung 2018; tom Dieck and Jung 2018).

AR system integration with other technology is another option for enhancing the user experience. An integrated AR system is more adaptive than a basic AR system, and provides more relevant information to match users' profiles and interests. Other people's opinions also influence people's decision making. For example, a person can obtain information from social media platforms like Twitter about a tourism destination based on someone else's opinion (Balduini et al. 2012, 2014). Social media might influence a person's interest in visiting a tourism destination.

Several selected articles adopted cloud technology in the AR system. García-Crespo et al. (2016) proposed a framework for cultural entertainment centred on a smart city with AR that employs cloud-based technology. Moreover, two studies used cloud computing for media storage (Lee, Chen and Su 2017) and speech-based query processing (Lin and Chen 2017). Rodrigues et al. (2019) used an AR system that provides experiences through the five basic human senses. While the AR system delivers visual and audio representing two human senses (sight and sound), the attached physical mobile device stimulates other senses like touch, smell, and taste. This allows the user to have an immersive five-sense experience during object observation.

Spatial marking offers a different immersive level of AR. Four studies employed Microsoft HoloLens (Raptis, Fidas and Avouris 2018; Hammady et al. 2020) or Meta One glasses (Pedersen et al. 2017; Oh, So and Gaydos 2018). These devices take the immersion of AR a step further by overlaying digital objects without a trigger. Instead, the devices track through the users' environment and anchor the digital object to the real environment on display. There is little known on research in the tourism area regarding use of these devices, opening up many related academic research opportunities.

3.4.1.2 Virtual reality features in tourism research

VR typically immerses the user in a computer-produced or alternative environment. The VR experience becomes realistic as the virtual environment blocks the user's real-world view. Users immerse themselves in the experience and have a sense of belief that they appear in the alternative world with the help of devices such as HMDs or 'cave'-like rooms (Hobson and Williams 1995). An HMD unit is a device worn on the head that covers both eyes. HMDs can be low cost and used with a smartphone to show the virtual environment, or can be more advanced, like Oculus Rift or HTC VIVE. Alternatively, the user can experience VR in a room with a virtual environment projected onto all of the walls. When VR uses space in this way, it is referred to as CAVE.

As illustrated in Table 3.9, HMDs are the most popular device (66.7%) in the selected articles in this review. A HMD is ideal for experiencing VR since the user's view of the real world is blocked entirely and replaced by a virtual environment. Another approach is to project a virtual environment on all the walls of a room while the user stands in the middle of the room (Ghadban et al. 2013). In some of the selected articles, VR was used to restore objects and the environment by generating a virtual environment to simulate a specific situation in the past (Kersten et al. 2018; Errichiello et al. 2019; Ghadban et al. 2013), marketing (Lin, Huang and Ho 2020), and additional entertainment during visitation (Puig et al. 2020). Interestingly, more than half of the selected VR-related articles used VR with 360° technology content (see Table 3.10). Although this meets VR's characteristic of immersing the user in another world, it is not a computer-generated environment, and no user interactivity is involved. Instead of interacting with the virtual object, the user can only view the surrounding environment from a specific defined point of view. The 360° technology is a new form of photography and filmmaking recorded with a special camera, and such content is widely known as VR because of the large amount of it on YouTube and Facebook. Nonetheless, 360° VR content might benefit market tourism destinations by simulating the real environment of a tourism location. Hence, there is still significant potential for the use of VR in certain aspects of tourism, such as planning and management, marketing, entertainment, education, accessibility and heritage preservation (Guttentag 2010).

Table 3.9. Virtual reality devices used in the empirical studies.

VR device	No. studies	%
HMD	16	66.7
HMD and computer	4	16.7
Computer	1	4.2
Cave automatic virtual environment	1	4.2
Not mentioned	2	8.2
Total	24	100.0

Table 3.10. Type of virtual reality content used in the empirical studies.

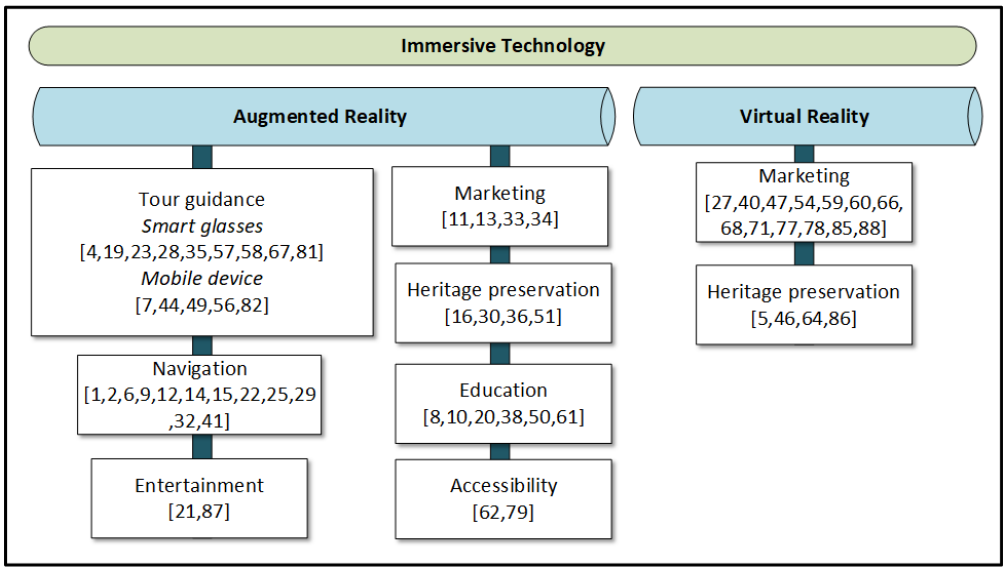
VR content	No. studies	%
360° video	8	33.3
Virtual environment	5	20.8
360° image	4	16.7
360° image and video	3	12.5
Virtual environment and 360° video	1	4.2
Not mentioned	3	12.5
Total	24	100.0

3.4.2 Immersive technology applications within the tourism area

Immersive technology offers academic and tourism stakeholders numerous opportunities in many areas of tourism. This section answers the following research question:

RQ2: To what extent does immersive technology play a role in tourism?

Figure 3.3 illustrates immersive technology adoption in the selected articles. AR-related studies investigated AR as tour guidance, navigation, education, marketing, heritage preservation, entertainment and accessibility. Studies have also used VR for marketing and heritage preservation. The following section details the findings in each of these categories.



Note: Numbering links to Appendix A

Figure 3.3. Immersive technology usage in various areas of tourism.

3.4.2.1 Immersive technology as a marketing tool

Augmented reality. Marketing is one of the areas of tourism in which immersive technology was implemented in the selected studies. This technology can serve as a promotional tool or facilitate research focusing on users' intentions to visit a tourism destination. This review identified four studies that used AR as a promotional tool. Jung, Chung, and Leue (2015) observed the impact of marker-based AR system quality on the intention of visitors to Jeju Island to recommend use of the AR system to others. They argued that the quality of the AR covering the content information, system quality and service quality positively influence user satisfaction, leading to an intention to recommend the AR system. This view was echoed by Chung, Han, and Joun (2015), who stated that the visual appeal of an AR system with adequate technical support influences users to interact with the AR and visit the tourism destination. Other studies focused on how AR features promote tourism destinations. For example, Lin and Chen (2017) found that users engage more with an AR system if they feel that videos they post online about the attraction can help other users. The next challenge is how tourism providers can persuade visitors to revisit the tourism destination. Lee, Chen, and Su (2017) explored whether mobile AR can increase tourists' motivation to revisit a tourism destination by exploring the post-travel experience using the entrance ticket as a scannable souvenir through the AR system.

Virtual reality. The use of VR as a marketing tool—specifically in pre-visit tourism destination promotion—in the tourism research reviewed here was more common than that of AR. When potential tourists are considering visiting a tourism destination, there is a high probability that they will search for information about the destination and decide whether it is worth visiting. The adoption of VR in tourism creates opportunities to promote tourism destinations (Cheeyong et al. 2017; Tussyadiah et al. 2018; Adachi, Cramer and Song 2020; Lin, Huang and Ho 2020; Lin and Chen 2017). A qualitative study by tom Dieck et al. (2018) revealed that VR influences tourists to use an application, revisit the destination, recommend it to others and experience the destination from a different perspective (i.e. from a helicopter instead of from the street). One of the characteristics of VR is a sense of presence. Users feel that their presence moves from the real world to the virtual world. VR provides a stronger sense of presence than does AR, increasing destination image formation (Yung, Khoo-Lattimore and Potter 2019), which promotes visit intention (Tussyadiah et al. 2018). Experiencing VR with a HMD was also found to be a better promotion tool and to provide better sensory stimulation and a more immersive experience compared with other systems (Flavián, Ibáñez-Sánchez and Orús 2019b), such as a computer (Adachi, Cramer and Song 2020), photographs (Yeh et al. 2017) or two-dimensional videos (Wagler and Hanus 2018). As a marketing tool, VR should provide content that represents the real conditions of a tourism destination. The tourism provider needs to ensure that the visual perspective of the tourism destination they offer is genuine and as realistic as possible from the user's perspective (Israel, Zerres and Tscheulin 2019). However, the VR developer should consider the length of a presentation if the content includes video (Marchiori, Niforatos and Preto 2018). Additionally, in a recent quantitative study, Zeng et al. (2020) stressed that VR could add promotional value as an extension of online reviews.

3.4.2.2 Immersive technology for heritage preservation

One use of AR and VR systems is reconstructing an object or environment, since these systems produce computer-generated objects. AR systems enable the user to experience a three-dimensional virtual object based on the real heritage object, which might not be possible to access, or may no longer be intact. In this way, the user can imagine and understand the object's shape without seeing the real object.

Augmented reality. Four of the selected studies used AR for heritage preservation. Madsen and Madsen (2015) developed a three-dimensional visualisation of a castle chapel. The visitors experience the digital cultural heritage using a tablet connected to a large TV screen, or a tablet PC. The authors argued that an AR system should provide more information and storytelling elements to maintain visitors' interest toward the presentation on the TV. Another study by Gimeno et al. (2017) examined mobile AR for Casa Batlló, a landmark building in Spain. Their AR system uses two approaches. First, it uses a gyroscope sensor and Bluetooth to trigger virtual objects to blend with the real world. In this way, the AR system augments virtual modelled elements or furniture and blends them with the real world captured by the camera. Second, the user can scan the building's physical model using a camera to see the virtual building on the screen, including detailed representations of the interior of each room on every floor of the building. Roongrungsi, Namahoot, and Brückner (2017) designed a marker-based AR system to augment Thailand's Wat Phra Sri Rattana Mahathat temple. Panou et al. (2018) discussed the software architecture for an outdoor AR system that enables the user to experience virtual historical buildings around Chania, Greece. The system implements the gamification concept to let the user engage and interact more with cultural information.

Virtual reality. Other researchers have adopted VR to simulate heritage objects or buildings. A lab experiment study by Ghadban et al. (2013) demonstrated the use of VR as an interactive environment to explore Hisham's Palace in Palestine. A critical challenge in building the model was related to the remains of the physical building and the building's insufficient history; both need to be accurate to ensure that a virtual, three-dimensional object is as similar as possible to the original intact object. Another example is a study by Kersten et al. (2018), who discussed a virtual model of a wooden model of Solomon's temple at the Hamburg Museum that uses a VR system. The system enables the user to virtually experience the temple's environment despite never visiting the temple in real life. Errichiello et al. (2019) observed the user experience in a past environment, in the form of a ship launch during a Grand Tour of Naples and music being played at San Teodoro Palace Music Hall. They argued that VR might be an effective way for visitors to enjoy a museum tour in that they can obtain comprehensive information from different perspectives. The results showed that the users had high intention to reuse the VR system and share their experience over the

Internet. A mixed method study by Puig et al. (2020) analysed the impact of a VR simulation of the Neolithic settlement of La Draga. The VR system provides a visual reconstruction of La Draga, where the user can interact with virtual objects such as Neolithic and non-Neolithic objects.

3.4.2.3 Immersive technology for education

This review categorised the use of immersive technology to improve knowledge learning during visitation to a tourism destination. A cross-over study by Sommerauer and Müller (2014) examined AR's influence on gaining mathematical knowledge in an informal environment like a museum. The authors concluded that AR could be a useful learning tool in both formal and informal environments. A quasi-experimental study by Chang et al. (2015) observed mobile AR's effectiveness in promoting learning performance at heritage sites in Taiwan. The authors reported that AR-guided participants acquire more knowledge about the heritage site than do audio-guided and non-guided groups. Pendit, Zaibon, and Bakar (2016) evaluated how AR might improve people's enjoyment of learning about cultural heritage. The findings showed that the respondents enjoyed the cultural heritage learning experience through AR. Tan and Lim (2017) implemented gamification in an AR system to increase visitors' interest in exploring and learning about a historical place, namely Kellie's Castle in Malaysia. A study by Oh, So, and Gaydos (2018) used AR with Meta One glasses to observe how this system can help users learn about refraction of light, at a science museum. The authors found that a group that experienced game-based performance followed by non-game simulation performed better than a group who experienced these activities in the opposite order. A qualitative study by Yoon et al. (2018) observed interactive AR used in a science museum to learn about different types of scaffold.

3.4.2.4 Immersive technology as tour guidance

Given how the relevant device delivers an image, only AR served as a tour guidance tool in the selected articles (see Figure 3.3). AR enhances the tourism experience in that the interactive virtual information overlays the real world. AR also provides additional interpretation resources to enhance users' engagement with the observed object during a visitation, which could significantly influence the visiting experience

(Damala et al. 2013). Two types of devices are used for AR tour guidance in the reviewed studies: mobile and wearable devices (e.g. smart glasses).

Augmented reality with smart glasses. Smart glasses are wearable devices like regular eyeglasses, but equipped with a processing unit, various sensors and transparent lenses. The information displayed on the screen is integrated onto one or both lenses in front of the eyes—as if, from the AR user's point of view, the digital information were overlaying the physical environment (Hein et al. 2017). Several studies have employed wearable devices such as Google Glass (Mason 2016; tom Dieck, Jung and Han 2016; tom Dieck, Jung and tom Dieck 2018; Tussyadiah, Jung and tom Dieck 2018; Han, Dieck and Jung 2019), HoloLens (Hammady et al. 2020) and Meta One (Pedersen et al. 2017). Use of wearable devices reflects the relationship between the human body and technology, where the user senses the device as being part of their body (Tussyadiah, Jung and tom Dieck 2018). Thus, compared with an AR system that uses a mobile device, smart glasses offer a more immersive experience to the user, as well as interest and a balanced focus between the physical object and the device screen, while exploring tourism destinations (Mason 2016). Smart glasses users have been found to spend more time exploring the environment and engaging with the observed objects (Hammady et al. 2020). Conversely, tom Dieck, Jung, and tom Dieck (2018) found that some participants, upon their first experience using smart glasses, tended to have a stronger recollection of the information provided by the device rather than of the paintings in the gallery, as users tended to pay more attention to the device than to the environment.

Some smart glasses have display limitations that might affect the displayed information. Participants in a study by Mason (2016) emphasised the difficulty of reading text on a Google Glass display because of the amount of information that can be displayed on the screen. Hence, tom Dieck, Jung, and Han (2016) stressed that application content should provide detailed and suitable information to help users experience the tourism destination. The information also needs to be delivered in real time to pique the user's interest and avoid an interrupted leisure experience (Han, Jung and Dieck 2019; Choi and Kim 2017). Pedersen et al. (2017) supported the idea of implementing a rewards system to lead users to more information and prompt them to proceed to the next object experience, thus making the visitation experience more enjoyable. Also, Damala et al. (2013) pointed out that relevant content results from

different stimuli induced during visitation, rather than predefined content based on the user's profile (e.g. adults, families).

Augmented reality using a mobile device. Modern mobile devices such as smartphones or tablet PCs equipped with a camera provide powerful computing to run AR-based applications. As most mobile devices are less expensive than smart glasses, it is feasible to use them to enhance the tourism visitation experience. Given that so much information can be displayed on a mobile device's screen, it is interesting to observe how users divide their focus between the mobile device and the real object. In a behavioural pattern study on painting appreciation by Chang et al. (2014), users still enjoyed observing the real painting and did not look at the device's screen excessively, although the AR system was considered new technology for some study participants. Conversely, some participants in Nisi et al. (2018) study reported feelings of isolation during the study. The authors stated that the AR application indirectly made the users focus more on the smartphone screen than on physically interacting with the real object.

tom Dieck, Jung, and Rauschnabel (2018) found that an AR system with place attachment encourages visitors to engage more with the tourism destination. This view was supported by Nisi et al. (2018), who reported that the combination of storytelling and the observed physical environment stimulated users' curiosity and willingness to explore that particular environment further, making the tourism experience educational and valuable. The information provided in an AR system is critical for providing a simple user interface with personalised information (Han, tom Dieck and Jung 2018) and interaction (tom Dieck and Jung 2018). Rather than shrinking an entire computer-based website layout to fit onto a mobile device screen, the information must be adapted to suit a mobile layout (Chung et al. 2018). Interestingly, different cultural characteristics can result in different technological adaptations. According to Jung et al. (2018), people who live in cultures that prioritise the group over the individual and rely on social norms show stronger dependence on social influence. Their decision to use tourism-based AR is likely based on the influence of friends and family.

3.4.2.5 Immersive technology as a navigation device

Some of the selected articles in this review used immersive technology as a navigation device. The results presented in this section show that AR was only used for tourism navigation. An AR system, such as that mainly used on smartphones, uses location sensors like Bluetooth, GPS and compasses to pinpoint a specific location. Balduini et al. (2012, 2014) designed BOTTARI, an AR system that provides a point-of-interest recommendation for the South Korean city of Seoul, based on a social media community's weighted opinions. The system continuously analyses social media streams and processes the information into personalised recommendations regarding places in the city. Chu, Lin, and Chang (2012) evaluated the Yehliu Geopark mGuiding system application that implements AR using GPS coordinates from a mobile device. A study by Kourouthanassis, Boletsis, and Lekakos (2015) examined eight mobile AR applications developed in previous studies to identify their design properties. A mobile AR application called CorfuAR was developed according to the design principles of the reviewed AR applications, and used to implement Layar, an AR browser app. The authors argued that the proposed design principles contributed to the mobile AR application's high usability and performance, improving the user–system interaction. A follow-up study by the same authors (Kourouthanassis et al. 2015) confirmed that the functional properties of the application stimulate a feeling of pleasure, which leads to an increase in the intention to use the application. Siang, Aziz, and Ahmad (2016) designed both the iMelaka 360 website and iMelaka AR app to help tourists explore Melaka, Malaysia. Abidin et al. (2018) suggested an adaptive user interface for a location-based AR system to improve the tourist experience and ease access to Islamic tourism information, specifically in Malaysia.

3.4.2.6 Immersive technology adoption for other purposes

Another use of immersive technology in the reviewed tourism studies was as entertainment and to support accessibility. A study by Shang, Zakaria, and Ahmad (2016) focused on using AR for post-visits. The mobile AR system used a postcard as a tourist souvenir to provide more information regarding the tourism destination recently visited by the tourist. Wu, Chiu, and Chen (2020) investigated users' behavioural intentions related to AR as part of the Avengers League World Tour

exhibition in Taiwan. The users experienced the action from the point of view of hero characters.

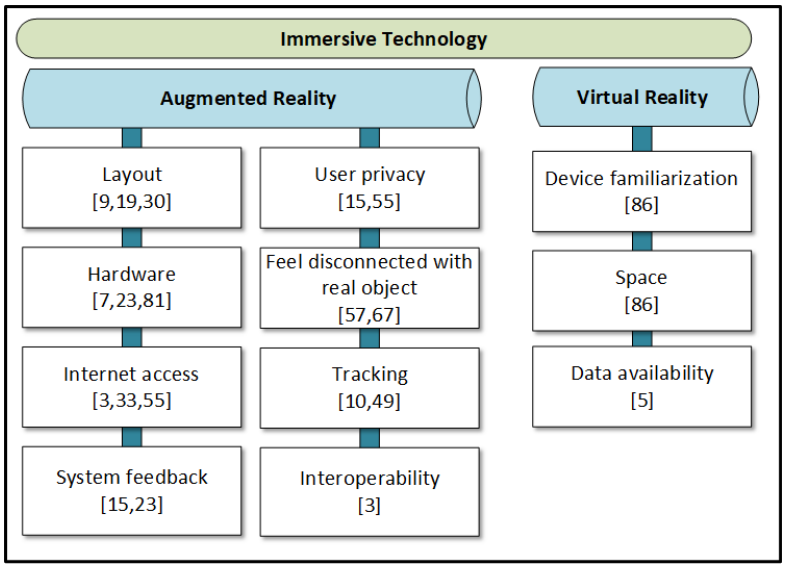
Despite immersive technology bringing many benefits to tourism, there has been little research on immersive technology for disabled people. One design research study by Baker et al. (2020) developed an AR tourism prototype for hard-of-hearing visitors. It is designed based on five conceptual elements: aesthetics, usability, interaction, motivation and satisfaction. In a follow-up study, Baker et al. (2020) evaluated the prototype using groups of hard-of-hearing instructors, museum employees, and experts. The prototype evaluation covered the interface, multimedia and interactivity.

3.4.3 The potential challenge in using immersive technology in tourism

While immersive technology shows significant potential for use in tourism, it also comes with several challenges. This section focused on answering the following research question:

RQ3: What are the potential challenges of developing immersive technology for the tourism domain?

Figure 3.4 illustrates potential challenges related to immersive technology in tourism that has been identified in the selected articles.



Note: Numbering links to Appendix A

Figure 3.4. Challenges in immersive technology for tourism.

First, there is a lack of interoperability across device platforms (Kounavis, Kasimati and Zamani 2012). AR cannot be used across all operating systems, yet many frameworks and toolkits are used to develop AR applications.

Second, some AR applications require an Internet connection to retrieve data from the server (Kasinathan et al. 2017). Some tourists consider mobile Internet to be expensive, and not all tourism areas or cities provide free Internet access (Kounavis, Kasimati and Zamani 2012; tom Dieck, Jung and tom Dieck 2018).

The third challenge lies in the physical size of AR devices. Participants in a study by Chang et al. (2014) complained about the thick, heavy tablet PC used for painting appreciation. They indicated that a smaller device, like a smartphone, would be more suitable to carry as a tour guide device. However, in two studies, the drawbacks of tour guides requiring use of wearable devices were identified as battery life (tom Dieck, Jung and Han 2016) and device cost (Hammady et al. 2020).

The fourth challenge is the AR tracking ability when using a camera as a sensor. Camera-tracking AR, whether markerless or marker based, must consider the amount of light and at what angle the camera faces the marker, picture or object. System responses, or feedback, are the fifth challenge of AR. The system should notify users of feedback errors to indicate the system's process (Kourouthanassis, Boletsis and Lekakos 2015) and create personalised navigation. (tom Dieck, Jung and Han 2016).

The fifth challenge is the application layout. The layout of an annotation system influences the user's perception of the observed area (Yovcheva et al. 2014). One participant in a study by Mason (2016) argued that it would be preferable for information to be shown via smart glasses rather than a mobile device screen.

The sixth challenge identified in AR for tourism is the user's engagement with the real object or surroundings. In an experimental design study by tom Dieck, Jung, and Rauschnabel (2018), participants experienced a new AR technology that caused them to focus more on the device's information than on the paintings they were observing. Thus, application designers should ensure that the user is not overloaded with information projected at a specific time, to avoid detracting from the leisure experience (Han, Dieck and Jung 2019).

The seventh challenge on AR adoption is feedback from the AR system. Real-time feedback from AR systems influenced user-system interaction. Users might experience a lower attitude toward using the system if they feel uncertain due to no response from the system (Kourouthanassis et al. 2015). Participants in a study by tom Dieck, Jung, and Han (2016) concerned about crashing and inadequate response from the system. System designers might need to minimize the possibility of system feedback issues to ensure users feel a smooth experience while using the AR system.

Finally, user privacy is another concern regarding the use of AR in tourism. The benefit of content personalisation or a context-aware system is the delivery of more related content to the user. However, if the system asks for too many personal details about the user, other parties can misuse collected data.

The challenges posed by VR in tourism are different from those posed by AR. The first challenge of using VR for tourism is device familiarisation. Puig et al. (2020) argued that familiarising the user with VR devices could be time-consuming. Further, the authors proposed combining the essentials of VR environment design with natural hand gesture interaction, which offers sufficient time and flexibility to obtain information.

The second challenge lies in the relationship between physical information from the real tourism destination and the virtual information in the VR environment. Puig et al. (2020) claimed that using information gained from the physical environment should help the user further explore information in a VR environment. Equally, the information from the virtual environment could help users learn about related tourism objects or situations.

The third challenge in using VR for tourism is data availability. When presenting a virtual object, environment or scenario from the past, making the image presented in VR as realistic as possible relies on data availability.

3.4.4 Immersive technology in user behaviour-related research

This section discuses behavioural theories applied in selected articles and answers the following research question:

RQ4: To what extent are behaviour theories or models adopted in immersive technology-related studies?

Table 3.11 summarises 15 articles from the 88 selected articles that adopted any theory related to the user's behavioural intention: 10 studies were related to AR and five adopted theories for VR usage. Four articles implemented the TAM (Davis 1985). A study by Li and Chen (2019) confirmed that the TAM supports all of their hypotheses about VR adoption, with perceived enjoyment as a mediating role between perceived ease of use, perceived usefulness and behavioural intention. Each of the other three studies (Chung, Han and Joun 2015; Lee, Chen and Su 2017; Jung et al. 2018) developed a research model extending the TAM with external variables.

The stimulus-organism-response (SOR) paradigm (Mehrabian and Russell 1974) was adapted in three empirical studies. Kourouthanassis et al. (2015) proposed a research framework based on the SOR with cognitive traits to investigate the use of a mobile AR (CorfuAR) and its influence regarding use of the application. A lab experiment by Flavián, Ibáñez-Sánchez, and Orús (2019b) compared VR with desktop PC and mobile phone usage. The authors designed a research model using SOR theory with tourism type (active/passive) as the moderating variable. Kim, Lee, and Jung (2020) adopted SOR theory to test various hypotheses to identify cognitive and affective responses towards VR as a mediator to predict the user's attachment and their intention to visit the tourism destination.

The experience economy theory postulates that a business focus shifts from products or service consumption orientation to four unique user experiences: entertainment, educational, aesthetic and escapist (Pine II and Gilmore 1998). Two articles in this review adapted the experience economy theory. Lee et al. (2019) argued that absorptive experience (education and entertainment) influences immersive experience (escapist and aesthetics) and the overall VR tour experience, which leads to an intention to visit the museum. The study by Jung et al. (2020) investigated AR experience with two target populations from Korea and Ireland. They argued that the

experience economy dimensions influence the overall assessment of perceived value of AR applications with long- or short-term orientation as the moderator.

Two quantitative studies developed a conceptual model based on process theory. Process theory explains that an event is initiated from a specific input state and ends with a particular outcome state (Chiles 2003). Jung, Chung, and Leue (2015) analysed responses from participants visiting a theme park in Jeju Island to examine the relationship between AR features and behavioural intention. AR features include content quality, service quality and personalised service quality. Wei, Qi, and Zhang (2019) study applied process theory with a sense of presence perspective to understand how VR enhances the visitor experience.

One article (Rodrigues et al. 2019) evaluated mobile AR systems using the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al. 2003). The authors combined the AR system for a museum with a portable device to enable the user to experience all five human senses. The study findings show that social influence, effort expectancy and facilitating conditions are the UTAUT key constructs that direct technology acceptance. Further, the current review identified three AR-related studies that adopted a combination of theory (Lin and Chen 2017; Chung et al. 2018; Paulo et al. 2018).

Table 3.11. Summary of articles using theory/model.

References	Theory / Model	Variable	
		Dependant	Independent
Jung et al. (2020)	Experience economy	Intention to use AR	• Education • Aesthetics • Entertainment • Escapist
Lee et al. (2019)	Experience economy	Offline museum visit intention	• Education • Entertainment
Chung et al. (2018)	Post acceptance model of information systems continuance Motivational theory & experience economy Balance theory	Behavioural intention (intention to visit)	Expected confirmation
Wei, Qi, and Zhang (2019)	Process theory	• Overall satisfaction • Intent to revisit • Intent to recommend	• Functional quality • Experiential quality
Jung, Chung, and Leue (2015)	Process theory	Intention to recommendation	• AR content quality • AR system quality • AR personalized service quality
Kourouthanassis et al. (2015)	Stimulus-organism-response	Behavioural intentions (Continue to use application)	• Performance expectancy • Effort expectancy • Personal innovativeness • Price value
Kim, Lee, and Jung (2020)	Stimulus-organism-response	Visit intention	Authentic experience

References	Theory / Model	Variable	
		Dependant	Independent
Flavián, Ibáñez-Sánchez, and Orús (2019b)	Stimulus-organism-response	• Engagement • Behavioural intentions (Intention to find further information about the destination and visit destination)	Technological embodiment (Low, medium, high)
Lee, Chen, and Su (2017)	Technology acceptance model	Behaviour Intention (intention to use)	• Perceived usefulness • Social
Chung, Han, and Joun (2015)	Technology acceptance model	• Intention to use AR • Intention to visit	• Technology readiness • Visual appeal • Facilitating conditions
Li and Chen (2019)	Technology acceptance model	Travel intention	• Perceived ease of use of VR • Perceived usefulness of VR
Jung et al. (2018)	Technology acceptance model	Behavioural intention (Intention to use AR)	• Aesthetics • Social influence

References	Theory / Model	Variable	
		Dependant	Independent
Paulo et al. (2018)	Technology task fit Unified theory of acceptance and use of technology 2	Use behaviour	• Task characteristics • Technology characteristics • Performance expectancy • Effort expectancy • Social influence • Facilitating conditions • Hedonic motivation • Price value • Habit
Lin and Chen (2017)	Uses and gratifications theory technology acceptance model	• Use intention • Attitude toward the attractions	• Self-Presentation • Information sharing
Rodrigues et al. (2019)	Unified theory of acceptance and use of technology	Use behaviour	• Performance expectancy • Effort expectancy • Social influence • Facilitating conditions

3.5 Conclusions and implications

This review aimed to explore immersive technology used in various tourism studies. The increasing number of journal articles published in this field reflects research interest in the use of immersive technology for tourism, primarily AR. This review evaluated the current research state of immersive technology in tourism by investigating 88 articles published between 2012 and 2020.

The review builds on knowledge from previous reviews (Baker, Bakar and Zulkifli 2017; Beck, Rainoldi and Egger 2019; Wei 2019; Yung and Khoo-Lattimore 2019). Findings from another study by Baker, Bakar, and Zulkifli (2017) revealed 11 major elements that need to be considered when designing mobile AR systems for hard-of-hearing individuals. Consideration of those elements could increase user engagement with the AR application in tourism. Findings from another VR-related review study (Beck, Rainoldi and Egger 2019) include that VR in tourism can be classified by its immersion level: non-immersive, semi-immersive and fully immersive. The major finding from Wei (2019) identified major constructs from previous studies and categorised them using the stimuli–dimensions–consequences framework. This framework synthesises key constructs associated with AR and VR in tourism and hospitality. Yung and Khoo-Lattimore (2019) explored AR and VR usage in the tourism sub-sector and identified the methodologies and theories applied in previous studies on AR/VR in tourism. In light of the findings of previous review findings, the present study extends knowledge on AR/VR usage in tourism. AR and VR were identified as the immersive technology used in the selected research articles.

Further, this review explored AR and VR in combination with other technology. It also identified potential challenges in the use of immersive technology. The information provided in this review chapter provides an overview that both academic and tourism stakeholders can use to better understand the current progress and possible research directions of immersive technology in tourism.

The following section elaborates on potential future research on immersive technology in tourism, and recommendations for stakeholders. It also identifies the limitations of this study that could be improved in future studies.

3.5.1 Limitations of the study

While this review provides detail on immersive technology research in tourism, there are some limitations that would be helpful to consider in future research. First, some articles related to tourist attractions such as cultural heritage and museums did not appear in the search results. Future research might include specific tourism attractions as keywords in the search query. Second, the inclusion criteria were limited to peer-reviewed journal articles. The findings indicate increasing immersive technology adoption in tourism-related studies. Because of this trend, it might be useful to expand the review to include conference proceedings, excluding studies also published in journals, to avoid duplication.

Finally, the oldest article included in this review was published in 2012. Given advances in technology over time, it is possible that the potential challenges in technology adoption in tourism might also change over time. For example, AR technology has matured with the availability of state-of-the-art mobile devices and AR integration with light detection and ranging (LiDAR). Recent VR technology can also deliver high-quality images with recent computations. It is thus recommended that future reviews should include only articles published in the preceding five years, as additional evidence is likely to alter the findings of the current systematic review.

3.5.2 Threats to validity

This section discusses the assessment of the systematic review process that has been done from threats to the validity perspective. Threats to validity ensure the credibility of the empirical study's result (Ampatzoglou et al. 2019) and the extent to which the given results are accurate and unbiased from the researchers point of view (Wohlin et al. 2012). Further, Ampatzoglou et al. (2019) also mentioned the importance of threat to validity for secondary studies (i.e. systematic review). Threats to validity might affect data extraction and quality assessment of selected studies within the systematic review protocol. This review adopted threats to validity classified by Ampatzoglou et al. (2019), which focused on secondary studies in software engineering. Threats to validity include study selection validity, data validity and research validity.

3.5.2.1 Study selection validity

Study selection validity relates to how adequate the search process identifies all relevant studies. In a systematic review, researchers' bias may affect the type and quantity of the extracted articles. There might be a different interpretation of the selected articles among researchers.

As the technology is growing fast, this review ensures that it covers the current state of immersive technology. It also minimises possible missing studies. Based on initial literature searching, 2012 is the appropriate starting year to represent the current technology development.

Each database library has its different search engines characteristic and limitations. For example, Taylor & Francis Online database can only find articles from abstract or title but not both. The extracted articles might have duplication if combined. Web of Science needs an extra string aside from keywords and Boolean operator. Therefore, this review minimises the search engine inefficiencies by using the same keywords and building a search query that fits each search engine.

The other threat in this category is article inaccessibility. During the article filtering phase, this review excludes any articles not available in full text. In addition, this review limits selected articles by excluding non-English articles and only published in a peer-review journal. Duplicate articles are handled with Endnote software (Clarivative Analytics n.d.).

3.5.2.2 Data validity

Data validity relates to data extraction bias. This review follows the PRISMA protocol (Moher et al. 2009) to select relevant articles. The article selection process began with identifying inclusion and exclusion criteria. The criteria were formalised after discussion with experts from relevant fields. The criteria were also tested frequently to find the ideal result. Two researchers worked independently to filter the extracted articles from databases. The filtering process on abstract and full-text was conducted based on the agreed selection criteria to ensure off-topic articles elimination. At the end of the filtering process, selected articles from two researchers were compared and discussed for any possible conflicts arising.

3.5.2.3 Research validity

Research validity covers generalizability and repeatability. The nature of a systematic review is following guidelines to conduct the review. Ampatzoglou et al. (2019) stated that systematic review needs to be repeatable by reporting the review process in detail. This review covers every phase of the review process in detail by including the process of defining keywords, building search strings, listing included databases, listing inclusion and exclusion criteria, and showing the number of excluded articles in each phase. Therefore, other researchers will get similar outcomes if they replicate this review.

This review specified the definition and characteristics of immersive technology. As a result, it limits classification uncertainty bias and gives the reader a better insight into the heterogeneity of selected articles. In addition, the risk of missing relevant text fragments and missing semantic contexts was minimised by reading each article carefully. The interpretation and derived conclusion were based on the extracted and synthesised data through tables and figures.

3.5.3 Future work

3.5.3.1 Integrating immersive technology with other technology to enhance user experience

This review identified the types of immersive technology used in tourism studies. Future research should focus on use of a wearable device to access the AR system to increase the immersive experience during visitation. Further, researchers might consider using multi-trigger AR systems to improve the destination exploration experience using marker and location sensors.

This review identified that only AR and VR was used in previous studies. Therefore, there is potential for future research to implement additional types of immersive technology under the MR umbrella, and other technology integration. The main AR systems used with mobile devices employ a trigger to initiate the digital content to display on the screen, overlaying the real-world view. Modern smart devices are powered with high system specifications that quickly load AR applications. One direction for future research would be to use AR with LiDAR to detect the user's environment. In this way, AR could better promote a tourism destination (Lee, Chen

and Su 2017; Lin and Chen 2017) or enhance the user experience during visitation (Rodrigues et al. 2019; Yoon et al. 2018; Nisi et al. 2018).

Another direction for future research with AR would be to use a wearable device to measure visitor responses to an enhanced experience during visitation (Hammady et al. 2020; Han, Dieck and Jung 2019; Tussyadiah, Jung and tom Dieck 2018). Although AR with wearable devices like Google Glass and HoloLens glasses is still considered expensive, its usage can deliver a seamless experience without requiring the user to hold the device. A third direction for future research might be to assess visitor responses on a multi-trigger AR system to improve the destination exploration experience using marker and location sensors.

Traditionally, VR visualises a virtual environment fully generated by a computer. The popularity of 360° technology in line with various HMD availability opens up the opportunity for tourism providers to create a VR experience using a 360° camera without the need for high-level programming knowledge. The following research agenda could be used to investigate the difference between using a computer modelling VR content and a 360° image or video for different situations, such as pre-visit/promotion, during visitation and post-visitation.

3.5.3.2 Immersive technology applications within the tourism area

Immersive technology has various uses in the area of tourism. A further review of the literature showed that AR is used primarily for tour guidance and navigation, while VR is used mostly to promote tourism destinations. One possible future research direction is to examine AR usage—especially personalisation based on visitor age—to enhance the learning experience during visitation (tom Dieck, Jung and tom Dieck 2018; Yoon et al. 2018).

One potential direction for future VR-related research is to assess whether a developed application reflects the expected specific environment; for example, in the case where VR content is intended to give the user the sensation that they are experiencing a situation in the past (Puig et al. 2020; Errichiello et al. 2019). Another potential research agenda focuses on cultural heritage, since VR can preserve heritage objects or situations and represent those using digital objects. It could also be interesting to explore immersive technology in areas other than those identified in this study, such

as VR applications to support accessibility for disabled people and their potential to replace actual visitation as a way to overcome physical restrictions.

3.5.3.3 Potential challenge in using immersive technology in tourism

The selected articles indicate several potential challenges of using immersive technology in tourism. These offer insights for tourism stakeholders, primarily application developers, in regard to designing suitable systems to meet users' needs. Some challenges can be resolved using current technology. For example, the interoperability issue (Kounavis, Kasimati and Zamani 2012) can be addressed by developing AR applications using Unity (Unity Technologies n.d.), which has ability to export the application for different operating systems. Tracking issues that occur while detecting markers (Nisi et al. 2018) can be handled by using smartphones with advanced camera sensors and new techniques for spatial marking, such as LiDAR.

Another challenge is that users may feel disconnected from the real object while using AR applications. Application developers must consider the balance of interactivity between exploring the actual object and using the application. Tourism providers can support the user experience by designing an interactive and attractive display presentation. Future research might also focus on the design aspect of immersive technology for tourism and its evaluation. It would also be interesting to explore the effect of content-aware immersive technology on providing information based on user characteristics.

3.5.3.4 Immersive technology in user behaviour-related studies

Immersive technology can add value to tourism destinations. Its potential to promote tourism destinations offers the advantage of influencing potential visitors to visit tourism destinations. One aspect that might be interesting to explore is how immersive technology, especially VR, can replace travel. Travelling restrictions during 2020 because of the global pandemic might have changed the way people enjoy tourism. Immersive technology enables a user to travel to their favorited destination without leaving home. Future research might explore how immersive technology changes how people enjoy tourism. Further, advances in immersive technology might allow the user to experience a tourism destination in real time. There is also the opportunity to observe how immersive technology helps disabled people to enjoy tourism.

The outcomes of tourism research focusing on behaviour will depend on the target population. A specific target participant might not represent a whole population with different characteristics. In line with suggestions from Yeh et al. (2017), Marasco et al. (2018), Tussyadiah et al. (2018), and Flavián, Ibáñez-Sánchez, and Orús (2019b), future studies might include the destination's characteristics, user personality traits and the level of interactivity.

3.6 Proposed work

The systematic review shows that immersive technology adoption is increasing in tourism research. Research directions arising from the literature form the foundation of this thesis. Zeng et al. (2020) suggested further research on VR technology to investigate its influence on user behaviour. Thus, this thesis focuses on one immersive technology, VR, and its influence on the user's behavioural intention by adopting the attitude–behaviour theory as suggested by Kim, Lee, and Jung (2020).

One research direction suggested in previous studies is to include technology-related variables in VR for tourism research (Errichiello et al. 2019). As VR technology becomes more advanced, there is a need to explore technical aspects of VR that might influence user behaviour. Research might also include a range of variables in VR-related design and examine their influence on the user (Fang and Lin 2019). Further, Flavián, Ibáñez-Sánchez, and Orús (2019b) pointed to the aspect of interactivity within VR. Thus, this thesis covers the system quality aspect of VR and its influence on the user's behavioural intention.

Another consideration identified from previous research is user characteristics (Yeh et al. 2017; Errichiello et al. 2019). A user's personality might play a role in their behaviour regarding adoption of a technology. Previous studies recommend that future research should examine user characteristics such as personality traits (Flavián, Ibáñez-Sánchez and Orús 2019b; Errichiello et al. 2019; Kim, Lee and Jung 2020; Li and Chen 2019). As people's decisions might be influenced by others, Errichiello et al. (2019) suggested inclusion of a social dimension. Those user personality aspects then can be combined by employing participants from different cultures and nationalities (Marasco et al. 2018; Li and Chen 2019; Wei, Qi and Zhang 2019) to enrich and strengthen the study.

To summarise, this thesis uses the research directions identified above and formulates research objectives as detailed in Chapter 4. The thesis covers VR usage from a system quality and user personality perspective and investigates its influence on the user's behavioural intention. To address the research objectives, Chapter 5 proposes a research model and the relationships between its constructs.

3.7 Summary

This chapter explored the use of immersive technology in the context of tourism through a comprehensive review of 88 articles published between 2012 and 2020. The increasing number of journal articles published in this field reflects the research interest in immersive technology for tourism, primarily in AR. This work advances prior works and reviews through several contributions. AR and VR combined with other technology can offer potential user experience enhancement. This review identified immersive technology usage within the tourism sub-sector and potential challenges of using immersive technologies. This review also generates an overview that both academic and tourism stakeholders can use to understand better the current progress and possible research directions on immersive technology in tourism. Immersive technology, such as AR and VR, has numerous real-world applications and the potential to spark new interest and uptake of travel destinations which have been lagging in recent years. It is hoped that this review stimulates further research both in applying this technology to novel contexts and taking advantage of cutting-edge VR technology which has become increasingly available in the consumer space. The results can be summarised as follows:

a. Two types of immersive technology were identified in previous studies: AR and VR. The number of published articles for each type of immersive technology increased during 2012–20.

b. This chapter identified the state of the art of immersive technology in tourism-related research. Some studies used AR in combination with other technology, such as a decision support system. VR technology development is evident in the advanced VR headset, which produces better image quality and more popular VR content using 360° technology.

c. This chapter identified the wide usage of immersive technology in the area of tourism. Each type of immersive technology has preferable usage depending on the context. For example, most studies have used AR for tour guidance, while most VR-related studies were found in the marketing context. It can be generalised that AR usage mostly occurs during visitation, while VR is used mainly as promotion media.

d. This chapter identified potential challenges in the use of immersive technology.

e. This chapter identified theories/models adoption in tourism research involving immersive technology. The TAM was applied in most selected articles, followed by the SOR theory. TAM is also considered more appropriate and relevant to explain technology usage acceptance. Therefore, this thesis develops a research model based on TAM and its model references, such as TRA and TPB.

On the basis of the systematic review findings, this thesis focuses on VR usage in tourism. VR is considered appropriate for the study as the nature of its usage influences a user's intention to visit a tourism destination. VR can be used to promote tourism destination prior visitation, unlike AR that might be suitable to use during visitation. Some identified gaps presented in this chapter form the basis of the research foundation. The next chapter formulates these gaps to define the research problem and research objectives.

Chapter 4. Research Problem Definition

4.1 Overview

This chapter outlines the key concepts used throughout the thesis, followed by the research issues it seeks to address. Research objectives formalise the goals of the thesis based on the identified research issues. An overview of the research design employed to answer the research questions is also provided.

4.2 Problem definition

Based on the systematic literature review in Chapter 3, three research gaps motivated this research. First, research is needed to understand the relationship between information quality of VR content and the user's behavioural intention in VR tourism. Delone and Mclean (1992) stressed the importance of quality information as a foundation for decision making. Second, interactivity is a factor that influences the user's perception of VR, along with immersion and presence (Mütterlein 2018). This thesis investigates how the user's interactivity in the virtual environment might influence their behavioural intention. Third, previous studies (Flavián, Ibáñez-Sánchez and Orús 2019b; Kim, Lee and Jung 2020) identified a need for research investigating the relationship between personality traits and the user's behavioural intention. As is true for intrapersonal factors like personality traits, no previous research has discussed VR tourism related to interpersonal factor (e.g. social influence). In general, this thesis discusses the influence of perceived quality and user personality in relation to VR tourism on the user's behavioural intention.

4.3 Key concepts used in this thesis

This section lists the critical concepts applied in the thesis. While structural definitions are explained in the next chapters, the definitions presented in this section are intended to specify the concepts, and these terms are utilised throughout the thesis. The key concepts follow:

Virtual reality. Two VR environments were used in the studies reported in this thesis. The VR in the first study is a virtual environment based on an actual tourism destination. A HMD was used to experience the VR. In the second study, the VR environment was a 360° panoramic image from a website. The content was designed to be used on a VR headset, although the user can explore the VR environment using a computer or any smart device.

Information quality. In the context of this thesis, information quality refers to how the information provided in VR meets the user's need in terms of being understandable and adequate.

Interactivity. Interactivity refers to the user's interactions with the VR environment. It covers the action–response between input from the user and output from the system in real-time simulations.

Visual attractiveness. This thesis defines visual attractiveness as how pleasant is the visual element presented by the VR through the user's visual perception.

Usability. This is the ease of use and effectiveness of use where specified users can use a product or system to effectively complete specific tasks with efficiency and satisfaction (International Organization for Standardization 2018).

Openness to experience. This refers to the degree of being imaginative, cultured, curious, original, broadminded and intelligent (Barrick and Mount 1991).

Conscientiousness. This variable is the degree to which one is thoughtful, organised and planful (Barrick and Mount 1991).

Social influence. This refers to the influence of people with whom someone interacts and who stimulate their attitudes and opinions.

Attitude. In this thesis, attitude refers to a person's general feeling of favourableness and unfavourableness towards VR.

Intention to visit. In this research, the intention to visit refers to the user's intention to visit a tourism destination after experiencing VR tourism.

Intention to use. This construct refers to the user's intention to use VR technology to aid in decision making for future travel.

4.4 Research objectives

Based on the literature, this thesis develops a conceptual model that explores the relationship between the perceived quality of VR and the user's personality in relation to their behavioural intention. This primary objective was to develop and test a research model explaining the relationship between perceived quality, personality and behavioural intention.

This thesis has the following specific objectives:

1. develop a conceptual model applicable to the use of VR in tourism
2. determine whether the perceived quality of VR influences the user to use VR as a tourism decision support tool regarding actual visitation to the tourism destination
3. determine whether the user's personality influences them to use VR as a tourism decision support tool regarding actual visitation to the tourism destination.

4.5 Research questions

The main purpose of this research is to investigate the influence of system quality and user's personality on behavioural intention. Hence, a set of primary research questions have been formulated to fulfil the aims of this research:

1. To what extent has immersive technology, particularly VR, been implemented in tourism-related studies?
2. How do system quality and user personality influence the user's behaviour intention?
3. To what extent do system quality on VR and user personality influence the user's behaviour intention?

4.6 Research design overview

A research philosophy uses pragmatic thinking that includes many different ways to interpret the world and is open to the possibility of multiple realities (Saunders, Lewis and Thornhill 2015). This research uses an abductive approach, which refers to using inductive and deductive logic to test hypotheses of a specific nature in regard to a phenomenon. The abductive approach develops a general theoretical framework and hypotheses before conducting research, which is later updated and fine-tuned to reflect the knowledge gained (Klag and Langley 2013). A quantitative research approach was employed to gain an insight into the use of VR on the user's behavioural intention. The research used the proposed model to test hypotheses to answer research questions stemming from the literature review. The proposed model has 10 constructs: information quality, interactivity, visual attractiveness, openness to experience, conscientiousness, social influence, intention to visit (tourism destination), and intention to use (VR as recommendation tool). A questionnaire survey was developed using validated items from previous studies, with some adjustment.

This thesis reports on two quantitative studies carried out to test the proposed research model. Both studies required participants to be 18 years or older, assuming that they could thus travel alone. The first study took place at an expo in September 2019 in Surakarta, Indonesia. Participants were invited to experience VR about a tourism destination environment through a HMD for approximately 5 minutes. They were then asked to complete a questionnaire based on the VR that they had experienced. Participants completed the questionnaire anonymously through Qualtrics via a website link or QR code. Because of global pandemic (COVID-19) restrictions, adjustments were made to the questionnaire to ensure it fit with the situation and remained relevant to the context of the study. The second study was entirely online, and participants were recruited using snowball sampling via social media. Both VR websites and questionnaire were accessible through the Qualtrics system via a website link or QR code. Two VR websites were used in this study. The data collection process took place during February–March 2021. Both studies used the same proposed model to test the hypotheses with a SEM approach. Chapter 6 outlines the research methodology and provides details about the design of each study presented in Chapter 7 and Chapter 8.

In general, the research process is documented as follows:

Define the problem (Chapter 4). At the first stage, the problem was defined to identify the research context that needed to be investigated. Research questions were developed using the PICO approach to generate keywords for finding relevant literature.

Literature review (Chapter 2 & Chapter 3). Keywords were used to find relevant articles from well-known databases. Only journal articles were used as sources in this thesis. The articles were then assessed following PRISMA to identify those most relevant to the research topic. A literature review was conducted to discover what was known and identify research gaps regarding VR in tourism.

Research model (Chapter 5). Based on the literature review, the research gaps were framed. A research model was developed according to the literature review. Moreover, hypothesis statements based on the research model were developed for further testing and validating of the relationships between variables.

Data collection (Chapter 7 & Chapter 8). The two studies included in this thesis each employed a mono method with a survey questionnaire as the primary data collection instrument. A survey questionnaire can be used to examine causal relationships between variables (Saunders, Lewis and Thornhill 2015). The questionnaire items were derived from prior literature with some adjustment. A pilot study was conducted to improve the survey instruments. The questionnaire was delivered through the Qualtrics system.

Data analysis (Chapter 7, Chapter 8). The data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) and AMOS. SPSS handled data cleaning, non-response bias, replacement of missing data, normality tests, measures of sampling adequacy and reliability tests; while AMOS was used to conduct confirmatory factor analysis (CFA), as well as construct, convergent and discriminant validity tests. Finally, using SEM, hypotheses were tested to investigate the causal relationship among constructs.

4.7 Summary

This chapter identified the research problem that needs to be addressed. The problem was formulated based on the literature reviews in Chapter 2 and Chapter 3, which was followed by a description of the research objectives and research questions. Subsequently, key concepts were defined and used to develop conceptual solutions. The chapter concluded with the research design used to achieve the research objectives and answer the research questions. The next chapter discusses the theoretical foundation for formulating the hypotheses and designing the research model based on the research objectives.

Chapter 5. Theoretical Foundation, Hypotheses, and Research Model

5.1 Overview

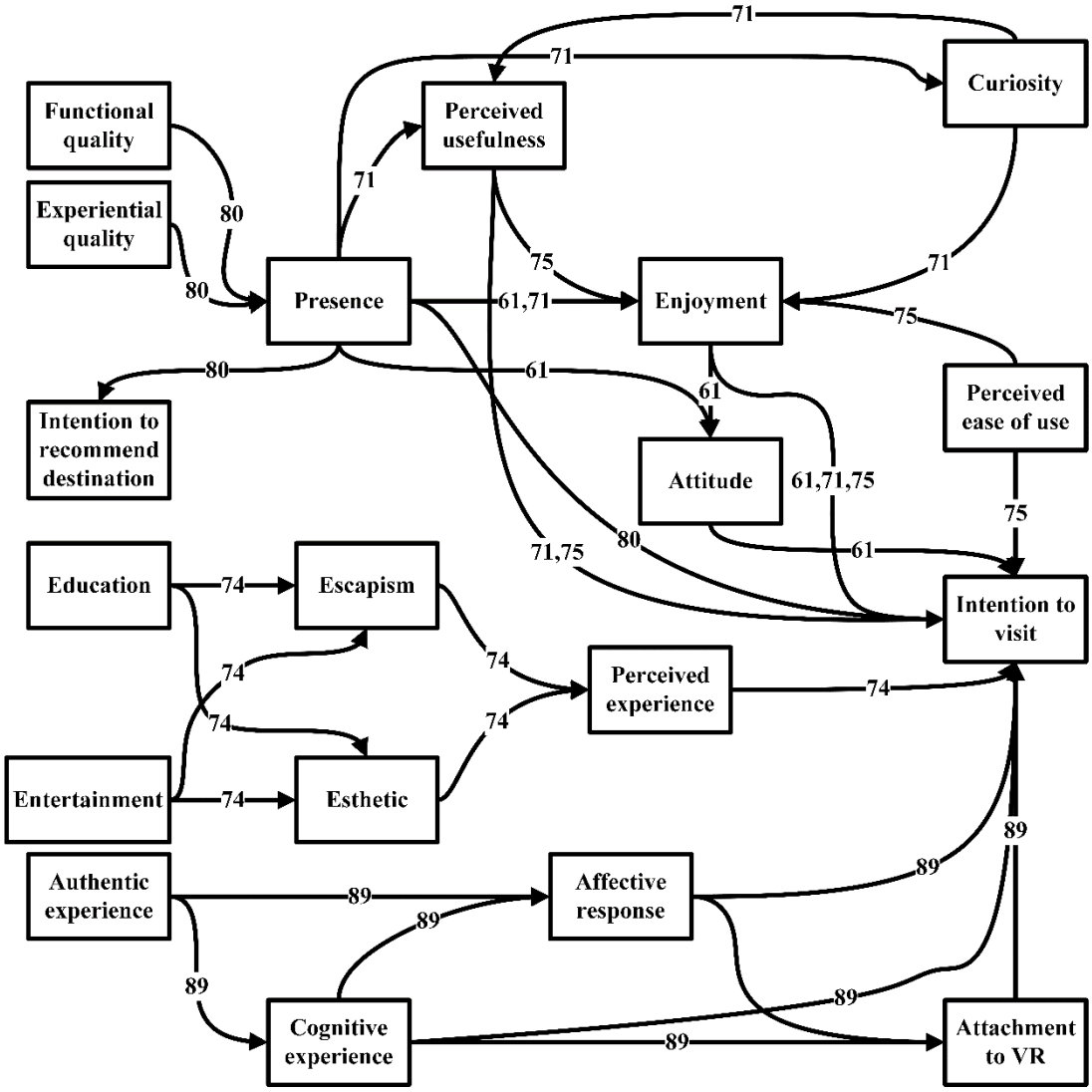
This chapter outlines the theoretical foundation used to develop hypotheses and the proposed research model. The literature reviews from Chapter 2 and Chapter 3 provided insight into knowledge from previous research on VR in tourism and identified potential research gaps. In the following section, the justification for expecting correlation between constructs based on existing theories and the literature is presented to formulate hypotheses. Then, the hypotheses are used to build a research model to incorporate the correlation between constructs.

5.2 Identifying constructs

A construct represents an abstract concept to describe a given phenomenon in which researchers are interested. It is necessary to identify the constructs examined in this research before building the research model for analysis. Figure 5.1 shows the constructs taken from the articles reviewed in Chapter 3, focusing on behavioural intention. The figure identifies constructs not investigated thoroughly in the literature.

Researchers have called for further investigation of the relationship between personality traits and behavioural intention (Flavián, Ibáñez-Sánchez and Orús 2019b; Kim, Lee and Jung 2020). In addition, Errichiello et al. (2019) recommended further research on the VR-mediated experience employing technology-related variables. The TRA (Fishbein and Ajzen 1975) provides a foundational structure for this study's research model through the basic principle linking people's attitudes, intentions and behaviour. Based on the identified research gaps, this thesis develops a new research model by extending the basic structure of the TRA (Fishbein and Ajzen 1975) in two key dimensions: system quality and user personality. This research proposes that the success of VR as a tourism promotion tool will be influenced by several dimensions of system quality: information quality, interactivity and visual attractiveness. System quality may influence usability and attitudes towards using VR. Further, this research suggests that user personality traits, notably their openness to experience,

conscientiousness and social influence may shape their attitudes towards use of VR. Therefore, the research model incorporates these three dimensions of user personality. The research investigates the relationship between these constructs to explain how VR quality and user personality might influence user behavioural intention. A conceptual mapping of theories revealed during the systematic literature review is depicted below, and discussed further in the next section.



Note: Numbering refers to list of articles in Appendix A

Figure 5.1. Constructs relating to behavioural intention.
Based on salient findings from literature review of virtual reality tourism articles in Chapter 3.

5.3 Constructs

5.3.1 Behavioural intention

Behavioural intention is among the variables included in widely used models and theories such as the TRA (Fishbein and Ajzen 1975), TPB (Ajzen 1991), TAM (Davis 1985) and UTAUT (Venkatesh et al. 2003) as the main determinant of usage behaviour. It is a dependant variable in most studies about technology adoption, although it can also be an antecedent to actual system use (Davis, Bagozzi and Warshaw 1989; Venkatesh et al. 2003). According to Fishbein and Ajzen (1975, 12), behavioural intention is 'a person's intentions to perform various behaviours'. It can be said that behavioural intention is the main factor influencing technology adoption as it is the primary determinant of actual system use; indeed, behavioural intention is considered 'the single best predictor of actual system usage' (Davis and Venkatesh 1996). Several studies have adopted the TAM and found that behavioural intention is a good determinant of technology adoption and technology use (Chung, Han and Joun 2015; Lee, Chen and Su 2017; Jung et al. 2018; tom Dieck and Jung 2018).

The influence of VR on behavioural intention has been investigated in some research areas; for example, VR usage in health (Bravo et al. 2020; Hen 2019), marketing (Diehl, Marín and Zreiqat 2020) and education (Shen et al. 2019; Bower, DeWitt and Lai 2020). VR also offers great potential benefit for the tourism sector. Previous studies have focused on VR usage in tourism and its influence on behavioural intention, such as in tourism marketing (Yung, Khoo-Lattimore and Potter 2021; Gibson and O'Rawe 2018), tourism planning (Disztinger, Schlögl and Groth 2017) and hotel booking (McLean and Barhorst 2021; Israel, Zerres and Tscheulin 2019).

Behavioural intention can also be defined as the strength of one's intention to perform a specified behaviour (Fishbein and Ajzen 1975). In this thesis, behavioural intention is used as the dependant factor in the use of VR tourism and is comprised of the intention to visit and the intention to use. The intention to use construct represents the user's intention to use VR technology as media to support their decision making around visiting a tourism destination in the future. The intention to visit construct reflects the user's intention to visit a tourism destination after experiencing VR.

5.3.2 Attitude

Attitude represents ‘a person’s general feeling of favourableness and unfavourableness toward some stimulus object’ (Fishbein and Ajzen 1975, 216). In this study’s context, the stimulus is VR experience. Teo and Noyes (2011) defined attitude as the user’s positive or negative feelings towards a target behaviour (e.g. adopting technology) or interaction with the object (e.g. system). Attitude is a central concept in psychology, and it is generally accepted that attitude will predict behaviour, although its degree of relationship consistency might differ depending on the context (Tussyadiah et al. 2018). This thesis defined attitude as the user’s feelings towards using VR tourism.

Several studies related to technology adoption have investigated the relationship between attitude and behavioural intention. Yaprak, Kılıç, and Okumuş (2021) investigated drone delivery system adoption. The authors identified a positive attitude towards drone delivery system usage among their participants. Studies on shopping chatbot usage Kasilingam (2020) and phone-embedded tracking (Ketelaar and van Balen 2018) also examined the attitude dimension and its relationship with behavioural intention.

Fishbein and Ajzen (1975) stated that a person holds a favourable belief towards an object if they like the object. Further, they might intend to perform a particular related behaviour. The authors also suggested that behavioural intention can be formed depending on the prior formation of attitude. Hence, this thesis includes attitude as a predictor of behavioural intention.

5.3.3 Usability

Usability is a fundamental concept in the area of human–computer interaction that has been debated in terms of its definition and measurement. Usability refers to the degree of effectiveness and ease of use of a system or product used by a specified user to complete a specific task. The term was introduced in the 1980s to represent a more user-centred approach at different design stages (Stevens 1983). Eason (1984) identified usability as a recognition space between a system’s potential and the degree to which the user can use and has the intention to use the system. The author characterised usability using four components: user characteristic, task characteristic, system function and environment. The system gains high acceptability when the user

sees benefit in it. Shackel and Richardson (1991) later added four components to usability: effectiveness, learnability, flexibility and attitude. These components are used for usability evaluation during system or product use.

A formal definition of usability was offered in 1998 by the International Organization for Standardization (1998). The latest standard from the International Organization for Standardization (2018) states that effectiveness, efficiency and satisfaction are the sub-construct of usability. Usability refers to the ability of users to achieve a goal task by using the system (effectiveness), the number of resources consumed while performing tasks (efficiency), and user satisfaction in the system (International Organization for Standardization 2018).

The International Organization for Standardization (2018) definition of usability is focused on the product or system (Jokela et al. 2003) rather than the user's perspective (Barnum 2001). Smith (1997, 12) stressed the importance of measuring usability within a specific context. Usability can only be meaningful if relates to the users, specific task, environment and goal to achieved. Similarly, Brooke (1996) stated that usability might best be defined as the appropriateness of a particular product for a purpose. Usability should be viewed in the context in which the tool or system is used. Specifying system usability should begin with defining who the user is, the task that needs to be performed and the context of the area in which it will be used. Hence, this study defines usability as the degree of effectiveness, efficiency, and satisfaction of user's experience while interacting the VR to perform a task.

5.3.4 Personality traits

Personality is the sum of characteristics that differentiate each individual based on their unique thoughts and actions (Wood 2012). Mischel and Shoda (1995) described the personality construct based on the assumption that different traits characterise individuals. Traits are invariant depending on context (van Lieshout 2000). Tupes and Christal (1992) proposed an initial personality model used to investigate 35 personality traits from eight studies. They identified five prominent factors among the studies and labelled them surgency, agreeableness, dependability, emotional stability and culture.

Many psychologists refer to the Big Five model as representing personality traits described in five dimensions: neuroticism, extraversion, openness to experience,

agreeableness and conscientiousness (McCrae and Costa Jr 1997). The Big Five model has been widely implemented in research and practice (Beer and Watson 2008). Each of its dimensions reflects a summary of many specific personality characteristics (John, Naumann and Soto 2008). Smith and Canger (2004) argued that the Big Five is essential given that is (a) classifies personality traits, (b) provides a framework for research, and (c) covers all basic personality characteristics. Mount and Barrick (1998) stated that the Big Five model offers an easy and efficient process for classification of thousands of personality traits using descriptive words found in an English dictionary. A relationship between personality and attitude exists, with personality acting as an intervening factor to influence actual behaviour (Percy 1976). Further, individual differences as stimuli for VR/AR behaviour and experience positively influence user adoption intention and should be considered antecedents in future VR/AR research (Wei 2019).

This thesis focuses on two Big Five personality traits: openness to experience and conscientiousness. This study excluded three other personality traits (extraversion, neuroticism, and agreeableness). Extraversion indicates how outgoing and sociable (Barrick and Mount 1991). Some characteristics that define extraversion are sociability, talkativeness, assertiveness, and excitability (Eysenck 2009). Although extraversion shows how social a person is, it is argued that other people's opinion predicts an individual's decision to use technology. Therefore, the social influence dimension is considered more relevant than extraversion. Neuroticism is also not included in this study as it represents individual differences in the likelihood of experiencing stress or anxiety (McCrae and John 1992). Similarly, this thesis does not include agreeableness as it reflects on social cooperation and harmony, which might have no relevance to the study context.

The openness to experience dimension is defined as the degree of being imaginative, cultured, curious, original, broadminded and intelligent (Barrick and Mount 1991). A person who is open to experience tends to be intellectually curious and willing to try new things (McCrae and John 1992). The dimension was introduced by McCrae and John (1992) as a variant of the original 'culture' personality dimension described by Tupes and Christal (1992).

Conscientiousness is defined as being thoughtful, organised and planful (Barrick and Mount 1991). It was recognised as one dimension in an early version of the Big Five model (Norman 1963). A person with a high score for conscientiousness tends to plan to be more organised, follow norms and rules, and think before making decisions (John and Srivastava 1999).

5.3.5 Social influence

People tend to influence or allow themselves to be influenced by other people in almost every segment of daily life. Social influence becomes a key component of social interaction in terms of behaving effectively, managing relationships and managing self-concept (Cialdini and Trost 1998). Social influence is defined as the interpersonal influence that stimulates someone's attitudes and opinions as part of decision making. Individuals shape their situation by changing attitudes and opinions according to referents with whom they interact (Friedkin and Johnsen 1999). Interpersonal factors are those concerning the involvement of others.

Social influence has been widely investigated in information systems research. Studies have demonstrated an effect of social influence on technology adoption, such as e-learning (Mehta et al. 2019), the Internet of Things (AlHogail and AlShahrani 2019), mobile payment (Park et al. 2019) and fitness application (Beldad and Hegner 2018). The UTAUT (Venkatesh et al. 2003) considers social influence as one factor influencing technology adoption.

Hence, this thesis presumes that recommendations from others can influence potential tourists. The perceived social pressure from important referents might influence the benefit of using VR. In turn, this influences the user's attitude and behavioural intention.

5.3.6 Visual attractiveness

Humans, consciously or not, engage with aesthetic activities, primarily in regard to visual elements (Zettl 2016). Most people consider an aesthetic appeal perspective where a well-designed product should be eye-pleasing and feel good to hold or touch (Garrett 2010, 4). Further, Crilly, Moultrie, and Clarkson (2004) stressed a product's visual appearance as a critical component in determining consumer judgment

response. Virtual product presentations can improve the demonstration of a product (Jiang and Benbasat 2004), which highlights the importance of appearance for product presentation.

User interface design, a subset of human-computer interaction field of study, covers the visual aesthetics. As visual aesthetics influence the user's evaluation of the interactive system in general (Tractinsky et al. 2006), a designer should consider what the user might find enjoyable and attractive, to satisfy the user's need in the most effective way (Galitz 2007, 4). Proper design allows a user to concentrate on the presentation rather than the mechanism to deliver the information itself. The more visually aesthetic the user experience, the higher the likelihood of the user feeling that the system is usable and will improve decision making (Isen 2001; Tractinsky, Katz and Ikar 2000).

Lindgaard and Dudek (2003) and Cyr, Head, and Ivanov (2006) investigated the effect of visual appeal on perception and user behaviour. This thesis derives its definition of visual attractiveness from van der Heijden (2003), as the degree to which a person senses that visual elements such as colour and layout are aesthetically pleasing to the eye. To suit the context of the study, this thesis defines visual attractiveness as the degree to which a person senses that the virtual environment within VR is aesthetically pleasing to the eye.

5.3.7 Interactivity

Steuer (1992) identified interactivity as a variable that affects telepresence—aside from the vividness dimension—from a technology perspective. The author defined interactivity as 'the extent to which users can participate in modifying the form and content of a mediated environment in real-time' (Steuer 1992, 84). Interactivity in VR technology means the ability of the user to navigate freely in the virtual environment and modify the environment. Interaction with a virtual object should not be confused with interactivity in instruction and system navigation (Schlosser 2003). An essential feature of interactivity is the action–response between the user input and the system in real time to simulate a continuous user experience (Ryan 1999). A higher level of interactivity will increase the user's flow experience.

From a broader communication perspective, interactivity relates to the concept of feedback, which is the degree to which a receiver can respond to a particular message from a sender. Rafaeli and Sudweeks (1997) stated that an interactivity setting can be declarative (one way), as mainly seen in mass media communication; reactive (two-way), which allows a response from a participant; or fully interactive, which enables simultaneous and continuous exchanges. The idea of interactivity has been approached from four perspectives: communication exchange (Burgoon et al. 2002; Rafaeli and Sudweeks 1997; Jensen 1998), system user's perception (Light and Wakeman 2001; McMillan 2000; Sundar, Kalyanaraman and Brown 2003), system features (Chou 2003; Downes and McMillan 2000; Coyle and Thorson 2001) and a combination of three mentioned earlier (Kiousis 2002; Liu and Shrum 2002; Mcmillan 2002).

Previous studies (Heeter 2000; Liu and Shrum 2002) defined interactivity in three dimensions: communication exchange, active user control, and synchronicity. Communication exchange refers to the media's ability to allow two-way communication through the provision of feedback input devices. Active user control relates to the media's ability to enable users to control their activities in terms of direction and information. Synchronicity refers to system response time providing feedback to the user.

Interactivity is a complex concept that has been conceptualised as unidimensional and multidimensional. For example, Laurel (1993) defined interactivity based on frequency, range and significance. Johnson, Bruner II, and Kumar (2006) validated three facets of interactivity: responsiveness, nonverbal information and speed of response. McMillan and Hwang (2002) study included three dimensions to reflect interactivity: the direction of communication, user control and time. Wu and Wu (2006) presented interactivity as a combination of perceived control, perceived responsiveness, and perceived personalisation. Liu (2003) tested a measurement scale for interactivity based on active control, two-way communication, and synchronicity.

5.3.8 Information quality

The value of information depends on how a person sees it through its quality. The meaning of information lies in how it is retrieved and utilised by a person. Nevertheless, the critical principle of information quality is whether or not the

information suits a user's needs (Miller 1996). If not, the user will find the information inadequate. Similarly, Salaün and Flores (2001) described good-quality information as that which satisfies a specified user's demand criteria and certain specific requirements.

Information quality is defined as how the provided information in VR meets the user's need in terms of being understandable and adequate. In the information systems success model of Delone and Mclean (1992), information quality serves as a key determinant. Some characteristics of information quality are precision, accuracy, reliability, completeness, format, relevance, ease of understanding, sufficiency and comparability (Mahmood and Medewitz 1985; Bailey and Pearson 1983; Srinivasan 1985).

Higher information quality is more likely to increase customer satisfaction (McKinney, Yoon and Zahedi 2002). Further, information accuracy plays an important role in customer satisfaction and behavioural intention (Collier and Bienstock 2006). In the context of website usage, Turban and Gehrke (2000) emphasised information quality as a clear measure of whether users will be attracted or will drift away while accessing a website.

Information quality has been investigated in several tourism and hospitality studies. For example, Perdue (2002), Ranganathan and Ganapathy (2002) and Ranganathan and Grandon (2002) found that information quality is the main factor in potential travellers making travel-related reservations. Similarly, information quality has been identified as the core dimension in the electronic service quality research context (Bevanda, Grzinic and Cervar 2008; Yeung and Law 2006; Ho and Lee 2007).

VR as a tourism marketing tool presents a mediated experience to explore a tourism destination and information quality is a critical determinant of building a positive image for a tourist experience.

5.4 Hypotheses and research model

This thesis aims to better understand the behavioural intention to use VR tourism by proposing and testing a research model of the determinants of tourists' attitudes and behavioural intentions. The TRA (Fishbein and Ajzen 1975) provides a foundational

structure for this model through the underlying principle linking people's intentions and their behaviour. The TRA stresses that attitude is a determinant of behavioural intention, and this is represented in the research model. This thesis develops a new research model by extending the basic structure in two key dimensions as its main contribution: system quality and user personality.

Building on the literature, it is believed that the success of VR as a tourism promotion tool will be influenced by several dimensions of system quality—information quality, interactivity and visual attractiveness—all of which may influence system usability. Finally, it is suggested that users' personality traits—notably their openness to experience, conscientiousness and social influences—may shape their attitude towards using VR. The proposed model thus incorporates these three dimensions of user personality. The theoretical development for each of the hypothesised relationships is detailed in the following sections.

5.4.1 Relationship between system quality and usability

Usability has gained the most interest in investigations of the user experience component, aside from technology adoption (Mäkinen et al. 2020). Usability is commonly described as the system's ability to provide the conditions for the user to perform a task with effectiveness, efficiency and satisfaction, to achieve a specific goal (International Organization for Standardization 2018). Jordan (2002) stated that usability is an attribute of the user's interaction with a system to perform a specified task, which might be context dependent. Similarly, Brooke (1996) stated that measures of effectiveness, efficiency and satisfaction can vary depending on the task, and defined usability as the quality of appropriateness of a system to meet its purpose. Therefore, for the specialised VR research at the heart of this thesis, it was necessary to contextualise the construct of usability. The thesis posits that several dimensions of VR system quality will influence the perceived usability of the environment.

Building on the literature, this thesis argues that VR as a promotion tool will be influenced by several dimensions of system quality: information quality, interactivity and visual attractiveness. Together these dimensions may influence usability. The value of information depends on how the person sees it through its quality. Low-quality information might diminish the quality experience overall (Gao and Bai 2014).

If the perceived information quality is high, users might feel that they have acquired useful and reliable information to enhance their understanding and decision making (Gao, Bai and Park 2017).

Previous research (Pai and Huang 2011; Lucas Jr. and Spitler 1999) has confirmed the essential nature of information quality for usefulness and ease of use. Jung, Chung, and Leue (2015) investigation confirmed the relationship between content quality and satisfaction in the context of AR. The authors also stressed that users are most concerned with high-quality content, followed by a personalised system. tom Dieck and Jung (2018) further identified a relationship between information quality, and perceived usefulness and perceived ease of use, based on a thematic analysis of 44 respondents in the context of urban heritage tourism. Therefore, the following hypothesis is proposed:

Hypothesis 1a (H1a): Information quality positively influences usability.

Interactivity is the bidirectional flow of information between the user and the VR system. Johnson, Bruner II, and Kumar (2006) identified interactivity as a reflection of reciprocity, responsiveness, speed of response, and nonverbal information of the system. Studies have confirmed the relationship between interactivity and usability. A group experiment study by Teo et al. (2003) found that the interactivity level appears to significantly influence the effectivity, efficiency and satisfaction of website usage. Satisfaction was reported to have the most substantial effect, followed by effectivity and efficiency. In another study, Brock et al. (2015) tested two geographic maps for 24 blind participants. The authors found that users reported higher efficiency and satisfaction with the interactive map than the classical embossed maps. Gu et al. (2018) found that the relationship between interactivity and usefulness was significantly positive regarding the influence of mobile Internet-based health service usage on word-of-mouth dissemination behaviour. Lowry et al. (2006) found that interactivity directly predicted satisfaction in the context of website usage. Based on the stated argument, this thesis argues that the user's interactivity in the virtual environment might influence VR usability. Therefore, the following hypothesis is proposed:

Hypothesis 1b (H1b): Interactivity positively influences usability.

There is a correlation between beauty and usability (Hassenzahl 2008). More specifically, a study by Thüring and Mahlke (2007) outlined a strong connection between a user's initial perception of a technology user interface aesthetic and the system's usability. Marasco et al. (2018) outlined that Fontanelle Cemetery in Naples, as seen through VR, was sufficiently attractive for users to visit the destination. The authors also suggested the importance of the visual attractiveness of VR experiences with HMDs as a positive influencer of the user's intention to visit the featured site. This indicates that the visual attractiveness of the VR might relate to system usability, which influences the user's behavioural intention. However, Kivistö (2021) found that an attractive website can be unpleasant to use to find information. It seems likely that the correlation between the visual attractiveness and usability of the website was not strong. In summary, it is argued that visual attractiveness of the virtual environment within VR affects VR usability. Therefore, the following hypothesis is proposed:

Hypothesis 1c (H1c): Visual attractiveness positively influences usability.

5.4.2 Relationship between usability and attitude

A qualitative study of VR adoption for tourism by tom Dieck et al. (2018) proposed a VR adoption model where usability is identified as one of the factors that influences VR adoption in the national park context. Attitude becomes a mediating variable between usability and behavioural intention. Lee and Koubek (2010) stated that usability itself is sufficient to explain user attitude. As usability is specific to system usage for a particular task, measuring usability should be context dependent (Jordan 2002). In a website context, Belanche, Casaló, and Guinalíu (2012) argued that usability is a key factor determining favourable attitude towards a website. Some studies reported a significant positive relationship between usability and attitude. Researchers have confirmed that usability directly influences the attitude towards website usage (Alcántara-Pilar et al. 2018; Wang and Senecal 2007) and mobile payments in relation to customers' repurchase intention (Sun, Law and Schuckert 2020). Therefore, the following hypothesis is proposed:

Hypothesis 2 (H2): Usability positively influences attitude.

5.4.3 Relationship between user personality and attitude

User personality in this thesis context is comprised of openness to experience, conscientiousness and social influence. Openness to experience and conscientiousness are personality traits that characterise individuals. Percy (1976) established a significant positive relationship between personality and attitude. Four studies confirmed the relationship between openness to experience and attitude towards technology usage. One of these investigated web usage (Tuten and Bosnjak 2001), while the other three demonstrated the effect of intervening factors on social networking sites (SNS) (Correa, Hinsley and de Zúñiga 2010; Amichai-Hamburger and Vinitzky 2010; Wang et al. 2012). In contrast, results reported by Wilson, Fornasier, and White (2010) and Hughes et al. (2012) indicated that openness to experience does not affect the attitude towards SNS usage.

Conscientiousness shapes tourists' travel (do Espírito Santo, Cardoso and do Espírito Santo 2016) and leisure motivation (Yurcu, Akinci and Kasalak 2017). Consequently, it has been argued that conscientiousness might influence attitudes toward visiting a tourist destination. No specific literature has discussed the influence of conscientiousness on attitudes toward VR tourism. However, studies in other contexts investigated the relationship between conscientiousness and attitude. Conscientiousness has been reported to be negatively correlated with attitude in most SNS-related studies (Andreassen, Torsheim and Pallesen 2014; Ryan and Xenos 2011; Wilson, Fornasier and White 2010; Butt and Phillips 2008; Ross et al. 2009), although Wang et al. (2012) found no significant correlation between those constructs.

VR offers an interesting experience in exploring a tourism destination virtually. People who tend to score highly for the openness to experience trait are more willingly to embrace new things and novel experiences. It is argued that people with high openness to experience will most likely try VR to explore a new experience, which shapes their intention to visit. In another case, travellers are likely to seek information about potential tourism destinations for their travel planning. They tend to find any related information that is sufficient to convince them to make their decision. Hence, it is argued that a person with a planful personality (high conscientiousness) will most likely have a positive attitude towards using VR as a travel support decision tool. Therefore, the following hypotheses are proposed:

Hypothesis 3a (H3a): Openness to experience positively influences attitude.

Hypothesis 3b (H3b): Conscientiousness positively influences attitude.

tom Dieck and Jung (2018) included others' recommendations in their proposed AR acceptance model for mobile AR in urban heritage tourism. They argued that recommendations from previous visitors would lead to users' positive perceived usefulness and ease of use of mobile AR applications. Interpersonal factors should be considered a stimulus that influences someone's behaviour and experience with immersive technologies, especially in studies where others' opinions and recommendations are highly expected and appreciated (Wei 2019). Culture (e.g. Western or Eastern) may influence a user's subjective experience with VR/AR tourism (Wei 2019). Studies have suggested there is a relationship between social influence and attitude in the context of online lottery adoption (Chiu et al. 2012), mobile technology (Park, Yang and Lehto 2007) and e-learning usage (Šumak, Polancic and Hericko 2010). However, these relationships were not significant in some studies. Paulo et al. (2018) stated that users did not consider the opinion of others about mobile AR for tourism, while Talukder and Quazi (2011) found that the impact of peer influence was not significant on users' attitudes and behaviour regarding technological innovation. Therefore, the following hypothesis is proposed:

Hypothesis 3c (H3c): Social influence positively influences attitude.

5.4.4 Relationship between attitude and behavioural intention

The TRA (Fishbein and Ajzen 1975) suggests that attitude is a direct antecedent and one of the primary determinants of a person's intention to perform a specific behaviour (e.g. intention to use technology (Israel, Tscheulin and Zerres 2019)). A strong relationship between attitude and behavioural intention exists if someone has a favourable attitude towards an action or object, leading to positive behaviour in regard to that object or action (Fishbein and Ajzen 1975, 288).

The TAM (Davis 1985) relates to the relationship between attitude and behavioural intention. The TAM is an information systems theory that represents how users accept and use technology, especially computers. In a comparative study, Davis (1989) found different effects of beliefs on intention between the TRA and TAM. The author stated that the attitude dimension has a partial or no mediating influence from either

perceived usefulness or perceived ease of use towards behavioural intention. This finding is inconsistent with the TRA, whose key principle is that attitudes fully mediate the influence of beliefs on intentions.

Several studies have claimed there is a positive relationship between attitude and behavioural intention in technology adoption, such as AR tourism (Chung, Han and Joun 2015; Lee, Chen and Su 2017), e-learning (Hussein 2017; Revythi and Tselios 2019) and mobile banking (Mehrad and Mohammadi 2017; Mohammadi 2015). More specific behavioural intentions have been investigated, such as the intention to visit (Chung, Han and Joun 2015; Tussyadiah et al. 2018), intention to use (Chung, Han and Joun 2015; Lee, Chen and Su 2017; Chung et al. 2018; Israel, Tscheulin and Zerres 2019) and intention to recommend (tom Dieck et al. 2018; Talukder et al. 2019). It is argued that attitude towards a tourism destination stemming from a VR experience is a predictor of intention to visit the tourism destination (Tussyadiah et al. 2018) and intention to use VR to support travelling decision making. Therefore, the following hypotheses are proposed:

> *Hypothesis 4 (H4): Attitude positively influences intention to visit the tourism destination.*
>
> *Hypothesis 5 (H5): Attitude positively influences intention to use VR as a recommendation tool.*

5.4.5 Research model

The research model developed for this thesis represents causal relationships within an observed real-world problem to help analyse collected data. It identifies the focus points to be studied (e.g. constructs, variables, concepts) and presumed correlations. Incorporating the hypotheses proposed in the previous section, the research model is illustrated in Figure 5.2.

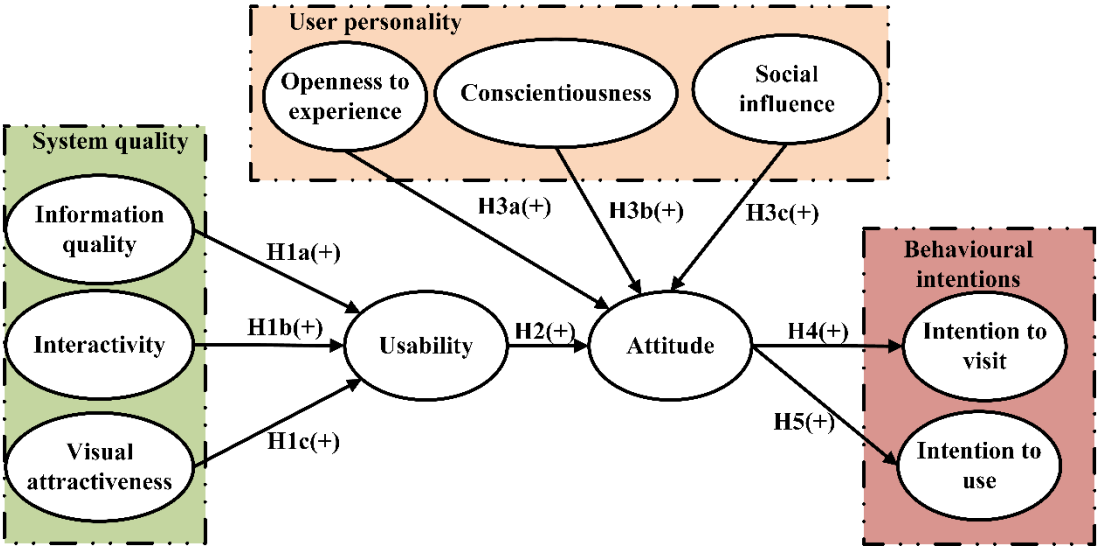


Figure 5.2. Research model.

5.5 Summary

This chapter highlighted the construct identification and theoretical justification as the foundation for predicting a correlation between constructs. Ten constructs are included in the proposed research model: information quality, interactivity, visual attractiveness, openness to experience, conscientiousness, social influence, usability, attitude, intention to use and intention to visit. The model also illustrates the relationship between constructs. The next chapter details the research methodology used to test the research model in the two main studies reported in Chapter 7 and Chapter 8.

Chapter 6. Research Methodology

6.1 Overview

This chapter describes in detail the methodology used for the studies reported in this thesis. The following section focuses on the research paradigm as the research design's foundation, followed by ethical considerations and data collection tool design. Last, the data analysis section explains the statistical techniques selected to test the proposed research model presented in the previous chapter.

6.2 Research approach

Beliefs and assumptions about what are essential determine the way someone makes a decision. This way of thinking is called a paradigm (Guba and Lincoln 1994, 107), but others might call it a worldview (Creswell 2014, 6) or philosophy (Saunders, Lewis and Thornhill 2015, 124). Research might take into account assumptions about human knowledge (epistemological), realities encountered in research (ontological) and the researcher's own values (axiological) (Saunders, Lewis and Thornhill 2015, 124). Therefore, the research philosophy is fundamental to the research methodology, to ensure data are collected effectively and appropriately to strengthen knowledge in a particular area. Saunders, Lewis, and Thornhill (2015, 135) identified five major research philosophies in business and management: positivism, critical realism, interpretivism, postmodernism and pragmatism.

The studies presented in this thesis employed a positivist approach to examine the relationship between perceived quality and personality, and the user's behavioural intention in regard to VR usage in tourism. Positivism sees organisational and other social entities similarly, as actual physical objects and natural phenomena (Saunders, Lewis and Thornhill 2015). The researcher tends to look for causal relationships in the data and produce law-like generalisations akin to those produced by scientists (Gill and Johnson 2002, 40). Positivist researchers usually use existing theories to develop hypotheses, but might also develop hypotheses based on their engagement with the real world, collecting data before testing. This thesis postulates hypotheses based on

the literature and proposes a research model to detail the causal relationships described in Chapter 5 on VR usage in tourism.

The research process involves philosophies, approaches, strategies, methodical choices, time horizons, techniques and procedures that can be drawn as layers (see Figure 6.1). This research can be termed an explanatory study as it explores the causal relationships between variables. The conceptual research framework was initially designed based on existing theories and construction of hypotheses, followed by design of a questionnaire based. The measurement items were adopted from previous studies and adjusted to fit into this study. The collected data require statistical testing of correlations to provide a clearer view of relationships (Saunders, Lewis and Thornhill 2015).

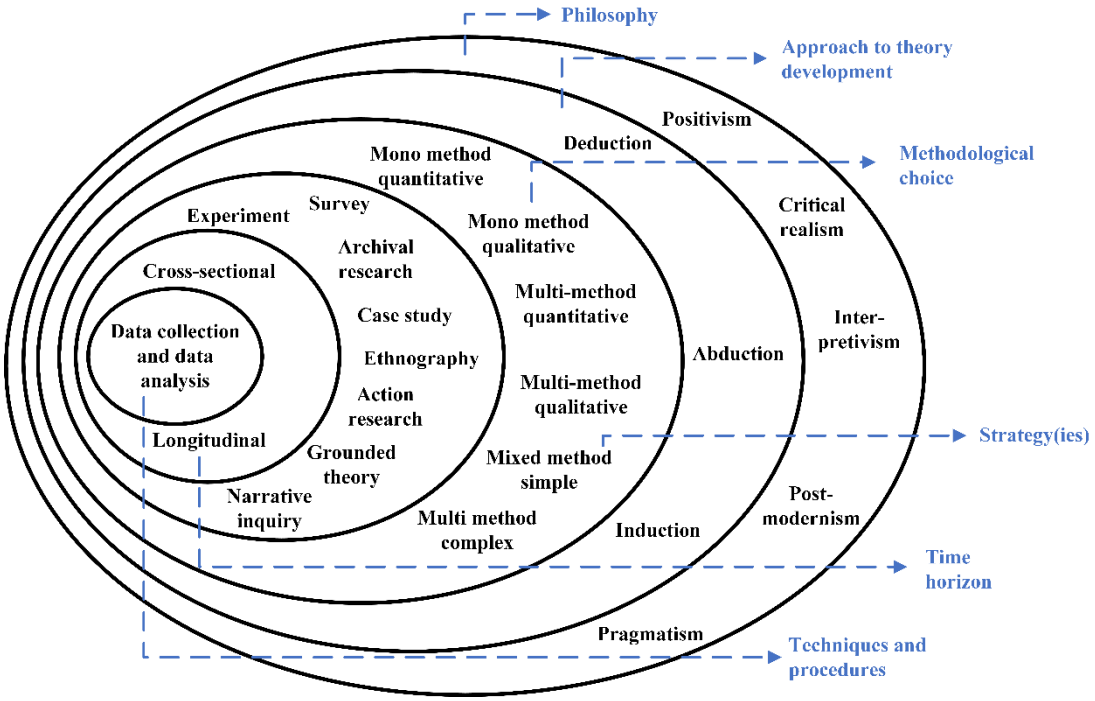


Figure 6.1. The research onion.

Source: Figure reproduced from Saunders, Lewis, and Thornhill (2015, 124) with permission.

Following the research onion developed by Saunders, Lewis, and Thornhill (2015, 124) (see Figure 6.1), this research uses a deductive approach as it begins with a theory developed from reading the academic literature and designs a research methodology to test the theory. The deductive approach begins with the general and narrows to become more specific. It uses data to evaluate hypotheses related to theory falsification

or verification (Saunders, Lewis and Thornhill 2015). The positivist philosophy is related to using a quantitative strategy, such as surveys, to support confirmation of theories (Bryman and Bell 2015). Hence, this thesis uses a quantitative mono method with a questionnaire survey for data collection. Questionnaire measurement instruments can have better reliability and validity if they refer to instruments used and tested in previous studies (Neuman and Robson 2011). A statistical test is then used to evaluate the research instruments, and the results might afford generalisation to a larger population (Creswell 2014). However, a quantitative research strategy cannot explain various detailed perceptions and feelings regarding a phenomenon (Neuman and Robson 2011). This research is categorised as cross-sectional as it provides a snapshot of a phenomenon at a specific time as a sample.

6.3 Ethical considerations

Neuman (2014, 145) defined ethics as what is or is not legitimate to do or what a 'moral' research procedure involves. Research involving humans as participants must satisfy three fundamental ethic principles: (1) respect for persons, (2) beneficence (minimise the harm that might occur during research), and (3) justice (risks of the research are equally distributed and benefits equally enjoyed) (Bošnjak 2001). Therefore, ethics approval was required before starting data collection in this research.

Participants' responses to a questionnaire are considered sensitive information. The data collection process thus followed the *National Statement on Ethical Conduct in Human Research* (National Health and Medical Research Council 2018b), *Australian Code for the Responsible Conduct of Research* (National Health and Medical Research Council 2018a) and *Curtin Human Research Ethics* guidelines. Participants cannot be identified from the collected participant information because sensitive personal information was not collected in the survey. Potential participants who refused to participate were respected and those who did proceed could withdraw at any stage of research. However, data submitted during the survey before the participant decided to withdraw could not be deleted as they are unidentifiable. The data collection analysis was documented in way that was as transparent as possible. Survey approval to collect data around Curtin University was obtained. An ethics application made to the Curtin Human Research Ethics Office was approved (approval number HRE2019-0626; see Appendix B) before data collection. A Participant Information Statement and Consent

Form in both English and Bahasa Indonesia (see Appendix C) were provided via Qualtrics (http://curtin.qualtrics.com/) and could be accessed by a participant before they agreed to participate in the research.

6.4 Questionnaire design

Questionnaires can be used as an instrument in a positivist approach by choosing a structured questionnaire with a deductive approach to generalise data (Saunders, Lewis and Thornhill 2015). A questionnaire is the most popular way to collect data as it provides a quick, economical and reliable way to represent a large population through a small representative dataset. Questions should be considered easy to understand by the respondents, and should avoid words or sentences that put respondents under pressure (Sekaran and Bougie 2016). The length of the questionnaire and number of questions should be limited, as participants might lose concentration or change their mind regarding participation. Any sensitive questions should be placed at the end of the questionnaire (Sekaran and Bougie 2016). Measurement items should use proper scaling to quantify judgment ratings (Banerjee et al. 1999). Lindell (2001) recommended a five-point rating scale since it is easy and quick to complete by respondents (Preston and Colman 2000). Hence, the questionnaire in this research adopted a five-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree) for all measurement items.

All participants completed the questionnaire through Qualtrics (n.d.) since an electronic questionnaire is easy to administer, inexpensive and can be processed automatically (Sekaran and Bougie 2016, 144). The questionnaire in Qualtrics could be accessed anonymously using any computer or smart device via a provided website link or QR code. The measurement items were adopted from previous studies with modifications to fit the study context. Study 1 in Chapter 7 used questionnaire items in Bahasa Indonesia (see Table 6.1) and Study 2 in Chapter 8 used questionnaire items in English (see Table 6.2). The questionnaire items reflect the constructs used in the proposed model, whose definitions were provided in Chapter 5.

Table 6.1. Questionnaire items in Bahasa Indonesia for Study 1.

Construct	Code	Items
Information quality (translated from Lee et al. (2002))	InQual_1	Kedalaman informasi yang diberikan mencukupi kebutuhan saya.
	InQual_2_rev	Jumlah informasi yang diberikan tidak sesuai dengan kebutuhan saya. (R)
	InQual_3	Informasi yang diberikan lengkap.
	InQual_4	Informasi yang diberikan memiliki luas dan kedalaman yang cukup untuk pengetahuan saya.
	InQual_5	Informasi yang diberikan disajikan secara konsisten dengan format yang sama.
	InQual_6_rev	Informasi tidak disajikan secara konsisten. (R)
	InQual_7	Mudah mengartikan maksud dari informasi yang diberikan.
	InQual_8	Informasi yang diberikan mudah dimengerti.
	InQual_9	Informasi yang diberikan mudah dipahami.
Interactivity (adapted and translated from Liu (2003))	Interact_1	Saat menggunakan Virtual Reality, saya dapat memilih dengan bebas apa yang ingin saya lakukan.
	Interact_2_rev	Saat menggunakan Virtual Reality, saya sama sekali tidak memiliki kendali atas apa yang dapat saya lakukan. (R)
	Interact_3	Saat menggunakan Virtual Reality, apa yang saya lakukan menentukan jenis respon yang saya dapatkan.
	Interact_4	Virtual Reality memproses aksi saya dengan sangat cepat.
	Interact_5	Saya dapat memperoleh informasi yang saya inginkan tanpa adanya penundaan/lambat.
	Interact_6	Ketika saya memilih objek, saya merasa mendapatkan informasi secara spontan.
	Interact_7_rev	Virtual reality sangat lambat dalam menanggapi permintaan saya. (R)
Visual attractiveness (adapted and translated from Chung, Han, and Joun (2015))	VisAttr_1	Tujuan wisata seperti yang terlihat melalui aplikasi Virtual Reality secara visual menarik.
	VisAttr_2	Saya merasakan tujuan wisata seperti yang terlihat melalui aplikasi Virtual Reality menekankan detail pada desain.
	VisAttr_3	Lingkungan tujuan wisata seperti yang terlihat melalui aplikasi Virtual Reality

Construct	Code	Items
		menyediakan cara bagi pengguna untuk mudah menggunakannya.
Openness to experience (translated from John, Donahue, and Kentle (1991))	OpenEx_1	Saya melihat diri saya sebagai pribadi yang pandai merancang sesuatu yang sebelumnya tidak ada.
	OpenEx_2	Saya melihat diri saya sebagai pribadi yang nyentrik, memiliki ide-ide baru.
	OpenEx_3	Saya melihat diri saya sebagai pribadi yang memiliki nilai artistik dan estetika.
	OpenEx_4	Saya melihat diri saya sebagai pribadi yang memiliki imajinasi aktif.
	OpenEx_5	Saya melihat diri saya sebagai pribadi yang suka merenung dan bermain dengan ide-ide.
	OpenEx_6	Saya melihat diri saya sebagai pribadi yang canggih dalam seni, musik, atau sastra.
	OpenEx_7	Saya melihat diri saya sebagai pribadi yang cerdas dan pemikir yang mendalam.
	OpenEx_8	Saya melihat diri saya sebagai pribadi yang ingin tahu tentang banyak hal yang berbeda.
	OpenEx_9_rev	Saya melihat diri saya sebagai pribadi yang lebih suka pekerjaan yang rutin. (R)
	OpenEx_10_rev	Saya melihat diri saya sebagai pribadi yang memiliki sedikit minat artistik. (R)
Conscientiousness (translated from John, Donahue, and Kentle (1991))	Consc_1	Saya melihat diri saya sebagai pribadi yang bekerja secara detail.
	Consc_2	Saya melihat diri saya sebagai pribadi yang melakukan pekerjaan secara efisien.
	Consc_3	Saya melihat diri saya sebagai pribadi yang selalu membuat rencana dan bertindak sesuai rencana tersebut.
	Consc_4	Saya melihat diri saya sebagai pribadi yang merupakan pekerja yang dapat diandalkan.
	Consc_5	Saya melihat diri saya sebagai pribadi yang tetap bekerja sampai tugas terselesaikan.
	Consc_6_rev	Saya melihat diri saya sebagai pribadi yang mudah terganggu. (R)
	Consc_7_rev	Saya melihat diri saya sebagai pribadi yang bisa agak ceroboh. (R)

Construct	Code	Items
	Consc_8_rev	Saya melihat diri saya sebagai pribadi yang cenderung malas. (R)
	Consc_9_rev	Saya melihat diri saya sebagai pribadi yang cenderung tidak terorganisir. (R)
Social influence (adapted and translated from See and Goh (2019))	SocInf_1	Saya akan mengunjungi tempat-tempat wisata yang pernah saya dengar dari keluarga/teman/rekan kerja.
	SocInf_2	Saya akan mengunjungi tempat-tempat wisata yang terkenal menurut keluarga/teman/rekan kerja.
	SocInf_3	Saya akan mengunjungi tempat-tempat wisata yang direkomendasikan oleh keluarga/teman/rekan kerja.
	SocInf_4	Saya akan menggunakan/merasakan aplikasi Virtual Reality yang pernah saya dengar dari keluarga/teman/rekan kerja.
	SocInf_5	Saya akan menggunakan/merasakan aplikasi Virtual Reality yang terkenal menurut keluarga/teman/rekan kerja.
	SocInf_6	Saya akan menggunakan/merasakan aplikasi Virtual Reality yang direkomendasikan oleh keluarga/teman/rekan kerja.
Usability (adapted and translated from Brooke (1996))	Usab_1	Saya merasa ingin lebih sering menggunakan Virtual Reality ini.
	Usab_2_rev	Saya merasa Virtual Reality rumit. (R)
	Usab_3	Saya merasa Virtual Reality mudah digunakan.
	Usab_4_rev	Saya merasa membutuhkan bantuan dari orang yang lebih ahli untuk dapat menggunakan Virtual Reality ini. (R)
	Usab_5	Saya merasa berbagai fungsi dalam Virtual Reality ini terintegrasi dengan baik.
	Usab_6_rev	Saya merasa ada terlalu banyak ketidakkonsistenan dalam Virtual Reality ini. (R)
	Usab_7	Kebanyakan orang dapat mempelajari penggunaan Virtual Reality ini dengan cepat.
	Usab_8_rev	Saya merasa Virtual Reality sangat tidak praktis untuk digunakan. (R)
	Usab_9	Saya merasa sangat percaya diri ketika menggunakan Virtual Reality.
	Usab_10_rev	Saya perlu belajar banyak hal sebelum bisa menggunakan Virtual Reality ini. (R)

Construct	Code	Items
Attitude (adapted and translated from Venkatesh et al. (2003))	Att_1	Menggunakan Virtual Reality adalah ide yang bagus.
	Att_2_rev	Menggunakan Virtual Reality adalah ide yang bodoh. (R)
	Att_3	Saya suka ide penggunaan Virtual Reality.
	Att_4_rev	Menggunakan Virtual Reality tidak menyenangkan. (R)
Intention to visit (adapted and translated from Kim, Lee, and Jung (2020))	IntVisit_1	Saya berencana untuk mengunjungi tempat wisata yang saya amati sebelumnya pada Virtual Reality.
	IntVisit_2	Saya berniat mengunjungi tempat wisata yang saya lihat di Virtual Reality dalam waktu dekat ini.
	IntVisit_3	Saya bersedia mengunjungi tempat yang saya lihat dalam kegiatan Virtual Reality dalam waktu dekat ini.
	IntVisit_4	Saya bermaksud mempersiapkan uang dan waktu saya untuk mengunjungi tempat wisata yang saya amati dalam Virtual Reality.
Intention to use (adapted and translated from Chung, Han, and Joun (2015))	IntUse_1	Saya bermaksud menggunakan Virtual Reality lagi untuk mendapatkan informasi mengenai tujuan wisata lainnya di kemudian hari.
	IntUse_2	Saya memperkirakan akan menggunakan Virtual Reality lagi untuk mendapatkan informasi tentang tujuan wisata lainnya di kemudian hari.
	IntUse_3	Saya berencana untuk menggunakan Virtual Reality lagi untuk mendapatkan informasi mengenai tujuan wisata lainnya di kemudian hari.

Note: (R) indicates reversed items.

Table 6.2. Questionnaire items in English for Study 2.

Construct	Code	Items
Information quality (adapted from Lee et al. (2002))	InQual_1	The information provided by the VR website is sufficient volume for my need.
	InQual_2	The amount of information provided by the VR website matches my need.
	InQual_3	The amount of information provided by the VR website is not sufficient for my need. (R)
	InQual_4	The amount of information provided by the VR website is neither too much nor too little.
	InQual_5	The information provided by the VR website is easy to understand.
	InQual_6	The meaning of the information provided by the VR website is difficult to understand. (R)
	InQual_7	The information provided by the VR website is easy to comprehend.
	InQual_8	The meaning of the information provided by the VR website is easy to understand.
Interactivity (adapted from Liu (2003))	Interact_1	I felt that I had a lot of control over my visiting experiences at the VR website.
	Interact_2	While I was on the VR website, I could freely choose what I wanted to.
	Interact_3	While surfing the VR website, I had no control over what I can do on the site. (R)
	Interact_4	While surfing the VR website, my actions decided on the kind of experiences I got.
Visual attractiveness (adapted from Chung, Han, and Joun (2015))	VisAttr_1	The environment of the tourism destination, as seen through the VR website, is quite attractive.
	VisAttr_2	The tourism destination, as seen through the VR website, is quite visually appealing.
	VisAttr_3	I felt the tourism destination, as seen through the VR website, shows attention to design detail.
	VisAttr_4	The tourism destination view, as seen through the VR website, provide a way for users to easily experience it
Openness to experience (John, Donahue and Kentle 1991)	OpenEx_1	I see myself as someone inventive.
	OpenEx_2	I see myself as someone original, always comes up with new ideas.
	OpenEx_3	I see myself as someone who has values artistic and aesthetic experiences.
	OpenEx_4	I see myself as someone who has an active imagination.

Construct	Code	Items
	OpenEx_5	I see myself as someone who likes to reflect and play with ideas.
	OpenEx_6	I see myself as someone sophisticated in art, music, or literature.
	OpenEx_7	I see myself as someone who is ingenious and a deep thinker.
	OpenEx_8	I see myself as someone curious about many different things.
	OpenEx_9	I see myself as someone who prefers work that is routine. (R)
	OpenEx_10	I see myself as someone who has few artistic interests. (R)
Conscientiousness (John, Donahue and Kentle 1991)	Consc_1	I see myself as someone who works in detail.
	Consc_2	I see myself as someone who does things efficiently.
	Consc_3	I see myself as someone who makes plans and follows through with them.
	Consc_4	I see myself as someone who is a reliable worker.
	Consc_5	I see myself as someone who keeps working until the task finish.
	Consc_6	I see myself as someone who is easily distracted. (R)
	Consc_7	I see myself as someone who can be somewhat careless. (R)
	Consc_8	I see myself as someone who tends to be lazy. (R)
	Consc_9	I see myself as someone who tends to be disorganized. (R)
Social influence (adapted from See and Goh (2019))	SocInf_1	I would like to visit any tourism destination that I have heard about from the people I know (e.g., family/friends/co-workers).
	SocInf_2	I would like to visit any tourism destination that are popular among the people I know (e.g., family/friends/co-workers).
	SocInf_3	I would like to visit any tourism destination that has been recommended by the people I know (e.g., family/friends/co-workers).
	SocInf_4	I would like to experience any tourism destination VR website that I have heard about from the people I know (e.g., family/friends/co-workers).
	SocInf_5	I would like to experience any tourism destination VR website that are popular

Construct	Code	Items
		among the people I know (e.g., family/friends/co-workers).
	SocInf_6	I would like to experience any tourism destination VR website that has been recommended by the people I know (e.g., family/friends/co-workers).
Usability (adapted from Brooke (1996))	Usab_1	I found the VR website unnecessarily complex. (R)
	Usab_2	I thought the VR website was easy to use.
	Usab_3	I think that I would need the support of a technical person to be able to use this VR website. (R)
	Usab_4	I found the various functions in the VR website were well integrated.
	Usab_5	I thought there was too much inconsistency on the VR website. (R)
	Usab_6	I would imagine that most people would learn to use this VR website very quickly.
	Usab_7	I found the VR website very cumbersome to use. (R)
	Usab_8	I felt very confident using the system.
	Usab_9	I needed to learn a lot of things before I could get going with the VR website. (R)
Attitude (adapted from Venkatesh et al. (2003))	Att_1	Using the VR website is a good idea.
	Att_2	Using the VR website is a foolish idea. (R)
	Att_3	I like the idea of using the VR website.
	Att_4	Using the VR website is pleasant.
Intention to visit (adapted from Kim, Lee, and Jung (2020))	IntVisit_1	I am planning to visit the place that I observed on the VR website one day.
	IntVisit_2	I intend to visit the place that I saw on the VR website in the near future.
	IntVisit_3	I am willing to visit the place that I saw on the VR website soon.
	IntVisit_4	I intend to invest money and time to visit the place that I observed on the VR website.
Intention to use (adapted from Chung, Han, and Joun (2015))	IntUse_1	I intend to use the VR website to get information about tourism destinations in the future.
	IntUse_2	I predict I would use the VR website for getting information about tourism destinations in the future.
	IntUse_3	I plan to use the VR website to get information about tourism destination in the future.

Note: (R) indicates reversed items.

6.5 Methods of data analysis

6.5.1 Data screening

Before starting data analysis, collected data need to go through a data cleaning process to eliminate unwanted responses. These include blank responses, missing values and unengaged responses. This step is essential to prepare the data before further statistical analysis and ensure they are valid for conceptual theory testing. Unwanted responses were dealt with as follows:

Blank responses. As the participant could quit the questionnaire any time, and might not skip questionnaire items, blank responses are possible. A blank response is a record with more than 10% missing values for a particular respondent. It needs to be removed to avoid statistical analysis bias (Bennett 2001) and ensure data quality. Microsoft Excel was used to identify blank responses by calculating the percentage of missing values for each response. Any row of data with more than 10% blank responses was eliminated.

Unengaged responses. Another possible source of undesirable data is unengaged responses. Participants might not be interested in completing the survey and may provide the same responses to most questionnaire items. The standard deviation feature in Microsoft Excel was used to identify unengaged responses. If any response had a standard deviation value of 0, it was not considered valid, and responses with a standard deviation less than 0.5 were marked as problem data (Gaskin 2016b). Responses that fell into these two categories were also removed.

Missing values. The studies used SEM to test causal relationships. Although SPSS software can handle the missing values problem, the AMOS software used for SEM cannot be run if there are missing values (Gaskin 2016a). Further, any missing data can lead to unreliable results and potentially biased conclusions in empirical research (Horton and Kleinman 2007). Missing values required data imputation using mean or median replacement implemented in SPSS.

6.5.2 Multivariate analysis

The next step after data screening is to evaluate the measurement items. Exploratory factor analysis (EFA) is a statistical approach used to identify correlations between variables. As all constructs are considered reflective constructs, measurement models are assessed on their one-dimensionality, sample adequacy, convergent validity and discriminant validity (Urbach and Ahlemann 2010; Hair et al. 2014). The analysis in this thesis employed IBM SPSS Statistic ver. 26 software to perform EFA. EFA mainly predicts unexplored relationships between variables based on prior knowledge (Hair et al. 2014). In this thesis, EFA prepared the variables to support analysis with SEM. The next step after EFA was CFA, which focuses on ensuring how well the measurement items represent the constructs (Hair et al. 2014). It includes validity and reliability tests that ensure model fit. The CFA was analysed using IBM SPSS AMOS ver. 26 to achieve convergent validity, determinant validity and model fit.

Common method bias (CMB) might be problematic in research related to behaviour (Podsakoff et al. 2003). Employing a single method (e.g. online survey) to measure an observed relationship might influence responses provided, by either inflating or deflating them. It is preferable to test the existence of CMB via several test options. CMB tests include Harman's single-factor test, specific biases using marker variables, correlations between latent factors and variable inflation factors. Each study in this thesis used different tests to detect CMB before moving on to SEM analysis.

6.5.3 Structural equation modelling (SEM)

SEM model includes two components: measurement and structural model (Urbach and Ahlemann 2010). A measurement model expresses the association between latent variables, while a structural model specifies the relationships among latent variables (Henseler, Hubona and Ray 2016). The analysis in this thesis used covariance-based SEM via IBM SPSS AMOS ver. 26 software to test the proposed research model. SEM is a suitable statistical methodology that takes a hypothesis testing approach to test a causal process based on existing theories (Kline 2015, 10; Byrne 2016, 3). SEM requires a large sample size; there is no rule of thumb regarding what is considered 'large enough' (Kline 2015; Wolf et al. 2013). Jackson (2003, 129) suggested that the minimum sample size for use with most SEM computer tools could employ the ideal

sample size ratio, N:q = 20:1, where N refers to the number of cases, and q refers to the number of model parameters. The median sample size from several studies is 200 cases, although this might be considered too few when analysing a complex model ((Kline 2015, 16). Therefore, a minimum of 200 participants was required for each of the studies reported in this thesis.

6.6 Summary

This chapter detailed the research methodology used in the empirical studies in this thesis. The nature of the studies is quantitative. A questionnaire was used as a data collection tool. Measurement items were adopted from previous studies with little justification to fit the context of the study. The electronic questionnaire was used to collect data from participants and was administered via the Qualtrics system. There were four steps in the data analysis phase. First, the data were screened to eliminate blank responses, unengaged responses and missing data. Unqualified responses were eliminated, and data imputation conducted for missing values. Second, EFA was performed to ensure that the measurement items load into the appropriate factor. Third, CFA was conducted to confirm how well the measurement items represent the construct. Finally, hypotheses were tested using SEM as causal relationship analysis. The following two chapters discuss the main studies of this thesis.

Chapter 7. Study 1—Virtual Reality at a Prehistoric Museum: Exploring the Influence of System Quality and User Personality on the Behavioural Intention

7.1 Overview

This chapter details the first main study included in this thesis. The study aimed to validate the research model in Chapter 5 and followed the research methodology described in Chapter 6. The study utilised computer-generated content about the Sangiran Museum in Surakarta, Indonesia. This VR environment is experienced using a VR HMD. The sample population was visitors at an expo in Surakarta who were 18 years of age or older. The chapter covers the data collection, data analysis and discussion stemming from the findings of the study.

7.2 Study design

This study applied a quantitative research design using a survey questionnaire for data collection. Data collection occurred in September 2019 (prior to the onset of the COVID-19 global pandemic) at the expo in Surakarta. The VR used for data collection in the study related to a prehistoric museum, Sangiran Museum (see Figure 7.1), located in Surakarta. The devices used for data collection were a VR HMD called BoboVR X1 (see Figure 7.2) and a joystick for navigation. BoboVR is a standalone VR HMD since it has a built-in computing processor. Potential participants were approached randomly and asked if they were willing to participate in the study. The participants were required to be 18 years or older. Each participant was asked to experience the VR using the VR HMD and obtain information within the VR environment as many as they could for a maximum of 5 minutes (see Figure 7.3). Afterwards, they were asked to complete a questionnaire based on their feelings during the VR experience. The survey could be completed using a tablet PC or laptop provided, or the participant's device via a QR code.

Appendix D provides a snapshot of the questionnaire administered on Qualtrics used in this study. The items were measured using five-point Likert scales ranging from 1

‘strongly disagree’ to 5 ‘strongly agree’. The questionnaire included a set of questions aimed to collect the demographic profile of participants. Some items were reversed statements to ensure that participants were engaged with the questionnaire. As this study was conducted in Indonesia, the questionnaire was translated into Bahasa Indonesia by a member of this research team who is a native speaker, to ensure that the measurement items had a similar meaning to the original English language version. The initial questionnaire was pilot tested with several experts, and some minor changes were made based on their feedback, to improve the questionnaire. A total of 276 participants completed the questionnaire.

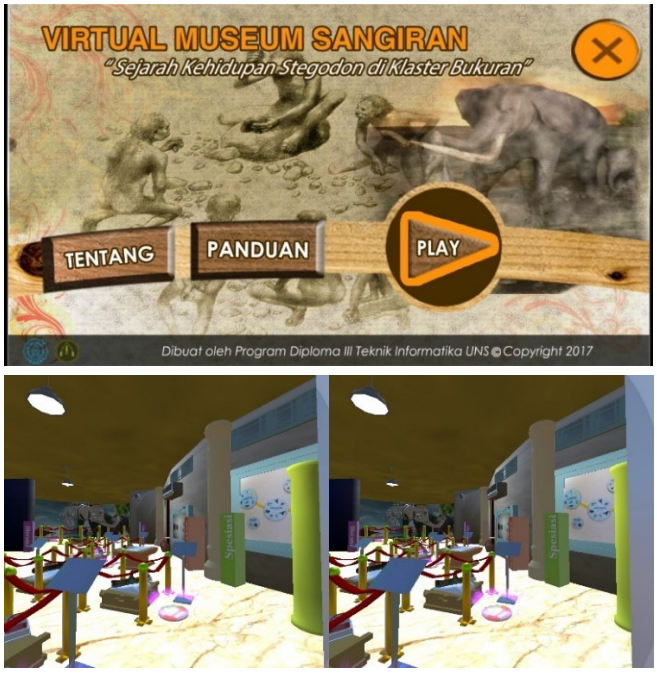


Figure 7.1. Sangiran museum VR app.

Figure 7.2. VR HMD for data collection.

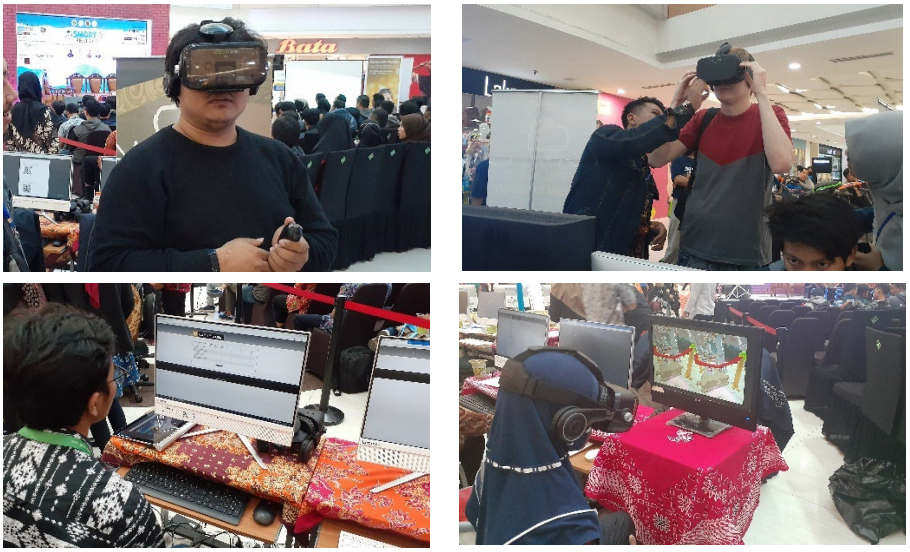


Figure 7.3. Data collection at an Expo in Surakarta.

7.3 Data screening

Prior to conducting data analysis, data screening was implemented to identify missing data and any less-than-fully-engaged participants, to improve data quality. First, any record with more than 10% missing values were excluded to avoid any bias in the statistical analysis (Bennett 2001) and because this study used SEM with AMOS, which unable to handle missing data (Gaskin 2016a). Second, any record with a standard deviation of less than 0.50 was also excluded as this indicates an unengaged response (Gaskin 2016b). This process resulted in a usable sample of 218 valid responses out of 276 total responses collected.

7.4 Analysis and results

Complete analysis results for this study are detailed in Appendix E. Of the respondents, 64.7% were male and 35.3% were female. Most participants (78.0%) were aged 18–25 years. A total of 138 participants (36.7%) had previous experience with VR. This is summarised in Table 7-1. Data normality was confirmed, with all variables' skewness values outside the ± 2 range (Sposito, Hand and Skarpness 1983) and no kurtosis values considered problematic (± 10 as defined by Kline (2015, 77)). This study utilised the SEM approach to test the research model (see Figure 5.2). SEM is a statistical methodology that takes a hypothesis testing approach to test a causal process based on prior theory (Kline 2015, 10; Byrne 2016, 3). A model represents theory as related constructs measured using observed construct items (Hayduk et al. 2007).

Table 7.1. Background profile of participants.

Characteristic	Frequency $n = 218$	%
Gender		
Male	141	64.7
Female	77	35.3
Age (years)		
18–25	170	78.0
26–35	32	14.7
36–45	12	5.5
46–55	3	1.4
56–64	0	0.0
65 or older	1	0.5
Occupation		
Employed	72	33.0
Unemployed	22	10.1
Retired	1	0.5
Student	121	55.5
Housewife/husband	2	0.9
Highest education		
Primary school	8	3.7
Secondary school	46	21.1
Vocational school	100	45.9
Bachelor degree	57	26.1
Postgraduate degree	6	2.8
Doctoral degree	1	0.5
Previous experience with VR		
Yes	138	63.3
No	80	36.7

When applying SEM, the relationship between latent variables and their measures are tested for validity and reliability before analysing the structural model to test relationships among the latent variables (Hair et al. 2014). Therefore, EFA and CFA were performed prior to hypotheses testing using a structural model. The data were analysed using IBM SPSS Statistics ver. 26 for EFA. The hypotheses were then tested using covariance-based SEM utilising IBM SPSS AMOS ver. 26 for CFA.

The mean level of the constructs was higher than neutral value. Nine constructs had an average of 3–4, while attitude had a mean value higher than 4. This suggests that respondents generally had a positive attitude towards using VR (4.2/5). Moreover, usability was slightly above neutral (3.3/5), suggesting that respondents believed that the VR was easy to use and useful. These findings are summarised in Figure 7.4 and Table 7.2.

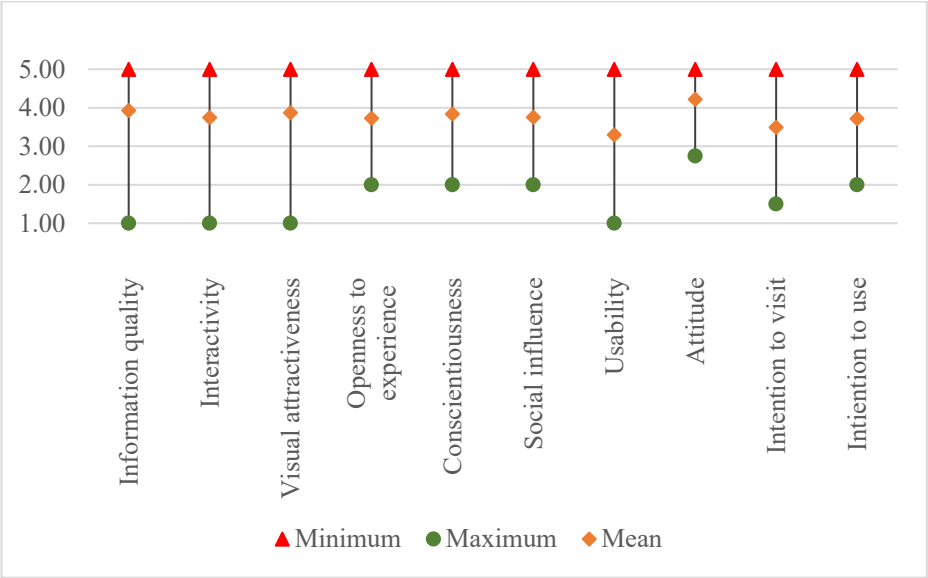


Figure 7.4. User responses variation

Table 7.2. Descriptive statistics.

Construct	Minimum	Maximum	Mean	Standard deviation	Composite reliability
Information quality	1.00	5.00	3.93	0.50	0.90
Interactivity	1.00	5.00	3.75	0.52	0.81
Visual attractiveness	1.00	5.00	3.87	0.54	0.84
Openness to experience	2.00	5.00	3.73	0.53	0.88
Conscientiousness	2.00	5.00	3.84	0.47	0.82
Social influence	2.00	5.00	3.76	0.66	0.99
Usability	1.00	5.00	3.30	0.71	0.75
Attitude	2.75	5.00	4.22	0.57	0.81
Intention to visit	1.50	5.00	3.50	0.73	0.93
Intention to use	2.00	5.00	3.72	0.70	0.98

7.4.1 Exploratory factor analysis

EFA was conducted with principal component analysis extraction and the Promax rotation method. The analysis indicated 10 factors after excluding items that did not load sufficiently. The Kaiser–Meyer–Olkin (KMO) and Bartlett's test for sampling adequacy were significant, with values higher than 0.50 (KMO = 0.80, p = 0.000), indicating the data were appropriate for further analysis (Hair et al. 2014, 102). Another indication of sample adequacy was the extracted communalities for items, all of which were higher than 0.50 (Hair et al. 2014, 117). Ten factors were recognised at this stage, with eigenvalues >1 and explaining 72.5% of the total variance. The factors also demonstrated both convergent and discriminant validity, with no strong cross-loading between items (>0.3), and average factor loadings of more than 0.70 in the pattern matrix (Hair et al. 2014). Reliability is the last validation criterion for an EFA. Cronbach's α for each factor was larger than the minimum value of 0.70, indicating good reliability (Hair et al. 2014).

7.4.2 Confirmatory factor analysis

The next analysis step involved conducting CFA to confirm the extracted factor structure of the EFA. To ensure quality criteria were met for validity and reliability, one item was dropped as its loading value was less than 0.50 (Hair et al. 2014). Convergent validity was assessed using average variance extracted (AVE) and composite reliability (CR) values, while discriminant validity was assessed using the Fornell–Larcker criterion (Fornell and Larcker 1981) and heterotrait-monotrait (HTMT) ratio (Henseler, Ringle and Sarstedt 2015). The AVE should be more than 0.50, and the CR greater than 0.70 to satisfy convergent validity (Hair et al. 2014). This study used plugins for AMOS (Gaskin, James and Lim 2019) to calculate these values. Although two factors had AVE slightly less than 0.50, the convergent validity was considered adequate based on CR alone as AVE is more stringent than CR (Malhotra and Dash 2016). Discriminant validity was established by assessing the Fornell–Larcker criterion, which revealed that each construct's AVE square root was greater than its correlations with other constructs (Hair et al. 2014).

Moreover, the results of a HTMT analysis supported discriminant validity. The shared HTMT value was below the recommended threshold of 0.90 (Henseler, Ringle and

Sarstedt 2015). Finally, the results indicated that the CFA model's 10 factors had a goodness of fit (χ^2/df = 1.91, Comparative Fit Index [CFI] = 0.91, standardised root mean square residual [SRMR] = 0.05, root mean square error of approximation [RMSEA] = 0.07) within acceptable limits (Hair et al. 2014, 605).

Before evaluating the model, two CMB tests were applied to determine if method bias was a potential concern for inflating or deflating the relationships between observed variables. All measurement items were collected simultaneously from respondents, providing a potential source of CMB (Podsakoff et al. 2003). CMB was assessed using two methods. First, a Harman's one-factor test provided a value of 27.2%; as this is less than 50% (Harman 1976, 129), it suggests that the data were not affected by CMB. Second, the variable inflation factor was calculated, with all values being less than the threshold value of 3.3 defined by Kock (2015), again indicating that the model was free from method bias.

7.4.3 Structural model and hypothesis testing

After completion of the CFA, the analysis continued with specifying and examining the causal model. The structural model results are provided in Figure 7.5, including the path coefficients and their significance. The fit indices for the structural model (χ2/df = 1.93, CFI = 0.90, SRMR = 0.07, RMSEA = 0.06) indicated a good model fit (Hair et al. 2014). H1a and H1b were not supported: although information quality was positively associated with usability the relationship was not significant (β = 0.15, $p > 0.05$). Further, interactivity and usability were inversely related but this also was not significant ($\beta = -0.21$, $p > 0.05$). The relationship between visual attractiveness and usability was positive and statistically significant ($\beta = 0.38$, $p < 0.001$), supporting H1c. The results showed that 14% of the variation in usability was accounted by its predictors.

Further analysis showed that usability positively influenced user attitudes, providing support for H2 ($\beta = 0.36$, $p < 0.001$). Additionally, 39% of the variation in attitude was explained by its predictors. As predicted by H3a and H3c, both openness to experience ($\beta = 0.23$, $p < 0.05$) and social influence ($\beta = 0.25$, $p < 0.001$) had a significant positive effect on attitude. However, H3b was not supported, indicating that conscientiousness was not significantly correlated to attitude regarding use of the VR ($\beta = 0.08$, $p > 0.05$).

The direct effect of the paths from attitude to intention to visit ($\beta = 0.21$, $p < 0.01$) and intention to use ($\beta = 0.36$, $p < 0.01$) was positive and significant, supporting H4 and H5, respectively. Finally, 33% of the variation in intention to visit was accounted by its predictors. At the same time, 53% of the variation in intention to use was accounted for by its predictor.

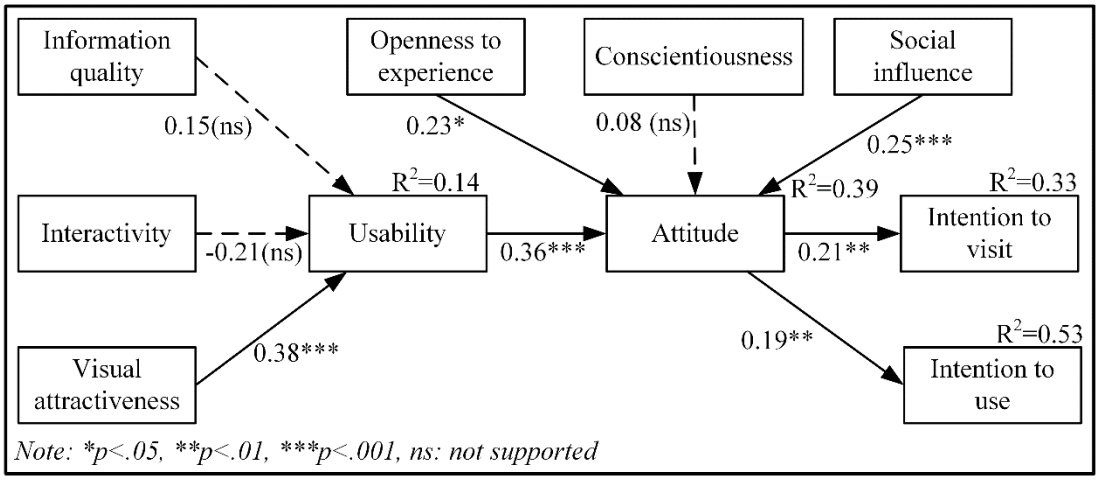


Figure 7.5. Study 1 structural model result.

7.4.4 Indirect effect analysis

The SEM analysis results revealed no significant relationship between visual attractiveness and usability, interactivity and usability, or conscientiousness and attitude. The indirect effect between those paths was analysed using mediation analysis to support the results. Mediation analysis identifies a causal chain where an independent variable affects a mediation variable, which influences the dependent variable. There can be one or more mediation variables. A bootstrapping approach (Preacher and Hayes 2008) was used to assess the mediation effect via the AMOS plugin (Gaskin, James and Lim 2020). The analysis revealed that the indirect effect of information quality, through usability and attitude to the intention to visit, was statistically significant ($B = 0.041$ $p < 0.001$). However, the indirect path from information quality to the intention to use was not significant ($B = 0.015$, $p > 0.05$). Conversely, the indirect effect of interactivity through usability and attitude to intention to visit ($B = -0.022$ $p < 0.05$) and intention to use ($B = -0.018$ $p < 0.05$) was significantly negative. In line with the SEM results, the indirect effect analysis from conscientiousness to intention to visit and intention to use through attitude were not significant. Full results are shown in Table 7.3.

Table 7.3. Indirect effect analysis.

Indirect path	Unstandardized estimate	*p*
InQual --> Usab --> Att --> IntVisit	0.041**	0.005
InQual --> Usab --> Att --> IntUse	0.015	0.137
Interact --> Usab --> Att --> IntVisit	-0.022*	0.048
Interact --> Usab --> Att --> IntUse	-0.018*	0.047
Consc --> Att --> IntVisit	0.030	0.254
Consc --> Att --> IntUse	0.025	0.341

*Note: *p < 0.05, **p < 0.01, ***p < 0.001.*

7.5 Discussion

This study found that only visual attractiveness (from the system quality perspective) affects usability. Another important finding was that openness to experience and social influence are two factors from the user's personality that influence the user's attitude towards using VR. The results also support the claim that the user's attitude towards VR influences their behavioural intention. Seven (out of 9) hypotheses in this study were supported by the results. This study argues that system quality (information quality, interactivity and visual attractiveness) influences usability. Usability consists of usefulness, ease of use and satisfaction (Lund 2001).

The study found that visual attractiveness has a strong and positive influence on usability. This result is in line with those of previous studies on virtual worlds (Verhagen et al. 2012), AR (Chung et al. 2018) and learning management systems (Ghapanchi et al. 2020). If the user feels the VR has sufficient visual aesthetics, this can ultimately influence VR usage. This supports the finding in previous studies that visual attractiveness is a crucial factor in enhancing the overall tourism experience (Mehmetoglu and Engen 2011; Oh, Fiore and Jeoung 2007). In addition, Dehghani et al. (2021) stated that their study participants identified visual appearance as one of the main concerns when using VR. Modern VR technology uses 360° panorama images or video to represent the actual destination as realistically as possible, relative to a computer-generated virtual environment.

Information quality showed a positive effect on usability, although it was not statistically significant. This result suggests that information quality is not significantly related to usability. This unexpected result is in contrast with the finding by Shatnawi and Algharabat (2018) that information quality has a positive influence on usability in

a website usage context. Further, the authors stated that information quality was the most significant factor predicting usability. A viable explanation for the insignificant relationship between information quality and usability in this study might be the volume of information or the way it was presented. Typically, websites contain rich information—primarily textual in nature. VR, however, emphasises viewing the virtual environment rather than finding specific information. Users might have a preference for either sound, visual or textual media when performing information-seeking tasks, and in website studies may associate these factors with information quality. In contrast, in the VR environment, users have a more consistent experience that is heavily geared towards visual imagery. As such, these dimensions of information quality may not be directly comparable with previous studies. Further, the mean levels of information quality in this study were high (3.93/5), and such a generally high construct value may have attenuated the correlations examined in the model testing (Jöreskog 1970). These findings highlight the need for future work to be contextualised in the VR environment, and for future studies to consider a wider range of experimental materials to better understand the role of user perceptions. The purpose of VR usage should also be considered. VR as a promotional tool might focus on addressing user's expectations regarding why they need to visit the destination, how to get there or when is the right time to visit the destination. This might be different for VR as a learning tool or part of an actual visitation, which might focus on each specific virtual object. Whether information is being presented in textual, visual or sound media, its delivery must be straightforward and sufficient to meet user's needs.

This study also provided no support for the hypothesised relationship between interactivity within the virtual environment, and usability. This contradicts previous studies on website (Lowry et al. 2006) and mobile Internet-based health service (Gu et al. 2018) usage. Once again, one possible explanation for this result is the differing levels of interactivity observed among studies. Websites are typically low in interactivity compared with a VR experience. Therefore, if this study had a wider range of materials, including fewer interactive ones (e.g. a simple website), a fuller comparison could have been made. It is also possible that since users are accustomed to low interactivity (and were primed for this as they accessed the experimental materials via the web), they may have felt overloaded, and their experience may not have been positively influenced by the extra information. This is a promising area for

ongoing research as it raises the question of whether it is possible for a system to have *too much* realism and interactivity. Results might also be different if the user goals were directly aligned with interactivity; for instance, if they were using VR as a learning tool, or as a replacement for physical travel. The more users engage in an activity, the more the users interact with the virtual environment by avoiding unnecessary information (Fang and Huang 2021).

The significant positive correlation between openness to experience and attitude revealed in this study contrasts with findings of previous study (Gossman 2014). This study's result was expected as an individual who tends to score high on openness to experience is likely to be more open minded and willing to try new things.

Several studies (Rana et al. 2016; Unnikrishnan and Jagannathan 2017; AlSaleh and Thakur 2019; Altalhi 2020; Vahdat et al. 2020; Zhu and Chang 2014; Choi et al. 2014) also reported a significant positive correlation between social influence and attitude towards using VR. A possible explanation for the current study's finding lies in the fact that the study took place in Indonesia, which is a highly collectivist culture in which individuals integrate into a solid and cohesive group to possess a strong group bond consciousness (Hofstede 2001).

This study was unable to demonstrate a significant relationship between conscientiousness and attitude, despite the positive direction of the correlation. This might be because highly conscientious individuals have the same general attitude towards using VR as the rest of the study population. However, it was anticipated that individuals with a high score on conscientiousness might plan their tourism trips as they are more organised about achieving goals (Hogan et al. 1997). The result is in contrast with the finding in a study by Zhang, Wu, and Rasheed (2020) of a statistically significant positive relationship between conscientiousness and attitude in smartphone recycling intention context. A significant negative relationship was reported in a study by Chua and Chua (2017) on SNS usage. This is understandable as highly conscientious individuals tend to avoid using social media, to avoid distraction. The mixed findings from previous work once again highlight that both studies and findings must be contextualised to a specific environment and may not be easily generalisable to a new interaction medium such as VR. This study therefore sets the scene for further

investigations and ongoing research to fully understand the implications of this growing area of technology.

This study also confirmed the significant causal relationship between usability and attitude. A positive relationship is consistent with previous studies' findings (Saad and Daud 2020; Phan and Pilík 2018).

This study also assumed that users' attitudes towards VR tourism would influence their intention to use VR and to visit a tourism destination. The findings agree with those of previous studies showing evidence for a significant positive relationship between the user's attitude and both intention to use (Shin 2009; Ismail and Razak 2011; Chung, Han and Joun 2015; Ramos-de-Luna, Montoro-Ríos and Liébana-Cabanillas 2016; French 2017; Kasilingam 2020) and intention to visit (Chung, Han and Joun 2015).

7.6 Summary

The findings of this study illuminate each constructs relationship investigation within the research model. This study used a VR HMD with computer-generated content. The results reveal that only the visual presentation of the tourism destination in a VR system significantly influenced the user's behavioural intention. Two other system quality dimensions did not significantly influence usability. Although the study findings show that the user's openness to experience and social influence was correlated with behavioural intention, this study found no evidence to support a correlation between conscientiousness and the attitude to use VR. Indirect effect analysis showed that information quality indirectly affected the intention to visit through usability and attitude. At the same time, there was no indirect effect of information quality on intention to use.

Interestingly, interactivity had an indirect effect on both behavioural intention constructs. Conscientiousness had no indirect effect on behavioural intention. The results indicate that visual representation in a VR environment is the central aspect on which the VR developers need to focus. However, there is a risk that if VR developers do not develop high-quality VR content, users might abandon VR technology. This would threaten both VR applications and the tourism industry. The next chapter discusses hypothesis testing following the same research methodology but with a different VR content and population sample.

Chapter 8. Study 2—Virtual Reality and Tourism: Effects of System Quality and User Personality on Behavioural Intention

8.1 Overview

This chapter presents the second study of this thesis, which used the same research model as Study 1 (Chapter 7). Initially, the research plan was to replicate the first study but with a different population sample. However, in response to restrictions applied in relation to the COVID-19 global pandemic this plan was adjusted. With lockdowns and physical distancing measures, it was infeasible to ask respondents to use a shared VR headset. Therefore, the environment was adjusted. Study 2 employed a VR website that users could experience using their own device (i.e. desktop computer, laptop, smartphone or tablet PC) and from their own home, unlike Study 1, which employed a VR HMD. Second, the participants were recruited through invitations via social media groups. The data analysis stage however was conducted in line with Study 1, and included data screening, EFA, CFA and hypothesis testing using the SEM approach. This revised study approach and online data collection had an additional benefit of enabling the collection of a larger sample of data than would have been otherwise possible.

8.2 Study design

This study was quantitative in nature. The approach to testing the research model involved designing a questionnaire that used Qualtrics software (Qualtrics n.d.) as a tool for data collection. Recent technology enables the researcher to administer online surveys in an efficient and fast manner (Toepoel 2017). The data were collected online by distributing the questionnaire through social media groups via snowball sampling. As the data analysis used SEM, the minimum sample size suggested was based on an $N{:}q = 20{:}1$ ratio (Jackson 2003), where N is the number of cases/respondents, and q is the number of variables. As there are 10 variables in the proposed model, the minimum desired sample size was 200 participants. Participants had to be at least 18 years old to participate in the study. The period of data collection was February–March 2021.

The questionnaire consisted of three sections. In the first part, participants were asked to experience a 360° virtual reality-based website and obtain information within the VR as many as possible for approximately 5 minutes. Each participant explored two tourism destinations, namely Mehu Tomb in Egypt (Matterport 2020b) and Batu Villa in British Virgin Islands (Matterport 2020a). Those 360° VR websites can be viewed through a computer, smartphone or VR headset. For the second part of the questionnaire, the participants completed the survey by choosing answers based on their experience while accessing the VR website. As well as the main construct items, the questionnaire also included social desirability items (Crowne and Marlowe 1960) (see

Table 8.1) as a marker to detect method bias. Finally, in the last part of the questionnaire, the participant completed questions related to their personal social background.

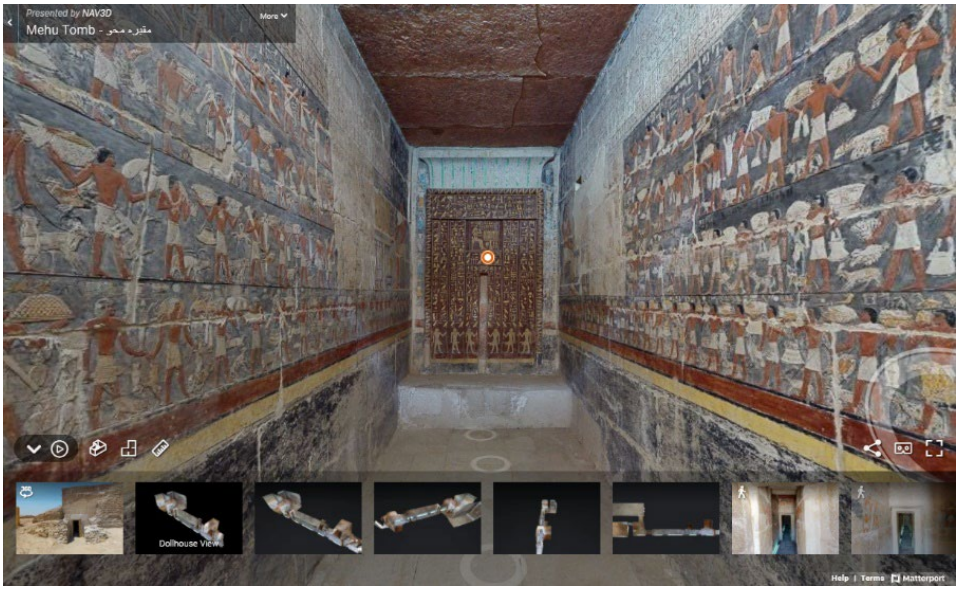


Figure 8.1. The Mehu Tomb virtual reality website.
Source*: Figure reproduced from Matterport (2020b)*

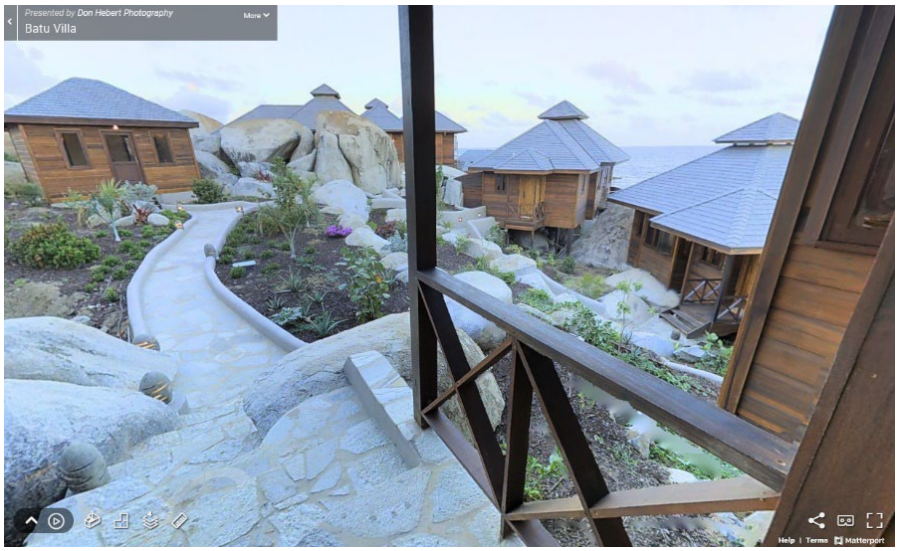


Figure 8.2. The Batu Villa virtual website.
Source*: Figure reproduced from Matterport (2020a)*

Table 8.1. Social desirability items for common method bias

Code	Item
SocDes_1	I'm always willing to admit it when I make a mistake.
SocDes_2	I always try to practice what I preach.
SocDes_3	I never resent being asked to return a favour.
SocDes_4	I have never deliberately said something that hurt someone's feelings.
SocDes_5	I like to gossip at times.
SocDes_6	There have been occasions when I took advantage of someone.
SocDes_7	I sometimes try to get even, rather than forgive and forget.
SocDes_8	At times I have really insisted on having things my own way.

Each construct in the proposed model was measured using measurement items adapted from previous studies. Most statements were reworded slightly to adjust to the context of the study. All used a five-point Likert scale from 1 'strongly disagree' to 5 'strongly agree'. For example, "Using the system is a good idea" (Venkatesh et al. 2003) was reworded to "Using the VR website is a good idea". One measurement item for information quality which originally "The amount of information is neither too much nor too little" (Lee et al. 2002) was reworded to "The amount of information provided by the VR website is neither too much nor too little". Another example is "I intend to visit the place that I saw in the tourism-related VR activity in near future" (Kim, Lee and Jung 2020) was reworded to "I intend to visit the place that I saw on the VR website in the near future". Appendix D provides a list of the measurement items with their references. Demographic profile questions covered the participant's age, education, employment and previous VR experience. The questionnaire was delivered

in English, following a pilot study involving several experts whose feedback improved the questionnaire. A total of 848 responses were collected during this stage.

8.3 Data screening

The collected responses went through a data screening phase to improve data quality before moving to the analysis phase. No missing data were identified. As some measurement items used reverse wording, the mean absolute difference was applied with a threshold of less than 1.47 to remove responses showing insufficient effort (Steedle 2018; Hong, Steedle and Cheng 2020); one indicator of this is that respondents may not read the measurement items thoroughly, which led to inconsistency in responses to reverse-worded (or negatively worded) items. A total of 680 responses were considered feasible for the data analysis phase.

8.4 Analysis and results

Of the 680 respondents, 48.3% were male and 51.3% female. Participant age was dominated by two groups: 18–25 (29.0%) and 26–35 (28.7%) years. Of the participants, 375 (55.1%) indicated they had previous VR experience, while the other 305 participants (44.9%) had no previous VR experience. Smartphones (39.3%) were used by most participants, followed by laptops (34.0%). The participants' demographic profiles are summarised in Table 8.2, and

Table 8.3 lists the participants' countries of origin. Data normality as confirmed as no values lay outside the threshold ranges for skewness ($\pm$2 as defined by Sposito, Hand, and Skarpness (1983)) and kurtosis ($\pm$10 as defined by Kline (2015, 77)).

As mentioned earlier, this study investigates the research model that represents the relationship between constructs based on prior theory by measuring with construct items (Hayduk et al. 2007). This study implemented the SEM approach to test the proposed research model (see Figure 5.2). SEM is a statistical methodology to test a hypothesised model based on existing theories (Kline 2015, 10; Byrne 2016, 3). The latent variables need to be tested for validity and reliability before the causal model is tested (Hair et al. 2014). EFA was performed with SPSS ver. 26. The AMOS ver. 26 software was used for CFA and testing of the hypothesised model using the covariance-based SEM technique.

Table 8.2. Background profile of participants.

Characteristic	Frequency $n = 680$	%
Gender		
Male	328	48.3
Female	349	51.3
Other	3	0.4
Age (years)		
18–25	197	29.0
26–35	195	28.7
36–45	141	20.7
46–55	91	13.4
56–64	42	6.2
65 or older	14	2.0
Occupation		
Full-time employed	324	47.6
Part-time employed	77	11.3
Self-employed	56	8.3
Student	147	21.6
Unemployed	44	6.5
Stay-at-home-parent	32	4.7
Highest education		
Year 12 or equivalent	142	20.9
Vocational school	75	11.0
Bachelor degree	277	40.7
Master degree	123	18.1
Doctoral degree	25	3.7
Professional degree	17	2.5
No formal qualification	21	3.1
User device		
Desktop computer	143	21.0
Laptop	231	34.0
Tablet PC	37	5.4
Smartphone	267	39.3
Other	2	0.3
Previous experience with VR		
Yes	375	55.1
No	305	44.9

Table 8.3. Participant's country of origin.

Country of origin	Frequency	%
Antigua	1	0.1
Australia	75	11.0
Austria	1	0.1
Brazil	1	0.1
Canada	3	0.4
Cayman Islands	1	0.1
China	2	0.3
Colombia	1	0.1
Czech Republic	1	0.1
Denmark	1	0.1
France	1	0.1
Germany	5	0.8
Hungary	1	0.1
India	8	1.3
Indonesia	112	16.6
Ireland	64	9.5
Italy	4	0.6
Japan	1	0.1
Malaysia	13	1.9
Netherlands	2	0.3
New Zealand	69	10.1
Papua New Guinea	3	0.4
Philippines	2	0.3
Poland	1	0.1
Portugal	2	0.3
Scotland	2	0.3
Singapore	72	10.7
Spain	1	0.1
Taiwan	2	0.3
United Kingdom	60	8.9
United States	168	24.8
Total	680	100.0

Almost all constructs had a mean value above neutral with intention to visit being only slightly above neutral (3.08/5). It is possible that travel restrictions due to the global pandemic influenced overall perceptions of respondents around their intention to visit or indeed to conduct any form of travel. However, attitude had the highest mean value (4.18), suggesting that the respondents generally had a positive attitude towards VR. A summary of these findings is presented in Figure 8.3 and Table 8.4.

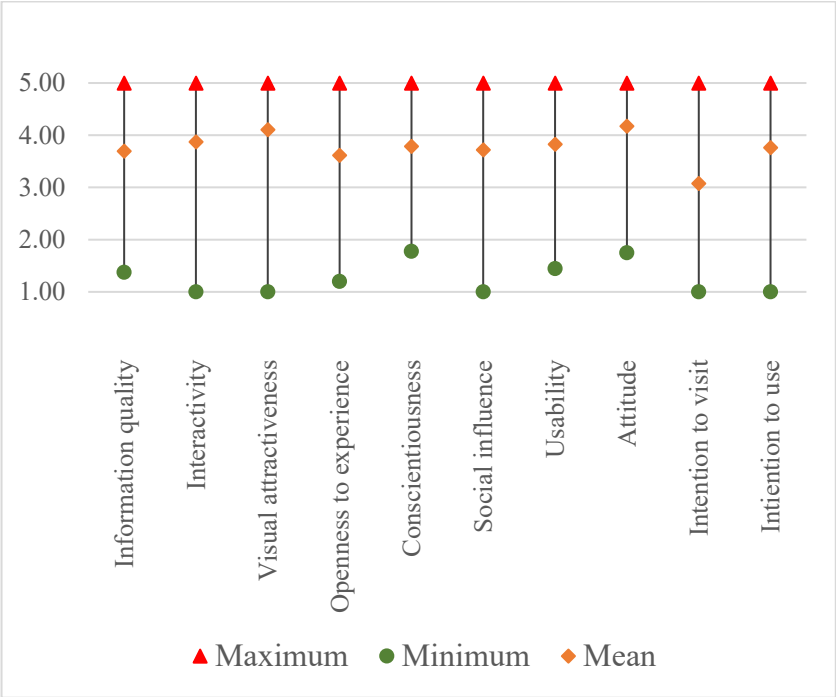


Figure 8.3. User's response variation

Table 8.4. Descriptive statistics.

Construct	Minimum	Maximum	Mean	Standard deviation	Composite reliability
Information quality	1.17	5.00	3.76	0.70	0.84
Interactivity	1.00	5.00	3.87	0.76	0.75
Visual attractiveness	1.00	5.00	4.11	0.79	0.86
Openness to experience	1.00	5.00	3.81	0.71	0.87
Conscientiousness	1.20	5.00	4.04	0.69	0.84
Social influence	1.00	5.00	3.72	0.77	0.90
Usability	1.33	5.00	3.78	0.82	0.86
Attitude	1.75	5.00	4.18	0.77	0.85
Intention to visit	1.00	5.00	3.08	1.01	0.89
Intention to use	1.00	5.00	3.76	1.06	0.92

8.4.1 Exploratory factor analysis

EFA in this study used maximum likelihood extraction with the Promax rotation method. After eliminating items that did not load sufficiently, the analysis identified 12 factors with eigenvalues >1 and that explained 64.4% of the total variance. Both information quality and social influence were extracted into two factors each. Those two constructs need to be treated as a second-order factor in CFA. The factor loading and Cronbach's α value for each construct are provided in Appendix F. The results met four primary validation criteria for EFA. First, KMO and Bartlett's test of sphericity (KMO = 0.94, p = 0.000) was significant and greater than 0.5 (Hair et al. 2014, 102). Second, communalities for each variable were greater than 0.2 (Child 2006, 47). Thus, the EFA result demonstrated adequacy, and the data were considered suitable for analysis. Third, the factors showed convergent validity. Most of the item loadings were larger than 0.5, with the exception of those for two items with loading greater than 0.3; this was still considered acceptable because of the large sample size (Hair et al. 2014, 115). Fourth, there was no strong cross-loading between items (>0.3) and Cronbach's α values for all factors were greater than the suggested threshold of 0.7, which demonstrated good discriminant validity and reliability (Hair et al. 2014).

8.4.2 Confirmatory factor analysis

The following analysis process investigated how well the variables represented the construct through a CFA. The results demonstrated good convergent validity and reliability, as the indicators were above the relevant threshold (CR > 0.7; AVE > 0.5) for almost all constructs (Hair et al. 2014). One factor had AVE slightly less than 0.5, but the convergent validity could still be considered adequate based on CR alone (Malhotra and Dash 2016). Further, the HTMT values (see Appendix F) were below the threshold of 0.85 (Voorhees et al. 2016) and the square root of AVE was greater than any correlation with other factor (Hair et al. 2014, 605), which indicated good discriminant validity. Finally, the model fit indices were assessed. The results showed that the CFA model met goodness-of-fit criteria for all indices (χ^2/df = 2.53, CFI = 0.93, SRMR = 0.05, RMSEA = 0.05, PClose = 0.1) and was thus acceptable (Hair et al. 2014).

The next stage of the analysis involved investigating CMB using a specific bias approach. An unrelated construct (social desirability) was introduced to the research model as the marker variable. Social desirability was measured using a scale developed by Crowne and Marlowe (1960). A chi-square difference test between the unconstrained model and the no-bias model indicated no significant difference. Therefore, the latent measure for testing method bias was not included in the structural model as a control variable.

8.4.3 Structural model and hypothesis testing

After completing CFA, the causal model was specified and estimated. The structural model satisfied goodness-of-fit index criteria (χ^2/df = 2.71, CFI = 0.92, SRMR = 0.07, RMSEA = 0.05, PClose = 0.48), indicating a model with good fit (Hair et al. 2014). The results for the direct effects of the causal model are provided in Figure 8.3. One of the nine hypothesised paths was not statistically significant; thus, H1c was not empirically supported.

Further analysis indicated direct effects of information quality and interactivity on usability, supporting H1a (β = 0.53, $p < 0.001$) and H1b (β = 0.28, $p < 0.001$). Its predictors explained 71% of the variation in usability. Openness to experience (β = 0.21, $p < 0.001$), conscientiousness (β = 0.09, $p < 0.05$) and social influence (β = 0.26, $p < 0.001$) were confirmed as having a significantly positive influence on attitude, supporting H3a, H3b and H3c. The direct effect of usability on attitude was also positive and significant. Thereby, H2 was supported. The results showed that its predictor accounted for 74% of the variation in attitude. Findings confirmed that attitude had a significantly positive influence on both intention to visit (β = 0.23, $p < 0.001$) and intention to use AR (β = 0.50, $p < 0.001$). Thus, H4 and H5 were supported. Moreover, only 6% of the variation in intention to visit was explained by its predictors. Its predictors explained 61% of the variation in intention to use. In addition, the effect size for usability was the largest among all the constructs (see Table 8.5).

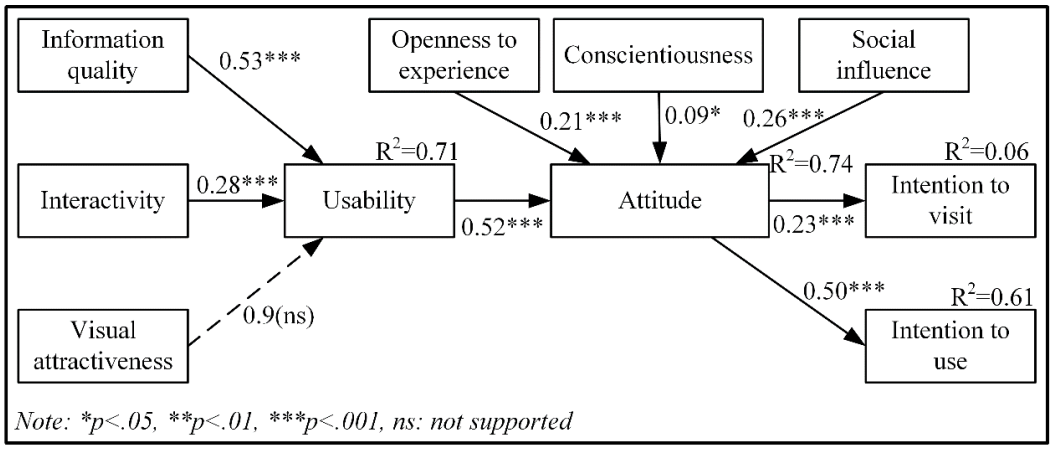


Figure 8.4. Study 2 structural model result.

Table 8.5. Effect size.

Constructs	f^2	Effect size
Information quality	0.172	Medium
Interactivity	0	None
Visual attractiveness	0	None
Openness to experience	0.07	Medium
Conscientiousness	0	None
Social influence	0.15	Medium
Usability	0.48	Large

f2 ≥ 0.02, f2 ≥ 0.15 and f2 ≥ 0.35 represent small, medium and large effect sizes, respectively (Cohen 1988).

8.4.4 Indirect effect analysis

Based on the SEM analysis results, there was no significant relationship between visual attractiveness and usability. Further, the effect size of visual attractiveness in influencing usability was zero. The indirect effect relationship between visual attractiveness and behavioural intention was analysed using mediation analysis to support these results. Mediation analysis reveals a causal chain where an independent variable affects a mediation variable, which affects the dependent variable. There can be one or more mediation variables. A bootstrapping approach (Preacher and Hayes 2008) was used to assess the mediation effect via the AMOS plugin (Gaskin, James and Lim 2020). Results from the indirect path analysis between visual attractiveness and behavioural intention are provided in Table 8.6. The indirect effects of visual

attractiveness, through usability and attitude, on the intention to visit (B = 0.015 p > 0.05) and intention to use (B = 0.03, p > 0.05) were not statistically significant.

Table 8.6. Indirect effect analysis.

Indirect path	Unstandardised estimate	p
VisAttr --> Usab --> Att --> IntVisit	0.015	0.298
VisAttr --> Usab --> Att --> IntUse	0.030	0.330

*Note: *p<.05, **p<.01, ***p<.001.*

8.5 Discussion

This study investigated the influence of VR usage on the user's behavioural intention. From the perspective of system quality and user personality, this study examined factors influencing potential tourists to use VR technology. Eight of the nine study hypotheses were supported. An interesting finding from this study was that no significant relationship was found between visual attractiveness and usability as VR focuses on visual presentation to deliver information. The results indicate that both information quality and interactivity were found to have positive influence on usability. Usability should be considered to focus on the appropriateness use of a system to meet its purpose (Brooke 1996). Further, usability can be measure from the system's usefulness, ease of use and satisfaction (Lund 2001).

The finding of this study confirmed that information quality was significant and positively influenced usability. It is consistent with the finding from Shatnawi and Algharabat (2018). The author underlined information quality as the most significant factor predicting usability in the e-donation website. This finding might indicate that the user found VR as informative and considered usable. Therefore, VR content should deliver informative information that meets user's needs. Typically, websites provide rich information from a combination of text, audio, image and video. The users tend to find the right information on a VR website the same way as exploring a common website. Based on this, the information quality from VR content may impact the user perception of VR usability, increasing the attitude to use VR. As a result, the positive attitude to use VR also increase users' intention to visit the tourism destination and use VR to support decision making for future travelling.

Interactivity was significant and positively influenced usability. The result is similar to prior studies for the same relationship between those constructs on mobile Internet-based health service (Gu et al. 2018) and website (Lowry et al. 2006). However, the effect size of interactivity towards usability is zero. It is an exciting area for further research. The system should focus on more realistic content to attract the user or more interactivity to explore the virtual environment. The more interaction within the system, the more users feel immersed with the content (Fang and Huang 2021).

Interestingly the result showed that the relationship between visual attractiveness and usability was not empirically supported. In addition, the result indicated that there was no effect size on the relationship between those two variables. There was also no significant indirect effect from visual attractiveness and behavioural intention. The possible explanation of the finding is that the users might not feel immersed in the virtual environment compared to a fully immersive VR wherein the users expect visual imagery of the content. There were 55.1% participants mentioned that they have been experiencing VR previously. The users might already have high initial expectations when hearing the term VR based on previous experience using VR with HMD. They might be comparing their previous experience with the VR in this study and feel that the VR visual presentation was not satisfied enough compared to their previous experience.

The direct positive relationship between openness to experience and users' attitude was significant. The result is as expected since a person who is highly open to experience will willingly try new things such as new technology and visit new places. Prior studies also supported the positive correlation between openness to experience and attitude (Rana et al. 2016; Unnikrishnan and Jagannathan 2017; AlSaleh and Thakur 2019; Altalhi 2020; Vahdat et al. 2020; Zhu and Chang 2014; Choi et al. 2014).

Conscientiousness showed a positive effect on users' attitudes. As anticipated, individuals with a high score on conscientiousness may tend to plan their tourism trips as they are more organised in achieving goals (Hogan et al. 1997). The result is in line with a study in a smartphone recycling context (Zhang, Wu and Rasheed 2020), where the author confirmed the relationship between conscientiousness and attitude. The result contradicts with a study in SNS usage (Chua and Chua 2017), where the relationship was found significantly negative. However, it is understandable since

individuals with high conscientiousness scores tend to avoid using social media to avoid distraction. It highlights that finding must be contextualised to a specific environment and may not be easily generalised to a new interaction medium such as VR. As VR will be used for tourism promotion, the information provided in VR content might need to include the best time to visit the destination and how the potential visitor reaches the destination from their location. Therefore, this study sets the scene for further investigation focusing on the conscientiousness construct to fully understand the implication for promoting the destination using current technology.

Hypothesis testing showed a positive influence relationship between social influence and attitude. Moreover, social influence has the largest effect size on affecting attitude. People inside a social circle shapes a person's mindset for decision making. When an individual integrates into a social group, the society's culture affects its member's values, which shapes the behaviour (Hofstede 2001).

Consistent with prior studies (Saad and Daud 2020; Phan and Pilík 2018), this study confirmed a significant causal relationship between usability and attitude to use VR. The effect size was also reported relatively high. It indicates that when the users perceived higher usability of the system, there will likely be a higher attitude towards the technology.

Finally, this study also attempted to investigate the relationship between the influence of user's attitudes towards the intention to visit the tourism destination and intention to use VR for travel planning. The study finding is consistent with prior studies, which found statistically positive significant evidence on the relationship between attitude and behavioural intention (Shin 2009; Ismail and Razak 2011; Chung, Han and Joun 2015; Ramos-de-Luna, Montoro-Ríos and Liébana-Cabanillas 2016; French 2017; Kasilingam 2020).

8.6 Summary

This study empirically tested the theorised research model using user data on two VR websites. Almost all hypothesised links were supported through this study. However, one hypothesis was not supported as it was not possible to confirm the link between visual attractiveness and usability. Indirect effect analysis also cannot confirm the significant indirect correlation between visual attractiveness and behavioural intention.

There is a possibility that the users might have entered into this web-based study with high expectations of an experiencing similar to using a VR HMD. The next chapter brings all findings from Study 1 and Study 2 to generate an understanding of VR usage's influence on behavioural intention.

Chapter 9. General Discussion and Conclusion

9.1 Overview

This chapter presents an overall discussion based on the results obtained from two studies in two previous chapters. Despite implementing the same research model, both studies used different data collection methods, VR applications and participants. Hence, both studies' findings cannot be generalised as they have different contexts. Hypotheses testing results from two studies are presented in Table 9.1. The following section discusses both study findings to answer the research questions formulated in Chapter 4. Following that, a section wraps up the thesis. It includes the implication of the study from theoretical and practical implications. Finally, study limitations are also presented with future research directions.

Table 9.1. SEM analysis result from two studies.

Hypothesis	**Study 1 (n = 218)**	**Study 2 (n = 680)**
H1a	$\beta = 0.15, p > 0.05$	$\beta = 0.53, p < 0.001$
H1b	$\beta = -0.21, p > 0.05$	$\beta = 0.28, p < 0.001$
H1c	$\beta = 0.38, p < 0.001$	$\beta = 0.9, p > 0.05$
H2	$\beta = 0.36, p < 0.001$	$\beta = 0.52, p < 0.001$
H3a	$\beta = 0.23, p < 0.05$	$\beta = 0.21, p < 0.001$
H3b	$\beta = 0.08, p > 0.05$	$\beta = 0.09, p < 0.05$
H3c	$\beta = 0.25, p < 0.001$	$\beta = 0.26, p < 0.001$
H4	$\beta = 0.21, p < 0.01$	$\beta = 0.23, p < 0.001$
H5	$\beta = 0.19, p < 0.01$	$\beta = 0.50, p < 0.001$

H1a: Information quality → Usability; H1b: Interactivity → Usability;
H1c: Visual attractiveness → Usability; H2: Usability → Attitude;
H3a: Openness to experience → Attitude; H3b: Conscientiousness → Attitude;
H3c: Social influence → Attitude; H4: Attitude → Intention to visit; H5: Attitude → Intention to use.

9.2 How does VR quality influence user behavioural intention?

System quality in this thesis is the technical perspective of VR which contains information quality, interactivity, and visual attractiveness. This section discusses findings from Study 1 and Study 2 related for each system quality dimensions.

The relationship between information quality and usability was not statistically significant in Study 1 ($\beta = 0.15$, $p > 0.05$). In contrast, the relationship between those dimensions was statistically significant and in positive direction ($\beta = 0.53$, $p < 0.001$) in Study 2. VR content in Study 1 contains information in audio narration while Study 2 the information is in textual. The insignificant result in Study 1 might be because of the unclear speaker narration due to music background. Some part of the speaker narration cannot be heard since the music background is too loud. As a result, the users might feel that they did not get enough information that influence them to experience the VR usability. The same reason might explain why the indirect effect from information quality to intention to use was not significant although it was significant for intention to visit.

Mixed results were also found on the relationship between interactivity and usability in both studies. Study 1 reported statistically insignificant for the relationship and having negative influence ($\beta = -0.21$, $p > 0.05$), while Study 2 vice versa ($\beta = 0.28$, $p < 0.001$). This result is interesting since in Study 1, the level of interactivity is higher compared to Study 2. The user could move fluently using a controller around the virtual environment. After reviewing the VR content for Study 1, the possible explanation of the insignificant result was lack of object interaction with the user. Although the user can freely explore the virtual environment of museum, the environment did not provide any object that the user can interact or manipulate with. Compared to VR in Study 2, where the user can point and choose a clickable object to show information. The indirect effect analysis from interactivity to behavioural intention through usability and attitude was reported significant for both studies. However, Study 1 showed negative direction while Study 2 has positive direction. Again, there might be possibility of fewer objects to interact with within the virtual environment in Study 1.

Different result showed between Study 1 and Study 2 in regards of the relationship between visual attractiveness and usability. Study 1 with computer-generated content demonstrated that visual attractiveness has a direct positive influence and statistically significant towards usability ($\beta = 0.38$, $p < 0.001$). In contrary, the result from Study 2 with 360° panorama images cannot prove significant relationship between the same dimensions ($\beta = 0.9$, $p > 0.05$). This result is interesting, considering the VR content with 360° panorama images provide the near-identical situation with the destination.

One reasonable justification is the way the users experience the VR content. Although the VR content for Study 2 can be experienced through VR HMD, all the participants used personal devices (see Table 8.2). Slightly more than half of participants reported that they have previous experience with VR. When these users hear the term "VR", they may have expected to feel a VR experience similar to that of a VR HMD. The findings of Study 2 revealed no indirect effect from visual attractiveness to user's behavioural intention. There is possibility if the users view 360° panorama images with VR HMD, the relationship between visual attractiveness and usability might be significant.

9.3 How user personality influence user behavioural intention on VR tourism usage?

This thesis includes user personality in the research model. Openness to experience, conscientiousness, and social dimension are the dimensions that might influence the user behavioural intention on VR tourism. This section discusses findings from Study 1 and Study 2 in relation to how user personality might influence the user behavioural intention.

Ideally, a person who like new challenges or trying new things might be interested to use a recent technology like VR, especially visiting new tourism destination. Evidence from the path analysis demonstrated openness to experience is a significant predictor for the user's attitude to use VR in both Study 1 ($\beta = 0.23$, $p < 0.05$) and Study 2 ($\beta = 0.21$, $p < 0.001$). The argument is also supported from the evidence that there is significant positive indirect effect from openness to experience towards user's behavioural intention through attitude in both studies.

This thesis argues that someone who always prepares before doing a task tends to apply this approach when arranging future travel plans. The significant result was only obtained in Study 2, where conscientiousness positively influences the user's attitude towards using VR ($\beta = 0.09$, $p < 0.05$), whereas the path analysis in Study 1 showed insignificant relationship ($\beta = 0.08$, $p > 0.05$). Mediating analysis revealed that there statistically no significant indirect effect from conscientiousness to behavioural intention through attitude. This result implies that the behavioural intention was not always predicted by the person's personality to do something thoroughly.

Results from both studies support the hypothesis that user's decision might influenced by people close to them. Path analyses give evidence that the relationship from social influence is statistically significant and has positive influence towards attitude for Study 1 ($\beta = 0.25$, $p < 0.001$) and Study 2 ($\beta = 0.26$, $p < 0.001$). Social influence also has significant indirect effect towards behavioural intention through attitude in both studies. The result is understandable and as predicted as decision making behaviour can be largely influenced by the values of the social group that the person belongs to.

9.4 Usability, attitude and behavioural intention

Usability is found positively influence attitude and statistically significant in Study 1 ($\beta = 0.36$, $p < 0.001$) and Study 2 ($\beta = 0.52$, $p < 0.001$). The same result also applied for the relationship between attitude and behavioural intention (intention to visit and intention to use VR). A plausible interpretation is that the higher the user find the system's usability, the more positive that the user feel about VR. As a result, the user might have higher intention to visit a tourism destination and use VR to support travelling plan in the future.

9.5 Conclusion

Referring to Chapter 4, this thesis aims to investigate VR usage in tourism and its influence towards users' behavioural intention. More specifically, the objectives are 1) developing a conceptual model that applicable to the use of VR in tourism, 2) determining whether the perceived quality of VR influences the user to use VR as a tourism decision support and tool to encourage actual visitation to the tourism destination, and 3) determine whether the user's personality influences the user to use VR as tourism decision support and actual visitation to the tourism destination. This thesis contributes to knowledge of VR technology, tourism, and human behaviour.

Based on the systematic review in Chapter 3, prior studies suggest to include technical perspective variable and personality trait (Flavián, Ibáñez-Sánchez and Orús 2019b; Errichiello et al. 2019; Kim, Lee and Jung 2020; Li and Chen 2019) in a VR-related studies for tourism. Therefore, the research model in thesis covers VR usage from two perspectives, system quality and user personality, and how its influence towards behavioural intention. System quality comprises information quality, interactivity, and

visual attractiveness. The user personality covers openness to experience, conscientiousness, and social influence. Those dimensions are linked with usability and attitude constructs based on prior studies. Behavioural intention is the independent variable that incorporate intention to visit the tourism destination and intention to use VR to support travelling decision.

This thesis involved two studies to examine the research model. On the first study, the participant is required to use a VR HMD and experience a computer-generated museum environment, while participants explore two VR websites with 360° panorama images on the second study. Target participant is the other difference between studies. The first study was an expo visitor, while the second study's participant recruited through social media groups' invitation. Both studies went through the similar analysis process. Table 9.2. summarises the research questions and methods to address those questions.

Table 9.2. Methods to answer research questions.

	Research questions	**Method**	**Location**
RQ1	To what extent has immersive technology, particularly VR, been implemented in tourism-related studies?	Systematic review using PRISMA	Chapter 3
RQ2	How do system quality on VR and user personality influence the user's behaviour intention?	SEM	Chapter 7
RQ3	To what extent do system quality on VR and user personality influence the user's behaviour intention?	SEM	Chapter 8

The first contribution of this research is a comprehensive review of the current state of immersive technology, specifically VR, in tourism research. Chapter 3 discusses type of immersive technology in tourism research and its integration with other technology to bring a more sense of immersion to the user experience. This is a valuable contribution, as it explores the benefit of enhancing the technology to fulfil the system's purpose. Further, the review explores areas in tourism where prior studies have identified research gaps. Technical challenges are also discussed to move towards improving the technical quality for the future work.

The second contribution of this thesis is the development and empirical evaluation of a research model to understand the influence of VR system quality and user's

personality on user behavioural intention. The research model was tested using two different VR types: fully immersive VR and non-immersive VR. Not all links were clear-cut, as mixed findings were both studies especially around the system quality perspective. Different VR type need to have different focus to optimise the content and the perceived quality delivered to the user. In the personality characteristics, although openness to experience and social influence were found to affect behavioural intention, conscientiousness was generally not a significant predictor of behavioural intention.

9.5.1 Theoretical implications

VR usage in tourism area is showing an increasing trend, and has potential to bring great benefits to this industry at a time when it is much-needed. This thesis provides a comprehensive insight into understanding the influences of technical and personality dimensions when using VR as a tool for tourism trip decision-making. Specifically, this thesis highlights how factors from system quality and user's personality perspective impact the potential visitor's behavioural intention. This is a strong area of theoretical contribution as prior work which considers personality traits on VR for tourism promotion is limited.

This thesis also highlights that findings cannot be easily generalised from prior work in related areas, and that direct study in the area of VR is necessary. Initial assumptions support the idea that users' personalities influence the attitude towards using VR, leading to their intention to use VR and visit the tourism destination. Additionally, this thesis contributed to understanding users' behavioural intention from three aspects of quality: information quality, interactivity, and visual attractiveness. Further, academia can apply the model's findings to initiate further related studies and further advance the field of VR for tourism research.

9.5.2 Practical implications

There are few possibilities of how the findings can be manifested in using VR for tourism areas. One significant finding from this study is the role of visual attractiveness. The relevance of this dimension is even observed in a direct report from VR users. For example, the National Geographic Explore VR app designed for Oculus HMD is produced by a well-known organisation and targets a high-end VR platform. When reviewing user feedback and rankings (Force Field Entertainment B.V. n.d.), it

can commonly be seen that visual attractiveness has been identified as the most exciting aspect of the app by end-users.

Similarly, although this thesis did not yield a significant link between interactivity and behavioural intention, user reviews also commonly note that the VR app was interactive enough for their needs. This suggests that VR can produce an eye-pleasing presentation that might lessen the need to interact within a virtual environment. Ultimately, interactivity within the VR content might be preferable rather than no interactivity at all.

In this age of travel restrictions, virtual and online experiences have also grown exponentially. A platform such as The Conqueror (Home Run Limited n.d.) offers users a range of journey challenges (e.g., trip to Mount Fuji, Mount Kilimanjaro, Grand Canyon) while at the same time experiencing virtual experiences of key milestones on the trip. Applications of this nature might attract funding from tourism providers if they directly promote the destination by advancing the virtual experience. Interestingly, the above-mentioned platform leverages other dimensions found in the model for its success. For example, The Conqueror leverage the social influence dimension by enabling the user to team up with the others to complete the challenge. There is excellent potential for kind of application to flourish and further develop if they can develop the social network within the application to allow finding travelling partners worldwide to complete the challenge. As the number of users grows, it gives an ample opportunity to improve the VR aspects of the application to promote tourism.

9.5.3 Limitations and future research

A generalisation of the findings is restricted. While this concluding chapter highlights the achievements of the research, some limitations should be noted. This section also proposes future research suggestions in a similar research area.

Health and hygienic consideration in using device for data collection. The first issue was the data collection during exceptional circumstances like the COVID-19 global pandemic. Users hesitate to participate in the study which involves contact with shared equipment due to hygiene concerns. This situation impacted the research direction, resulting in an adjustment to the research methodology in Study 2. Ensuring the devices and the environment are hygienic might give potential participants

confidence to be involved in the study. It is also worthwhile to assume that the same health policy standards enacted during the global pandemic might change public habits and thus remain the same for the foreseeable future. Future research using devices like VR HMD as part of data collection should keep its hygienic state using special treatment. Implementing a suitable health safety procedure might encourage potential participants to participate without hesitation. A disinfectant device (Cleanbox n.d.) can eliminate germs using ultraviolet light and no chemical usage. Although the disinfectant device is considered expensive, it is still viable for long-term usage. Health safety procedures on the surrounding environment should also be considered during the data collection process. Good ventilation can help air circulation and optimise fresh airflow by using an air conditioning system.

Re-evaluating the theoretical model with a different sample. The second limitation concerns the scope of the VR content. Both studies in this thesis use a specific tourism destination (i.e., Sangiran Museum, Mehu Tomb, Batu Villa). Moreover, Study 1 focused on a specific population. Although Study 1 provides a pertinent contribution to the field, results cannot be generalised to represent the entire population or other destinations. Future research should thus implement the research model with a sample from different geographical locations, cultures or tourism destinations to determine whether any cultural differences exist. The research model can be re-evaluated with different scenarios focusing on behavioural intention in VR tourism usage. Society changes over time might give different result interpretations with the same model. Researchers might implement the same method using a questionnaire. PLS-SEM analysis can be another way to test the model as it facilitates higher-order model (SmartPLS n.d.).

Device's variation used during data collection. Another limitation was the device used in Study 2. As the data collection was fully online, participants experienced VR using different devices (i.e. laptop, smartphone and tablet PC). The downside is that there might be a difference in perceived VR experience between participants and possibly affect the result. Future research on a similar method to the field should specify the screen resolution while experiencing VR. By specifying the device's screen size, participants are expected to have the same experience. Specific device requirements can be stated on the participant's invitation and utilise web-based survey tools such as Qualtrics' feature (Qualtrics n.d.) on limiting device type.

VR as an alternative method for travelling. Though this research was impacted midway by the global COVID-19 pandemic, the situation has also raised some interesting potential for future applications of VR. Most countries implemented travel restriction policies that might have a long term impact on people plan trips. It is possible that some may now see VR as an alternative to experience tourism travel without leaving home. Future studies of VR in tourism might examine VR as an alternative for tourism travel. A quantitative approach can accommodate the study. The method can explain causal relationship especially due to changes on people's behaviour because of global pandemic. Another possible study is using a qualitative approach to explore factors that might influence people to use VR for experiencing tourism destination rather than actual visitation.

Data collection. There are several limitations to the data collection that require acknowledgement. There was a possibility that users had visited or were familiar with the museum in Study 1. This condition may have positively or negatively impacted the result. Future studies should collect data using VR with locations that are not familiar to most users. The environmental conditions could also have affected the users' experience in VR. Unlike Study 2, data collection for Study 1 was conducted in an expo. The loud and crowded environment may have influenced the users' VR experience. Future studies should consider ensuring a comfortable user environment during data collection.

Expanding research model. The fifth limitation concerns the research model applied to this research. The research model was developed based on prior studies and is open for improvement. System quality and use personality are the two dimensions this thesis focused on. Future research might further improve the model by adding other dimensions that might influence behaviour intention such as presence, technology readiness, perceived authenticity or simulation sickness. Further research might include physiological measurement using eye-tracking to observe which part of the VR environment most likely attracts user attention. A quantitative study might suit to explain the relationship between any parts of VR environment that interest the users and the users' behaviour intention.

Method bias prevention. The sixth limitation concerns the questionnaire items that were collected at the same time. The downside of collecting data with a single method

such as an online survey might in behavioural research is a potential systematic response bias that inflates or deflate observed relationships between constructs (Podsakoff et al. 2003). This was addressed during the study design, but is being acknowledged a potential limitation nonetheless. Both studies in this thesis have included method bias checks in the data analysis phase as prevention. Further studies might include prevention techniques to control CMB. For example, Podsakoff et al. (2003) suggested separating data collection of the independent dan dependent variables. The authors also stated that researchers might use different response formats, media, or locations. This future research suggestion is only fit into quantitative study since method bias is part of analysis with SEM technique.

VR content type. Finally, VR for tourism promotion should represent the actual condition of the destination. This research has demonstrated two studies with a different types of VR content: computer-generated and 360° panorama images. Choosing the VR content type between computer-generated and 360° technology should correspond to the purpose of the VR design. Therefore, future studies might compare computer-generated content and 360° technology and their influence on visiting the tourism destination. This research direction is well suited for a quantitative approach as statistical analysis will shed light on any differences in perceived experience between computer-generated and 360° panorama images VR content.

References

Abidin, Rimaniza Zainal, Haslina Arshad, Saidatul A'isyah Ahmad Shukri, and Mah Fui Ling. 2018. "Leveraging multimodal interaction and adaptive interfaces for location-based augmented reality Islamic tourism application." *International Journal on Advanced Science, Engineering and Information Technology* 8 (4-2): 1784-1791. https://doi.org/10.18517/ijaseit.8.4-2.6822.

Adachi, Renan, Emily M. Cramer, and Hayeon Song. 2020. "Using virtual reality for tourism marketing: A mediating role of self-presence." *The Social Science Journal*. https://doi.org/10.1080/03623319.2020.1727245.

Ajzen, Icek. 1991. "The Theory of Planned Behavior." *Organizational Behavior and Human Decision Processes* 50 (2): 179-211. https://doi.org/10.1016/0749-5978(91)90020-T.

Ajzen, Icek. 2012. "Martin Fishbein's Legacy: The Reasoned Action Approach." *The Annals of the American Academy of Political and Social Science* 640: 11-27. https://doi.org/10.1177/0002716211423363.

Ajzen, Icek. 2019. "Theory of Planned Behavior Diagram." https://people.umass.edu/aizen/tpb.diag.html.

Akbaş, Anna, Wojciech Marszałek, Anna Kamieniarz, Jacek Polechoński, Kajetan J. Słomka, and Grzegorz Juras. 2019. "Application of Virtual Reality in Competitive Athletes - A Review." *Journal of Human Kinetics* 69: 5-16. https://doi.org/10.2478/hukin-2019-0023.

Alcántara-Pilar, Juan Miguel, Francisco Javier Blanco-Encomienda, Mª Rodríguez-López, and Salvador Del Barrio-García. 2018. "Enhancing Consumer Attitudes toward a Website as a Contributing Factor in Business Success." *Tourism & Management Studies* 14 (1): 108-116. https://doi.org/10.18089/tms.2018.14109.

AlHogail, Areej, and Mona AlShahrani. 2019. "Building Consumer Trust to Improve Internet of Things (IoT) Technology Adoption." In *Advances in Neuroergonomics and Cognitive Engineering*, Hasan Ayaz and Lukasz Mazur, eds., 325-334. Washington: Springer International Publishing. https://doi.org/10.1007/978-3-319-94866-9_33.

AlSaleh, Dhoha, and Ramendra Thakur. 2019. "Impact of Cognition, Affect, and Social Factors on Technology Adoption." *International Journal of Technology Marketing* 13 (2): 178-200. https://doi.org/10.1504/ijtmkt.2019.102266.

Alsop, Thomas. 2020. "Virtual reality (VR) - Statistics & facts." https://www.statista.com/topics/2532/virtual-reality-vr/.

Altalhi, Maryam. 2020. "Toward a Model for Acceptance of MOOCs in Higher Education: The Modified UTAUT Model for Saudi Arabia." *Education and Information Technologies* 26: 1589-1605. https://doi.org/10.1007/s10639-020-10317-x.

Aluri, Ajay. 2017. "Mobile augmented reality (MAR) Game as a travel guide: Insights from Pokémon Go." *Journal of Hospitality and Tourism Technology* 8 (1): 55-72. https://doi.org/10.1108/JHTT-12-2016-0087.

Amichai-Hamburger, Yair, and Gideon Vinitzky. 2010. "Social Network Use and Personality." *Computers in Human Behavior* 26 (6): 1289-1295. https://doi.org/10.1016/j.chb.2010.03.018.

Ampatzoglou, Apostolos, Stamatia Bibi, Paris Avgeriou, Marijn Verbeek, and Alexander Chatzigeorgiou. 2019. "Identifying, Categorizing and Mitigating Threats to Validity in Software Engineering Secondary Studies." *Information and Software Technology* 106: 201-230. https://doi.org/10.1016/j.infsof.2018.10.006.

Andreassen, Cecilie Schou, Torbjørn Torsheim, and Ståle Pallesen. 2014. "Predictors of Use of Social Network Sites at Work - A Specific Type of Cyberloafing." *Journal of Computer-Mediated Communication* 19 (4): 906-921. https://doi.org/10.1111/jcc4.12085.

Angelov, Vladislav, Emiliyan Petkov, Georgi Shipkovenski, and Teodor Kalushkov. 2020. "Modern Virtual Reality Headsets." In *2020 International Congress on Human-Computer Interaction, Optimization and Robotic Applications (HORA)*, *Turkey,* June 26-28. 1-5. Turkey: IEEE. https://doi.org/10.1109/HORA49412.2020.9152604.

Azuma, Ronald T. 1997. "A survey of augmented reality." *Presence: Teleoperators and Virtual Environments* 6 (4): 355-385. https://doi.org/10.1162/pres.1997.6.4.355.

Bailey, James E., and Sammy W. Pearson. 1983. "Development of a Tool for Measuring and Analyzing Computer User Satisfaction." *Management Science* 29 (5): 530. https://doi.org/10.1287/mnsc.29.5.530.

Baker, Esraa Jaffar, Juliana Aida Abu Bakar, and Abdul Nasir Zulkifli. 2017. "Mobile augmented reality elements for museum hearing impaired visitors' engagement." *Journal of Telecommunication, Electronic and Computer Engineering* 9 (2-12): 171-178. https://jtec.utem.edu.my/jtec/article/view/2788.

Baker, Esraa Jaffar, Juliana Aida Abu Bakar, Abdul Nasir Zulkifli, Ruzinoor Che Mat, Mohd Fitri Yusoff, Mazida Ahmad, and Azizah Che Omar. 2020. "Design, development and expert evaluation of the Marhime prototype for HI museum visitors' engagement." *International Journal of Advanced Science and Technology* 29 (8): 155-165. http://sersc.org/journals/index.php/IJAST/article/view/16984.

Baker, Esraa Jaffar, Juliana Aida Abu Bakar, Abdul Nasir Zulkifli, and Azizah Che Omar. 2019. "Development of the MARHIME app embedding the mobile augmented reality for hearing-impaired museum visitors engagement model." *International Journal of Innovative Technology and Exploring Engineering* 8 (8): 363-368. https://www.ijitee.org/wp-content/uploads/papers/v8i8s/H10620688S19.pdf.

Balduini, Marco, Irene Celino, Daniele Dell'Aglio, Emanuele D. Valle, Yi Huang, Tony Lee, Seon-Ho Kim, and Volker Tresp. 2012. "BOTTARI: An augmented reality mobile application to deliver personalized and location-based recommendations by continuous analysis of social media streams." *Journal of Web Semantics* 16: 33-41. https://doi.org/10.1016/j.websem.2012.06.004.

Balduini, Marco, Irene Celino, Daniele Dell'Aglio, Emanuele D. Valle, Yi Huang, Tony Lee, Seon-Ho Kim, and Volker Tresp. 2014. "Reality mining on micropost streams deductive and inductive reasoning for personalized and location-based recommendations." *Semantic Web* 5 (5): 341-356. https://doi.org/10.3233/sw-130107.

Banerjee, Mousumi, Michelle Capozzoli, Laura McSweeney, and Debajyoti Sinha. 1999. "Beyond Kappa: A Review of Interrater Agreement Measures." *Canadian Journal of Statistics* 27 (1): 3-23. https://doi.org/10.2307/3315487.

Barker, Philip. 1993. "Virtual Reality: Theoretical Basis, Practical Applications." *ALT-J* 1 (1): 15-25. https://doi.org/10.1080/0968776930010103.

Barnum, Carol M. 2001. *Usability Testing and Research*. 1st ed. United States: Allyn & Bacon, Inc.

Barrick, Murray R., and Michael K. Mount. 1991. "The Big Five Personality Dimensions And Job Performance: A Meta-Analysis." *Personnel Psychology* 44 (1): 1-26. https://doi.org/10.1111/j.1744-6570.1991.tb00688.x.

Beck, Julia, Mattia Rainoldi, and Roman Egger. 2019. "Virtual reality in tourism: A state-of-the-art review." *Tourism Review* 74 (3): 586-612. https://doi.org/10.1108/TR-03-2017-0049.

Beer, Andrew, and David Watson. 2008. "Asymmetry in Judgments of Personality: Others Are Less Differentiated Than the Self." *Journal of Personality* 76 (3): 535-560. https://doi.org/10.1111/j.1467-6494.2008.00495.x.

Belanche, Daniel, Luis V. Casaló, and Miguel Guinalíu. 2012. "Website Usability, Consumer Satisfaction and the Intention to Use a Website: The Moderating Effect of Perceived Risk." *Journal of Retailing and Consumer Services* 19 (1): 124-132. https://doi.org/10.1016/j.jretconser.2011.11.001.

Beldad, Ardion D., and Sabrina M. Hegner. 2018. "Expanding the Technology Acceptance Model with the Inclusion of Trust, Social Influence, and Health Valuation to Determine the Predictors of German Users' Willingness to Continue using a Fitness App: A Structural Equation Modeling Approach." *International Journal of Human–Computer Interaction* 34 (9): 882-893. https://doi.org/10.1080/10447318.2017.1403220.

Bennett, Derrick A. 2001. "How Can I Deal with Missing Data in My Study?" *Australian and New Zealand Journal of Public Health* 25 (5): 464-469. https://doi.org/10.1111/j.1467-842X.2001.tb00294.x.

Berg, Leif P, and Judy M Vance. 2017. "Industry Use of Virtual Reality in Product Design and Manufacturing: A Survey." *Virtual Reality* 21 (1): 1-17. https://doi.org/10.1007/s10055-016-0293-9.

Bevanda, Vanja, Jasmina Grzinic, and Emanuel Cervar. 2008. "Analysing the Users Perception of Web Design Quality by Data Mining Tools." *Tourism and Hospitality Management* 14 (2): 251-262. https://doi.org/10.20867/thm.14.2.4.

Billinghurst, Mark, Daniel Belcher, Arnab Gupta, and Kiyoshi Kiyokawa. 2003. "Communication Behaviors in Colocated Collaborative AR Interfaces." *International Journal of Human–Computer Interaction* 16 (3): 395-423. https://doi.org/10.1207/S15327590IJHC1603_2.

Bogicevic, Vanja, Soobin Seo, Jay A. Kandampully, Stephanie Q. Liu, and Nancy A. Rudd. 2019. "Virtual reality presence as a preamble of tourism experience: The role of mental imagery." *Tourism Management* 74: 55-64. https://doi.org/10.1016/j.tourman.2019.02.009.

Bogomazova, Irina Victorovna, and Svetlana Gennad'evna Stenyushkina. 2017. "Excursion tours and the possibility of using augmented reality technologies for improving the local tourist attractiveness." *Journal of Environmental Management & Tourism* 8 (4): 943-951. https://journals.aserspublishing.eu/jemt/article/view/1431.

Bošnjak, Snežana. 2001. "The Declaration of Helsinki: The Cornerstone of Research Ethics." *Archive of Oncology* 9 (3): 179-184. http://www.onk.ns.ac.rs/archive/Vol9/PDFVol9/V9n3p179.pdf.

Bostanci, Erkan, Nadia Kanwal, and Adrian F. Clark. 2012. "Extracting Planar Features from Kinect Sensor." In *2012 4th Computer Science and Electronic Engineering Conference (CEEC)*, *Sept 12-13, 2012* United Kingdom: IEEE. https://doi.org/10.1109/CEEC.2012.6375388.

Bower, Matt, Dorothy DeWitt, and Jennifer W. M. Lai. 2020. "Reasons Associated with Preservice Teachers' Intention to Use Immersive Virtual Reality in Education." *British Journal of Educational Technology* 51 (6): 2215-2233. https://doi.org/10.1111/bjet.13009.

Bravo, Luis González, Marcelo Fernández Sagredo, Pilar Torres Martínez, Carolina Barrios Penna, Juan Fonseca Molina, Ionut Dorin Stanciu, and Nicolae Nistor. 2020. "Psychometric Analysis of a Measure of Acceptance of New Technologies (UTAUT), Applied to the Use of Haptic Virtual Simulators in Dental Students." *European Journal of Dental Education* 24 (4): 706-714. https://doi.org/10.1111/eje.12559.

Brock, Anke M., Philippe Truillet, Bernard Oriola, Delphine Picard, and Christophe Jouffrais. 2015. "Interactivity Improves Usability of Geographic Maps for Visually Impaired People." *Human–Computer Interaction* 30 (2): 156-194. https://doi.org/10.1080/07370024.2014.924412.

Brooke, John. 1996. "SUS-A Quick and Dirty Usability Scale." In *Usability Evaluation in Industry*, Patrick W. Jordan, Bruce Thomas, Bernard A. Weerdmeester and Ian L. McClelland, eds., 189-194. London: Taylor & Francis Ltd. https://www.taylorfrancis.com/chapters/edit/10.1201/9781498710411-35/sus-quick-dirty-usability-scale-john-brooke.

Browning, Drew R., Carolina Cruz-Neira, Daniel J. Sandin, and Thomas A. DeFanti. 1993. "Cave Automatic Virtual Environment: Projection-Based Virtual Environments and Disability." In *Virtual Reality Conference*, *1993*: Califonia State University. http://www.csun.edu/~hfdss006/conf/1993/proceedings/CAVE~1.htm.

Bryman, Alan, and Emma Bell. 2015. *Business Research Methods*. 4th ed. United Kingdom: Oxford University Press.

Bryson, Steve. (n.d.). "Virtual reality: Definition and requirements." National Aeronautics and Space Administration, available at: https://www.nas.nasa.gov/Software/VWT/vr.html. May 12, 2020

Buabeng-Andoh, Charles. 2018. "Predicting Students' Intention to Adopt Mobile Learning." *Journal of Research in Innovative Teaching & Learning* 11 (2): 178-191. https://doi.org/10.1108/JRIT-03-2017-0004.

Burgoon, Judee K., Joseph A. Bonito, Artemio Ramirez Jr., Norah E. Dunbar, Karadeen Kam, and Jenna Fischer. 2002. "Testing the Interactivity Principle: Effects of Mediation, Propinquity, and Verbal and Nonverbal Modalities in Interpersonal Interaction." *Journal of Communication* 52 (3): 657-677. https://doi.org/10.1111/j.1460-2466.2002.tb02567.x.

Butt, Sarah, and James G. Phillips. 2008. "Personality and Self Reported Mobile Phone Use." *Computers in Human Behavior* 24 (2): 346-360. https://doi.org/10.1016/j.chb.2007.01.019.

Byrne, Barbara M. 2016. *Structural Equation Modeling With AMOS: Basic Concepts, Applications, and Programming*. 3rd ed. New York: Routledge. https://doi.org/10.4324/9781315757421.

Chang, Hsuan Hsuan, and Chin Chung Chiang. 2022. "Is Virtual Reality Technology an Effective Tool for Tourism Destination Marketing? A Flow Perspective." *Journal of Hospitality and Tourism Technology* 13 (3): 427-440. https://doi.org/10.1108/JHTT-03-2021-0076.

Chang, Kuo-En, Chia-Tzu Chang, Huei-Tse Hou, Yao-Ting Sung, Huei-Lin Chao, and Cheng-Ming Lee. 2014. "Development and behavioral pattern analysis of a mobile guide system with augmented reality for painting appreciation instruction in an art museum." *Computers & Education* 71: 185-197. https://doi.org/10.1016/j.compedu.2013.09.022.

Chang, Yu-Lien, Huei-Tse Hou, Chao-Yang Pan, Yao-Ting Sung, and Kuo-En Chang. 2015. "Apply an augmented reality in a mobile guidance to increase sense of place for heritage places." *Journal of Educational Technology & Society* 18 (2): 166-178. https://www.j-ets.net/collection/published-issues/18_2.

Cheeyong, Kim, Jong-Chan Kim, Se-Hoon Jung, and Eung-Kon Kim. 2017. "Marine leisure sports based on realistic VR system for Bleisure Busan." *International Journal of Grid and Distributed Computing* 10 (10): 69-78. https://doi.org/10.14257/ijgdc.2017.10.10.06.

Cheng, Kun-Hung, and Chin-Chung Tsai. 2013. "Affordances of Augmented Reality in Science Learning: Suggestions for Future Research." *Journal of Science Education and Technology* 22 (4): 449-462. https://doi.org/10.1007/s10956-012-9405-9.

Chia, Kar Wee, Adrian David Cheok, and Simon J. D. Prince. 2002. "Online 6 DOF Augmented Reality Registration from Natural Features." In *Proceedings of the 1st International Symposium on Mixed and Augmented Reality*, *Darmstadt, 2002*2002. Darmstadt: IEEE Computer Society. https://doi.org/10.1109/ISMAR.2002.1115123.

Child, Dennis. 2006. *The Essentials of Factor Analysis*. 3rd ed. Cornwall: Bloomsbury Academic.

Chiles, Todd H. 2003. "Process Theorizing: Too Important to Ignore in a Kaleidic World." *Academy of Management Learning & Education* 2 (3): 288-291. https://doi.org/10.5465/AMLE.2003.10932145.

Chiu, Yen-Ting Helena, Wan- I. Lee, Chia-Chi Liu, and Li-Yu Liu. 2012. "Internet Lottery Commerce: An Integrated View of Online Sport Lottery Adoption." *Journal of Internet Commerce* 11 (1): 68-80. https://doi.org/10.1080/15332861.2012.650990.

Choi, Hee-soo, and Sang-heon Kim. 2017. "A content service deployment plan for metaverse museum exhibitions—Centering on the combination of beacons and HMDs." *International Journal of Information Management* 37 (1, Part B): 1519-1527. https://doi.org/10.1016/j.ijinfomgt.2016.04.017.

Choi, Jaewon, Hong Joo Lee, Farhana Sajjad, and Habin Lee. 2014. "The Influence of National Culture on the Attitude Towards Mobile Recommender Systems." *Technological Forecasting and Social Change* 86: 65-79. https://doi.org/10.1016/j.techfore.2013.08.012.

Chou, Chien. 2003. "Interactivity and Interactive Functions in Web-Based Learning Systems: A Technical Framework for Designers." *British Journal of Educational Technology* 34 (3): 265-279. https://doi.org/10.1111/1467-8535.00326.

Chu, Tzu-How, Meng-Lung Lin, and Chia-Hao Chang. 2012. "MGuiding (mobile guiding) – Using a mobile GIS app for guiding." *Scandinavian Journal of Hospitality & Tourism* 12 (3): 269-283. https://doi.org/10.1080/15022250.2012.724921.

Chua, Yan Piaw, and Yee Pei Chua. 2017. "Do Computer-Mediated Communication Skill, Knowledge and Motivation Mediate the Relationships Between Personality Traits and Attitude Toward Facebook?" *Computers in Human Behavior* 70: 51-59. https://doi.org/10.1016/j.chb.2016.12.034.

Chung, Namho, Heejeong Han, and Youhee Joun. 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. https://doi.org/10.1016/j.chb.2015.02.068.

Chung, Namho, Hyunae Lee, Jin-Young Kim, and Chulmo Koo. 2018. "The role of augmented reality for experience-influenced environments: The case of cultural heritage tourism in Korea." *Journal of Travel Research* 57 (5): 627-643. https://doi.org/10.1177/0047287517708255.

Cialdini, Robert B., and Melanie R. Trost. 1998. "Social Influence: Social Norms, Conformity and Compliance." In *The Handbook of Social Psychology*. 151-192. New York, NY, US: McGraw-Hill.

Clarivative Analytics. (n.d.). "Endnote X9." available at: https://clarivate.libguides.com/endnote_training/users/enx9. accessed 5 March, 2019.

Cleanbox. (n.d.). "Cleanbox Products." available at: https://cleanboxtech.com/products/. December 13, 2021

Clini, Paolo, Emanuele Frontoni, Ramona Quattrini, and Roberto Pierdicca. 2014. "Augmented Reality Experience: From High-Resolution Acquisition to Real Time Augmented Contents." *Advances in Multimedia* 2014. https://doi.org/10.1155/2014/597476.

Cohen, Jacob. 1988. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed: Routledge. https://doi.org/10.4324/9780203771587.

Collier, Joel E., and Carol C. Bienstock. 2006. "Measuring Service Quality in E-Retailing." *Journal of Service Research* 8 (3): 260-275. https://doi.org/10.1177/1094670505278867.

Correa, Teresa, Amber Willard Hinsley, and Homero Gil de Zúñiga. 2010. "Who Interacts on the Web?: The Intersection of Users' Personality and Social Media Use." *Computers in Human Behavior* 26 (2): 247-253. https://doi.org/10.1016/j.chb.2009.09.003.

Coyle, James R., and Esther Thorson. 2001. "The Effects of Progressive Levels of Interactivity and Vividness in Web Marketing Sites." *Journal of Advertising* 30 (3): 65-77. https://doi.org/10.1080/00913367.2001.10673646.

Cranford, M. 1996. "The Social Trajectory of Virtual Reality: Substantive Ethics in a World without Constraints." *Technology in Society* 18 (1): 79-92. https://doi.org/10.1016/0160-791X(95)00023-K.

Cranmer, Eleanor E., M. Claudia tom Dieck, and Paraskevi Fountoulaki. 2020. "Exploring the value of augmented reality for tourism." *Tourism Management Perspectives* 35. https://doi.org/10.1016/j.tmp.2020.100672.

Creagh, Heather. 2003. "Cave Automatic Virtual Environment." In *Electrical Insulation Conference and Electrical Manufacturing and Coil Winding Technology Conference*, *25-25 Sept. 2003, 2003* United States: IEEE. https://doi.org/10.1109/EICEMC.2003.1247937.

Creswell, John W. 2014. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 4th ed. Thousand Oaks: Thousand Oaks : SAGE Publications.

Crilly, Nathan, James Moultrie, and P. John Clarkson. 2004. "Seeing Things: Consumer Response to the Visual Domain in Product Design." *Design Studies* 25 (6): 547-577. https://doi.org/10.1016/j.destud.2004.03.001.

Crowne, Douglas P., and David Marlowe. 1960. "A New Scale of Social Desirability Independent of Psychopathology." *Journal of Consulting Psychology* 24 (4): 349-354. https://doi.org/10.1037/h0047358.

Cushing, Amber L., and Benjamin R. Cowan. 2017. "Walk1916: Exploring non-research user access to and use of digital surrogates Via a mobile walking tour app." *Journal of Documentation* 73 (5): 917-933. https://doi.org/10.1108/JD-03-2017-0031.

Cyr, Dianne, Milena Head, and Alex Ivanov. 2006. "Design Aesthetics Leading to M-Loyalty in Mobile Commerce." *Information & Management* 43 (8): 950-963. https://doi.org/10.1016/j.im.2006.08.009.

Damala, Areti, Eva Hornecker, Merel van der Vaart, Dick van Dijk, and Ian Ruthven. 2016. "The Loupe: Tangible augmented reality for learning to look at ancient greek art." *Mediterranean Archaeology & Archaeometry* 16 (5): 73-85. https://doi.org/10.5281/zenodo.204970.

Damala, Areti, Tobias Schuchert, I. Rodriguez, J. Moragues, K. Gilleade, and N. Stojanovic. 2013. "Exploring the affective museum visiting experience: Adaptive augmented reality (A2R) and cultural heritage." *International Journal of Heritage in the Digital Era* 2 (1): 117-142. https://doi.org/10.1260/2047-4970.2.1.117.

Davis, Fred D. 1985. "A Technology Acceptance Model for Empirically Testing New End-User Information Systems : Theory and Results." diss., Sloan School of Management Massachusetts Institute of Technology. Cambridge, Massachusetts. https://dspace.mit.edu/handle/1721.1/15192.

Davis, Fred D. 1989. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology." *MIS Quarterly* 13 (3): 319-340. https://doi.org/10.2307/249008.

Davis, Fred D. 1993. "User Acceptance of Information Technology: System Characteristics, User Perceptions and Behavioral Impacts." *International Journal of Man-Machine Studies* 38 (3): 475-487. https://doi.org/10.1006/imms.1993.1022.

Davis, Fred D., Richard P. Bagozzi, and Paul R. Warshaw. 1989. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models." *Management Science* 35 (8): 982-1003. https://doi.org/10.1287/mnsc.35.8.982.

Davis, Fred D., and Viswanath Venkatesh. 1996. "A Critical Assessment of Potential Measurement Biases in the Technology Acceptance Model: Three Experiments." *International Journal of Human-Computer Studies* 45 (1): 19-45. https://doi.org/10.1006/ijhc.1996.0040.

Dehghani, Milad, Fulya Acikgoz, Atefeh Mashatan, and Seung Hwan Lee. 2021. "A Holistic Analysis towards Understanding Consumer Perceptions of Virtual Reality Devices in the Post-Adoption Phase." *Behaviour & Information Technology*: 1-19. https://doi.org/10.1080/0144929X.2021.1876767.

Delone, William H., and Ephraim R. Mclean. 1992. "Information Systems Success: The Quest for the Dependent Variable." *Information Systems Research* 3 (1): 60-95. https://doi.org/10.1287/isre.3.1.60.

Diehl, Francene Scott, Luz Stella Marín, and Majed Zreiqat. 2020. "An Evaluation of AT&T Social Marketing Delivery Modes Aimed at Teen Smartphone Use while Driving." *Journal of Cultural Marketing Strategy* 5 (1): 60-75. https://www.ingentaconnect.com/content/hsp/jcms/2020/00000005/00000001/art00007.

Diemer, Julia, Georg W Alpers, Henrik M Peperkorn, Youssef Shiban, and Andreas Mühlberger. 2015. "The Impact of Perception and Presence on Emotional Reactions: A Review of Research in Virtual Reality." *Frontiers in Psychology* 6: 26. https://doi.org/10.3389/fpsyg.2015.00026.

Disztinger, Peter, Stephan Schlögl, and Aleksander Groth. 2017. "Technology Acceptance of Virtual Reality for Travel Planning." In *ENTER2017 eTourism Conference*, *Rome, Italy, 2017*2017. Italy: Springer International Publishing. https://doi.org/10.1007/978-3-319-51168-9_19.

do Espírito Santo, Pedro Manuel, Patrícia Milene Azinheira Cardoso, and Lídia Maria do Espírito Santo. 2016. "Effects of Personality Traits on Hedonic Travel Motivation." *International Journal of Business and Management Invention* 5 (3): 89-96. https://www.ijbmi.org/papers/Vol(5)3/Version-2/M50302089096.pdf.

Downes, Edward J., and Sally J. McMillan. 2000. "Defining Interactivity:A Qualitative Identification of Key Dimensions." *New Media & Society* 2 (2): 157-179. https://doi.org/10.1177/14614440022225751.

Eason, Ken D. 1984. "Towards the Experimental Study of Usability." *Behaviour & Information Technology* 3 (2): 133-143. https://doi.org/10.1080/01449298408901744.

Ebardo, Ryan A., Reynold C. Padagas, and John Byron D. Tuazon. 2021. "Regulatory and Management Support in the Adoption of Cloud Technologies among Teachers: A Theory of Reasoned Action Approach." In *2021 IEEE 8th International Conference on Industrial Engineering and Applications (ICIEA)*, *23-26 April 2021, 2021* United States: IEEE. https://doi.org/10.1109/ICIEA52957.2021.9436708.

Edwards-Stewart, Amanda, Tim Hoyt, and Greg M. Reger. 2016. "Classifying different types of augmented reality technology." *Annual Review of CyberTherapy and Telemedicine* 14: 199-202.

Errichiello, Luisa, Roberto Micera, Marcello Atzeni, and Giacomo Del Chiappa. 2019. "Exploring the implications of wearable virtual reality technology for museum visitors' experience: A cluster analysis." *International Journal of Tourism Research* 21 (5): 590-605. https://doi.org/10.1002/jtr.2283.

Estriegana, Rosa, José-Amelio Medina-Merodio, and Roberto Barchino. 2019. "Student Acceptance of Virtual Laboratory and Practical Work: An Extension of the Technology Acceptance Model." *Computers & Education* 135: 1-14. https://doi.org/10.1016/j.compedu.2019.02.010.

Eysenck, Hans J. 2009. *The Biological Basis of Personality*. New Brunswick, New Jersey: Transaction publishers.

Fang, Yu-Min, and Yen-Jung Huang. 2021. "Comparison of the Usability and Flow Experience of an Exercise Promotion Virtual Reality Programme for Different Age Groups." *Behaviour & Information Technology* 40 (12): 1-15. https://doi.org/10.1080/0144929X.2021.1938680.

Fang, Yu-Min, and Chun Lin. 2019. "The usability testing of vr interface for tourism apps." *Applied Sciences* 9 (16). https://doi.org/10.3390/app9163215.

Fenu, Cristina, and Fabio Pittarello. 2018. "Svevo Tour: The design and the experimentation of an augmented reality application for engaging visitors of a literary museum." *International Journal of Human-Computer Studies* 114: 20-35. https://doi.org/10.1016/j.ijhcs.2018.01.009.

Fishbein, Martin, and Icek Ajzen. 1975. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Canada: Addison-Wesley Pub. Co. https://people.umass.edu/aizen/f&a1975.html.

Flavián, Carlos, Sergio Ibáñez-Sánchez, and Carlos Orús. 2019a. "The Impact of Virtual, Augmented and Mixed Reality Technologies on the Customer Experience." *Journal of Business Research* 100: 547-560. https://doi.org/10.1016/j.jbusres.2018.10.050.

Flavián, Carlos, Sergio Ibáñez-Sánchez, and Carlos Orús. 2019b. "Integrating virtual reality devices into the body: Effects of technological embodiment on customer engagement and behavioral intentions toward the destination." *Journal of Travel & Tourism Marketing* 36 (7): 847-863. https://doi.org/10.1080/10548408.2019.1618781.

Force Field Entertainment B.V. n.d. "National Geographic Explore VR." https://www.oculus.com/experiences/quest/2046607608728563/?locale=en_US.

Fornell, Claes, and David F. Larcker. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error." *Journal of Marketing Research* 18 (1): 39-50. https://doi.org/10.2307/3151312.

French, Aaron M. 2017. "Let's Meet Offline: A Mixed-Methods Approach Exploring New Trends in Social Networking." *Information Technology & People* 30 (4): 946-968. https://doi.org/10.1108/ITP-08-2015-0213.

Friedkin, Noah, and Eugene Johnsen. 1999. "Social Influence Networks and Opinion Change." In *Advances in Group Process*. 1-29. JAI Press Inc. https://doi.org/10.1108/agp.

Galitz, Wilbert O. 2007. *The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques*. 3rd ed. United States: Wiley Publishing, Inc.

Gao, Lingling, and Xuesong Bai. 2014. "Online Consumer Behaviour and Its Relationship to Website Atmospheric Induced Flow: Insights into Online Travel Agencies in China." *Journal of Retailing and Consumer Services* 21 (4): 653-665. https://doi.org/10.1016/j.jretconser.2014.01.001.

Gao, Lingling, Xuesong Bai, and Anthony Park. 2017. "Understanding Sustained Participation in Virtual Travel Communities from the Perspectives of IS Success Model and Flow Theory." *Journal of Hospitality & Tourism Research* 41 (4): 475-509. https://doi.org/10.1177/1096348014563397.

García-Crespo, Ángel, Israel González-Carrasco, José L. López-Cuadrado, Daniel Villanueva, and Álvaro González. 2016. "CESARSC: Framework for creating cultural entertainment systems with augmented reality in smart cities." *Computer Science and Information Systems* 13 (2): 395-425. https://doi.org/10.2298/csis150620006g.

Garrett, Jesse James. 2010. *The Elements of User Experience: User-Centered Design for the Web and Beyond*. 2nd ed. United Kingdom: Pearson Education.

Gaskin, James. 2016a. "Causal Modelling." 2020 (November 10). http://statwiki.gaskination.com/index.php?title=Causal_Models.

Gaskin, James. 2016b. "Data Screening." 2020 (November 10). http://statwiki.kolobkreations.com/index.php?title=Data_screening.

Gaskin, James, M. James, and J. Lim. 2019. *Master Validity Tool*. Gaskination's StatWiki.

Gaskin, James, M. James, and J. Lim. 2020. *Indirect Effects*. AMOS Plugin. Gaskination's StatWiki.

Ghadban, Shadi, Ramzi Hassan, Omar Aboudi, and Yousef Khateeb. 2013. "The development of an interactive virtual environment for hisham palace in Jericho, Palestine." *International Journal of Architectural Research* 7 (2): 118-135. https://doi.org/10.26687/archnet-ijar.v7i2.159.

Ghapanchi, Amir Hossein, Afrooz Purarjomandlangrudi, Alasdair McAndrew, and Yuan Miao. 2020. "Investigating the Impact of Space Design, Visual Attractiveness and Perceived Instructor Presence on Student Adoption of Learning Management Systems." *Education and Information Technologies* 25 (6): 5053-5066. https://doi.org/10.1007/s10639-020-10204-5.

Gibson, Alex, and Mary O'Rawe. 2018. "Virtual Reality as a Travel Promotional Tool: Insights from a Consumer Travel Fair." In *Augmented Reality and Virtual Reality: Empowering Human, Place and Business*, Timothy Jung and M. Claudia tom Dieck, eds., 93-107. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-64027-3_7.

Gill, John, and Phil Johnson. 2002. *Research Methods for Managers*. 3rd ed. India: SAGE Publications.

Gimeno, Jesús, Cristina Portalés, Inmaculada Coma, Marcos Fernández, and Bibiana Martínez. 2017. "Combining traditional and indirect augmented reality for indoor crowded environments. A case study on the Casa Batlló Museum." *Computers & Graphics* 69: 92-103. https://doi.org/10.1016/j.cag.2017.09.001.

Glaesser, Dirk. 2006. *Crisis Management in the Tourism Industry*. 2nd ed. Oxford: Butterworth-Heinemann.

Goeldner, Charles R., and J. R. Brent Ritchie. 2012. *Tourism: Principles, Practices, Philosophies*. 12th ed. New Jersey: John Wiley & Sons, Inc.

Gossman, Dana. 2014. "Impact of Social Networking Site Usage on Fashion Consumers Behavioral Intention." thesis, California State University. Northridge. https://scholarworks.calstate.edu/downloads/47429d32m.

Graham, Peter. 2019. "China's VR Star Theme Park is a Vision of the Future, but not for Western Audiences." https://www.vrfocus.com/2019/02/chinas-vr-star-theme-park-is-a-vision-of-the-future-but-not-for-western-audiences/.

Grehan, Patrick, Rosemary Flanagan, and Robert Malgady. 2011. "Successful Graduate Students: The Roles of Personality Traits and Emotional Intelligence." *Psychology in the Schools* 48 (4): 317-331. https://doi.org/10.1002/pits.20556.

Grubert, Jens, Michel Pahud, Raphael Grasset, Dieter Schmalstieg, and Hartmut Seichter. 2015. "The utility of Magic Lens interfaces on handheld devices for touristic map navigation." *Pervasive and Mobile Computing* 18: 88-103. https://doi.org/10.1016/j.pmcj.2014.08.005.

Gu, Dongxiao, Xuejie Yang, Xingguo Li, Hemant K Jain, and Changyong Liang. 2018. "Understanding the Role of Mobile Internet-Based Health Services on Patient Satisfaction and Word-of-Mouth." *International Journal of Environmental Research and Public Health* 15 (9): 1972. https://doi.org/10.3390/ijerph15091972.

Guba, Egon G, and Yvonna S Lincoln. 1994. "Competing Paradigms in Qualitative Research." In *Handbook of Qualitative Research*, N.K. Denzin and Y.S. Lincoln, eds., 105-117. Thousand Oaks: Sage Publications, Inc.

Guttentag, Daniel A. 2010. "Virtual reality: Applications and implications for tourism." *Tourism Management* 31 (5): 637-651. https://doi.org/10.1016/j.tourman.2009.07.003.

Hair, Joseph F., Jr., William C. Black, Barry J. Babin, and Rolph E. Anderson. 2014. *Multivariate Data Analysis*. Edited by William C. Black. 7th ed. Harlow, Essex: Pearson Education Limited.

Hammady, Ramy, Minhua Ma, Carl Strathern, and Mostafa Mohamad. 2020. "Design and development of a spatial mixed reality touring guide to the Egyptian museum." *Multimedia Tools and Applications* 79 (5-6): 3465-3494. https://doi.org/10.1007/s11042-019-08026-w.

Han, Dai-In Danny, M. Claudia Tom Dieck, and Timothy Jung. 2019. "Augmented reality smart glasses (ARSG) visitor adoption in cultural tourism." *Leisure Studies* 38 (5): 618-633. https://doi.org/10.1080/02614367.2019.1604790.

Han, Dai-In Danny, Timothy Jung, and M. Claudia Tom Dieck. 2019. "Translating tourist requirements into mobile AR application engineering through QFD." *International Journal of Human-Computer Interaction* 35 (19): 1842-1858. https://doi.org/10.1080/10447318.2019.1574099.

Han, Dai-In, M. Claudia tom Dieck, and Timothy Jung. 2018. "User experience model for augmented reality applications in urban heritage tourism." *Journal of Heritage Tourism* 13 (1): 46-61. https://doi.org/10.1080/1743873X.2016.1251931.

Harman, Harry H. 1976. *Modern Factor Analysis*. 3rd ed. Chicago: The University of Chicago Press.

Hassenzahl, Marc. 2008. "Aesthetics in Interactive Products: Correlates and Consequences of Beauty." In *Product Experience*, Hendrik N. J. Schifferstein and Paul Hekkert, eds., 287-302. San Diego: Elsevier. https://doi.org/10.1016/B978-008045089-6.50014-9.

Hayduk, Leslie, Greta Cummings, Kwame Boadu, Hannah Pazderka-Robinson, and Shelley Boulianne. 2007. "Testing! Testing! One, Two, Three-Testing The Theory in Structural Equation Models!" *Personality and Individual Differences* 42 (5): 841-850. https://doi.org/10.1016/j.paid.2006.10.001.

Heeter, Carrie. 2000. "Interactivity in the Context of Designed Experiences." *Journal of Interactive Advertising* 1 (1): 3-14. https://doi.org/10.1080/15252019.2000.10722040.

Hein, Daniel W. E., Jennah L. Jodoin, Philipp A. Rauschnabel, and Björn S. Ivens. 2017. "Are wearables good or bad for society?: An exploration of societal benefits, risks, and consequences of augmented reality smart glasses." In *Mobile technologies and augmented reality in open education*, Kurubacak Gulsun and Altinpulluk Hakan, eds., 1-25. IGI Global. https://doi.org/10.4018/978-1-5225-2110-5.ch001.

Hen, Libi Beke. 2019. "Exploring Surgeon's Acceptance of Virtual Reality Headset for Training." In *Augmented Reality and Virtual Reality: The Power of AR and VR for Business*, M. Claudia tom Dieck and Timothy Jung, eds., 291-304. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-06246-0_21.

Henderson, Amy, Nicol Korner-Bitensky, and Mindy Levin. 2007. "Virtual Reality in Stroke Rehabilitation: A Systematic Review of its Effectiveness for Upper Limb Motor Recovery." *Topics in Stroke Rehabilitation* 14 (2): 52-61. https://doi.org/10.1310/tsr1402-52.

Henseler, Jörg, Geoffrey Hubona, and Pauline Ash Ray. 2016. "Using PLS Path Modeling in New Technology Research: Updated Guidelines." *Industrial Management & Data Systems* 116 (1): 2-20. https://doi.org/10.1108/IMDS-09-2015-0382.

Henseler, Jörg, Christian M. Ringle, and Marko Sarstedt. 2015. "A New Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modeling." *Journal of the Academy of Marketing Science* 43 (1): 115-135. https://doi.org/10.1007/s11747-014-0403-8.

Herrero Crespo, Ángel, and Ignacio Rodríguez del Bosque. 2008. "The Effect of Innovativeness on the Adoption of B2C E-commerce: A Model Based on the Theory of Planned Behaviour." *Computers in Human Behavior* 24 (6): 2830-2847. https://doi.org/10.1016/j.chb.2008.04.008.

Hirschfeld, Robert R., Mark H. Jordan, Christopher H. Thomas, and Hubert S. Feild. 2008. "Observed Leadership Potential of Personnel in a Team Setting: Big Five Traits and Proximal Factors as Predictors." *International Journal of Selection and Assessment* 16 (4): 385-402. https://doi.org/10.1111/j.1468-2389.2008.00443.x.

Ho, Chaang-Iuan, and Yi-Ling Lee. 2007. "The Development of an E-Travel Service Quality Scale." *Tourism Management* 28 (6): 1434-1449. https://doi.org/10.1016/j.tourman.2006.12.002.

Hobson, J. S. Perry, and A. Paul Williams. 1995. "Virtual reality: A new horizon for the tourism industry." *Journal of Vacation Marketing* 1 (2): 124-135. https://doi.org/10.1177/135676679500100202.

Hofstede, Geert. 2001. *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations*. 2nd ed. London: Sage Publications.

Hogan, Robert, John Johnson, Stephen Briggs, and Stephen Briggs. 1997. *Handbook of Personality Psychology*. Burlington, United States: Elsevier Science & Technology.

Home Run Limited. (n.d.). "The Conqueror virtual challenges." available at: https://www.theconqueror.events/. accessed 17 September, 2021.

Hong, Maxwell, Jeffrey T. Steedle, and Ying Cheng. 2020. "Methods of Detecting Insufficient Effort Responding: Comparisons and Practical Recommendations." *Educational and Psychological Measurement* 80 (2): 312-345. https://doi.org/10.1177/0013164419865316.

Horton, Nicholas J., and Ken P. Kleinman. 2007. "Much Ado About Nothing: A Comparison of Missing Data Methods and Software to Fit Incomplete Data Regression Models." *The American Statistician* 61 (1): 79-90. https://doi.org/10.1198/000313007X172556.

Huang, Yu-Chih, Sheila J. Backman, Kenneth F. Backman, and DeWayne Moore. 2013. "Exploring User Acceptance of 3D Virtual Worlds in Travel and Tourism Marketing." *Tourism Management* 36: 490-501. https://doi.org/10.1016/j.tourman.2012.09.009.

Hughes, David John, Moss Rowe, Mark Batey, and Andrew Lee. 2012. "A Tale of Two Sites: Twitter vs. Facebook and the Personality Predictors of Social Media Usage." *Computers in Human Behavior* 28 (2): 561-569. https://doi.org/10.1016/j.chb.2011.11.001.

Hussein, Zuhal. 2017. "Leading to Intention: The Role of Attitude in Relation to Technology Acceptance Model in E-Learning." *Procedia Computer Science* 105: 159-164. https://doi.org/10.1016/j.procs.2017.01.196.

International Organization for Standardization. 1998. *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 11: Guidance on usability*. SAI Global https://www.iso.org/standard/16883.html.

International Organization for Standardization. 2018. *Ergonomics of Human-System Interaction -- Part 11: Usability: Definitions and Concepts*. SAI Global https://www.iso.org/standard/63500.html.

Isen, Alice M. 2001. "An Influence of Positive Affect on Decision Making in Complex Situations: Theoretical Issues With Practical Implications." *Journal of Consumer Psychology* 11 (2): 75-85. https://doi.org/10.1207/S15327663JCP1102_01.

Isleyen, Ergin, and H. Sebnem Duzgun. 2019. "Use of Virtual Reality in Underground Roof Fall Hazard Assessment and Risk Mitigation." *International Journal of Mining Science and Technology* 29 (4): 603-607. https://doi.org/10.1016/j.ijmst.2019.06.003.

Ismail, Mohammad, and Razli Che Razak. 2011. "The Determinant Factors Influencing Young Consumers Acceptance of Mobile Marketing in Malaysia." *African Journal of Business Management* 5 (32): 12531-12542. https://academicjournals.org/journal/AJBM/article-abstract/B2B235220772.

Israel, Kai, Dieter K. Tscheulin, and Christopher Zerres. 2019. "Virtual Reality in the Hotel Industry: Assessing the Acceptance of Immersive Hotel Presentation." *European Journal of Tourism Research* 21: 5-22. https://doi.org/10.54055/ejtr.v21i.355.

Israel, Kai, Christopher Zerres, and Dieter K. Tscheulin. 2019. "Presenting hotels in virtual reality: Does it influence the booking intention?" *Journal of Hospitality and Tourism Technology* 10 (3): 443-463. https://doi.org/10.1108/JHTT-03-2018-0020.

Jackson, Dennis L. 2003. "Revisiting Sample Size and Number of Parameter Estimates: Some Support for the N:q Hypothesis." *Structural Equation Modeling: A Multidisciplinary Journal* 10 (1): 128-141. https://doi.org/10.1207/S15328007SEM1001_6.

Jensen, Jens F. 1998. "Interactivity: Tracking a New Concept in Media and Communication Studies." *Nordicom Review* 12: 185-204. http://www.nordicom.gu.se/sites/default/files/kapitel-pdf/38_jensen.pdf.

Jiang, Bolan, Ulrich Neumann, and Suya You. 2004. "A Robust Hybrid Tracking System for Outdoor Augmented Reality." In *IEEE Virtual Reality 2004*, *27-31 March 2004, 2004* https://doi.org/10.1109/VR.2004.1310049.

Jiang, Zhenhui, and Izak Benbasat. 2004. "Virtual Product Experience: Effects of Visual and Functional Control of Products on Perceived Diagnosticity and Flow in Electronic Shopping." *Journal of Management Information Systems* 21 (3): 111-147. https://doi.org/10.1080/07421222.2004.11045817.

John, Oliver P, and Sanjay Srivastava. 1999. "The Big Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives." In *Handbook of Personality: Theory and Research*, Lawrence A. Pervin and Oliver P. John, eds., 102-138. United States: Guilford Press.

John, Oliver P., Eileen M. Donahue, and Robert L. Kentle. 1991. 'The Big Five Inventory--Versions 4a and 54.' Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

John, Oliver P., Laura P. Naumann, and Christopher J. Soto. 2008. "Paradigm Shift to the Integrative Big Five Trait Taxonomy: History, Measurement, and Conceptual Issues." In *Handbook of Personality : Theory and Research*, Oliver P. John, Richard W. Robins and Lawrence A. Pervin, eds., 114-158. New York, United States: Guilford Publications. https://www.guilford.com/books/Handbook-of-Personality/John-Robins/9781462550487.

Johnson, Grace J, Gordon C Bruner II, and Anand Kumar. 2006. "Interactivity and Its Facets Revisited: Theory and Empirical Test." *Journal of Advertising* 35 (4): 35-52. https://doi.org/10.2753/JOA0091-3367350403.

Johnston, David J., Martin Fleury, Andy C. Downton, and Adrian Clark. 2005. "Real-Time Positioning for Augmented Reality on a Custom Parallel Machine." *Image and Vision Computing* 23 (3): 271-286. https://doi.org/10.1016/j.imavis.2003.08.002.

Jokela, Timo, Netta Iivari, Juha Matero, and Minna Karukka. 2003. "The Standard of User-Centered Design and the Standard Definition of Usability: Analyzing ISO 13407 Against ISO 9241-11." *Rio de Janeiro, Brazil, 2003*: Association for Computing Machinery. https://doi.org/10.1145/944519.944525.

Jordan, Patrick W. 2002. *An Introduction to Usability*. Florida: CRC Press. https://doi.org/10.1201/9781003062769.

Jöreskog, K. G. 1970. "A General Method for Analysis of Covariance Structures." *Biometrika* 57 (2): 239-251. https://doi.org/10.1093/biomet/57.2.239.

Joshi, Sayali, Michael Hamilton, Robert Warren, Danny Faucett, Wenmeng Tian, Yu Wang, and Junfeng Ma. 2021. "Implementing Virtual Reality Technology for Safety Training in the Precast/Prestressed Concrete Industry." *Applied Ergonomics* 90. https://doi.org/10.1016/j.apergo.2020.103286.

Jung, Timothy, Namho Chung, and M. Claudia Leue. 2015. "The determinants of recommendations to use augmented reality technologies: The case of a Korean theme park." *Tourism Management* 49: 75-86. https://doi.org/10.1016/j.tourman.2015.02.013.

Jung, Timothy Hyungsoo, Hyunae Lee, Namho Chung, and M. Claudia tom Dieck. 2018. "Cross-cultural differences in adopting mobile augmented reality at cultural heritage tourism sites." *International Journal of Contemporary Hospitality Management* 30 (3): 1621-1645. https://doi.org/10.1108/IJCHM-02-2017-0084.

Jung, Timothy Hyungsoo, and M. Claudia tom Dieck. 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* 10 (2): 140-151. https://doi.org/10.1108/JPMD-07-2016-0045.

Jung, Timothy, M. Claudia tom Dieck, Hyunae Lee, and Namho Chung. 2016. "Effects of Virtual Reality and Augmented Reality on Visitor Experiences in Museum." *Spain, 2016* Switzerland: Springer, Cham.

Jung, Timothy, M. Claudia Tom Dieck, Hyunae Lee, and Namho Chung. 2020. "Moderating role of long-term orientation on augmented reality adoption." *International Journal of Human-Computer Interaction* 36 (3): 239-250. https://doi.org/10.1080/10447318.2019.1630933.

Kamal, Syeda Ayesha, Muhammad Shafiq, and Priyanka Kakria. 2020. "Investigating Acceptance of Telemedicine Services through an Extended Technology Acceptance Model (TAM)." *Technology in Society* 60. https://doi.org/10.1016/j.techsoc.2019.101212.

Kasilingam, Dharun Lingam. 2020. "Understanding the Attitude and Intention to Use Smartphone Chatbots for Shopping." *Technology in Society* 62. https://doi.org/10.1016/j.techsoc.2020.101280.

Kasinathan, Vinothini, Aida Mustapha, Yeap Chee Seong, and Aida Zamnah Zainal Abidin. 2017. "Footprint: Tourism information search based on mixed reality." *International Journal on Advanced Science, Engineering and Information Technology* 7 (4-2 Special Issue): 1504-1509. https://doi.org/10.18517/ijaseit.7.4-2.3400.

Kassim, Mohd Hisyamuddin, Ahmad Rafi Eshaq, and Charles Peter Woods. 2019. "Mobile augmented reality: An alternative way toward museum visitors' experience." *International Journal of Recent Technology and Engineering* 8 (2 Special Issue 8): 1420-1425. https://doi.org/10.35940/ijrte.B1077.0882S819.

Kersten, Thomas Peter, Felix Tschirschwitz, Maren Lindstaedt, and Simon Deggim. 2018. "The historic wooden model of Solomon's temple: 3D recording, modelling and immersive virtual reality visualisation." *Journal of Cultural Heritage Management and Sustainable Development* 8 (4): 448-464. https://doi.org/10.1108/JCHMSD-09-2017-0067.

Ketelaar, Paul E., and Mark van Balen. 2018. "The Smartphone as Your Follower: The Role of Smartphone Literacy in the Relation between Privacy Concerns, Attitude and Behaviour towards Phone-Embedded Tracking." *Computers in Human Behavior* 78: 174-182. https://doi.org/10.1016/j.chb.2017.09.034.

Kim, Myung Ja, Choong-Ki Lee, and Timothy Jung. 2020. "Exploring consumer behavior in virtual reality tourism using an extended stimulus-organism-response model." *Journal of Travel Research* 59 (1): 69-89. https://doi.org/10.1177/0047287518818915.

Kiousis, Spiro. 2002. "Interactivity: A Concept Explication." *New Media & Society* 4 (3): 355-383. https://doi.org/10.1177/146144480200400303.

Kivistö, Maria Sofia. 2021. "The Impact of Website Design Features on the Consumer's Purchase Decision." thesis, School of Business and Management LUT University. Finland. https://lutpub.lut.fi/handle/10024/162258.

Klag, Malvina, and Ann Langley. 2013. "Approaching the Conceptual Leap in Qualitative Research." *International Journal of Management Reviews* 15 (2): 149-166. https://doi.org/doi:10.1111/j.1468-2370.2012.00349.x.

Kline, Rex B. 2015. *Principles and Practice of Structural Equation Modeling*. 4th ed. New York: The Guilford Publications.

Kock, Ned. 2015. "Common Method Bias in PLS-SEM: A Full Collinearity Assessment Approach." *International Journal of e-Collaboration (IJeC)* 11 (4): 1-10. https://doi.org/10.4018/ijec.2015100101.

Koo, Seungbum, Jinyoung Kim, Changhyuk Kim, Jeeyeop Kim, and Hee Sung Cha. 2019. "Development of an augmented reality tour guide for a cultural heritage site." *Journal on Computing and Cultural Heritage* 12 (4). https://doi.org/10.1145/3317552.

Kounavis, Chris D., Anna E. Kasimati, and Efpraxia D. Zamani. 2012. "Enhancing the tourism experience through mobile augmented reality: Challenges and prospects." *International Journal of Engineering Business Management* 4. https://doi.org/10.5772/51644.

Kourouthanassis, Panos, Costas Boletsis, Cleopatra Bardaki, and Dimitra Chasanidou. 2015. "Tourists responses to mobile augmented reality travel guides: The role of emotions on adoption behavior." *Pervasive and Mobile Computing* 18: 71-87. https://doi.org/10.1016/j.pmcj.2014.08.009.

Kourouthanassis, Panos E., Costas Boletsis, and George Lekakos. 2015. "Demystifying the design of mobile augmented reality applications." *Multimedia Tools and Applications* 74 (3): 1045-1066. https://doi.org/10.1007/s11042-013-1710-7.

Kourtesis, Panagiotis, Simona Collina, Leonidas A. A. Doumas, and Sarah E. MacPherson. 2019. "Validation of the Virtual Reality Neuroscience Questionnaire: Maximum Duration of Immersive Virtual Reality Sessions Without the Presence of Pertinent Adverse Symptomatology." *Frontiers in Human Neuroscience* 13 (417). https://doi.org/10.3389/fnhum.2019.00417.

Kwon, Chongsan. 2019. "Verification of the Possibility and Effectiveness of Experiential Learning using HMD-Based Immersive VR Technologies." *Virtual Reality* 23 (1): 101-118. https://doi.org/10.1007/s10055-018-0364-1.

Lacka, Ewelina. 2020. "Assessing the impact of full-fledged location-based augmented reality games on tourism destination visits." *Current Issues in Tourism* 23 (3): 345-357. https://doi.org/10.1080/13683500.2018.1514370.

Laurel, Brenda. 1993. *Computers as Theatre*. Germany: Addison-Wesley.

Lee, Hyunae, Timothy Hyungsoo Jung, M. Claudia tom Dieck, and Namho Chung. 2019. "Experiencing immersive virtual reality in museums." *Information & Management* 57 (5). https://doi.org/10.1016/j.im.2019.103229.

Lee, I-Jui, Chien-Hsu Chen, and Chun-Yun Su. 2017. "App based souvenirs and entry tickets: A new means of enhancing post visit memories: A Case study from Taiwan." *Tourism Management Perspectives* 24: 177-185. https://doi.org/10.1016/j.tmp.2017.09.001.

Lee, Kwan Min. 2006. "Presence, Explicated." *Communication Theory* 14 (1): 27-50. https://doi.org/10.1111/j.1468-2885.2004.tb00302.x.

Lee, Sangwon, and Richard J. Koubek. 2010. "The Effects of Usability and Web Design Attributes on User Preference for e-Commerce Web Sites." *Computers in Industry* 61 (4): 329-341. https://doi.org/https://doi.org/10.1016/j.compind.2009.12.004.

Lee, Seonho, Yeseul Lim, and Junchul Chun. 2013. "3D Interaction in Augmented Reality with Stereo-Vision Technique." In *2013 15th International Conference on Advanced Communications Technology (ICACT)*, *Korea, 27-30 Jan. 2013, 2013*2013. South Korea: IEEE. https://ieeexplore.ieee.org/document/6488216.

Lee, Seung Hak, Hae-Yoon Jung, Seo Jung Yun, Byung-Mo Oh, and Han Gil Seo. 2020. "Upper Extremity Rehabilitation Using Fully Immersive Virtual Reality Games With a Head Mount Display: A Feasibility Study." *PM&R* 12 (3): 257-262. https://doi.org/10.1002/pmrj.12206.

Lee, Yang W., Diane M. Strong, Beverly K. Kahn, and Richard Y. Wang. 2002. "AIMQ: A Methodology for Information Quality Assessment." *Information & Management* 40 (2): 133-146. https://doi.org/10.1016/S0378-7206(02)00043-5.

Lexico. 2019a. "Immersive." *Oxford Dictionary*. https://www.lexico.com/en/definition/immersive.

Lexico. 2019b. "Virtual Reality." *Oxford Dictionary*. https://www.lexico.com/definition/virtual_reality.

Li, Tao, and Yun Chen. 2019. "Will virtual reality be a double-edged sword? Exploring the moderation effects of the expected enjoyment of a destination on travel intention." *Journal of Destination Marketing & Management* 12: 15-26. https://doi.org/10.1016/j.jdmm.2019.02.003.

Light, Ann, and Ian Wakeman. 2001. "Beyond the Interface: Users' Perceptions of Interaction and Audience on Websites." *Interacting with Computers* 13 (3): 325-351. https://doi.org/10.1016/s0953-5438(00)00044-8.

Lin, Hui-Fei, and Chi-Hua Chen. 2017. "Combining the technology acceptance model and uses and gratifications theory to examine the usage behavior of an augmented reality tour-sharing application." *Symmetry* 9 (7). https://doi.org/10.3390/sym9070113.

Lin, Li-Pin, Shu-Chun Huang, and Yao-Chun Ho. 2020. "Could virtual reality effectively market slow travel in a heritage destination?" *Tourism Management* 78. https://doi.org/10.1016/j.tourman.2019.104027.

Lindell, Michael K. 2001. "Assessing and Testing Interrater Agreement on a Single Target Using Multi-Item Rating Scales." *Applied Psychological Measurement* 25 (1): 89-99. https://doi.org/10.1177/01466216010251007.

Linden Research. (n.d.). "Second Life." available at: https://secondlife.com/. accessed 24 September, 2019.

Lindgaard, Gitte, and Cathy Dudek. 2003. "What is This Evasive Beast We Call User Satisfaction?" *Interacting with Computers* 15 (3): 429-452. https://doi.org/10.1016/s0953-5438(02)00063-2.

Liu, Yuping. 2003. "Developing a Scale to Measure the Interactivity of Websites." *Journal of Advertising Research* 43 (2): 207-216. https://doi.org/10.2501/JAR-43-2-207-216.

Liu, Yuping, and L. J. Shrum. 2002. "What Is Interactivity and Is It Always Such a Good Thing? Implications of Definition, Person, and Situation for the Influence of Interactivity on Advertising Effectiveness." *Journal of Advertising* 31 (4): 53-64. https://doi.org/10.1080/00913367.2002.10673685.

Lombard, Matthew, and Theresa Ditton. 1997. "At the Heart of It All: The Concept of Presence." *Journal of Computer-Mediated Communication* 3 (2). https://doi.org/10.1111/j.1083-6101.1997.tb00072.x.

Lowry, Paul Benjamin, Trent Spaulding, Taylor Michael Wells, Gregory Daniel Moody, Kevin Moffit, and Sebastian Madariaga. 2006. "A Theoretical Model and Empirical Results Linking Website Interactivity and Usability Satisfaction." In *39th Annual Hawaii International Conference on System Sciences (HICSS'06)*, *Hawaii, 4-7 January 2006, 2006*: IEEE Computer Society. https://doi.org/10.1109/HICSS.2006.33.

Lucas Jr., Henry C., and V.K. Spitler. 1999. "Technology Use and Performance: A Field Study of Broker Workstations." *Decision Sciences* 30 (2): 291-311. https://doi.org/10.1111/j.1540-5915.1999.tb01611.x.

Lund, Arnold M. 2001. "Measuring Usability with the USE Questionnaire." *Usability Interface* 8 (2): 3-6. https://www.researchgate.net/publication/230786746_Measuring_Usability_with_the_USE_Questionnaire.

Madsen, Jacob B., and Claus B. Madsen. 2015. "Handheld visual representation of a castle chapel ruin." *ACM Journal on Computing and Cultural Heritage* 9 (1): 1-18. https://doi.org/10.1145/2822899.

Mahmood, Mo A., and Jeanette N. Medewitz. 1985. "Impact of Design Methods on Decision Support Systems Success: An Empirical Assessment." *Information & Management* 9 (3): 137-151. https://doi.org/10.1016/0378-7206(85)90010-2.

Mäkinen, Henna, Elina Haavisto, Sara Havola, and Jaana-Maija Koivisto. 2020. "User Experiences of Virtual Reality Technologies for Healthcare in Learning: An Integrative Review." *Behaviour & Information Technology*: 1-17. https://doi.org/10.1080/0144929X.2020.1788162.

Makransky, Guido, Gustav B. Petersen, and Sara Klingenberg. 2020. "Can an Immersive Virtual Reality Simulation Increase Students' Interest and Career Aspirations in Science?" *British Journal of Educational Technology* 51 (6): 2079-2097. https://doi.org/10.1111/bjet.12954.

Malhotra, Naresh K, and Satyabhusan Dash. 2016. *Marketing Research: An Applied Orientation*. 7th ed. India: Pearson India Education Services Pvt. Ltd.

Marasco, Alessandra, Piera Buonincontri, Mathilda van Niekerk, Marissa Orlowski, and Fevzi Okumus. 2018. "Exploring the role of next-generation virtual technologies in destination marketing." *Journal of Destination Marketing & Management* 9: 138-148. https://doi.org/10.1016/j.jdmm.2017.12.002.

Marchiori, Elena, Evangelos Niforatos, and Luca Preto. 2018. "Analysis of users' heart rate data and self-reported perceptions to understand effective virtual reality characteristics." *Information Technology & Tourism* 18 (1-4): 133-155. https://doi.org/10.1007/s40558-018-0104-0.

Mason, Marco. 2016. "The MIT museum glassware prototype: Visitor experience exploration for designing smart glasses." *ACM Journal on Computing and Cultural Heritage* 9 (3): 1-28. https://doi.org/10.1145/2872278.

Matterport. 2020a. "Batu Villa." https://matterport.com/gallery/batu-villa.

Matterport. 2020b. "Mehu Tomb." 2021. https://matterport.com/gallery/mehu-tomb-mqbrh-mhw.

Matterport. (2021). "3D Tour Gallery." Matterport Inc.,, available at: https://matterport.com/gallery. February 14, 2019, accessed February 14, 2019.

McCrae, Robert R., and Paul T. Costa Jr. 1997. "Personality Trait Structure as a Human Universal." *American Psychologist* 52 (5): 509-516. https://doi.org/10.1037/0003-066X.52.5.509.

McCrae, Robert R., and Oliver P. John. 1992. "An Introduction to the Five-Factor Model and Its Applications." *Journal of Personality* 60 (2): 175-215. https://doi.org/10.1111/j.1467-6494.1992.tb00970.x.

McKinney, Vicki, Kanghyun Yoon, and Fatemeh "Mariam" Zahedi. 2002. "The Measurement of Web-Customer Satisfaction: An Expectation and Disconfirmation Approach." *Information Systems Research* 13 (3): 296-315. https://doi.org/10.1287/isre.13.3.296.76.

McLean, Graeme, and Jennifer B Barhorst. 2021. "Living the Experience Before You Go . . . but Did It Meet Expectations? The Role of Virtual Reality during Hotel Bookings." *Journal of Travel Research*: 1-19. https://doi.org/10.1177/00472875211028313.

McMillan, Sally J. 2000. "Interactivity is in the Eye of the Beholder: Function, Perception, Involvement, and Attitude toward the Website." *2000* Michigan: American Academy of Advertising.

Mcmillan, Sally J. 2002. "A Four-Part Model of Cyber-Interactivity: Some Cyber-Places are More Interactive than Others." *New Media & Society* 4 (2): 271-291. https://doi.org/10.1177/146144480200400208.

McMillan, Sally J., and Jang-Sun Hwang. 2002. "Measures of Perceived Interactivity: An Exploration of the Role of Direction of Communication, User Control, and Time in Shaping Perceptions of Interactivity." *Journal of Advertising* 31 (3): 29-42. https://doi.org/10.1080/00913367.2002.10673674.

Mechatech. (n.d.). "What is a 3 DoF vs 6 DoF in VR?", available at: https://www.mechatech.co.uk/journal/what-is-a-3dof-vs-6dof-in-vr. accessed August 10, 2021.

Mehmetoglu, Mehmet, and Marit Engen. 2011. "Pine and Gilmore's Concept of Experience Economy and Its Dimensions: An Empirical Examination in Tourism." *Journal of Quality Assurance in Hospitality & Tourism* 12 (4): 237-255. https://doi.org/10.1080/1528008X.2011.541847.

Mehrabian, Albert, and James A. Russell. 1974. *An Approach to Environmental Psychology*. Edited by James A. Russell. Cambridge: M.I.T. Press.

Mehrad, Daniel, and Shahriar Mohammadi. 2017. "Word of Mouth Impact on the Adoption of Mobile Banking in Iran." *Telematics and Informatics* 34 (7): 1351-1363. https://doi.org/10.1016/j.tele.2016.08.009.

Mehta, Ashwin, Neil P. Morris, Bronwen Swinnerton, and Matt Homer. 2019. "The Influence of Values on E-learning Adoption." *Computers & Education* 141. https://doi.org/10.1016/j.compedu.2019.103617.

Merchant, Zahira, Ernest T. Goetz, Lauren Cifuentes, Wendy Keeney-Kennicutt, and Trina J. Davis. 2014. "Effectiveness of Virtual Reality-Based Instruction on Students' Learning Outcomes in K-12 and Higher Education: A Meta-Analysis." *Computers & Education* 70: 29-40. https://doi.org/10.1016/j.compedu.2013.07.033.

Mihelj, Matjaž, Domen Novak, and Samo Beguš. 2014. *Virtual Reality Technology and Applications*, *Intelligent Systems, Control and Automation: Science and Engineering*. New York: Springer Science+Business Media. https://doi.org/0.1007/978-94-007-6910-6_1.

Milgram, Paul, and Fumio Kishino. 1994. "A taxonomy of mixed reality visual displays." *IEICE TRANSACTIONS on Information and Systems* 77 (12): 1321-1329. https://search.ieice.org/bin/summary.php?id=e77-d_12_1321&category=D&year=1994&lang=E&abst=.

Miller, Holmes. 1996. "The Multiple Dimensions of Information Quality." *Information Systems Management* 13 (2): 79-82. https://doi.org/10.1080/10580539608906992.

Mischel, Walter, and Yuichi Shoda. 1995. "A Cognitive-Affective System Theory of Personality: Reconceptualizing Situations, Dispositions, Dynamics, and Invariance in Personality Structure." *Psychological Review* 102 (2): 246-268. https://doi.org/10.1037/0033-295X.102.2.246.

Mishra, Deepti, Ibrahim Akman, and Alok Mishra. 2014. "Theory of Reasoned Action Application for Green Information Technology Acceptance." *Computers in Human Behavior* 36: 29-40. https://doi.org/10.1016/j.chb.2014.03.030.

Mohammadi, Hossein. 2015. "A Study of Mobile Banking Loyalty in Iran." *Computers in Human Behavior* 44: 35-47. https://doi.org/10.1016/j.chb.2014.11.015.

Moher, David, Alessandro Liberati, Jennifer Tetzlaff, and Douglas G Altman. 2009. "Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement." *BMJ* 2009; 339 (b2535). https://doi.org/10.1136/bmj.b2535.

Mount, Michael K., and Murray R. Barrick. 1998. "Five Reasons Why the "Big Five" Article has been Frequently Cited." *Personnel Psychology* 51 (4): 849-857. https://doi.org/10.1111/j.1744-6570.1998.tb00743.x.

Mütterlein, Joschka. 2018. "The Three Pillars of Virtual Reality? Investigating the Roles of Immersion, Presence, and Interactivity." In *51st Hawaii International Conference on System Sciences*, *2018*2018. Hawaii: University of Hawaii. https://doi.org/10.24251/HICSS.2018.174.

National Health and Medical Research Council. 2018a. *Australian Code for The Responsible Conduct of Research*. Australian Research Council http://www.nhmrc.gov.au/guidelines/publications/r41.

National Health and Medical Research Council. 2018b. *National Statement on Ethical Conduct in Human Research*. Australian Code for The Responsible Conduct of Research http://www.nhmrc.gov.au/guidelines/publications/e72.

Neuman, William Lawrence. 2014. *Social Research Methods: Qualitative and Quantitative Approaches*. 7th ed. United Kingdom: Pearson Education, Limited.

Neuman, William Lawrence, and Karen Robson. 2011. *Basics of Social Research: Qualitative and Quantitative Approaches*. Canada: Pearson Education Canada.

Neumann, Ulrich, Suya You, Youngkwan Cho, Jongweon Lee, and Jun Park. 1999. "Augmented reality tracking in natural environments." In *International Symposium on Mixed Realities*. Ohmsha Ltd and Springer-Verlag Tokyo. https://doi.org/10.1007/978-3-642-87512-0_6.

Nisi, Valentina, Mara Dionisio, Mary Barreto, and Nuno Nunes. 2018. "A mixed reality neighborhood tour: Understanding visitor experience and perceptions." *Entertainment Computing* 27: 89-100. https://doi.org/10.1016/j.entcom.2018.04.002.

Norman, Warren T. 1963. "Toward an Adequate Taxonomy of Personality Attributes: Replicated Factor Structure in Peer Nomination Personality Ratings." *The Journal of Abnormal and Social Psychology* 66 (6): 574–583. https://doi.org/10.1037/h0040291.

Nyasulu, Chimango, and Winner Dominic Chawinga. 2019. "Using the Decomposed Theory of Planned Behaviour to Understand University Students' Adoption of WhatsApp in Learning." *E-Learning and Digital Media* 16 (5): 413-429. https://doi.org/10.1177/2042753019835906.

Oh, Haemoon, Ann Marie Fiore, and Miyoung Jeoung. 2007. "Measuring Experience Economy Concepts: Tourism Applications." *Journal of Travel Research* 46 (2): 119-132. https://doi.org/10.1177/0047287507304039.

Oh, Seungjae, Hyo-Jeong So, and Matthew Gaydos. 2018. "Hybrid augmented reality for participatory learning: The hidden efficacy of multi-user game-based simulation." *IEEE Transactions on Learning Technologies* 11 (1): 115-127. https://doi.org/10.1109/TLT.2017.2750673.

Okoli, Chitu. 2015. "A guide to conducting a standalone systematic literature review." *Communications of the Association for Information Systems* 37 (1): 879-910. https://doi.org/10.17705/1CAIS.03743.

Pai, Fan-Yun, and Kai-I Huang. 2011. "Applying the Technology Acceptance Model to the Introduction of Healthcare Information Systems." *Technological Forecasting and Social Change* 78 (4): 650-660. https://doi.org/10.1016/j.techfore.2010.11.007.

Panou, Chris, Lemonia Ragia, Despoina Dimelli, and Katerina Mania. 2018. "An architecture for mobile outdoors augmented reality for cultural heritage." *ISPRS International Journal of Geo-Information* 7 (12). https://doi.org/10.3390/ijgi7120463.

Park, JungKun, Jiseon Ahn, Toulany Thavisay, and Tianbao Ren. 2019. "Examining the Role of Anxiety and Social Influence in Multi-Benefits of Mobile Payment Service." *Journal of Retailing and Consumer Services* 47: 140-149. https://doi.org/10.1016/j.jretconser.2018.11.015.

Park, JungKun, SuJin Yang, and Xinran Lehto. 2007. "Adoption of Mobile Technologies for Chinese Consumers." *Journal of Electronic Commerce Research* 8 (3): 196-206. http://www.jecr.org/node/156.

Paulo, Maria Madalena, Paulo Rita, Tiago Oliveira, and Sérgio Moro. 2018. "Understanding mobile augmented reality Adoption in a consumer context." *Journal of Hospitality and Tourism Technology* 9 (2): 142-157. https://doi.org/10.1108/JHTT-01-2017-0006.

Pedersen, Isabel, Nathan Gale, Pejman Mirza-Babaei, and Samantha Reid. 2017. "More than meets the eye: The benefits of augmented reality and holographic displays for digital cultural heritage." *ACM Journal on Computing and Cultural Heritage* 10 (2): 1-15. https://doi.org/10.1145/3051480.

Pendit, Ulka Chandini, Syamsul Bahrin Zaibon, and Juliana Aida Abu Bakar. 2016. "Enjoyable informal learning at cultural heritage site using Mobile augmented reality: Measurement and evaluation." *Journal of Telecommunication, Electronic and Computer Engineering* 8 (10): 13-21. http://journal.utem.edu.my/index.php/jtec/article/view/1359.

Percy, Larry. 1976. "A Look at Personality Profiles and the Personality-Attitude-Behavior Link in Predicting Consumer Behavior." *1976* Cincinnati, Ohio: Association for Consumer Research. https://www.acrwebsite.org/volumes/9184/volumes/v03/NA-03.

Perdue, Richard R. 2002. "Internet Site Evaluations: The Influence of Behavioral Experience, Existing Images, and Selected Website Characteristics." *Journal of Travel & Tourism Marketing* 11 (2-3): 21-38. https://doi.org/10.1300/J073v11n02_02.

Phan, Quyen P. T., and Michal Pilík. 2018. "The Relationship Between Website Design and Positive eWOM Intention: Testing Mediator and Moderator Effect." *Journal of Business Economics and Management* 19 (2): 382-398. https://doi.org/10.3846/JBEM.18.5690.

Pierce, Charles A., and Herman Aguinis. 1997. "Using Virtual Reality Technology in Organizational Behavior Research." *Journal of Organizational Behavior* 18 (5): 407-410. https://doi.org/10.1002/(sici)1099-1379(199709)18:5<407::Aid-job869>3.0.Co;2-p.

Pine II, B. Joseph, and James H. Gilmore. 1998. Welcome to the Experience Economy. *Harvard Business Review*, July-August, 1998, 97-105. https://hbr.org/1998/07/welcome-to-the-experience-economy.

Pino, Nick. 2021. "PlayStation VR Review." https://www.techradar.com/reviews/gaming/playstation-vr-1235379/review.

PlayStation. (n.d.). "PlayStation VR." available at: https://www.playstation.com/en-au/ps-vr/. accessed 19 August 2021,

Podsakoff, Philip M., Scott B. MacKenzie, Lee Jeong-Yeon, and Nathan P. Podsakoff. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies." *Journal of Applied Psychology* 88 (5): 879. https://doi.org/10.1037/0021-9010.88.5.879.

Pollock, Alex, and Eivind Berge. 2018. "How to do a systematic review." *International Journal of Stroke* 13 (2): 138-156. https://doi.org/10.1177/1747493017743796.

Pombo, Lúcia, and Margarida Morais Marques. 2017. "Marker-Based Augmented Reality Application for Mobile Learning in an Urban Park: Steps to Make It Real under the EduPARK Project." In *2017 International Symposium on Computers in Education (SIIE)*, *Lisbon, Portugal, 9-11 Nov. 2017, 2017*2017. Portugal: IEEE. https://doi.org/10.1109/SIIE.2017.8259669.

Pontonnier, Charles, Georges Dumont, Asfhin Samani, Pascal Madeleine, and Marwan Badawi. 2014. "Designing and Evaluating a Workstation in Real and Virtual Environment: Toward Virtual Reality Based Ergonomic Design Sessions." *Journal on Multimodal User Interfaces* 8 (2): 199-208. https://doi.org/10.1007/s12193-013-0138-8.

Portman, Michelle E, Asya Natapov, and Dafna Fisher-Gewirtzman. 2015. "To Go Where No Man has Gone Before: Virtual Reality in Architecture, Landscape Architecture and Environmental Planning." *Computers, Environment and Urban Systems* 54: 376-384. https://doi.org/10.1016/j.compenvurbsys.2015.05.001.

Preacher, Kristopher J., and Andrew F. Hayes. 2008. "Asymptotic and Resampling Strategies for Assessing and Comparing Indirect Effects in Multiple Mediator Models." *Behavior Research Methods* 40 (3): 879-891. https://doi.org/10.3758/BRM.40.3.879.

Preston, Carolyn C, and Andrew M Colman. 2000. "Optimal Number of Response Categories in Rating Scales: Reliability, Validity, Discriminating Power, and Respondent Preferences." *Acta Psychologica* 104 (1): 1-15. https://doi.org/10.1016/S0001-6918(99)00050-5.

Puig, Anna, Inmaculada Rodríguez, Josep Ll. Arcos, Juan A. Rodríguez-Aguilar, Sergi Cebrián, Anton Bogdanovych, Núria Morera, Antoni Palomo, and Raquel Piqué. 2020. "Lessons learned from supplementing archaeological museum exhibitions with virtual reality." *Virtual Reality* 24 (2): 343-358. https://doi.org/10.1007/s10055-019-00391-z.

Qiao, Xiuquan, Pei Ren, Schachram Dustdar, Ling Liu, Huadong Ma, and Junliang Chen. 2019. "Web AR: A Promising Future for Mobile Augmented Reality—State of the Art, Challenges, and Insights." *2019*: IEEE. https://doi.org/10.1109/JPROC.2019.2895105.

Qualtrics. (n.d.). "Qualtrics XM Platform." (Website (http://www.qualtrics.com)). available at: http://www.qualtrics.com. accessed May 12, 2019.

Rafaeli, Sheizaf, and Fay Sudweeks. 1997. "Networked Interactivity." *Journal of Computer-Mediated Communication* 2 (4). https://doi.org/10.1111/j.1083-6101.1997.tb00201.x.

Rafique, Hamaad, Alaa Omran Almagrabi, Azra Shamim, Fozia Anwar, and Ali Kashif Bashir. 2020. "Investigating the Acceptance of Mobile Library Applications with an Extended Technology Acceptance Model (TAM)." *Computers & Education* 145. https://doi.org/10.1016/j.compedu.2019.103732.

Ramos-de-Luna, Iviane, Francisco Montoro-Ríos, and Francisco Liébana-Cabanillas. 2016. "Determinants of the Intention to Use NFC Technology as a Payment System: An Acceptance Model Approach." *Information Systems and e-Business Management* 14 (2): 293-314. https://doi.org/10.1007/s10257-015-0284-5.

Rana, Nripendra P., Yogesh K. Dwivedi, Michael D. Williams, and Vishanth Weerakkody. 2016. "Adoption of Online Public Grievance Redressal System in India." *Computers in Human Behavior* 59: 265–282. https://doi.org/10.1016/j.chb.2016.02.019.

Ranganathan, Chandrasekaran, and Shobha Ganapathy. 2002. "Key Dimensions of Business-to-Consumer Web Sites." *Information & Management* 39 (6): 457-465. https://doi.org/10.1016/S0378-7206(01)00112-4.

Ranganathan, Chandrasekaran, and Elizabeth Grandon. 2002. "An Exploratory Examination of Factors Affecting Online Sales." *Journal of Computer Information Systems* 42 (3): 87-93. https://doi.org/10.1080/08874417.2002.11647507.

Raptis, George E., Christos Fidas, and Nikolaos Avouris. 2018. "Effects of mixed-reality on players' behaviour and immersion in a cultural tourism game: A cognitive processing perspective." *International Journal of Human-Computer Studies* 114: 69-79. https://doi.org/10.1016/j.ijhcs.2018.02.003.

Regan, EC, and KR Price. 1994. "The Frequency of Occurrence and Severity of Side-Effects of Immersion Virtual Reality." *Aviation, Space, and Environmental Medicine* 65 (6): 527-530.

Revythi, Anastasia, and Nikolaos Tselios. 2019. "Extension of Technology Acceptance Model by Using System Usability Scale to Assess Behavioral Intention to Use e-Learning." *Education and Information Technologies* 24 (4): 2341-2355. https://doi.org/10.1007/s10639-019-09869-4.

Robertson, George G., Stuart K. Card, and Jock D. Mackinlay. 1993. "Three Views of Virtual Reality: Nonimmersive Virtual Reality." *Computer* 26 (2): 81. https://doi.org/10.1109/2.192002.

Rodrigues, João M. F., Célia M. Q. Ramos, João A. R. Pereira, João D. P. Sardo, and Pedro J. S. Cardoso. 2019. "Mobile five senses augmented reality system: Technology acceptance study." *IEEE Access* 7: 163022-163033. https://doi.org/10.1109/access.2019.2953003.

Roongrungsi, Adirek, Chakkrit Snae Namahoot, and Michael Brückner. 2017. "Augmented reality application for cultural and historical tourist attraction display (ARCH-TOUR)." *Journal of Telecommunication, Electronic and Computer Engineering* 9 (2-4): 65-69. https://jtec.utem.edu.my/jtec/article/view/2360.

Rose, Vienna, Inga Stewart, Keith G Jenkins, Luma Tabbaa, Chee Siang Ang, and Maria Matsangidou. 2021. "Bringing the Outside in: The Feasibility of Virtual Reality with People with Dementia in an Inpatient Psychiatric Care Setting." *Dementia* 20 (1): 106-129. https://doi.org/10.1177/1471301219868036.

Ross, Craig, Emily S. Orr, Mia Sisic, Jaime M. Arseneault, Mary G. Simmering, and R. Robert Orr. 2009. "Personality and Motivations Associated with Facebook Use." *Computers in Human Behavior* 25 (2): 578-586. https://doi.org/10.1016/j.chb.2008.12.024.

Ryan, Marie-Laure. 1999. "Immersion vs. Interactivity: Virtual Reality and Literary Theory." *SubStance* 28 (2): 110-137. https://doi.org/10.2307/3685793.

Ryan, Tracii, and Sophia Xenos. 2011. "Who Uses Facebook? An Investigation into the Relationship between the Big Five, Shyness, Narcissism, Loneliness, and Facebook Usage." *Computers in Human Behavior* 27 (5): 1658-1664. https://doi.org/10.1016/j.chb.2011.02.004.

Saad, Aslina, and Ermie Dharlya Daud. 2020. "The Acceptance of an Online Educational Management Information System (EMIS) among Data and Information Teachers." *Journal of Information Systems and Digital Technologies* 2 (2): 1-17. https://journals.iium.edu.my/kict/index.php/jisdt/article/view/124.

Salaün, Yvette, and Karine Flores. 2001. "Information Quality: Meeting the Needs of the Consumer." *International Journal of Information Management* 21 (1): 21-37. https://doi.org/10.1016/S0268-4012(00)00048-7.

Santos, Carlos G. R., Tiago D. O. Araújo, Chagas Jr., Paulo R., Nelson C.S. Neto, and Bianchi S. Meiguins. 2017. "Recognizing and exploring Azulejos on historic buildings' facades by combining computer vision and geolocation in mobile augmented reality applications." *Journal of Mobile Multimedia* 13 (1-2): 057-074. https://doi.org/10.5555/3177197.3177201.

Saunders, Mark, Philip Lewis, and Adrian Thornhill. 2015. *Research Methods for Business Students*. Vol. 7th. New York: Pearson.

Schlosser, Ann E. 2003. "Experiencing Products in the Virtual World: The Role of Goal and Imagery in Influencing Attitudes versus Purchase Intentions." *Journal of Consumer Research* 30 (2): 184-198. https://doi.org/10.1086/376807.

Schubert, Thomas, Frank Friedmann, and Holger Regenbrecht. 2001. "The Experience of Presence: Factor Analytic Insights." *Presence: Teleoperators and Virtual Environments* 10 (3): 266-281. https://doi.org/10.1162/105474601300343603.

Schuemie, Martijn J., Peter van der Straaten, Merel Krijn, and Charles A.P.G. van der Mast. 2001. "Research on Presence in Virtual Reality: A Survey." *CyberPsychology & Behavior* 4 (2): 183-201. https://doi.org/10.1089/109493101300117884.

See, Guat-Tham, and Yen-Nee Goh. 2019. "Tourists' Intention to Visit Heritage Hotels at George Town World Heritage Site." *Journal of Heritage Tourism* 14 (1): 1-16. https://doi.org/10.1080/1743873X.2018.1458853.

Sekaran, Uma, and Roger Bougie. 2016. *Research Methods for Business: A Skill Building Approach*. 7th ed. United Kingdom: Wiley.

Shackel, Brian, and S. J. Richardson. 1991. *Human Factors for Informatics Usability*: Cambridge University Press.

Shang, Low Wei, Mohd Hafiz Zakaria, and Ibrahim Ahmad. 2016. "Mobile phone augmented reality postcard." *Journal of Telecommunication, Electronic and Computer Engineering* 8 (2): 135-139. https://jtec.utem.edu.my/jtec/article/download/972/562/2680.

Shatnawi, Tamather, and Raed S Algharabat. 2018. "Investigating Antecedents and Their Consequences of Usability in Online Donations: The Case of University Students' Community Services Programs." *International Journal of Technology, Policy and Management* 18 (2): 125-154. https://doi.org/10.1504/IJTPM.2018.092296.

Shen, Chien-wen, Jung-tsung Ho, Pham Thi Minh Ly, and Ting-chang Kuo. 2019. "Behavioural Intentions of Using Virtual Reality in Learning: Perspectives of Acceptance of Information Technology and Learning Style." *Virtual Reality* 23 (3): 313-324. https://doi.org/10.1007/s10055-018-0348-1.

Sherman, William R., and Alan B. Craig. 2018. *Understanding Virtual Reality: Interface, Application, and Design*. 2nd ed. Boston: Morgan Kaufmann. https://doi.org/10.1016/C2013-0-18583-2.

Shin, Dong-Hee. 2009. "Towards an Understanding of the Consumer Acceptance of Mobile Wallet." *Computers in Human Behavior* 25 (6): 1343-1354. https://doi.org/10.1016/j.chb.2009.06.001.

Shukri, Saidatul A'isyah Ahmad, Haslina Arshad, and Rimaniza Zainal Abidin. 2017. "Mobile augmented reality system design guidelines based on tourist's emotional state." *Journal of Telecommunication, Electronic and Computer Engineering* 9 (2-12): 75-79. https://jtec.utem.edu.my/jtec/article/view/2773.

Siang, Tan Gek, Kamarulzaman Ab. Aziz, and Zauwiyah Ahmad. 2016. "Determining tourists' behavioural intention to use mobile tourism applications: Moderating effect of gender." *Information* 19 (8A): 3167-3172. http://shdl.mmu.edu.my/id/eprint/6510.

Siltanen, Sanni. 2012. "Theory and Applications of Marker-Based Augmented Reality." thesis, VTT Technical Research Centre of Finland. https://cris.vtt.fi/en/publications/theory-and-applications-of-marker-based-augmented-reality-licenti.

Slater, Mel, Vasilis Linakis, Martin Usoh, and Rob Kooper. 1996. "Immersion, Presence and Performance in Virtual Environments: An Experiment with Tri-Dimensional Chess." In *ACM Symposium on Virtual Reality Software and Technology*, *Hong Kong, 1996*1996. Hong Kong: Association for Computing Machinery. https://doi.org/10.1145/3304181.3304216.

Slater, Mel, and Anthony Steed. 2000. "A Virtual Presence Counter." *Presence* 9: 413-434. https://doi.org/10.1162/105474600566925.

Slater, Mel, and Martin Usoh. 1993. "Representations Systems, Perceptual Position, and Presence in Immersive Virtual Environments." *Presence: Teleoperators and Virtual Environments* 2 (3): 221-233. https://doi.org/10.1162/pres.1993.2.3.221.

Slater, Mel, and Sylvia Wilbur. 1997. "A framework for immersive virtual environments (FIVE): Speculations on the role of presence in virtual environments." *Presence: Teleoperators and Virtual Environments* 6 (6): 603-616. https://doi.org/10.1162/pres.1997.6.6.603.

SmartPLS. (n.d.). "Higher-Order Models." available at: https://www.smartpls.com/documentation/algorithms-and-techniques/higher-order/. accessed March 30, 2022.

Smith, Andy. 1997. *Human Computer Factors: A Study of Users and Information Systems*. United States: McGraw-Hill.

Smith, Mark, and Jonathan Canger. 2004. "Effects of Supervisor "Big Five" Personality on Subordinate Attitudes." *Journal of Business and Psychology* 18 (4): 465-481. https://doi.org/10.1023/B:JOBU.0000028447.00089.12.

Smithikrai, Chuchai. 2008. "Moderating Effect of Situational Strength on the Relationship between Personality Traits and Counterproductive Work Behaviour." *Asian Journal of Social Psychology* 11 (4): 253-263. https://doi.org/10.1111/j.1467-839X.2008.00265.x.

Sommerauer, Peter, and Oliver Müller. 2014. "Augmented reality in informal learning environments: A field experiment in a mathematics exhibition." *Computers & Education* 79: 59-68. https://doi.org/10.1016/j.compedu.2014.07.013.

Sony Interactive Entertainment. 2020. "PlayStation Network Monthly Active Users Reaches 103 Million." https://www.sie.com/en/corporate/release/2020/200107.html.

Sposito, V. A., M. L. Hand, and Bradley Skarpness. 1983. "On the Efficiency of Using the Sample Kurtosis in Selecting Optimal Lp Estimators." *Communications in Statistics - Simulation and Computation* 12 (3): 265-272. https://doi.org/10.1080/03610918308812318.

Srinivasan, Ananth. 1985. "Alternative Measures of System Effectiveness: Associations and Implications." *MIS Quarterly* 9 (3): 243-253. https://doi.org/10.2307/248951.

Steedle, Jeffrey. 2018. *Detecting Inattentive Responding on a Psychosocial Measure of College Readiness*. Iowa: ACT. https://www.act.org/content/dam/act/unsecured/documents/pdfs/R1697-inattentive-responding-2018-10.pdf.

Steuer, Jonathan. 1992. "Defining Virtual Reality: Dimensions Determining Telepresence." *Journal of Communication* 42 (4): 73-93. https://doi.org/10.1111/j.1460-2466.1992.tb00812.x.

Stevens, G. C. 1983. "User-Friendly Computer Systems?: A Critical Examination of the Concept." *Behaviour & Information Technology* 2 (1): 3-16. https://doi.org/10.1080/01449298308914465.

Suh, Ayoung, and Jane Prophet. 2018. "The State of Immersive Technology Research: A Literature Analysis." *Computers in Human Behavior* 86: 77-90. https://doi.org/10.1016/j.chb.2018.04.019.

Šumak, Boštjan, G. Polancic, and M. Hericko. 2010. "An Empirical Study of Virtual Learning Environment Adoption Using UTAUT." In *2010 Second International Conference on Mobile, Hybrid, and On-Line Learning*, *10-16 Feb. 2010, 2010* https://doi.org/10.1109/eLmL.2010.11.

Sun, Sunny, Rob Law, and Markus Schuckert. 2020. "Mediating Effects of Attitude, Subjective Norms and Perceived Behavioural Control for Mobile Payment-Based Hotel Reservations." *International Journal of Hospitality Management* 84: 102331. https://doi.org/10.1016/j.ijhm.2019.102331.

Sundar, S. Shyam, Sriram Kalyanaraman, and Justin Brown. 2003. "Explicating Web Site Interactivity: Impression Formation Effects in Political Campaign Sites." *Communication Research* 30 (1): 30-59. https://doi.org/10.1177/0093650202239025.

Syal, Anurag. 2017. "Panorama vs 360° vs 3D vs VR — The Big Difference." https://medium.com/frulix/panorama-vs-360-vs-3d-vs-vr-the-big-difference-d9e490819a0.

Talukder, Majharul, and Ali Quazi. 2011. "The Impact of Social Influence on Individuals' Adoption of Innovation." *Journal of Organizational Computing and Electronic Commerce* 21 (2): 111-135. https://doi.org/10.1080/10919392.2011.564483.

Talukder, Md Shamim, Raymond Chiong, Yukun Bao, and Babur Hayat Malik. 2019. "Acceptance and Use Predictors of Fitness Wearable Technology and Intention to Recommend." *Industrial Management & Data Systems* 119 (1): 170-188. https://doi.org/10.1108/IMDS-01-2018-0009.

Tan, Kian Lam, and Chen Kim Lim. 2017. "Digital heritage gamification: An augmented-virtual walkthrough to learn and explore tangible cultural heritage." *Journal of Telecommunication, Electronic and Computer Engineering* 9 (2-12): 125-129. https://doi.org/10.1063/1.5005472.

Teo, Hock-Hai, Lih-Bin Oh, Chunhui Liu, and Kwok-Kee Wei. 2003. "An Empirical Study of the Effects of Interactivity on Web User Attitude." *International Journal of Human-Computer Studies* 58 (3): 281-305. https://doi.org/10.1016/S1071-5819(03)00008-9.

Teo, Timothy, and Jan Noyes. 2011. "An Assessment of the Influence of Perceived Enjoyment and Attitude on the Intention to Use Technology among Pre-Service Teachers: A Structural Equation Modeling Approach." *Computers & Education* 57 (2): 1645-1653. https://doi.org/10.1016/j.compedu.2011.03.002.

Thomas, Bruce H. 2012. "A Survey of Visual, Mixed, and Augmented Reality Gaming." *Computers in Entertainment (CIE)* 10 (1): 3. https://doi.org/10.1145/2381876.2381879.

Thomas, Wendy A., and Sheila Carey. 2005. "Actual/Virtual Visits: What Are The Links?" In *Museums and the Web 2005*, March 31. edited by J. Trant and D. Bearman. Toronto: Archives & Museum Informatics. http://www.archimuse.com/mw2005/papers/thomas/thomas.html.

Thüring, Manfred, and Sascha Mahlke. 2007. "Usability, Aesthetics and Emotions in Human–Technology Interaction." *International Journal of Psychology* 42 (4): 253-264. https://doi.org/10.1080/00207590701396674.

Tinsley, Ross, and Paul Lynch. 2001. "Small Tourism Business Networks and Destination Development." *International Journal of Hospitality Management* 20 (4): 367-378. https://doi.org/10.1016/S0278-4319(01)00024-X.

Toepoel, Vera. 2017. "Online Survey Design." In *The SAGE Handbook of Online Research Methods*, Nigel G. Fielding, Raymond M. Lee and Grant Blank, eds., 184-202. London: SAGE Publications Ltd. https://doi.org/10.4135/9781473957992.

tom Dieck, Dario, M. Claudia tom Dieck, Timothy Jung, and Natasha Moorhouse. 2018. "Tourists' virtual reality adoption: An exploratory study from Lake District national park." *Leisure Studies* 37 (4): 371-383. https://doi.org/10.1080/02614367.2018.1466905.

tom Dieck, M. Claudia, and Timothy Jung. 2018. "A theoretical model of mobile augmented reality acceptance in urban heritage tourism." *Current Issues in Tourism* 21 (2): 154-174. https://doi.org/10.1080/13683500.2015.1070801.

tom Dieck, M. Claudia, Timothy Jung, and Dai-In Han. 2016. "Mapping requirements for the wearable smart glasses augmented reality museum application." *Journal of Hospitality and Tourism Technology* 7 (3): 230-253. https://doi.org/10.1108/jhtt-09-2015-0036.

tom Dieck, M. Claudia, and Timothy Hyungsoo Jung. 2017. "Value of augmented reality at cultural heritage sites: A stakeholder approach." *Journal of Destination Marketing & Management* 6 (2): 110-117. https://doi.org/10.1016/j.jdmm.2017.03.002.

tom Dieck, M. Claudia, Timothy Hyungsoo Jung, and Philipp A. Rauschnabel. 2018. "Determining visitor engagement through augmented reality at science festivals: An experience economy perspective." *Computers in Human Behavior* 82: 44-53. https://doi.org/10.1016/j.chb.2017.12.043.

tom Dieck, M. Claudia, Timothy Hyungsoo Jung, and Dario tom Dieck. 2018. "Enhancing art gallery visitors' learning experience using wearable augmented reality: Generic learning outcomes perspective." *Current Issues in Tourism* 21 (17): 2014-2034. https://doi.org/10.1080/13683500.2016.1224818.

Tourism Australia. n.d. "International market performance statistics." https://www.tourism.australia.com/en/markets-and-stats/tourism-statistics/international-market-performance.html.

Tourism Research Australia. n.d. "International visitor survey results December 2020." https://www.tra.gov.au/data-and-research/reports/international-visitor-survey-results-december-2020/international-visitor-survey-results-december-2020.

Tractinsky, Noam, Avivit Cokhavi, Moti Kirschenbaum, and Tal Sharfi. 2006. "Evaluating the Consistency of Immediate Aesthetic Perceptions of Web Pages." *International Journal of Human-Computer Studies* 64 (11): 1071-1083. https://doi.org/10.1016/j.ijhcs.2006.06.009.

Tractinsky, Noam, A. S. Katz, and D. Ikar. 2000. "What is Beautiful is Usable." *Interacting with Computers* 13 (2): 127-145. https://doi.org/10.1016/S0953-5438(00)00031-X.

Trojan, Jakub. 2016. "Integrating AR services for the masses: Geotagged POI transformation platform." *Journal of Hospitality and Tourism Technology* 7 (3): 254-265. https://doi.org/10.1108/JHTT-07-2015-0028.

Tsai, Shu-pei. 2019. "Augmented reality enhancing place satisfaction for heritage tourism marketing." *Current Issues in Tourism* 23 (9): 1-6. https://doi.org/10.1080/13683500.2019.1598950.

Tupes, Ernest C., and Raymond E. Christal. 1992. "Recurrent Personality Factors Based on Trait Ratings." *Journal of Personality* 60 (2): 225-251. https://doi.org/10.1111/j.1467-6494.1992.tb00973.x.

Turban, Efraim, and Dave Gehrke. 2000. "Determinants of e-Commerce Website." *Human Systems Management* 19: 111-120. https://doi.org/10.3233/HSM-2000-19205.

Tussyadiah, Iis P., Timothy H. Jung, and Mandy C. tom Dieck. 2018. "Embodiment of wearable augmented reality technology in tourism experiences." *Journal of Travel Research* 57 (5): 597-611. https://doi.org/10.1177/0047287517709090.

Tussyadiah, Iis P., Dan Wang, Timothy H. Jung, and Mandy C. tom Dieck. 2018. "Virtual reality, presence, and attitude change: Empirical evidence from tourism." *Tourism Management* 66: 140-154. https://doi.org/10.1016/j.tourman.2017.12.003.

Tuten, Tracy L., and Michael Bosnjak. 2001. "Understanding Differences in Web Usage: The Role of Need for Cognition and the Five Factor Model of Personality." *Social Behavior and Personality* 29 (4): 391. https://doi.org/10.2224/sbp.2001.29.4.391.

United Nations World Tourism Organization. 2019. "International tourism highlights, 2019 edition." https://doi.org/10.18111/9789284421152.

United Nations World Tourism Organization. 2021. *International Tourism Highlights, 2020 Edition*. Madrid: UNWTO. https://doi.org/10.18111/9789284422456.

United Nations World Tourism Organization. n.d. "International tourism and COVID-19." https://www.unwto.org/international-tourism-and-covid-19.

Unity Technologies. (n.d.). "Unity." available at: https://www.unity.com/. accessed May 12, 2020.

Unnikrishnan, Roshny, and Lakshmi Jagannathan. 2017. "Adoption of Mobile Payment Services in Bangalore Urban-A Structural Equation Modelling Based Approach." *Journal of Contemporary Research in Management* 12 (4): 1-19. https://www.proquest.com/docview/2070392023.

Urbach, Nils, and Frederik Ahlemann. 2010. "Structural Equation Modeling in Information Systems Research using Partial Least Squares." *Journal of Information Technology Theory and Application* 11 (2): 5-40. https://aisel.aisnet.org/jitta/vol11/iss2/2/.

Vahdat, Arash, Ali Alizadeh, Sara Quach, and Nicolas Hamelin. 2020. "Would You Like to Shop via Mobile App Technology? The Technology Acceptance Model, Social Factors and Purchase Intention." *Australasian Marketing Journal*. https://doi.org/10.1016/j.ausmj.2020.01.002.

van der Heijden, Hans. 2003. "Factors Influencing the Usage of Websites: The Case of a Generic Portal in the Netherlands." *Information & Management* 40 (6): 541-549. https://doi.org/10.1016/S0378-7206(02)00079-4.

van Lieshout, Cornelis F. M. 2000. "Lifespan Personality Development: Self-Organising Goal-Oriented Agents and Developmental Outcome." *International Journal of Behavioral Development* 24 (3): 276-288. https://doi.org/10.1080/01650250050118259.

Venkatesh, Viswanath, and Hillol Bala. 2008. "Technology Acceptance Model 3 and a Research Agenda on Interventions." *Decision Sciences* 39 (2): 273-315. https://doi.org/10.1111/j.1540-5915.2008.00192.x.

Venkatesh, Viswanath, and Fred D. Davis. 2000. "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies." *Management Science* 46 (2): 186-204. https://doi.org/10.1287/mnsc.46.2.186.11926.

Venkatesh, Viswanath, Michael G. Morris, Gordon B. Davis, and Fred D. Davis. 2003. "User Acceptance of Information Technology: Toward a Unified View." *MIS Quarterly* 27 (3): 425-478. https://doi.org/10.2307/30036540.

Verhagen, Tibert, Frans Feldberg, Bart van den Hooff, Selmar Meents, and Jani Merikivi. 2012. "Understanding Users' Motivations to Engage in Virtual Worlds: A Multipurpose Model and Empirical Testing." *Computers in Human Behavior* 28 (2): 484-495. https://doi.org/10.1016/j.chb.2011.10.020.

Verma, Surabhi, Som Sekhar Bhattacharyya, and Saurav Kumar. 2018. "An Extension of the Technology Acceptance Model in the Big Data Analytics System Implementation Environment." *Information Processing & Management* 54 (5): 791-806. https://doi.org/10.1016/j.ipm.2018.01.004.

Voorhees, Clay M., Michael K. Brady, Roger Calantone, and Edward Ramirez. 2016. "Discriminant Validity Testing in Marketing: An Analysis, Causes for Concern, and Proposed Remedies." *Journal of the Academy of Marketing Science* 44 (1): 119-134. https://doi.org/10.1007/s11747-015-0455-4.

Wagler, Adam, and Michael D. Hanus. 2018. "Comparing virtual reality tourism to real-life experience: Effects of presence and engagement on attitude and enjoyment." *Communication Research Reports* 35 (5): 456-464. https://doi.org/10.1080/08824096.2018.1525350.

Walker, John R., and Josielyn T. Walker. 2013. *Introduction to Hospitality Management*. 4th ed. England: Pearson.

Wang, Jianfeng, and Sylvain Senecal. 2007. "Measuring Perceived Website Usability." *Journal of Internet Commerce* 6 (4): 97-112. https://doi.org/10.1080/15332860802086318.

Wang, Jin-Liang, Linda A. Jackson, Da-Jun Zhang, and Zhi-Qiang Su. 2012. "The Relationships Among the Big Five Personality Factors, Self-Esteem, Narcissism, and Sensation-Seeking to Chinese University Students' Uses of Social Networking Sites (SNSs)." *Computers in Human Behavior* 28 (6): 2313-2319. https://doi.org/10.1016/j.chb.2012.07.001.

Wang, Yu-Yin, Yi-Shun Wang, and Yu-Min Wang. 2020. "What Drives Students' Internet Ethical Behaviour: An Integrated Model of the Theory of Planned Behaviour, Personality, and Internet Ethics Education." *Behaviour & Information Technology*: 1-23. https://doi.org/10.1080/0144929X.2020.1829053.

Ward, Caleb. 2017. "Demystifying 360 vs. VR." *Vimeo blog*. September 22, 2017. https://vimeo.com/blog/post/virtual-reality-vs-360-degree-video/.

Wei, Wei. 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* 10 (4): 539-570. https://doi.org/10.1108/JHTT-04-2018-0030.

Wei, Wei, Ruoxi Qi, and Lu Zhang. 2019. "Effects of virtual reality on theme park visitors' experience and behaviors: A presence perspective." *Tourism Management* 71: 282-293. https://doi.org/10.1016/j.tourman.2018.10.024.

Wilson, Kathryn, Stephanie Fornasier, and Katherine M. White. 2010. "Psychological Predictors of Young Adults' Use of Social Networking Sites." *Cyberpsychology, Behavior and Social Networking* 13 (2): 173-7. https://doi.org/10.1089/cyber.2009.0094.

Wirth, Werner, Tilo Hartmann, Saskia Böcking, Peter Vorderer, Christoph Klimmt, Holger Schramm, Timo Saari et al. 2007. "A Process Model of the Formation of Spatial Presence Experiences." *Media Psychology* 9 (3): 493-525. https://doi.org/10.1080/15213260701283079.

Witmer, Bob G., and Michael J. Singer. 1998. "Measuring Presence in Virtual Environments: A Presence Questionnaire." *Presence* 7 (3): 225-240. https://doi.org/10.1162/105474698565686.

Wohlin, Claes, Per Runeson, Martin Höst, Magnus C. Ohlsson, Björn Regnell, and Anders Wesslén. 2012. "Planning." In *Experimentation in Software Engineering*. 89-116. Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-29044-2_8.

Wolf, Erika J., Kelly M. Harrington, Shaunna L. Clark, and Mark W. Miller. 2013. "Sample Size Requirements for Structural Equation Models: An Evaluation of Power, Bias, and Solution Propriety." *Educational and psychological measurement* 76 (6): 913-934. https://doi.org/10.1177/0013164413495237.

Wood, Stacy. 2012. "Prone to Progress: Using Personality to Identify Supporters of Innovative Social Entrepreneurship." *Journal of Public Policy & Marketing* 31 (1): 129-141. https://doi.org/10.1509/jppm.11.060.

Wu, Guohua, and Guohua Wu. 2006. "Conceptualizing and Measuring the Perceived Interactivity of Websites." *Journal of Current Issues & Research in Advertising* 28 (1): 87-104. https://doi.org/10.1080/10641734.2006.10505193.

Wu, Hung-Che, Chi-Han Ai, and Ching-Chan Cheng. 2019. "Virtual reality experiences, attachment and experiential outcomes in tourism." *Tourism Review* 75 (3): 481-495. https://doi.org/10.1108/TR-06-2019-0205.

Wu, Shou-Tsung, Ching-Hsing Chiu, and Yeong-Shyang Chen. 2020. "The influences of innovative technological introduction on interpretive experiences of exhibition: A discussion on the intention to use augmented reality." *Asia Pacific Journal of Tourism Research* 25 (6): 652-667. https://doi.org/10.1080/10941665.2020.1752754.

Xiang, Siyuan, Ruoyu Wang, and Chen Feng. 2021. "Mobile Projective Augmented Reality for Collaborative Robots in Construction." *Automation in Construction* 127. https://doi.org/10.1016/j.autcon.2021.103704.

Yaprak, Ümit, Fatih Kılıç, and Abdullah Okumuş. 2021. "Is the Covid-19 Pandemic Strong Enough to Change the Online Order Delivery Methods? Changes in the Relationship between Attitude and Behavior towards Order Delivery by Drone." *Technological Forecasting and Social Change* 169: 120829. https://doi.org/10.1016/j.techfore.2021.120829.

Yeh, Ching-Hsuan, Yi-Shun Wang, Hsien-Ta Li, and Shuo-Yan Lin. 2017. "The effect of information presentation modes on tourists' responses in internet marketing: The moderating role of emotions." *Journal of Travel & Tourism Marketing* 34 (8): 1018-1032. https://doi.org/10.1080/10548408.2016.1276509.

Yeung, Tom Au, and Rob Law. 2006. "Evaluation of Usability: A Study of Hotel Web Sites in Hong Kong." *Journal of Hospitality & Tourism Research* 30 (4): 452-473. https://doi.org/10.1177/1096348006290115.

Yoon, Susan A., Emma Anderson, Miyoung Park, Karen Elinich, and Joyce Lin. 2018. "How augmented reality, textual, and collaborative scaffolds work synergistically to improve learning in a science museum." *Research in Science & Technological Education* 36 (3): 261-281. https://doi.org/10.1080/02635143.2017.1386645.

Yovcheva, Zornitza, Dimitrios Buhalis, Christos Gatzidis, and Corné P.J.M. van Elzakker. 2014. "Empirical evaluation of smartphone augmented reality browsers in an urban tourism destination context." *International Journal of Mobile Human Computer Interaction* 6 (2): 10-31. https://doi.org/10.4018/ijmhci.2014040102.

Yung, Ryan, and Catheryn Khoo-Lattimore. 2019. "New realities: A systematic literature review on virtual reality and augmented reality in tourism research." *Current Issues in Tourism* 22 (17): 2056-2081. https://doi.org/10.1080/13683500.2017.1417359.

Yung, Ryan, Catheryn Khoo-Lattimore, and Leigh Ellen Potter. 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): 368-384. https://journals.tdl.org/ertr/index.php/ertr/article/view/522.

Yung, Ryan, Catheryn Khoo-Lattimore, and Leigh Ellen Potter. 2021. "Virtual Reality and Tourism Marketing: Conceptualizing a Framework on Presence, Emotion, and Intention." *Current Issues in Tourism* 24 (11): 1505-1525. https://doi.org/10.1080/13683500.2020.1820454.

Yurcu, Gulseren, Zeki Akinci, and Murad Alpaslan Kasalak. 2017. "The Effects of Tourism Students' Personality Traits on Leisure Motivation and Social Well-being." *International Interdisciplinary Business-Economics Advancement Journal* 2 (1): 10-26. https://doi.org/10.5038/2640-6489.2.1.1016.

Zahorik, Pavel, and Rick L Jenison. 1998. "Presence as Being-in-the-World." *Presence* 7 (1): 78-89. https://doi.org/10.1162/105474698565541.

Zeng, Guojun, Xinning Cao, Zhibin Lin, and Sarah H. Xiao. 2020. "When online reviews meet virtual reality: Effects on consumer hotel booking." *Annals of Tourism Research* 81: 102860. https://doi.org/10.1016/j.annals.2020.102860.

Zettl, Herbert. 2016. *Sight, Sound, Motion: Applied Media Aesthetics*. 6th ed. United States: Cengage Learning.

Zhang, Xiaofei, Xitong Guo, Kee-hung Lai, Feng Guo, and Chenlei Li. 2014. "Understanding Gender Differences in m-Health Adoption: A Modified Theory of Reasoned Action Model." *Telemedicine and e-Health* 20 (1): 39-46. https://doi.org/10.1089/tmj.2013.0092.

Zhang, Yue, Song Wu, and Muhammad Imran Rasheed. 2020. "Conscientiousness and Smartphone Recycling Intention: The Moderating Effect of Risk Perception." *Waste Management* 101: 116-125. https://doi.org/10.1016/j.wasman.2019.09.040.

Zhu, Dong Hong, and Ya Ping Chang. 2014. "Investigating Consumer Attitude and Intention Toward Free Trials of Technology-Based Services." *Computers in Human Behavior* 30: 328-334. https://doi.org/10.1016/j.chb.2013.09.008.

Zyda, Michael. 2005. "From Visual Simulation to Virtual Reality to Games." *Computer* 38 (9): 25-32. https://doi.org/10.1109/MC.2005.297.

APPENDICES

Appendix A. List of selected articles from systematic review

No	Author	Research location	AR/VR	Type of work	Focused tourism place/object	Technology used
1	Balduini et al. (2012)	South Korea	AR	Design research	City's point of interest	Location-based; BOTTARI app; Smartphone /Tablet; Twitter
2	Chu, Lin, and Chang (2012)	China	AR	Design research	Park	Location-based; Geopark app; Smartphone
3	Kounavis, Kasimati, and Zamani (2012)	Not available	AR	Conceptual	Not mentioned	Not mentioned
4	Damala et al. (2013)	Not available	AR	Conceptual	Museum	Eye-tracking; Gesture-tracking; Audio-tracking; Physiological sensing; ARtSENSE; Smartglasses
5	Ghadban et al. (2013)	Palestine	VR	Design research	Cultural heritage	Virtual environment; U-shape theatre projector; Polarized-glasess; Controller
6	Balduini et al. (2014)	South Korea	AR	Design research	City's point of interest	Location-based; BOTTARI app; Smartphone/Tablet; Twitter

No	Author	Research location	AR/VR	Type of work	Focused tourism place/object	Technology used
7	Chang et al. (2014)	Taiwan	AR	Empirical – Mixed method	Museum	Markerless-based; Tablet PC
8	Sommerauer and Müller (2014)	Liechtenstein	AR	Empirical – Quantitative	Exhibition	Marker-based; Smartphone; Aurasma Glued
9	Yovcheva et al. (2014)	United Kingdom	AR	Design research	City's point of interest	Location-based; Smartphone; Junaio; LocalScope; Wikitude; AccrossAir
10	Chang et al. (2015)	Taiwan	AR	Empirical – Mixed method	Cultural site	Markerless-based; Tablet
11	Chung, Han, and Joun (2015)	South Korea	AR	Empirical - Quantitative	Palace	Location-based; Deoksugung In My Hand app; Smartphone
12	Grubert et al. (2015)	Austria	AR	Design research	Ski resort	Markerless-based; Smartphone
13	Jung, Chung, and Leue (2015)	South Korea	AR	Empirical - Quantitative	Theme park	Marker-based
14	Kourouthanassis et al. (2015)	Greece	AR	Design research	City's point of interest	Location-based; CorfuAR app; Layar
15	Kourouthanassis, Boletsis, and Lekakos (2015)	Greece	AR	Design research	City's point of interest	Location-based; CorfuAR app; Layar
16	Madsen and Madsen (2015)	Denmark	AR	Design research	Museum	Markerless-based; Tablet
17	Damala et al. (2016)	Netherlands	AR	Design research	Museum	Markerless-based; Smartphone

No	Author	Research location	AR/VR	Type of work	Focused tourism place/object	Technology used
18	García-Crespo et al. (2016)	Not available	AR	Design research	City	Location-based; Cloud-based integration
19	Mason (2016)	United States of America	AR	Design research	Museum	Marker-based; Google Glass
20	Pendit, Zaibon, and Bakar (2016)	Malaysia	AR	Evaluation	Cultural site	Location-based; AR@Melaka
21	Shang, Zakaria, and Ahmad (2016)	Malaysia	AR	Design research	Not mentioned	Markerless-based
22	Siang, Aziz, and Ahmad (2016)	Malaysia	AR	Empirical - Quantitative	City	Location-based;
23	tom Dieck, Jung, and Han (2016)	England	AR	Design research	Art gallery	Markerless-based; Museum Zoom app; Google Glass
24	Trojan (2016)	Czech	AR	Design research	City's point of interest	Integrating AR services for the masses: geotagged POI transformation platform
25	Aluri (2017)	United States of America	AR	Empirical - Quantitative	Not mentioned	Location-based; Pokemon Go; Smartphone
26	Bogomazova and Stenyushkina (2017)	Russia	AR	Conceptual	Not mentioned	Not mentioned
27	Cheeyong et al. (2017)	South Korea	VR	Design research	Marine leisure sport	360° video; Head Mounted Display
28	Choi and Kim (2017)	South Korea	AR	Design research	Museum	Location-based; Head Mounted Display

No	Author	Research location	AR/VR	Type of work	Focused tourism place/object	Technology used
29	Cushing and Cowan (2017)	Ireland	AR	Design research	Cultural site	Location-based; Walk1916 app; Smartphone
30	Gimeno et al. (2017)	Spain	AR	Design research	Museum	Marker-based; Location-based; Smartphone
31	Jung and tom Dieck (2017)	United Kingdom	AR	Conceptual	Museum	Marker-based
32	Kasinathan et al. (2017)	Not available	AR	Design research	Not mentioned	Location-based
33	Lee, Chen, and Su (2017)	Taiwan	AR	Empirical - Quantitative	Cultural site	Markerless-based; Smartphone
34	Lin and Chen (2017)	Thailand	AR	Empirical - Quantitative	Ethnic	Markerless-based; Smartphone; Google Speech API; Samsung text-to-speech engine
35	Pedersen et al. (2017)	Canada	AR	Design research	Museum	Tombseer app; Meta Developer Kit
36	Roongrungsi, Namahoot, and Brückner (2017)	Thailand	AR	Design research	Cultural site	Marker-based; ARCH-TOUR
37	Shukri, Arshad, and Abidin (2017)	Not available	AR	Conceptual	Not mentioned	Not mentioned
38	Tan and Lim (2017)	Malaysia	AR	Design research	Cultural site	Markerless-based; MIGHT
39	tom Dieck and Jung (2017)	United Kingdom	AR	Empirical - Qualitative	Museum	Not mentioned
40	Yeh et al. (2017)	Taiwan	VR	Empirical - Quantitative	City’s point of interest	360° image; Computer

No	Author	Research location	AR/VR	Type of work	Focused tourism place/object	Technology used
41	Abidin et al. (2018)	Not available	AR	Design research	Not mentioned	Location-based
42	Chung et al. (2018)	South Korea	AR	Empirical - Quantitative	Palace	Location-based; Deoksugung In My Hand app; Smartphone
43	Fenu and Pittarello (2018)	Italy	AR	Design research	Museum	Markerless-based; Smartphone; Wikitude
44	Han, tom Dieck, and Jung (2018)	Ireland	AR	Empirical - Qualitative	City's point of interest	Marker-based; Location-based; DublinAR app; Smartphone
45	Jung et al. (2018)	South Korea; Ireland	AR	Empirical - Quantitative	Palace, Post office	Marker-based; Location-based; DublinAR app; Deoksugung In My Hand app; Smartphone
46	Kersten et al. (2018)	Germany	VR	Design research	Museum	3D-modelling; HTC Vive
47	Marasco et al. (2018)	Italy	VR	Empirical - Quantitative	Cultural site	360° video; Oculus Rift
48	Marchiori, Niforatos, and Preto (2018)	Switzerland	VR	Empirical - Quantitative	City's point of interest	360° image; 360° video; Oculus Rift
49	Nisi et al. (2018)	Portugal	AR	Design research	Museum	Marker-based; Yasmin Adventure app; Smartphone
50	Oh, So, and Gaydos (2018)	South Korea	AR	Design research	Museum	ARfract app; Meta One
51	Panou et al. (2018)	Greece	AR	Design research	Cultural site	Location-based; Smartphone

No	Author	Research location	AR/VR	Type of work	Focused tourism place/object	Technology used
52	Paulo et al. (2018)	Portugal	AR	Empirical - Quantitative	Not mentioned	Mobile device
53	Raptis, Fidas, and Avouris (2018)	Greece	AR	Empirical – Mixed method	Cultural site	Holo Tour; HoloLens; Tobii Pro Glasses 2
54	tom Dieck et al. (2018)	United Kingdom	VR	Empirical – Mixed method	Park	360° video; Google Cardboard
55	tom Dieck and Jung (2018)	Ireland	AR	Empirical - Qualitative	City's point of interest	Marker-based; Location-based; DublinAR app; Smartphone
56	tom Dieck, Jung, and Rauschnabel (2018)	England	AR	Empirical - Quantitative	City's point of interest	Location-based; iBeacon; Smartphone
57	tom Dieck, Jung, and tom Dieck (2018)	United Kingdom	AR	Empirical - Qualitative	Art gallery	Museum Zoom app; Google Glass
58	Tussyadiah, Jung, and tom Dieck (2018)	United Kingdom	AR	Empirical - Quantitative	Art gallery	Museum Zoom app; Google Glass
59	Tussyadiah et al. (2018)	Hongkong; United Kingdom	VR	Empirical - Quantitative	City; Park	360° image; 360° video; Google Cardboard; Samsung Gear VR
60	Wagler and Hanus (2018)	United States of America	VR	Empirical - Quantitative	Capitol building	360° video; Oculus Rift
61	Yoon et al. (2018)	United States of America	AR	Empirical – Mixed method	Museum	Interactive device
62	Baker et al. (2019)	Iraq	AR	Design research	Museum	Marker-based
63	Bogicevic et al. (2019)	United States of America	VR	Empirical - Quantitative	Hotel	360° image; HTC Vive; Laptop

No	Author	Research location	AR/VR	Type of work	Focused tourism place/object	Technology used
64	Errichiello et al. (2019)	Italy	VR	Empirical - Quantitative	Cultural site	3D modelling; Samsung Oculus Gear
65	Fang and Lin (2019)	Taiwan	VR	Empirical - Quantitative	City	360° image; 360° video; Google Street; Veer VR; VR Box
66	Flavián, Ibáñez-Sánchez, and Orús (2019b)	Not available	VR	Empirical - Quantitative	City; Canyon	360° video; HMD; Computer
67	Han, Dieck, and Jung (2019)	United Kingdom	AR	Empirical - Qualitative	Art gallery	Google Glass
68	Israel, Zerres, and Tscheulin (2019)	Germany	VR	Empirical - Quantitative	Hotel	360° image; Gear VR
69	Kassim, Eshaq, and Woods (2019)	Not available	AR	Evaluation	Museum	Not mentioned
70	Koo et al. (2019)	South Korea	AR	Design research	Fortress	Markerless-based; Smartphone
71	Lee et al. (2019)	United Kingdom	VR	Empirical - Quantitative	Museum	360° video; Samsung Gear VR
72	Li and Chen (2019)	China	VR	Empirical - Quantitative	Cultural site	HMD
73	Rodrigues et al. (2019)	Portugal	AR	Empirical - Quantitative	Museum	Location-based; Portable device for touch, taste and smell (PDTTS); Smartphone
74	Tsai (2019)	China	AR	Empirical - Quantitative	Cultural site	Location-based

No	Author	Research location	AR/VR	Type of work	Focused tourism place/object	Technology used
75	Wei, Qi, and Zhang (2019)	United States of America	VR	Empirical - Quantitative	Theme park	Not mentioned
76	Wu, Ai, and Cheng (2019)	Taiwan	VR	Empirical - Quantitative	City	360° video; Oculus
77	Yung, Khoo-Lattimore, and Potter (2019)	Not available	VR	Empirical - Quantitative	Cruise ship	360° video; Princess Cruise; HTC Vive
78	Adachi, Cramer, and Song (2020)	Not available	VR	Empirical - Quantitative	City's point of interest	360° video; Samsung Gear VR; Computer
79	Baker et al. (2020)	Not available	AR	Design research	Museum	Marker-based; Smartphone
80	Cranmer, tom Dieck, and Fountoulaki (2020)	Germany	AR	Empirical - Qualitative	Tourism trade fair	Not mentioned
81	Hammady et al. (2020)	Egypt	AR	Design research	Museum	HoloLens
82	Jung et al. (2020)	South Korea; Ireland	AR	Empirical - Quantitative	Palace; Museum	Markerless-based; DublinAR app; Deoksugung In My Hand app
83	Kim, Lee, and Jung (2020)	Not available	VR	Empirical - Quantitative	Not mentioned	Not mentioned
84	Lacka (2020)	Not available	AR	Empirical - Quantitative	Not mentioned	Location-based
85	Lin, Huang, and Ho (2020)	China; Taiwan	VR	Empirical - Quantitative	Painting	3D modelling; HTC Vive
86	Puig et al. (2020)	Spain	VR	Design research	Cultural site	3D modelling; Draga 360; HTC Vive

No	Author	Research location	AR/VR	Type of work	Focused tourism place/object	Technology used
87	Wu, Chiu, and Chen (2020)	Taiwan	AR	Empirical - Quantitative	Exhibition	Not mentioned
88	Zeng et al. (2020)	China	VR	Empirical - Quantitative	Hotel	360° image; HMD

Appendix B. Research Ethic Approval

B.1 Ethics approval from Curtin human research ethics office

Curtin University

Research Office at Curtin

GPO Box U1987
Perth Western Australia 6845

Telephone +61 8 9266 7863
Facsimile +61 8 9266 3793
Web research.curtin.edu.au

11-Nov-2020

Name: Nik Thompson
Department/School: School of Management
Email: Nik.Thompson@curtin.edu.au

Dear Nik Thompson

RE: Amendment approval
Approval number: HRE2019-0626

Thank you for submitting an amendment request to the Human Research Ethics Office for the project **The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism**.

Your amendment request has been reviewed and the review outcome is: **Approved**

The amendment approval number is HRE2019-0626-03 approved on 11-Nov-2020.

The following amendments were approved:
Current method for the second data collection is asking the potential participant to experience Virtual Reality using Head Mounted Display and filling the questionnaire based on the VR experience. The target participant is Curtin student and staff.

The Head Mounted Display will be replaced with VR website (attached on Qualtrics questionnaire). My proposed method change is potential participant will be asked to access and explore a specified VR website and filling the questionnaire afterwards. The target participant will be any person who 18 years old or more, instead limiting only to Curtin student and staff. The invitation will be sent via email and social media.

Condition of Approval
It is the responsibility of the Chief Investigator to ensure that any activity undertaken under this project adheres to the latest available advice from the Government or the University regarding COVID-19.

Any special conditions noted in the original approval letter still apply.

Standard conditions of approval

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
   - proposed changes to the approved proposal or conduct of the study
   - unanticipated problems that might affect continued ethical acceptability of the project
   - major deviations from the approved proposal and/or regulatory guidelines
   - serious adverse events
3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants)
4. An annual progress report must be submitted to the Human Research Ethics Office on or before the anniversary of approval and a completion report submitted on completion of the project
5. Personnel working on this project must be adequately qualified by education, training and experience for their role, or supervised
6. Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, that bears on this project

Curtin University

Research Office at Curtin

GPO Box U1987
Perth Western Australia 6845

Telephone +61 8 9266 7863
Facsimile +61 8 9266 3793
Web research.curtin.edu.au

18-Sep-2019

Name: Nik Thompson
Department/School: School of Management
Email: Nik.Thompson@curtin.edu.au

Dear Nik Thompson

RE: Ethics Office approval
Approval number: HRE2019-0626

Thank you for submitting your application to the Human Research Ethics Office for the project **The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism**.

Your application was reviewed through the Curtin University Low risk review process.

The review outcome is: **Approved**.

Your proposal meets the requirements described in the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research (2007)*.

Approval is granted for a period of one year from **18-Sep-2019** to **17-Sep-2020**. Continuation of approval will be granted on an annual basis following submission of an annual report.

Personnel authorised to work on this project:

Name	Role
Thompson, Nik	CI
Potdar, Vidy	Supervisor
Pratisto, Eko Harry	Student

Approved documents:

Document

Standard conditions of approval

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
   - proposed changes to the approved proposal or conduct of the study
   - unanticipated problems that might affect continued ethical acceptability of the project
   - major deviations from the approved proposal and/or regulatory guidelines
   - serious adverse events
3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants)

4. An annual progress report must be submitted to the Human Research Ethics Office on or before the anniversary of approval and a completion report submitted on completion of the project
5. Personnel working on this project must be adequately qualified by education, training and experience for their role, or supervised
6. Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, that bears on this project
7. Changes to personnel working on this project must be reported to the Human Research Ethics Office
8. Data and primary materials must be retained and stored in accordance with the Western Australian University Sector Disposal Authority (WAUSDA) and the Curtin University Research Data and Primary Materials policy
9. Where practicable, results of the research should be made available to the research participants in a timely and clear manner
10. Unless prohibited by contractual obligations, results of the research should be disseminated in a manner that will allow public scrutiny; the Human Research Ethics Office must be informed of any constraints on publication
11. Approval is dependent upon ongoing compliance of the research with the Australian Code for the Responsible Conduct of Research, the National Statement on Ethical Conduct in Human Research, applicable legal requirements, and with Curtin University policies, procedures and governance requirements
12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

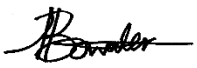
Special Conditions of Approval

None.

This letter constitutes low risk/negligible risk approval only. This project may not proceed until you have met all of the Curtin University research governance requirements.

Should you have any queries regarding consideration of your project, please contact the Ethics Support Officer for your faculty or the Ethics Office at hrec@curtin.edu.au or on 9266 2784.

Yours sincerely

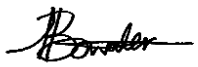


Amy Bowater
Ethics, Team Lead

7. Changes to personnel working on this project must be reported to the Human Research Ethics Office
8. Data and primary materials must be retained and stored in accordance with the Western Australian University Sector Disposal Authority (WAUSDA) and the Curtin University Research Data and Primary Materials policy
9. Where practicable, results of the research should be made available to the research participants in a timely and clear manner
10. Unless prohibited by contractual obligations, results of the research should be disseminated in a manner that will allow public scrutiny; the Human Research Ethics Office must be informed of any constraints on publication
11. Ethics approval is dependent upon ongoing compliance of the research with the Australian Code for the Responsible Conduct of Research, the National Statement on Ethical Conduct in Human Research, applicable legal requirements, and with Curtin University policies, procedures and governance requirements
12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

Should you have any queries regarding consideration of your project, please contact the Ethics Support Officer for your faculty or the Ethics Office at hrec@curtin.edu.au or on 9266 2784.

Yours sincerely



Amy Bowater
Ethics, Team Lead

B.2 Curtin survey approval

From: Curtin Survey Approvals
Sent: Tuesday, 25 June 2019 4:29 PM
To: Eko Harry Pratisto
Subject: 190625 Req No 2019_113 The Influence of Perceived Quality and Personality on the Behavi Intention of Virtual Reality for Tourism (Eko Harry Pratisto)

Dear Harry

Thank you for notifying us of your intention to use approximately 200 Curtin staff and students for research purposes.

Based on the information provided, please consider this email to be approval for your project (you do not require anything else from us).

With respect to conducting intercepts (ie. approaching students) on the Curtin Bentley campus:

- The intercepts must take place in open spaces (so not in classrooms/libraries/cafeteria etc. where students/staff can be disrupted).
- Confidentiality of participant details must be assured and the project must meet industry code of practice/standards.

Approval is subject to meeting the Disability Access and Inclusion Plan (DAIP) Requirement as detailed here: http://planning.curtin.edu.au/mir/surveyapprovals.cfm#what.

Please note:

- When completing the survey approvals form you were asked for up to 5 key words to describe your research. These key words (along with your contact details and project summary) will appear in our register of approved activity which will be uploaded to our website at the end of every month. You may wish to view this register to see what other researchers are doing and/or find opportunities for collaboration https://planning.curtin.edu.au/mir/surveyapprovals.cfm Please contact us if you do not wish for your project details to appear in this register.

- Ethics approval: **If you can please provide us with your ethics approval number** (if applicable) once this is available so that we can update our register, this would be appreciated.

- Curtin Survey Approvals process approves research activities, samples, and research timing as specified in the application. Survey Approvals does not guarantee researchers the access to any information (e.g., lists of contact details of participants etc.) that will facilitate stated research activities. Whether requested information is allowed access should be liaised with the data owner, and it is eventually up to the data owner's discretion and consideration of relevant rules of the university and work areas. The Office of Strategy and Planning does not have authority in issuing access to any information or data that is beyond its work scope.

Best wishes with your study.

Kind regards
Julie-Ann

Julie-Ann Pegden
Evaluation Analyst/Coordinator | Office of Strategy and Planning

Curtin University
Tel | +61 8 9266 1317
Email | J.Pegden@curtin.edu.au
Web | www.evaluate.curtin.edu.au/

Appendix C. Participant information sheet and consent form

C.1 Study 1

C.1.1 Participant information sheet (Bahasa Indonesia)

Curtin University

The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism

PERNYATAAN INFORMASI PESERTA

HREC Project Number:	**HRE2019-0626**
Project Title:	The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism
Chief Investigator:	Dr Nik Thompson, Senior Lecturer, School of Management, Curtin University, Australia
Student researcher:	Eko Harry Pratisto, PhD Student, School of Management, Curtin University, Australia
Version Number:	1
Version Date:	22/May/2019

Proyek ini tentang apa?
Penelitian ini bertujuan untuk mempelajari hubungan antara penggunaan Virtual Reality (VR) terhadap keinginan pengguna untuk mengunjungi tujuan wisata serta penggunaan VR sebagai rekomendasi tempat pariwisata. Hasil dari penelitian ini bertujuan untuk memberikan pemahaman yang lebih baik tentang penggunaan VR yang mempengaruhi perilaku keinginan pengguna.

Siapa yang melakukan Penelitian?
Proyek ini dilakukan oleh Eko Harry Pratisto, seorang mahasiswa doktoral di Curtin University, Australia. Hasil dari proyek penelitian ini akan digunakan oleh Eko Harry Pratisto untuk memperoleh gelar *Doctor of Philosophy* (PhD) di Curtin University.

Mengapa saya diminta untuk mengambil bagian dan apa yang harus saya lakukan?
Kami mencari peserta untuk merasakan VR tentang tujuan wisata tertentu untuk mendapatkan pengetahuan mengenai pengalaman pengguna tentang VR terhadap niat perilaku keinginan pengguna. Studi ini akan berlangsung di beberapa tempat seperti Expo di Indonesia, serta area di dalam Curtin University di Bentley atau lokasi yang disepakati.
Dalam proyek ini, kami akan meminta Anda untuk menggunakan aplikasi VR dengan *Head Mounted Display* selama maksimal 5 menit. Setelah itu, kami mengharapkan Anda mengisi kuesioner berdasarkan apa yang telah Anda rasakan selama penggunaan VR dalam waktu tidak lebih dari 10 menit. Kuesioner bersifat *online* dan disediakan dengan menggunakan laptop, tablet PC atau *smartphone*.
Tidak akan ada biaya yang dikeluarkan bagi Anda untuk mengambil bagian dalam penelitian ini dan Anda tidak akan diberikan upah untuk mengambil bagian.
Kami juga ingin Anda mempertimbangkan untuk mengizinkan kami mengirim informasi tentang survei lanjutan melalui email Anda mengenai kunjungan Anda yang di kemudian hari ke tujuan wisata tertentu seperti yang terlihat di VR. Setelah Anda menerima informasi tersebut, adalah pilihan Anda dalam memutuskan untuk mengambil bagian pada proyek ini atau tidak.

Apakah ada manfaat berperan dalam proyek penelitian ini?

Mungkin tidak ada manfaat langsung bagi Anda dari berpartisipasi dalam penelitian ini.
Kami berharap hasil penelitian ini akan menambah pengetahuan tentang Virtual Reality dalam pariwisata.

Apakah ada risiko, efek samping, ketidaknyamanan atau ketidaknyamanan karena berada dalam proyek penelitian?

Penggunaan VR dalam waktu yang lama dimungkinkan menyebabkan mual, pusing, atau ketidakseimbangan. Oleh karena itu, kami membatasi penggunaan VR hingga maksimum 5 menit sehingga tidak ada risiko yang dapat diperkirakan dari proyek penelitian ini.
Selain meluangkan waktu Anda, kami tidak mengharapkan terdapat risiko atau ketidaknyamanan lainnya yang terkait dengan mengambil bagian dalam penelitian ini.

Siapa yang akan memiliki akses ke informasi saya?

Orang-orang berikut akan memiliki akses ke informasi yang kami kumpulkan dalam penelitian ini: tim peneliti dan, dalam hal audit atau investigasi, staf dari Curtin University Office of Research and Development.
Kami akan meminta alamat email Anda ketika kami mengumpulkan data, agar kami dapat menghubungi Anda untuk menindaklanjuti survei. Ini berarti data yang kami kumpulkan akan dapat diidentifikasi. Namun, setelah data terkumpul, kami akan menghapus semua informasi pengidentifikasi dari data tersebut. Ini berarti data yang kami analisis dan data yang kami simpan tidak dapat diidentifikasi, dan kami tidak akan memiliki cara untuk mengidentifikasi informasi Anda.

Data akan disalin dari Qualtrics dan disimpan pada komputer peneliti utama dalam folder platform *cloud storage* serta penyimpanan dalam jaringan yang disediakan Curtin University, untuk memastikan *backup* dan *recovery* dimungkinkan dalam hal kerusakan - atau hilangnya - perangkat keras komputer.
Informasi yang kami kumpulkan dalam penelitian ini akan disimpan dalam kondisi aman di Curtin University selama 7 tahun setelah penelitian diterbitkan dan kemudian akan dimusnahkan.
Hasil penelitian ini dapat dipresentasikan di konferensi atau dipublikasikan di jurnal profesional. Anda tidak akan diidentifikasi dalam hasil apa pun yang dipublikasikan atau disajikan.

Maukah Anda memberi tahu saya hasil penelitian?

Jika Anda tertarik untuk mendapatkan ringkasan hasil penelitian, silakan hubungi para peneliti dalam waktu sekitar 6 bulan.

Apakah saya harus ikut serta dalam proyek penelitian?

Mengambil bagian dalam proyek penelitian ini bersifat sukarela. Merupakan pilihan Anda untuk mengambil bagian atau tidak. Anda tidak harus setuju jika tidak berkenan. Jika Anda memutuskan untuk mengambil bagian dan kemudian berubah pikiran, tidak apa-apa, Anda dapat menarik diri dari proyek ini. Jika Anda memilih untuk tidak mengambil bagian atau telah memulai dan kemudian berhenti berpartisipasi, tidak akan mempengaruhi hubungan Anda dengan Universitas, staf, atau

kolega. Karena penelitian ini menggunakan kuesioner, Anda dapat menarik partisipasi Anda sebelum mengirimkan tanggapan hanya dengan menutup browser.
Dengan izin Anda, jika Anda memilih untuk meninggalkan penelitian ini, kami akan menggunakan informasi apa pun yang dikumpulkan kecuali Anda memberi tahu kami untuk tidak melakukannya.

Apa yang terjadi selanjutnya dan siapa yang dapat saya hubungi tentang penelitian ini?
Jika Anda memiliki pertanyaan lebih lanjut, silakan hubungi, pada kontak yang diberikan di bawah ini:

- Eko Harry Pratisto (ekoharry.pratisto@postgrad.curtin.edu.au)
- Dr Nik Thompson (nik.thompson@curtin.edu.au)
- Dr Vidyasagar Potdar (vidyasagar.potdar@cbs.curtin.edu.au)

Pada awal kuesioner, tersedia melalui tautan/*link* yang disediakan, terdapat kotak centang untuk menunjukkan Anda telah memahami informasi yang diberikan pada lembar informasi ini.

Curtin University Human Research Ethics Committee (HREC) telah menyetujui penelitian ini (HRE2019-0626). Jika Anda ingin mendiskusikan penelitian dengan seseorang yang tidak terlibat langsung, khususnya, segala hal yang berkaitan dengan pelaksanaan penelitian atau hak-hak Anda sebagai partisipan, atau Anda ingin mengajukan keluhan secara rahasia, Anda dapat menghubungi Ethics Officer di (+60 8) 9266 9223 atau Manager, Research Integrity di (+60 8) 9266 7093 atau email hrec@curtin.edu.au.

PARTICIPANT INFORMATION STATEMENT

HREC Project Number:	**HRE2019-0626**
Project Title:	The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism
Chief Investigator:	Dr Nik Thompson, Senior Lecturer, School of Management, Curtin University, Australia
Student researcher:	Eko Harry Pratisto, PhD Student, School of Management, Curtin University, Australia
Version Number:	1
Version Date:	22/May/2019

What is the Project About?

Virtual Reality (VR) in tourism has gained increased attention, largely because it provides users with information regarding tourism destinations to help them making decision for visitation. VR provides full computer-generated environment to give the user experience on feeling to move from the reality into the Virtual Environment. There is a lack of research on the relation between Perceived Quality and Personality on the use of VR on the user intention to visit tourism destination and user intention to use VR as tourism recommendation. The outcome of this study aims to provide a better understanding of Perceived Quality, and Personality Traits on VR influencing the user behavioural intention. Apart from theoretical contributions, this research will be significant to tourism stakeholders including tourism destination provider on developing marketing policy, researchers on adding knowledge especially VR in tourism and society on gaining information regarding tourism destination prior visitation. To support this project, a minimum of 200 participants are needed.

Who is doing the Research?

The project is being conducted by Eko Harry Pratisto, a doctoral degree student at Curtin University, Australia. The results of this research project will be used by Eko Harry Pratisto to obtain a Doctor of Philosophy at Curtin University.

Why am I being asked to take part and what will I have to do?

We are looking for participants to experience VR about specific tourism destination to get insight of participants' experience on Virtual Reality toward the user's behaviour intention. The study will take some places such as Expo in Indonesia, any places within Curtin University area at Bentley or a mutually convenient location.

In this project, we will ask you to experience Virtual Reality using Head Mounted Display for approximately 5 minutes. After that, we would like you to fill the questionnaire based on Virtual Reality that you had experienced which will take not more than 12 minutes. The questionnaire is online and provided by using laptop, tablet PC or smartphone.

There will be no cost to you for taking part in this research and you will not be paid for taking part. We would like you also to consider allowing us to send you information about follow up survey via e-mail regarding your actual visitation to the specific tourism destination in the future. Once you receive the information it is your choice if you decide to take part or not.

Are there any benefits' to being in the research project?

There may be no direct benefit to you from participating in this research.
We hope the results of this research will allow us to add knowledge about Virtual Reality in tourism.

Are there any risks, side-effects, discomforts or inconveniences from being in the research project?

Using VR in a prolonged time can cause nausea, dizziness or imbalance. Therefore, we limit the use of VR to maximum of 5 minutes and there are no foreseeable risks from this research project.
Apart from giving up your time, we do not expect that there will be any risks or inconveniences associated with taking part in this study.

Who will have access to my information?

The information collected in this research will be non-identifiable (anonymous). This means that we do not need to collect individual names or information is anonymous and will not include a code number or name. No one, not even the research team will be able to identify your information. The following people will have access to the information we collect in this research: the research team and, in the event of an audit or investigation, staff from the Curtin University Office of Research and Development
We will ask for your email address when we collect the data, to allow us to contact you for follow up survey. This means the data we collect will be identifiable. However, after the data gathered we will remove all identifying information from the data. That means the data we analyse and the data we store will be non-identifiable, and we will have no way to identify your information.

The data will be copied off Qualtrics and stored on the principal investigators computer in the folder of a cloud storage platform as well as Curtin University's provided network storage, to ensure backups are captured and recovery is possible in the instance of damage to - or loss of - computer hardware.
The information we collect in this study will be kept under secure conditions at Curtin University for 7 years after the research is published and then it will be destroyed.
The results of this research may be presented at conferences or published in professional journals. You will not be identified in any results that are published or presented.

Will you tell me the results of the research?

If you are interested in obtaining a summary of the results please contact the researchers in about 6 months.

Do I have to take part in the research project?

Taking part in a research project is voluntary. It is your choice to take part or not. You do not have to agree if you do not want to. If you decide to take part and then change your mind, that is okay, you can withdraw from the project. If you choose not to take part or start and then stop the study, it will not affect your relationship with the University, staff or colleagues. As this study is using

questionnaire, you can withdraw your participation prior to submitting responses by simply closing the browser. However, as data are anonymous you cannot withdraw your data after your responses have been submitted.
With your permission, if you chose to leave the study we will use any information collected unless you tell us not to.

What happens next and who can I contact about the research?
If you have any further questions, please contact, on the details given below:

- Eko Harry Pratisto (ekoharry.pratisto@postgrad.curtin.edu.au)
- Dr Nik Thompson (nik.thompson@curtin.edu.au)
- Dr Vidyasagar Potdar (vidyasagar.potdar@cbs.curtin.edu.au)

At the start of the questionnaire, available via the link provided, there is a checkbox to indicate you have understood the information provided here in the information sheet.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HRE2019-0626). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

C.1.2 Consent form (Bahasa Indonesia)

Curtin University

The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism

LEMBAR PERSETUJUAN

HREC Project Number:	**HRE2019-0626**
Project Title:	The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism
Chief Investigator:	Dr Nik Thompson, Senior Lecturer, School of Management, Curtin University, Australia
Student researcher:	Eko Harry Pratisto, PhD Student, School of Management, Curtin University, Australia
Version Number:	1
Version Date:	22/May/2019

- Saya telah membaca, atau telah dibacakan kepada saya dalam bahasa percakapan utama saya, pernyataan informasi yang tercantum di atas dan saya mengerti isinya.
- Saya percaya saya memahami tujuan, cakupan dan kemungkinan risiko dari keterlibatan saya dalam proyek ini.
- Saya secara sukarela menyetujui untuk ikut serta dalam proyek penelitian ini.
- Saya memiliki kesempatan untuk mengajukan pertanyaan dan saya puas dengan jawaban yang saya terima.
- Saya mengerti bahwa proyek ini telah disetujui oleh Komite Etika Penelitian terhadap Manusia Curtin University dan akan dilaksanakan sesuai dengan the *National Statement on Ethical Conduct in Human Research* (2007).
- Saya mengerti bahwa saya akan menerima salinan dari Pernyataan Informasi dan Lembar Persetujuan ini.

☐ Saya bersedia	☐ Saya tidak bersedia	consent to you using any data I provided before withdrawing from the study, if relevant menyetujui kepada Anda untuk menggunakan data apapun yang saya berikan sebelum mengundurkan diri dari penelitian ini, jika relevan.

Nama Partisipan	
Tanda Tangan Partisipan	
Tanggal	

Deklarasi oleh peneliti: Saya telah menyediakn Lembar Informasi dan Lembar Pernyataan kepada peserta yang telah menandatangani di atas, dan percaya bahwa mereka memahami tujuan, cakupan, dan kemungkinan risiko dari keterlibatan mereka dalam proyek ini.

Nama Peneliti	Eko Harry Pratisto
Tanda Tangan Peneliti	
Tanggal	

C.2 Study 2

C.2.1 Participant information sheet (English)

The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism

PARTICIPANT INFORMATION STATEMENT

HREC Project Number:	**HRE2019-0626**
Project Title:	The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism
Chief Investigator:	Dr Nik Thompson, Senior Lecturer, School of Management, Curtin University, Australia
Student researcher:	Eko Harry Pratisto, PhD Student, School of Management, Curtin University, Australia
Version Number:	**2**
Version Date:	19/Oct/2020

What is the Project About?

Virtual Reality (VR) in tourism has gained increased attention, largely because it provides users with information regarding tourism destinations to help them making decision for visitation. VR provides full computer-generated environment to give the user experience on feeling to move from the reality into the Virtual Environment. There is a lack of research on the relation between Perceived Quality and Personality on the use of VR on the user intention to visit tourism destination and user intention to use VR as tourism recommendation. The outcome of this study aims to provide a better understanding of Perceived Quality, and Personality Traits on VR influencing the user behavioural intention. Apart from theoretical contributions, this research will be significant to tourism stakeholders including tourism destination provider on developing marketing policy, researchers on adding knowledge especially VR in tourism and society on gaining information regarding tourism destination prior visitation. To support this project, a minimum of 200 participants are needed.

Who is doing the Research?

The project is being conducted by Eko Harry Pratisto, a doctoral degree student at Curtin University, Australia. The results of this research project will be used by Eko Harry Pratisto to obtain a Doctor of Philosophy at Curtin University.

Why am I being asked to take part and what will I have to do?

We are looking for participants to experience VR about specific tourism destination to get insight of participants' experience on Virtual Reality toward the user's behaviour intention.

In this project, we will ask you to experience tourism related VR on a website using link provided for approximately 1-3 minutes. After that, we would like you to fill the questionnaire based on Virtual Reality that you had experienced which will take not more than 20 minutes. The questionnaire is online and can be accessed using laptop, tablet PC or smartphone.

There will be no cost to you for taking part in this research and you will not be paid for taking part.

We would like you also to consider allowing us to send you information about follow up survey via e-mail regarding your actual visitation to the specific tourism destination in the future. Once you receive the information it is your choice if you decide to take part or not.

Are there any benefits' to being in the research project?

There may be no direct benefit to you from participating in this research.
We hope the results of this research will allow us to add knowledge about Virtual Reality in tourism.

Are there any risks, side-effects, discomforts or inconveniences from being in the research project?

Using VR in a prolonged time can cause nausea, dizziness or imbalance. Therefore, we limit the use of VR to maximum of 5 minutes and there are no foreseeable risks from this research project.
Apart from giving up your time, we do not expect that there will be any risks or inconveniences associated with taking part in this study.

Who will have access to my information?

The information collected in this research will be non-identifiable (anonymous). This means that we do not need to collect individual names or information is anonymous and will not include a code number or name. No one, not even the research team will be able to identify your information. The following people will have access to the information we collect in this research: the research team and, in the event of an audit or investigation, staff from the Curtin University Office of Research and Development
We will ask for your email address when we collect the data, to allow us to contact you for follow up survey. This means the data we collect will be identifiable. However, after the data gathered we will remove all identifying information from the data. That means the data we analyse and the data we store will be non-identifiable, and we will have no way to identify your information.

The data will be copied off Qualtrics and stored on the principal investigators computer in the folder of a cloud storage platform as well as Curtin University's provided network storage, to ensure backups are captured and recovery is possible in the instance of damage to - or loss of - computer hardware.
The information we collect in this study will be kept under secure conditions at Curtin University for 7 years after the research is published and then it will be destroyed.
The results of this research may be presented at conferences or published in professional journals. You will not be identified in any results that are published or presented.

Will you tell me the results of the research?

If you are interested in obtaining a summary of the results please contact the researchers in about 6 months.

Do I have to take part in the research project?

Taking part in a research project is voluntary. It is your choice to take part or not. You do not have to agree if you do not want to. If you decide to take part and then change your mind, that is okay, you can withdraw from the project. If you choose not to take part or start and then stop the study, it will not affect your relationship with the University, staff or colleagues. As this study is using questionnaire, you can withdraw your participation prior to submitting responses by simply closing

the browser. However, as data are anonymous you cannot withdraw your data after your responses have been submitted.
With your permission, if you chose to leave the study we will use any information collected unless you tell us not to.

What happens next and who can I contact about the research?
If you have any further questions, please contact, on the details given below:

- Eko Harry Pratisto (ekoharry.pratisto@postgrad.curtin.edu.au)
- Dr Nik Thompson (nik.thompson@curtin.edu.au)
- Dr Vidyasagar Potdar (vidyasagar.potdar@cbs.curtin.edu.au)

At the start of the questionnaire, available via the link provided, there is a checkbox to indicate you have understood the information provided here in the information sheet.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HRE2019-0626). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

C.2.2 Consent form (English)

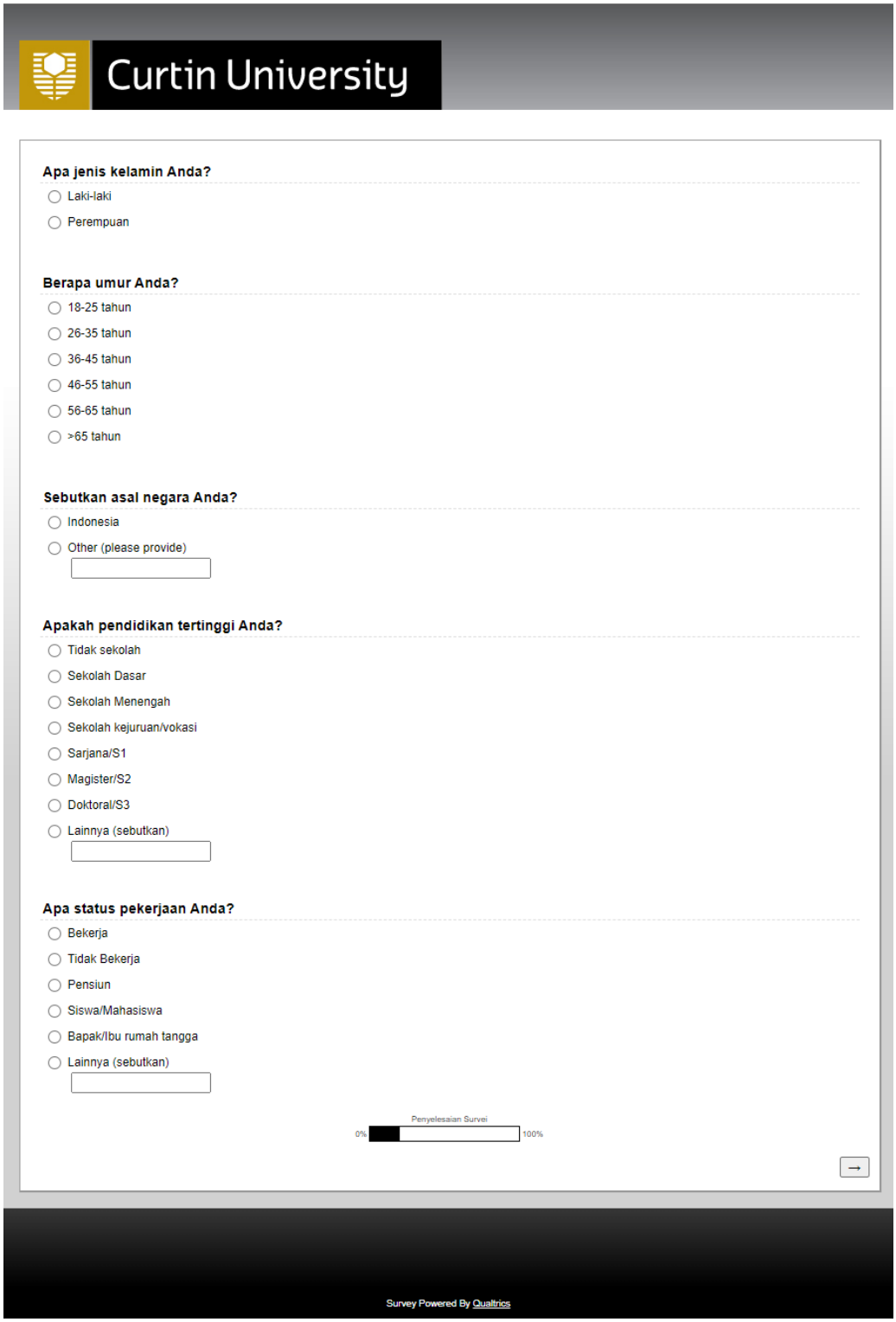
Consent to Participate in the Research

The Influence of Perceived Quality and Personality on the Behaviour Intention of Virtual Reality for Tourism

- I have read the information statement regarding the above project and I understand its contents.
- I believe I understand the purpose, extent and possible risks of my involvement in this project.
- I voluntarily consent to take part in this research project.
- I understand that I can download this Consent Form and the Information Statement.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007) – updated March 2014.
- I have received information regarding this research and had an opportunity to ask questions from the researchers. I believe I understand the purpose, extent and possible risks of my involvement in this project and I voluntarily consent to take part.

Appendix D. Questionnaire

D.1 Questionnaire items in Bahasa Indonesia for Study 1



Curtin University

Apakah Anda pernah menggunakan alat Virtual Reality sebelumnya?

- ○ Pernah
- ○ Belum pernah

Apakah Anda pernah mengunjungi tempat wisata yang ditampilkan pada Virtual Reality pada penelitian ini?

- ○ Pernah
- ○ Belum pernah

Apakah Anda mengetahui tentang tempat wisata yang ditampilkan Virtual Reality pada penelitian ini?

- ○ Sangat tahu
- ○ Sedikit mengetahui
- ○ Tidak tahu

Penyelesaian Survei

0% 100%

→

Survey Powered By Qualtrics

Curtin University

Questionnaire berikut berhubungan dengan pengalaman Anda setelah menggunakan Virtual Reality. Pilih atau tandai jawaban yang tersedia berdasarkan apa yang Anda rasakan ketika menggunakan Virtual Reality. Tidak ada jawaban benar atau salah, tolong tanggapi pernyataan-pernyataan dengan sebenar-benarnya.

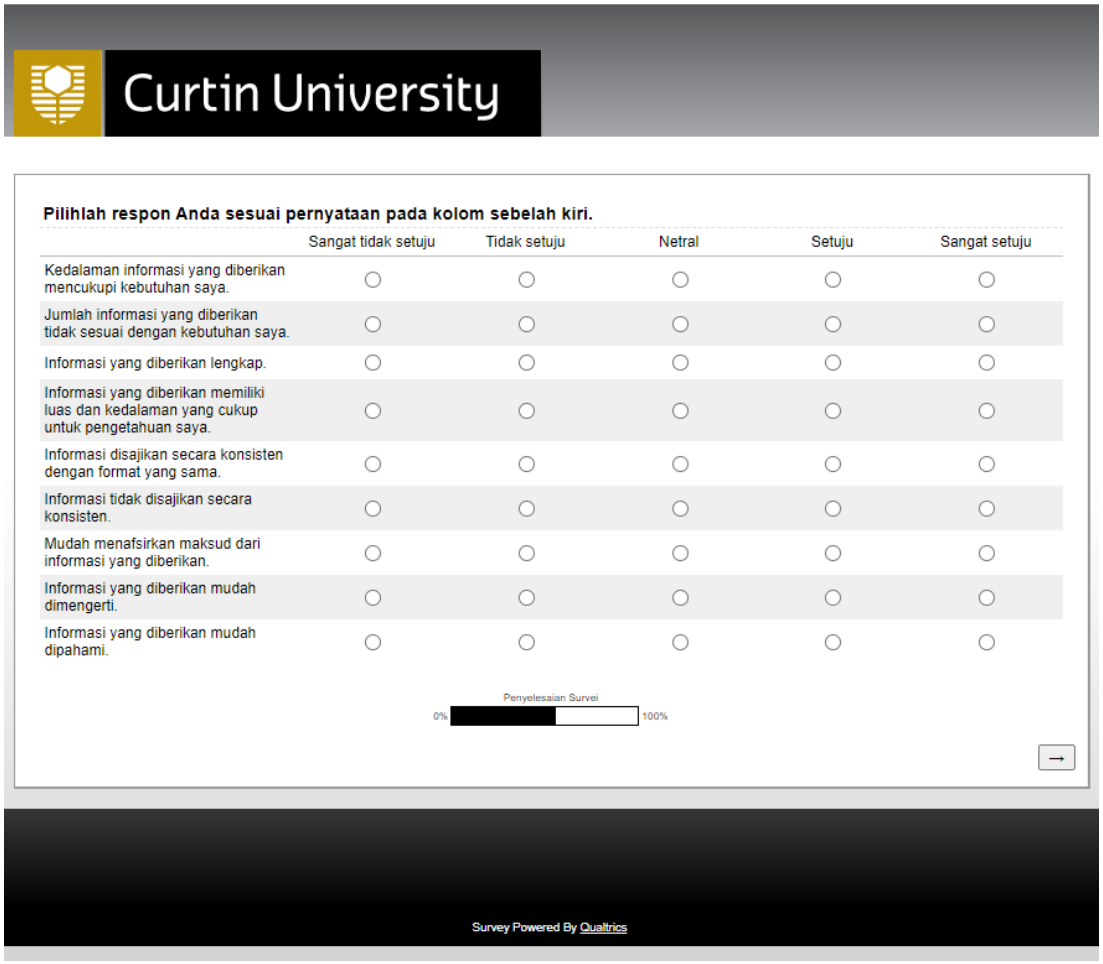
Questionnaire terdiri dari 66 pernyataan dan membutuhkan waktu kurang lebih 10 menit untuk menyelesaikan.

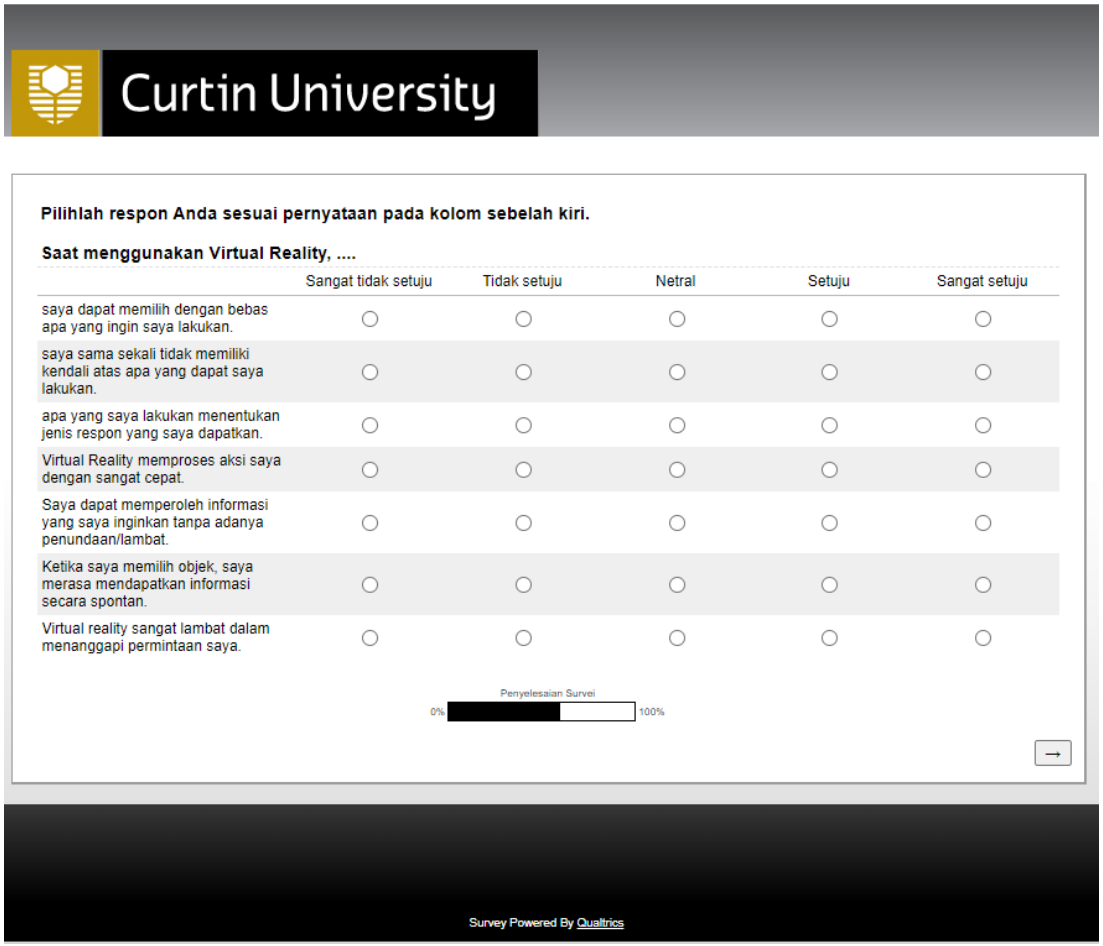
Penyelesaian Survei

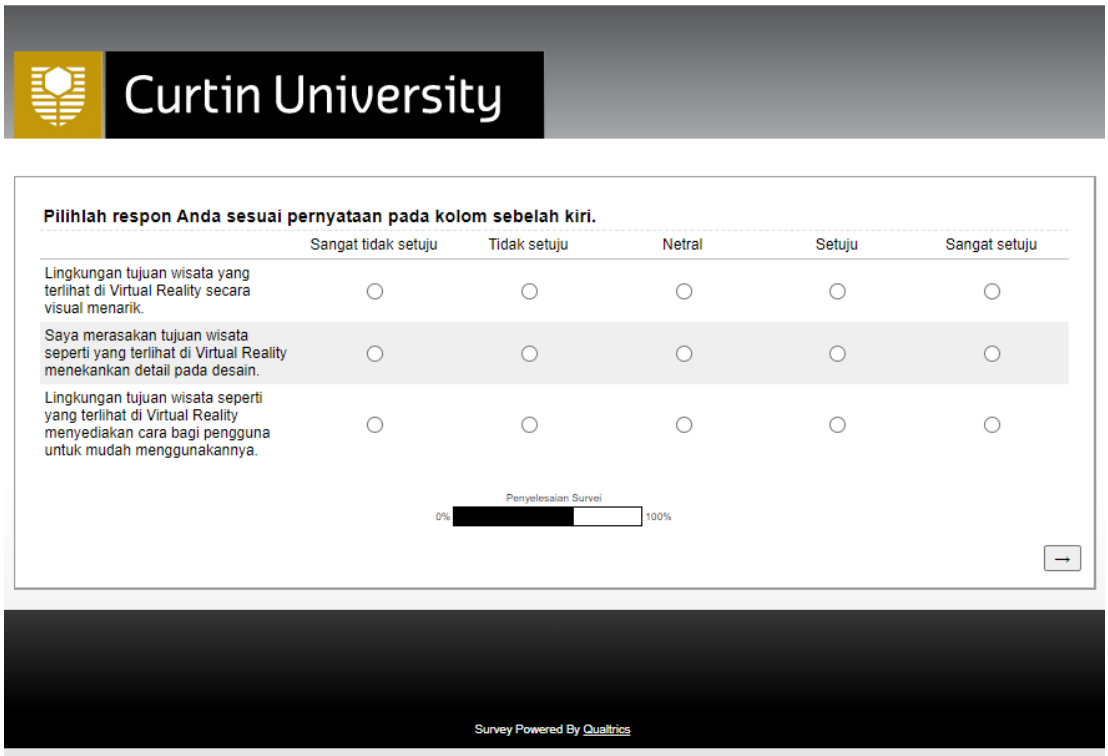
0% 100%

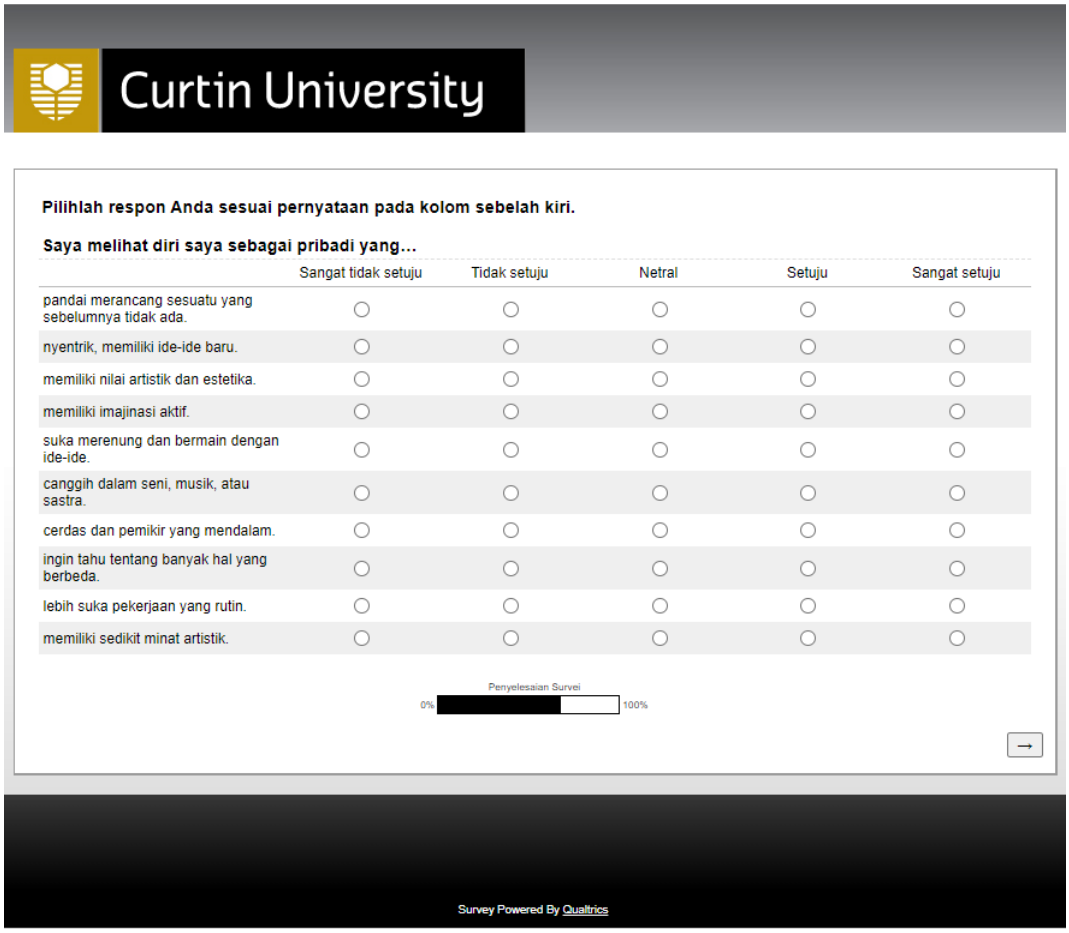
→

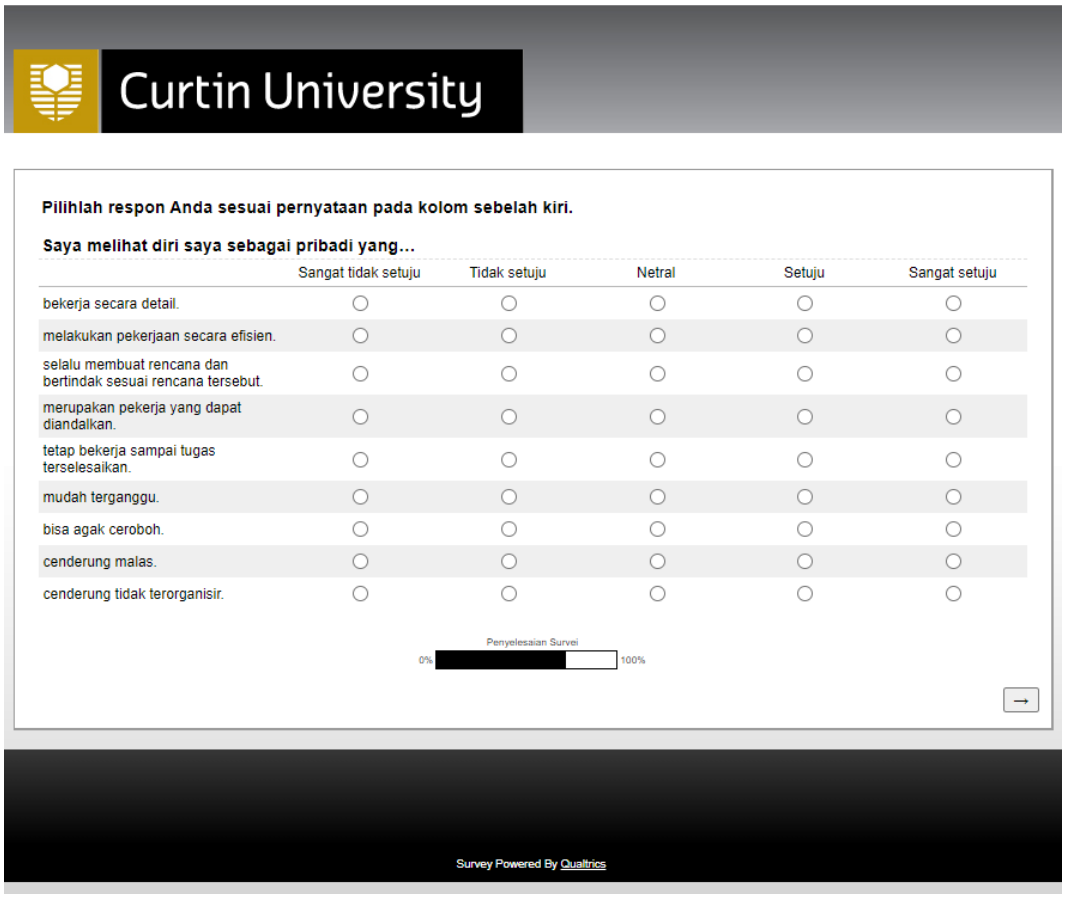
Survey Powered By Qualtrics

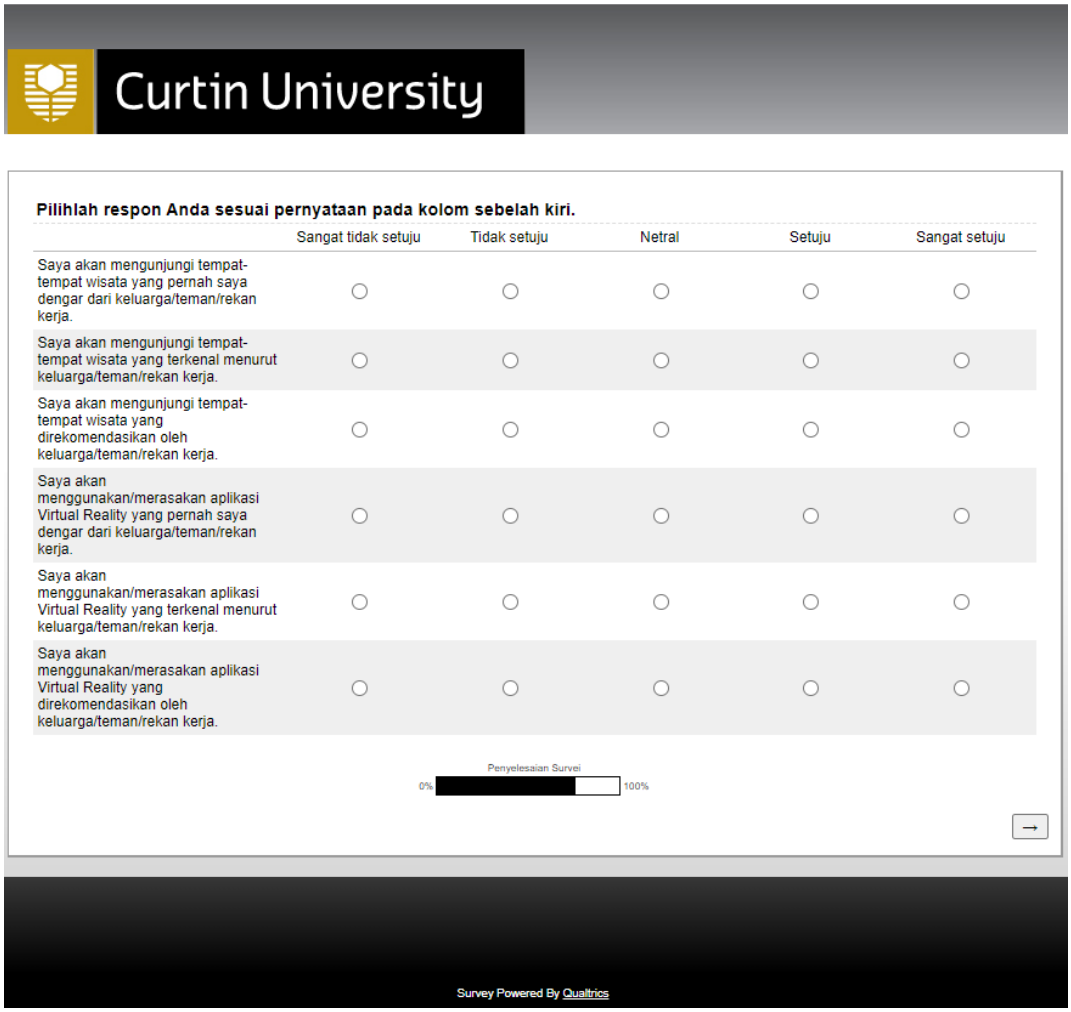

Curtin University
Pilihlah respon Anda sesuai pernyataan pada kolom sebelah kiri.
Sangat tidak setuju
Tidak setuju
Netral
Setuju
Sangat setuju
Kedalaman informasi yang diberikan mencukupi kebutuhan saya.
Jumlah informasi yang diberikan tidak sesuai dengan kebutuhan saya.
Informasi yang diberikan lengkap.
Informasi yang diberikan memiliki luas dan kedalaman yang cukup untuk pengetahuan saya.
Informasi disajikan secara konsisten dengan format yang sama.
Informasi tidak disajikan secara konsisten.
Mudah menafsirkan maksud dari informasi yang diberikan.
Informasi yang diberikan mudah dimengerti.
Informasi yang diberikan mudah dipahami.
Penyelesaian Survei
0%
100%
→
Survey Powered By Qualtrics

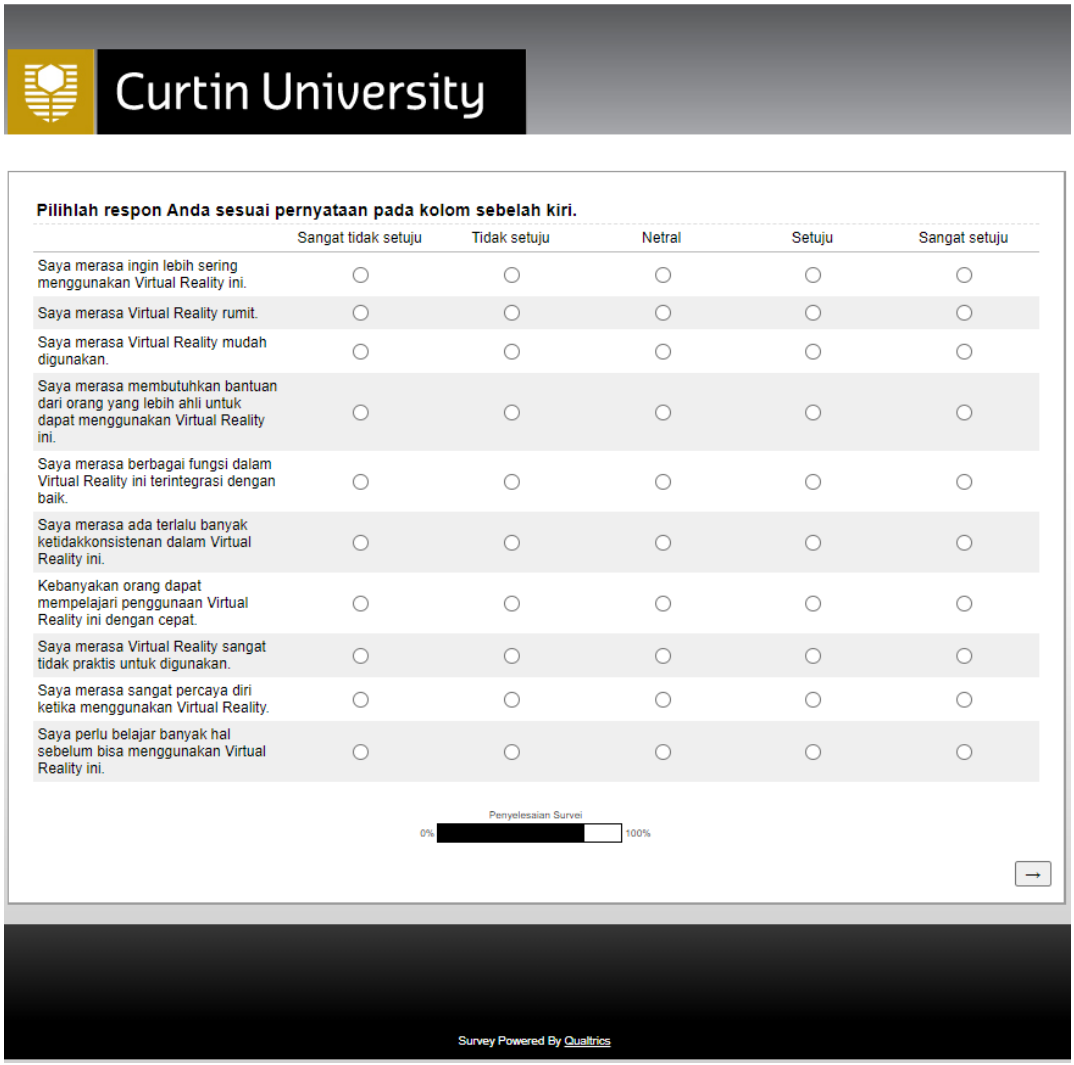

Curtin University
Pilihlah respon Anda sesuai pernyataan pada kolom sebelah kiri.
Saat menggunakan Virtual Reality, ...
Sangat tidak setuju
Tidak setuju
Netral
Setuju
Sangat setuju
saya dapat memilih dengan bebas apa yang ingin saya lakukan.
saya sama sekali tidak memiliki kendali atas apa yang dapat saya lakukan.
apa yang saya lakukan menentukan jenis respon yang saya dapatkan.
Virtual Reality memproses aksi saya dengan sangat cepat.
Saya dapat memperoleh informasi yang saya inginkan tanpa adanya penundaan/lambat.
Ketika saya memilih objek, saya merasa mendapatkan informasi secara spontan.
Virtual reality sangat lambat dalam menanggapi permintaan saya.
Penyelesaian Survei
0%
100%
→
Survey Powered By Qualtrics

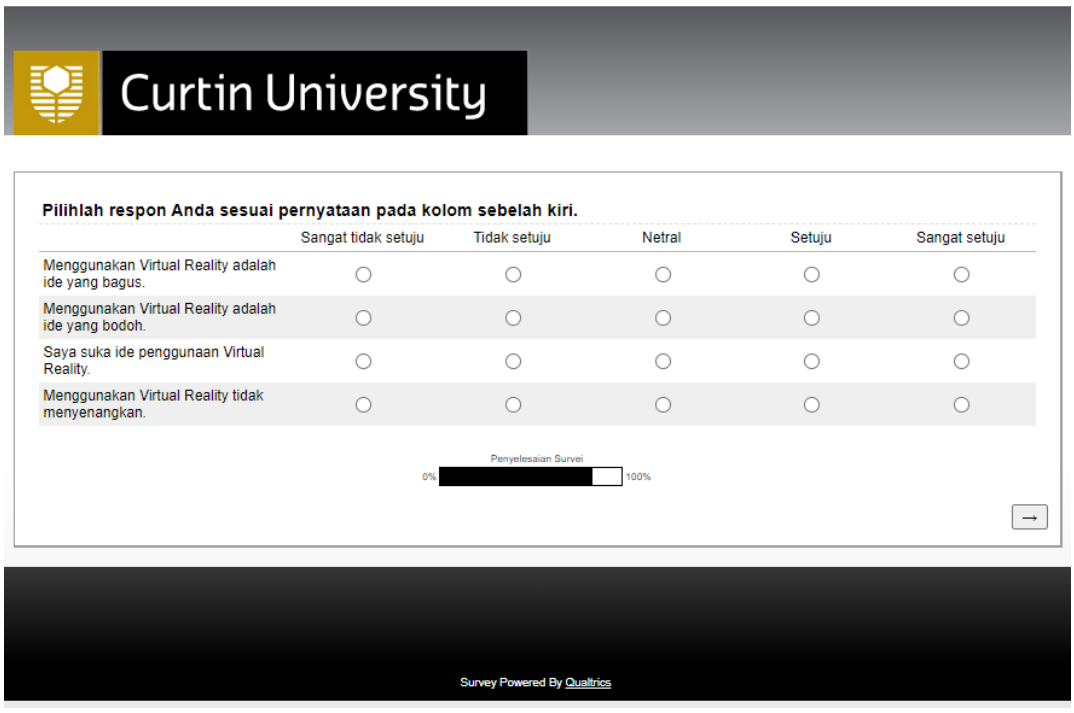

Curtin University
Pilihlah respon Anda sesuai pernyataan pada kolom sebelah kiri.
Sangat tidak setuju
Tidak setuju
Netral
Setuju
Sangat setuju
Lingkungan tujuan wisata yang terlihat di Virtual Reality secara visual menarik.
Saya merasakan tujuan wisata seperti yang terlihat di Virtual Reality menekankan detail pada desain.
Lingkungan tujuan wisata seperti yang terlihat di Virtual Reality menyediakan cara bagi pengguna untuk mudah menggunakannya.
Penyelesaian Survei
0%
100%
→
Survey Powered By Qualtrics

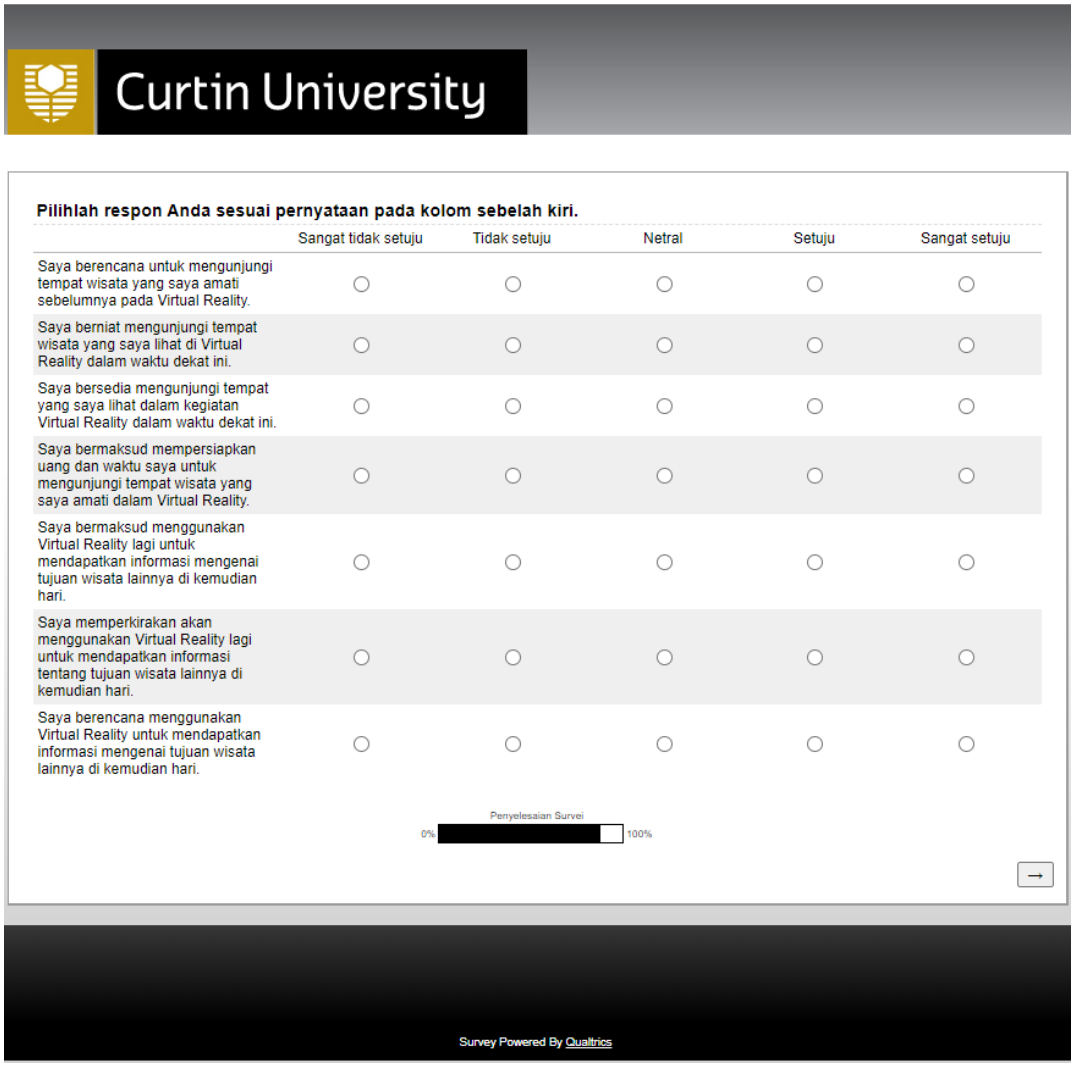

Curtin University
Pilihlah respon Anda sesuai pernyataan pada kolom sebelah kiri.
Saya melihat diri saya sebagai pribadi yang...
Sangat tidak setuju
Tidak setuju
Netral
Setuju
Sangat setuju
pandai merancang sesuatu yang sebelumnya tidak ada.
nyentrik, memiliki ide-ide baru.
memiliki nilai artistik dan estetika.
memiliki imajinasi aktif.
suka merenung dan bermain dengan ide-ide.
canggih dalam seni, musik, atau sastra.
cerdas dan pemikir yang mendalam.
ingin tahu tentang banyak hal yang berbeda.
lebih suka pekerjaan yang rutin.
memiliki sedikit minat artistik.
Penyelesaian Survei
0%
100%
→
Survey Powered By Qualtrics

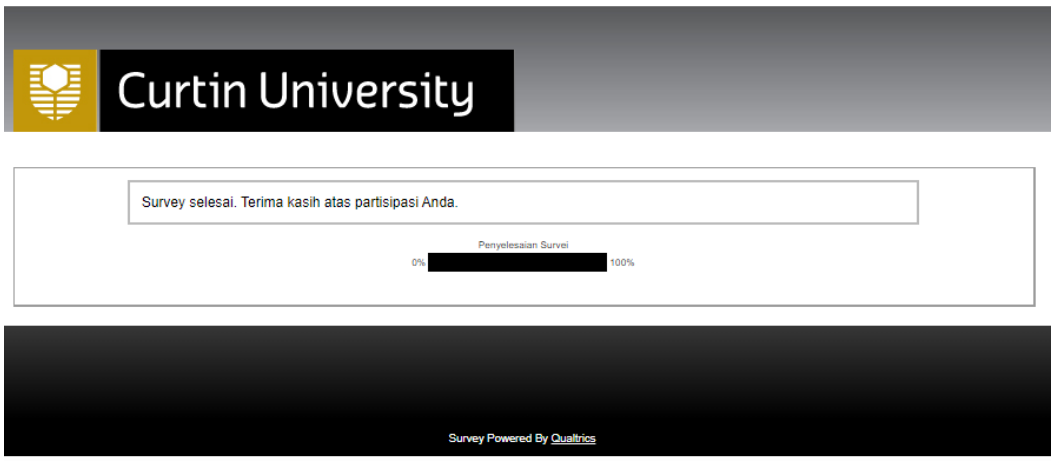

Curtin University
Pilihlah respon Anda sesuai pernyataan pada kolom sebelah kiri.
Saya melihat diri saya sebagai pribadi yang...
Sangat tidak setuju
Tidak setuju
Netral
Setuju
Sangat setuju
bekerja secara detail.
melakukan pekerjaan secara efisien.
selalu membuat rencana dan bertindak sesuai rencana tersebut.
merupakan pekerja yang dapat diandalkan.
tetap bekerja sampai tugas terselesaikan.
mudah terganggu.
bisa agak ceroboh.
cenderung malas.
cenderung tidak terorganisir.
Penyelesaian Survei
0%
100%
→
Survey Powered By Qualtrics


Curtin University
Pilihlah respon Anda sesuai pernyataan pada kolom sebelah kiri.
Sangat tidak setuju
Tidak setuju
Netral
Setuju
Sangat setuju
Saya akan mengunjungi tempat-tempat wisata yang pernah saya dengar dari keluarga/teman/rekan kerja.
Saya akan mengunjungi tempat-tempat wisata yang terkenal menurut keluarga/teman/rekan kerja.
Saya akan mengunjungi tempat-tempat wisata yang direkomendasikan oleh keluarga/teman/rekan kerja.
Saya akan menggunakan/merasakan aplikasi Virtual Reality yang pernah saya dengar dari keluarga/teman/rekan kerja.
Saya akan menggunakan/merasakan aplikasi Virtual Reality yang terkenal menurut keluarga/teman/rekan kerja.
Saya akan menggunakan/merasakan aplikasi Virtual Reality yang direkomendasikan oleh keluarga/teman/rekan kerja.
Penyelesaian Survei
0%
100%
→
Survey Powered By Qualtrics

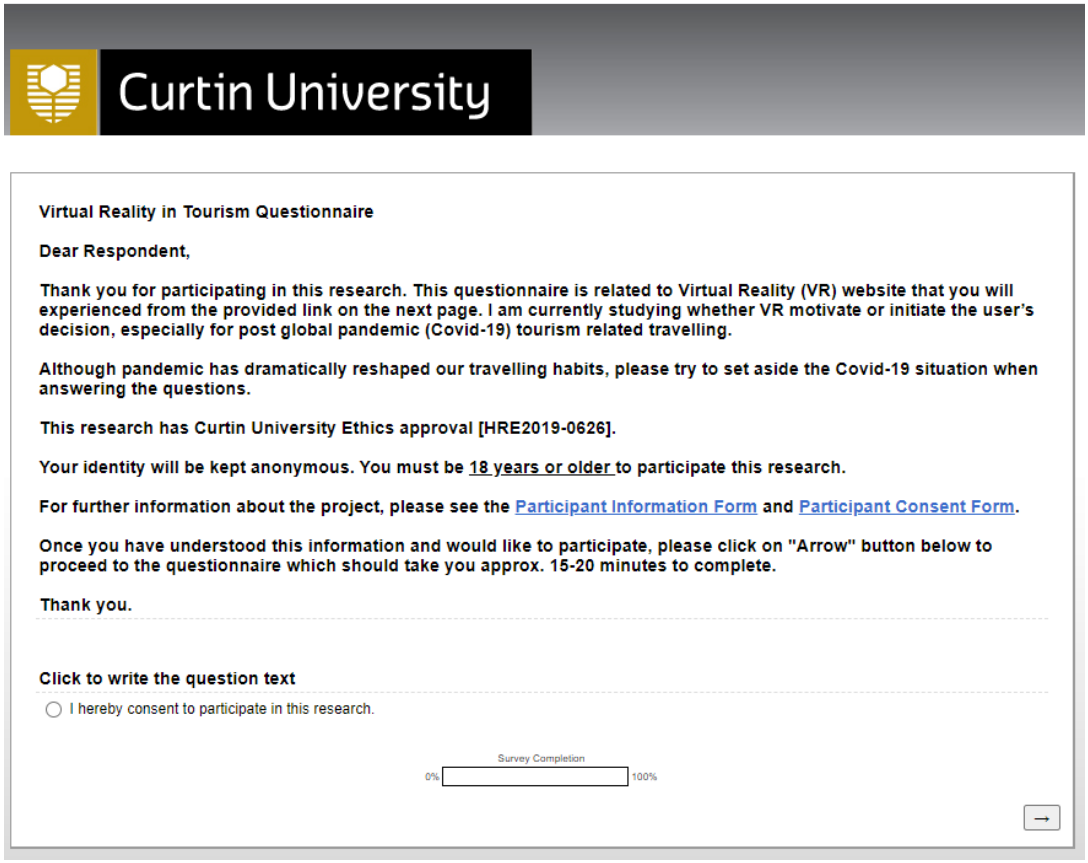

Curtin University
Pilihlah respon Anda sesuai pernyataan pada kolom sebelah kiri.
Sangat tidak setuju
Tidak setuju
Netral
Setuju
Sangat setuju
Saya merasa ingin lebih sering menggunakan Virtual Reality ini.
Saya merasa Virtual Reality rumit.
Saya merasa Virtual Reality mudah digunakan.
Saya merasa membutuhkan bantuan dari orang yang lebih ahli untuk dapat menggunakan Virtual Reality ini.
Saya merasa berbagai fungsi dalam Virtual Reality ini terintegrasi dengan baik.
Saya merasa ada terlalu banyak ketidakkonsistenan dalam Virtual Reality ini.
Kebanyakan orang dapat mempelajari penggunaan Virtual Reality ini dengan cepat.
Saya merasa Virtual Reality sangat tidak praktis untuk digunakan.
Saya merasa sangat percaya diri ketika menggunakan Virtual Reality.
Saya perlu belajar banyak hal sebelum bisa menggunakan Virtual Reality ini.
Penyelesaian Survei
0%
100%
→
Survey Powered By Qualtrics

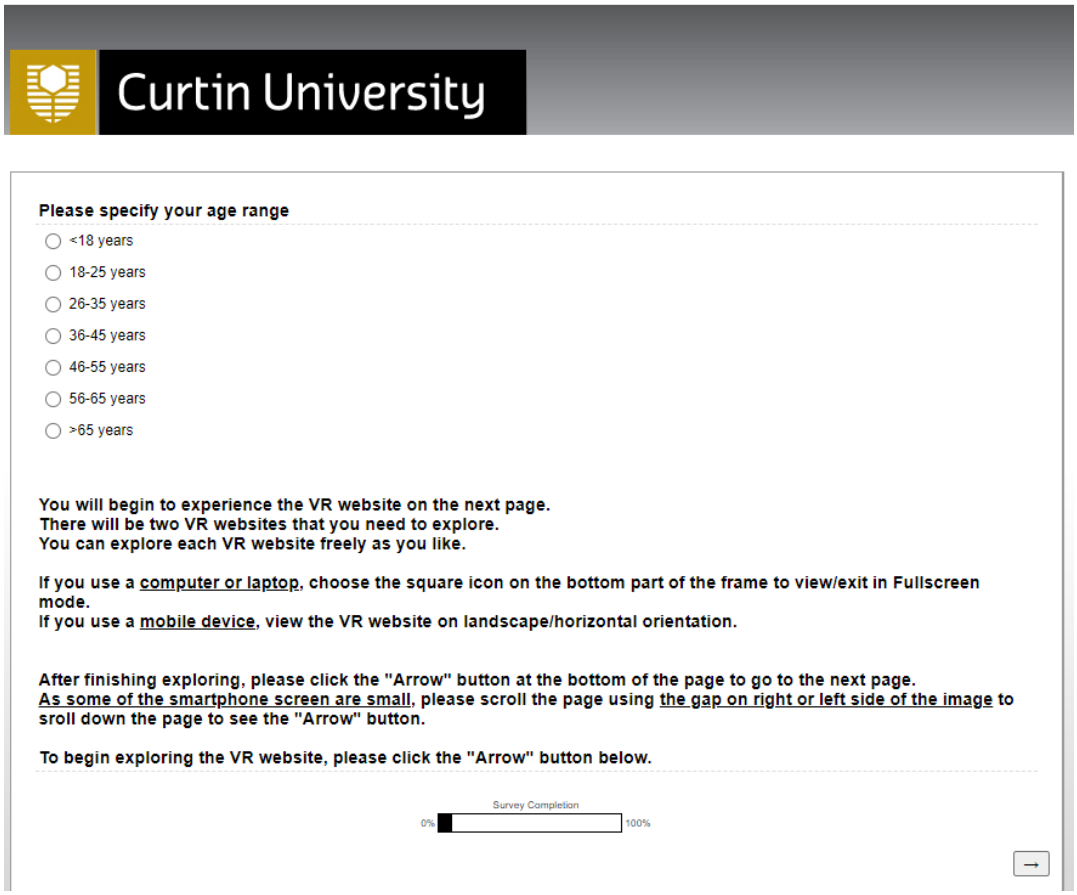

Curtin University
Pilihlah respon Anda sesuai pernyataan pada kolom sebelah kiri.
Sangat tidak setuju
Tidak setuju
Netral
Setuju
Sangat setuju
Menggunakan Virtual Reality adalah ide yang bagus.
Menggunakan Virtual Reality adalah ide yang bodoh.
Saya suka ide penggunaan Virtual Reality.
Menggunakan Virtual Reality tidak menyenangkan.
Penyelesaian Survei
0%
100%
→
Survey Powered By Qualtrics


Curtin University
Pilihlah respon Anda sesuai pernyataan pada kolom sebelah kiri.
Sangat tidak setuju
Tidak setuju
Netral
Setuju
Sangat setuju
Saya berencana untuk mengunjungi tempat wisata yang saya amati sebelumnya pada Virtual Reality.
Saya berniat mengunjungi tempat wisata yang saya lihat di Virtual Reality dalam waktu dekat ini.
Saya bersedia mengunjungi tempat yang saya lihat dalam kegiatan Virtual Reality dalam waktu dekat ini.
Saya bermaksud mempersiapkan uang dan waktu saya untuk mengunjungi tempat wisata yang saya amati dalam Virtual Reality.
Saya bermaksud menggunakan Virtual Reality lagi untuk mendapatkan informasi mengenai tujuan wisata lainnya di kemudian hari.
Saya memperkirakan akan menggunakan Virtual Reality lagi untuk mendapatkan informasi tentang tujuan wisata lainnya di kemudian hari.
Saya berencana menggunakan Virtual Reality untuk mendapatkan informasi mengenai tujuan wisata lainnya di kemudian hari.
Penyelesaian Survei
0%
100%
→
Survey Powered By Qualtrics


Curtin University
Survey selesai. Terima kasih atas partisipasi Anda.
Penyelesaian Survei
0%
100%
Survey Powered By Qualtrics

D.2 Questionnaire in English for Study 2



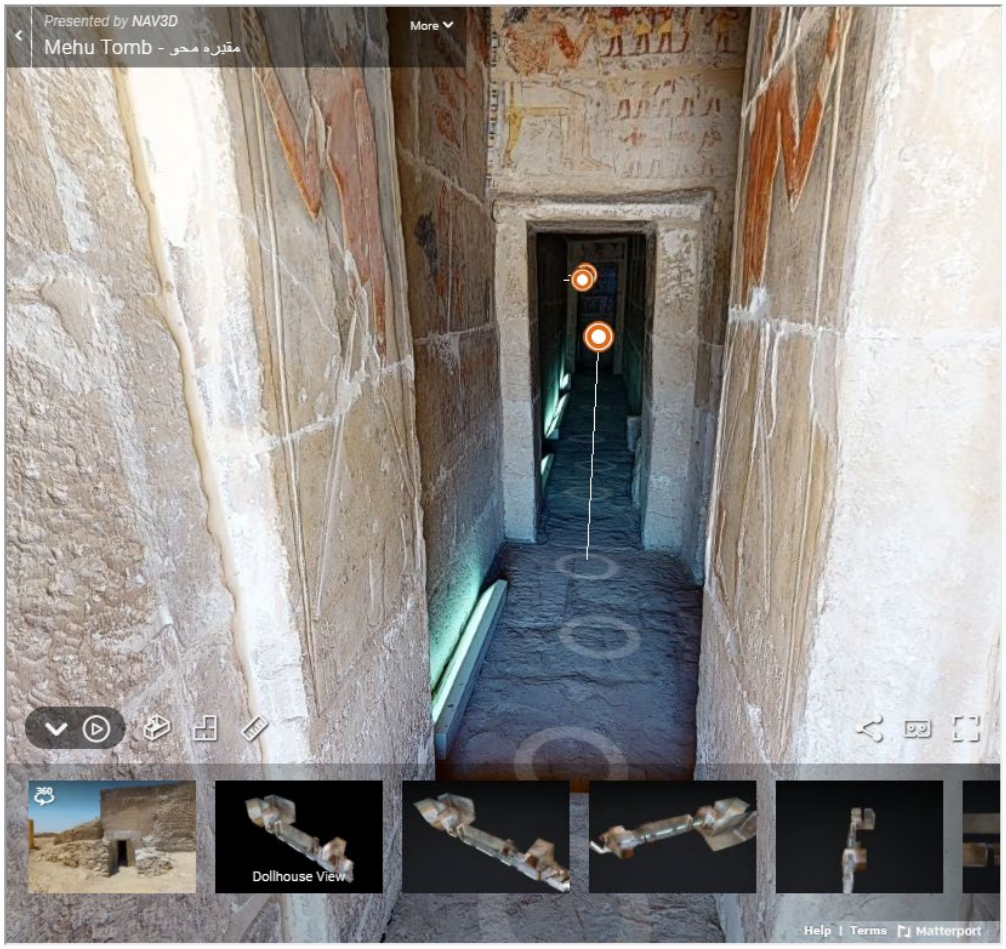


Curtin University

Timing

These page timer metrics will not be displayed to the recipient.

First Click	0 seconds
Last Click	0 seconds
Page Submit	0 seconds
Click Count	0 clicks



If you have finished exploring, please click the"Arrow" button below to go to the next page.

Survey Completion

0% 100%

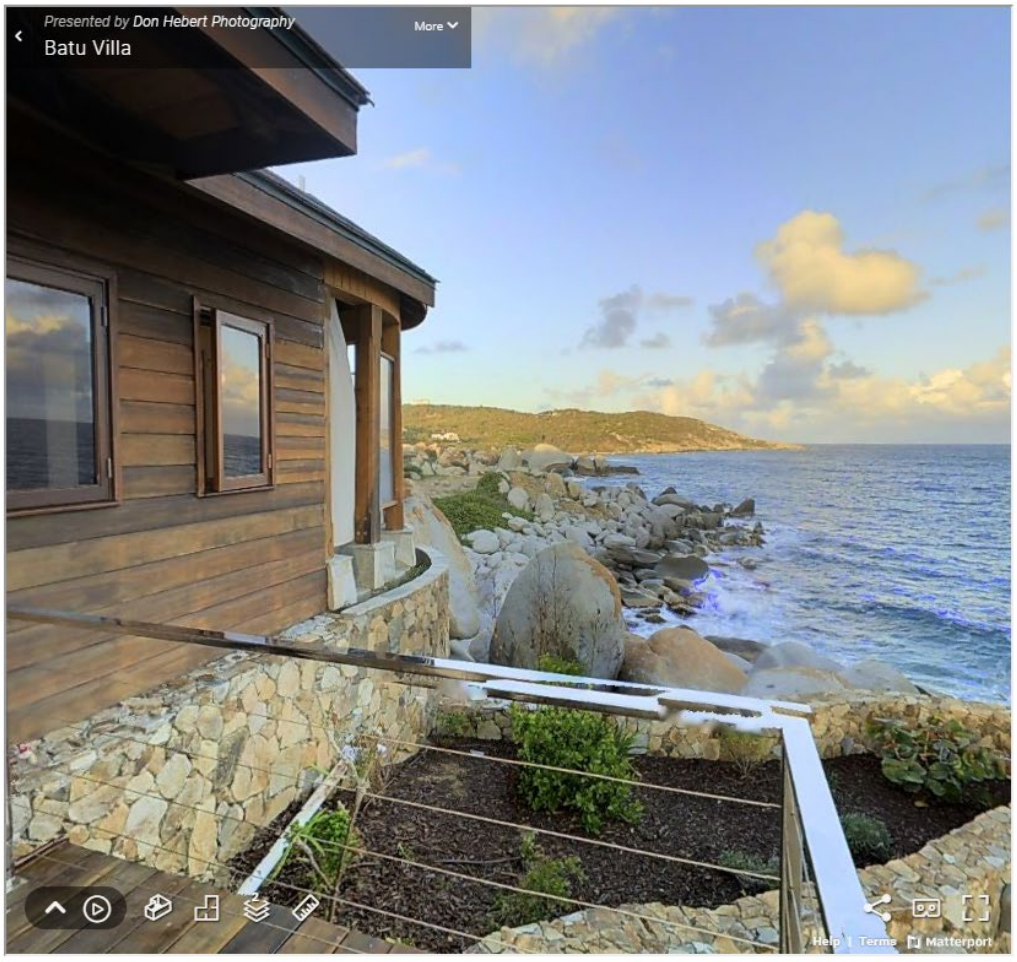
→

Curtin University

Timing

These page timer metrics will not be displayed to the recipient.

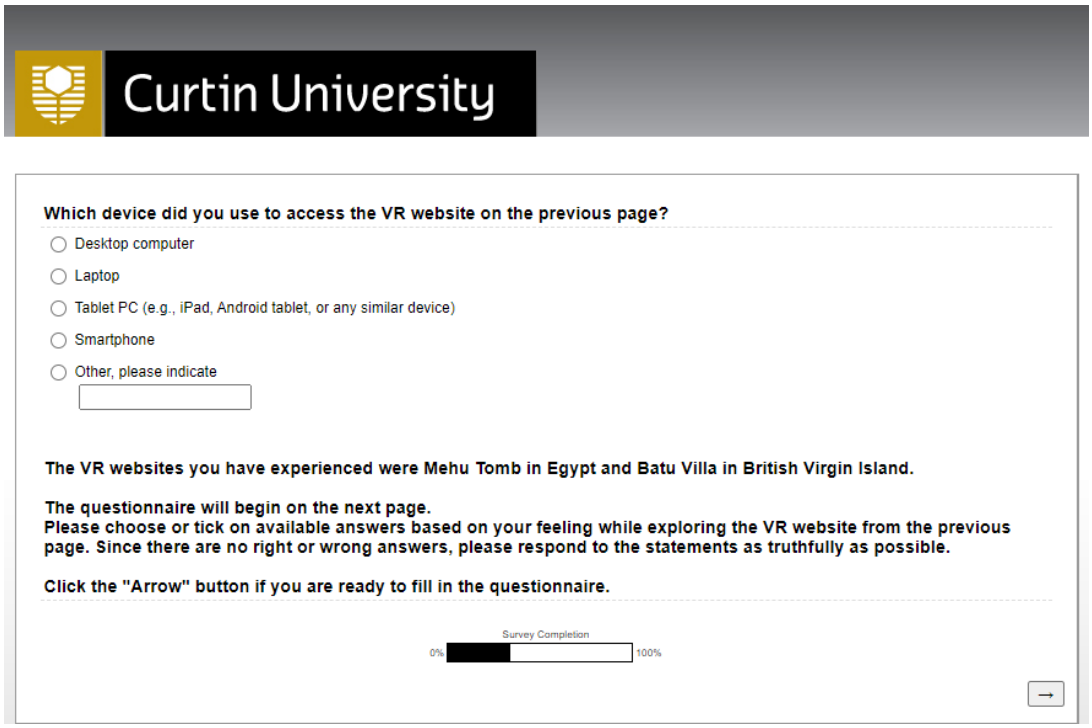
First Click	34.637 seconds
Last Click	34.637 seconds
Page Submit	0 seconds
Click Count	1 clicks

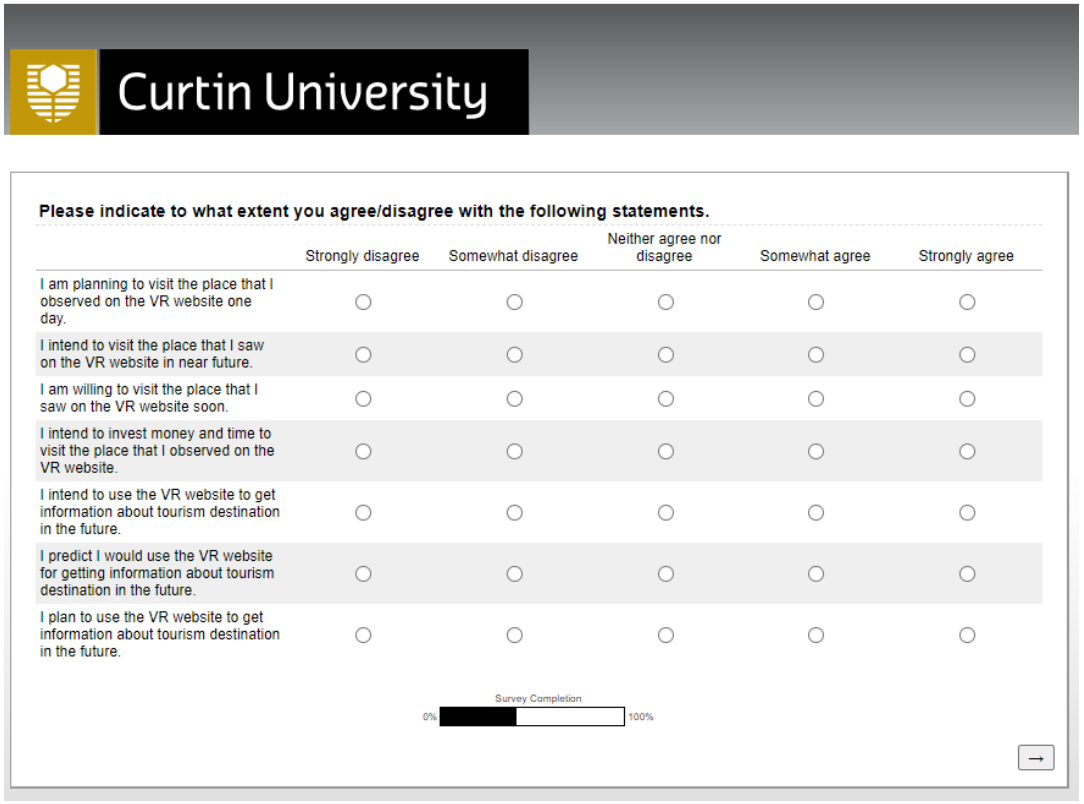


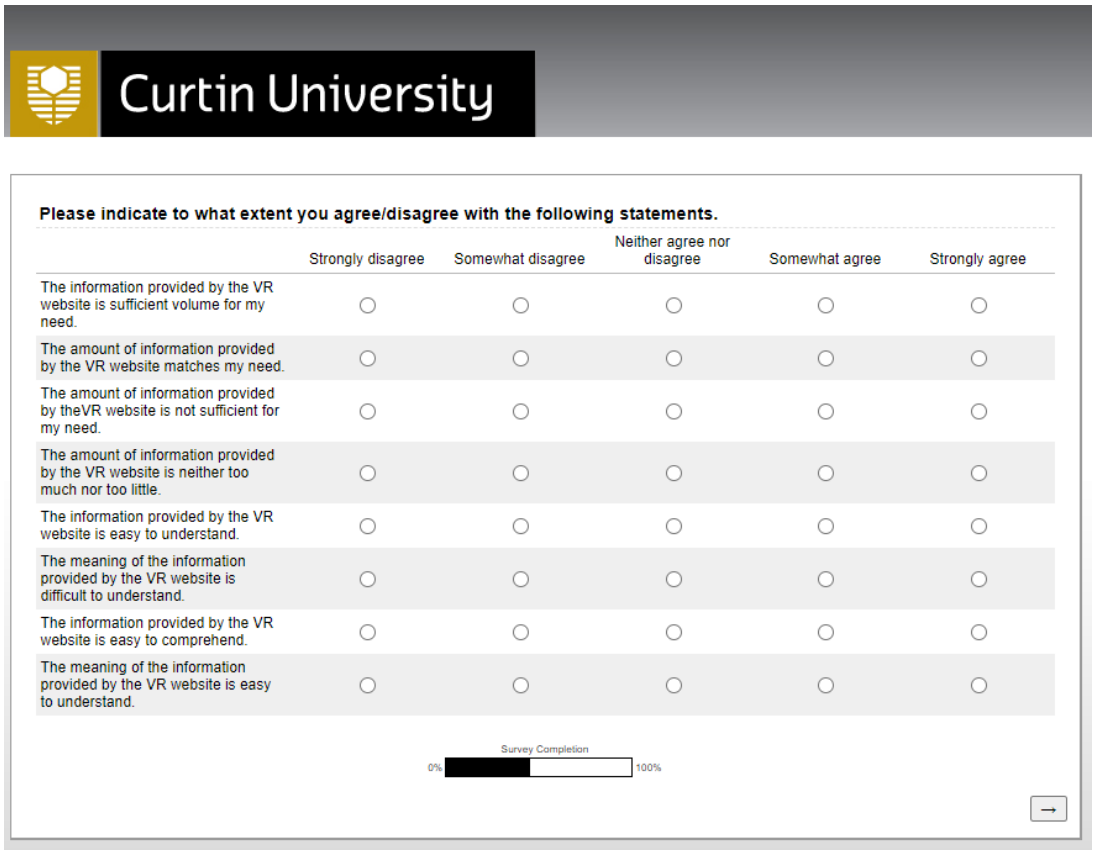
If you have finished exploring, please click the"Arrow" button below to go to the next page.

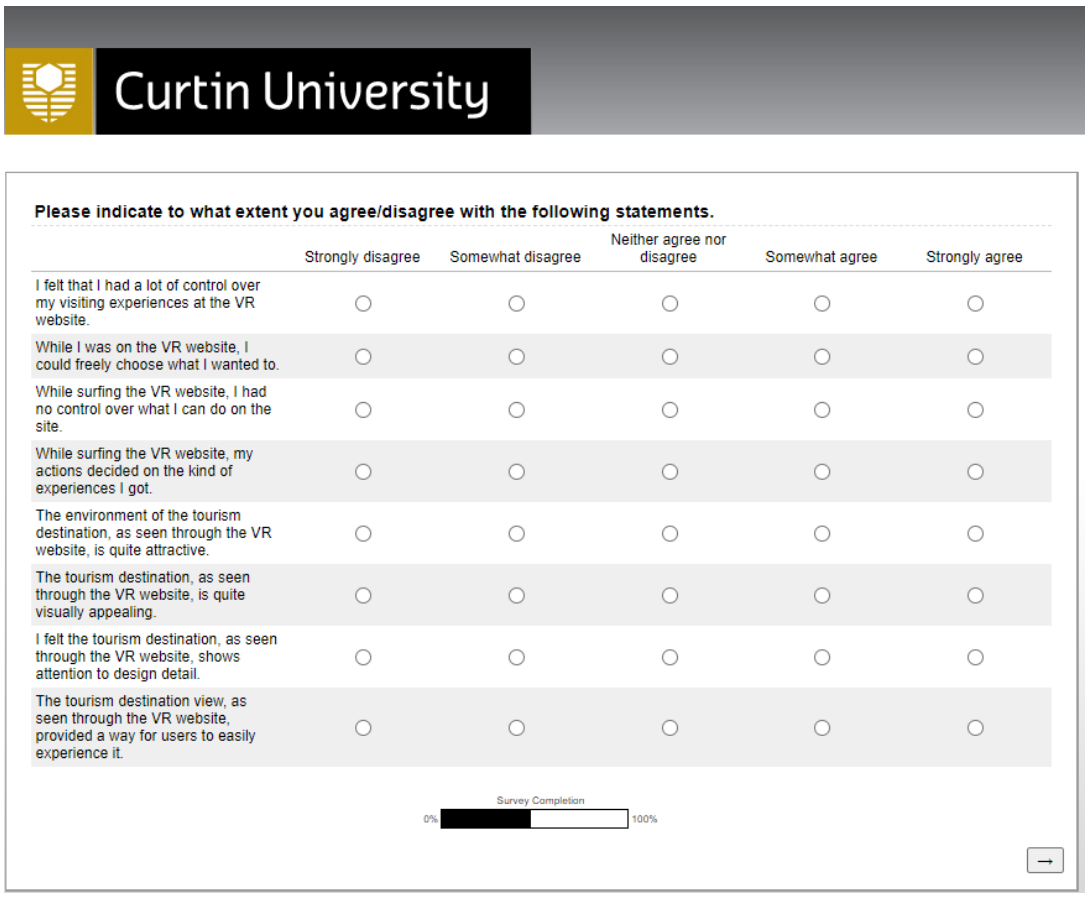
Survey Completion
0% 100%

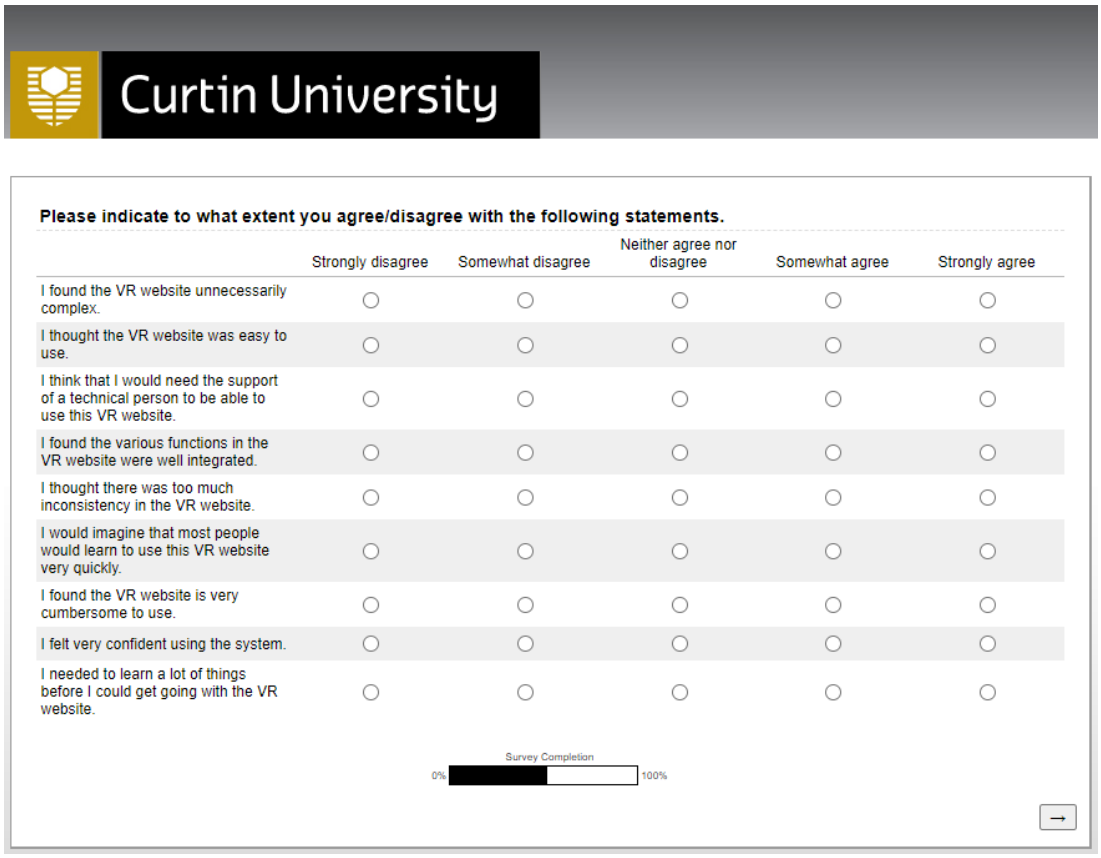
→

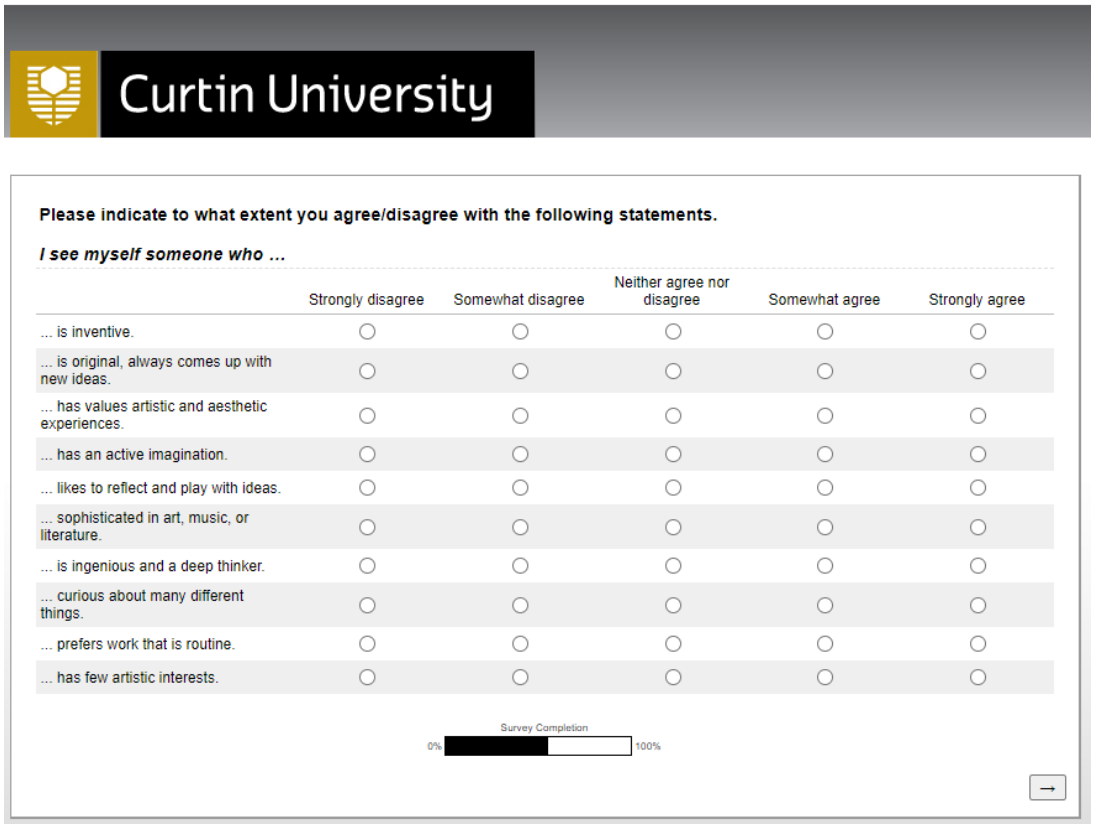

Curtin University
Which device did you use to access the VR website on the previous page?
Desktop computer
Laptop
Tablet PC (e.g., iPad, Android tablet, or any similar device)
Smartphone
Other, please indicate
The VR websites you have experienced were Mehu Tomb in Egypt and Batu Villa in British Virgin Island.
The questionnaire will begin on the next page.
Please choose or tick on available answers based on your feeling while exploring the VR website from the previous page. Since there are no right or wrong answers, please respond to the statements as truthfully as possible.
Click the "Arrow" button if you are ready to fill in the questionnaire.
Survey Completion
0%
100%
→

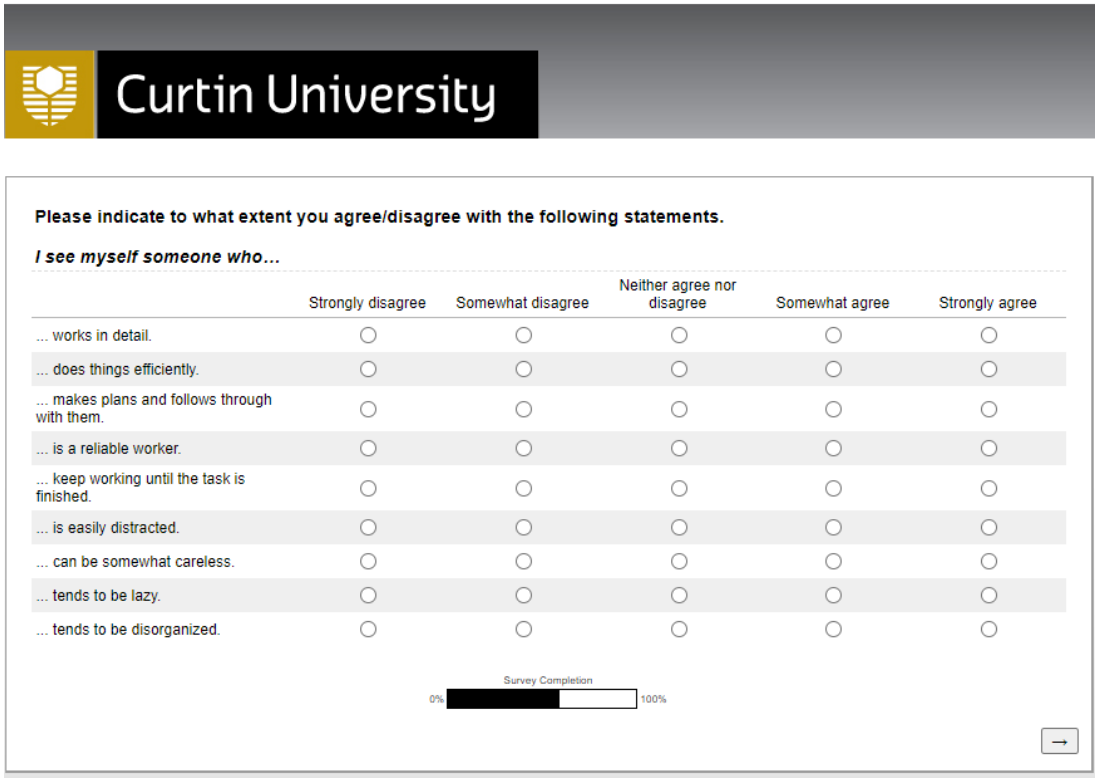

Curtin University
Please indicate to what extent you agree/disagree with the following statements.
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
I am planning to visit the place that I observed on the VR website one day.
I intend to visit the place that I saw on the VR website in near future.
I am willing to visit the place that I saw on the VR website soon.
I intend to invest money and time to visit the place that I observed on the VR website.
I intend to use the VR website to get information about tourism destination in the future.
I predict I would use the VR website for getting information about tourism destination in the future.
I plan to use the VR website to get information about tourism destination in the future.
Survey Completion
0%
100%
→

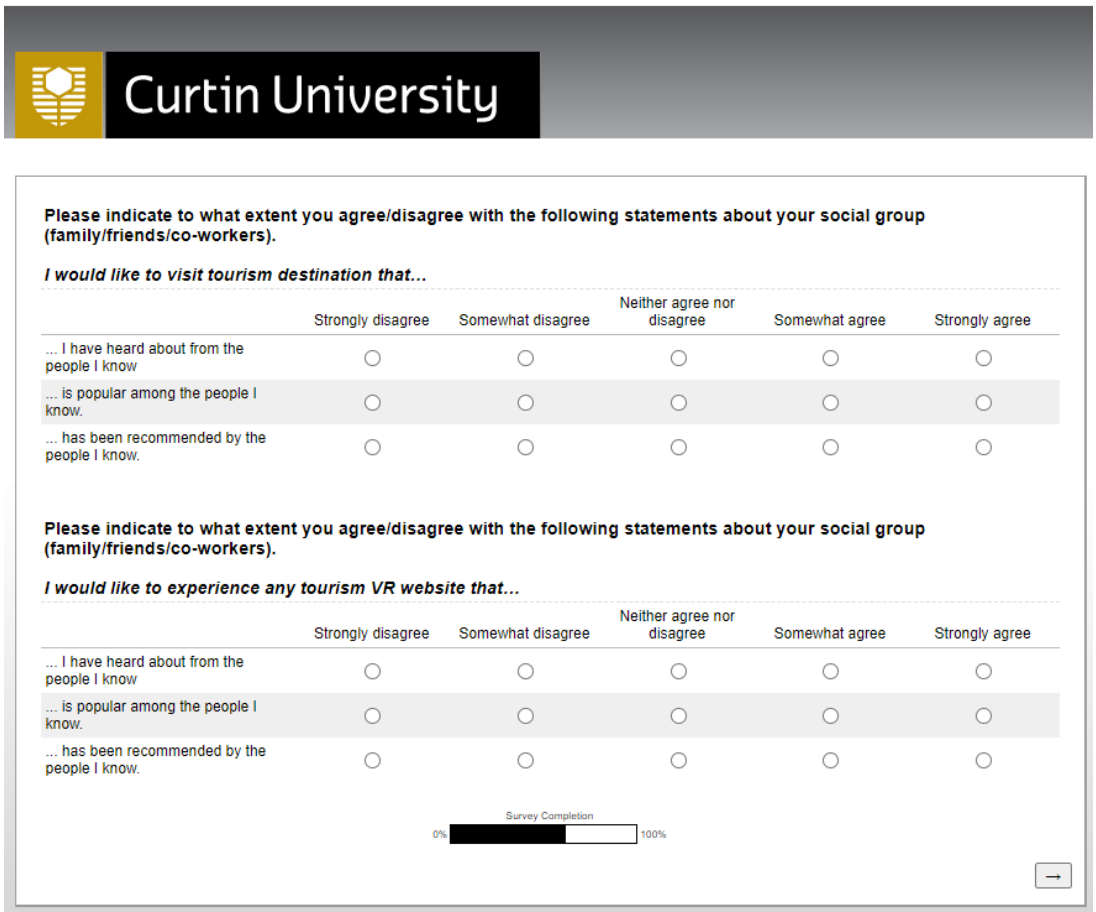

Curtin University
Please indicate to what extent you agree/disagree with the following statements.
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
The information provided by the VR website is sufficient volume for my need.
The amount of information provided by the VR website matches my need.
The amount of information provided by theVR website is not sufficient for my need.
The amount of information provided by the VR website is neither too much nor too little.
The information provided by the VR website is easy to understand.
The meaning of the information provided by the VR website is difficult to understand.
The information provided by the VR website is easy to comprehend.
The meaning of the information provided by the VR website is easy to understand.
Survey Completion
0%
100%
→

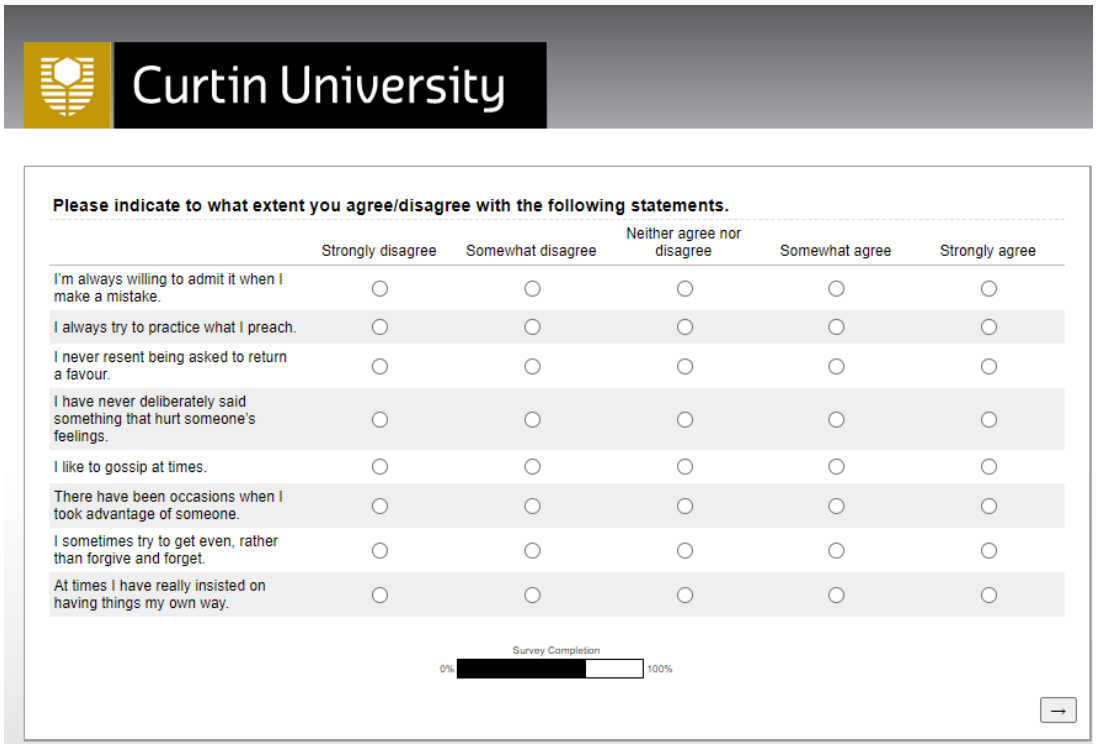

Curtin University
Please indicate to what extent you agree/disagree with the following statements.
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
I felt that I had a lot of control over my visiting experiences at the VR website.
While I was on the VR website, I could freely choose what I wanted to.
While surfing the VR website, I had no control over what I can do on the site.
While surfing the VR website, my actions decided on the kind of experiences I got.
The environment of the tourism destination, as seen through the VR website, is quite attractive.
The tourism destination, as seen through the VR website, is quite visually appealing.
I felt the tourism destination, as seen through the VR website, shows attention to design detail.
The tourism destination view, as seen through the VR website, provided a way for users to easily experience it.
Survey Completion
0%
100%
→

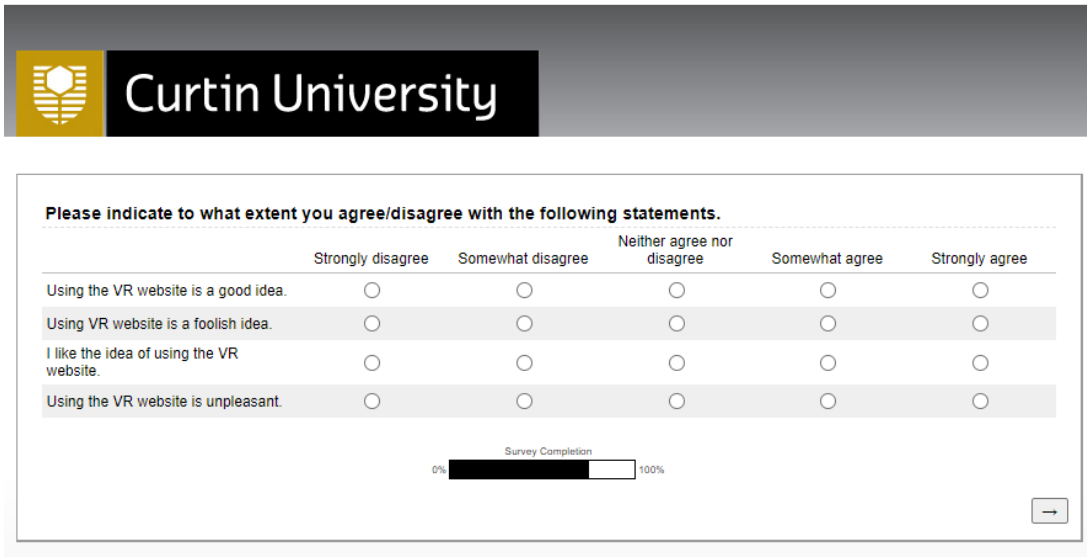

Curtin University
Please indicate to what extent you agree/disagree with the following statements.
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
I found the VR website unnecessarily complex.
I thought the VR website was easy to use.
I think that I would need the support of a technical person to be able to use this VR website.
I found the various functions in the VR website were well integrated.
I thought there was too much inconsistency in the VR website.
I would imagine that most people would learn to use this VR website very quickly.
I found the VR website is very cumbersome to use.
I felt very confident using the system.
I needed to learn a lot of things before I could get going with the VR website.
Survey Completion
0%
100%
→

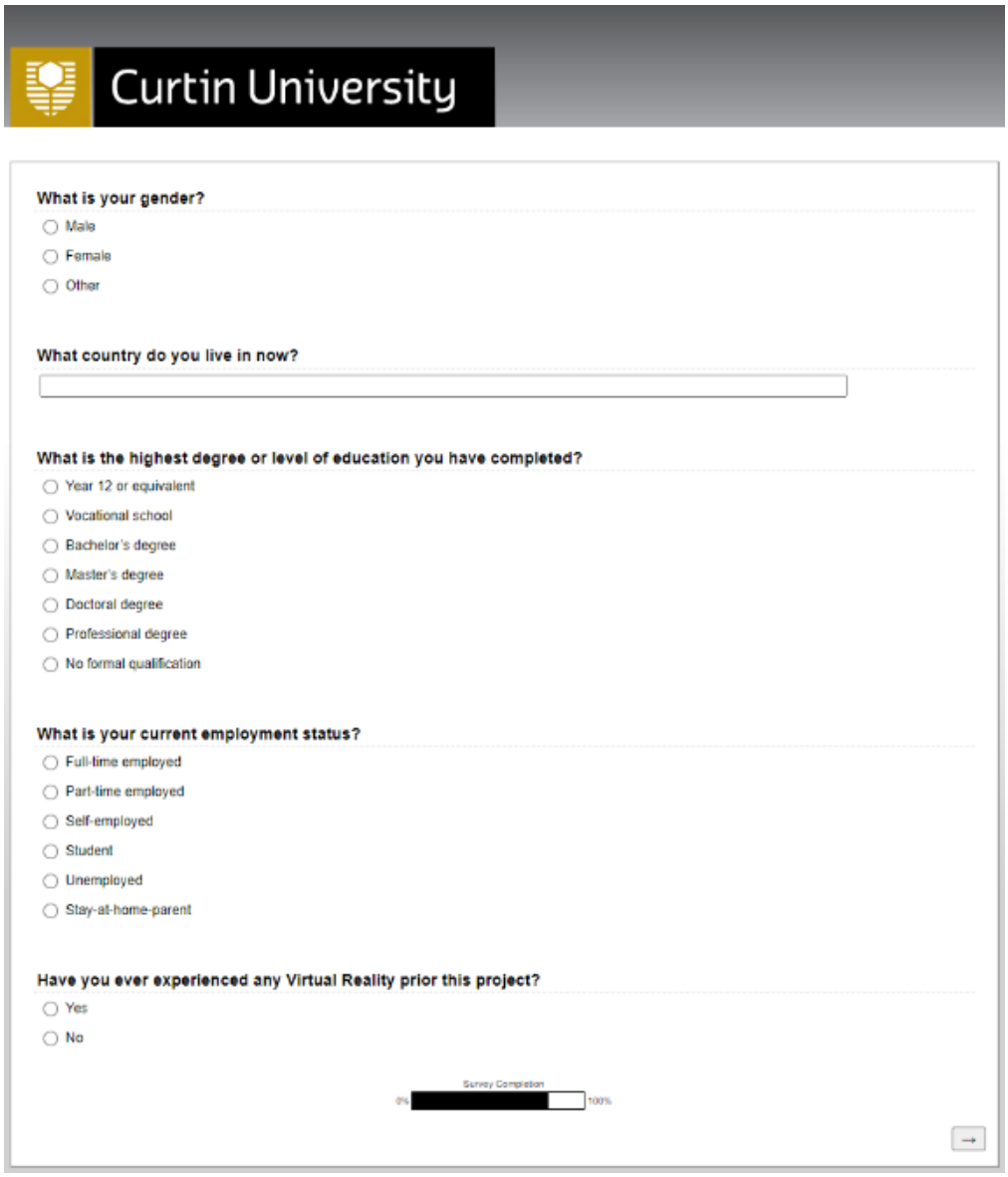

Curtin University
Please indicate to what extent you agree/disagree with the following statements.
I see myself someone who ...
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
... is inventive.
... is original, always comes up with new ideas.
... has values artistic and aesthetic experiences.
... has an active imagination.
... likes to reflect and play with ideas.
... sophisticated in art, music, or literature.
... is ingenious and a deep thinker.
... curious about many different things.
... prefers work that is routine.
... has few artistic interests.
Survey Completion
0%
100%
→

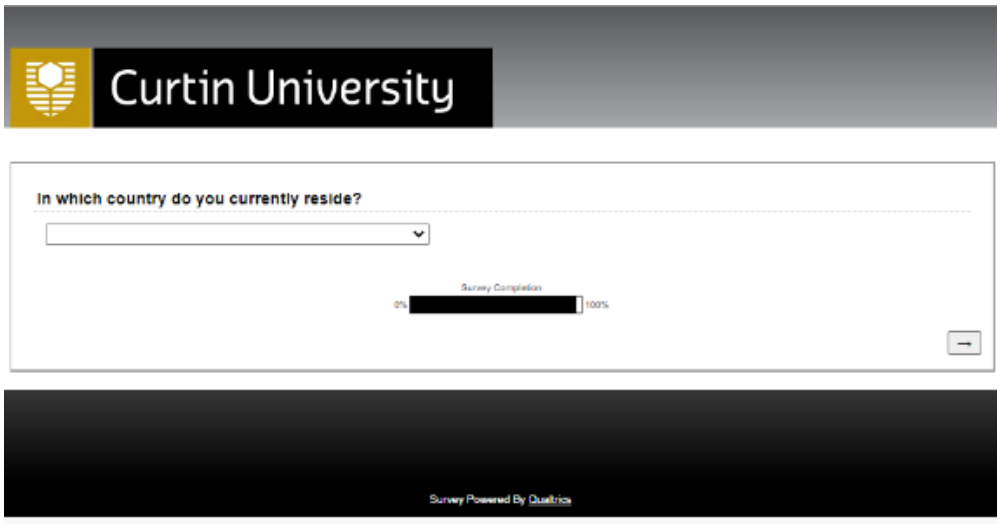

Curtin University
Please indicate to what extent you agree/disagree with the following statements.
I see myself someone who...
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
... works in detail.
... does things efficiently.
... makes plans and follows through with them.
... is a reliable worker.
... keep working until the task is finished.
... is easily distracted.
... can be somewhat careless.
... tends to be lazy.
... tends to be disorganized.
Survey Completion
0%
100%
→


Curtin University
Please indicate to what extent you agree/disagree with the following statements about your social group (family/friends/co-workers).
I would like to visit tourism destination that...
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
... I have heard about from the people I know
... is popular among the people I know.
... has been recommended by the people I know.
Please indicate to what extent you agree/disagree with the following statements about your social group (family/friends/co-workers).
I would like to experience any tourism VR website that...
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
... I have heard about from the people I know
... is popular among the people I know.
... has been recommended by the people I know.
Survey Completion
0%
100%
→


Curtin University
Please indicate to what extent you agree/disagree with the following statements.
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
I'm always willing to admit it when I make a mistake.
I always try to practice what I preach.
I never resent being asked to return a favour.
I have never deliberately said something that hurt someone's feelings.
I like to gossip at times.
There have been occasions when I took advantage of someone.
I sometimes try to get even, rather than forgive and forget.
At times I have really insisted on having things my own way.
Survey Completion
0%
100%
→


Curtin University
Please indicate to what extent you agree/disagree with the following statements.
Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree
Using the VR website is a good idea.
Using VR website is a foolish idea.
I like the idea of using the VR website.
Using the VR website is unpleasant.
Survey Completion
0%
100%
→


Curtin University
What is your gender?
Male
Female
Other
What country do you live in now?
What is the highest degree or level of education you have completed?
Year 12 or equivalent
Vocational school
Bachelor's degree
Master's degree
Doctoral degree
Professional degree
No formal qualification
What is your current employment status?
Full-time employed
Part-time employed
Self-employed
Student
Unemployed
Stay-at-home-parent
Have you ever experienced any Virtual Reality prior this project?
Yes
No
Survey Completion
0%
100%
→


Curtin University
In which country do you currently reside?
Survey Completion
0%
100%
→
Survey Powered By Qualtrics

Appendix E. Analysis result for Study 1

E.1 Descriptive analysis

Items	Mean	STD	Skewness	Kurtosis
InQual_1	3.85	.622	-1.045	3.678
InQual_2_rev	3.43	1.059	-.499	-.558
InQual_3	3.76	.664	-.742	1.503
InQual_4	3.78	.599	-.776	2.111
InQual_5	3.72	.607	-.398	1.173
InQual_6_rev	3.61	.964	-.563	-.329
InQual_7	3.88	.613	-.892	2.830
InQual_8	3.95	.515	-.888	5.346
InQual_9	3.95	.497	-1.010	6.331
Interact_1	3.88	.650	-.788	2.149
Interact_2_rev	3.57	.949	-.687	-.005
Interact_3	3.76	.637	-.496	1.272
Interact_4	3.72	.665	-.470	.967
Interact_5	3.70	.686	-.740	1.115
Interact_6	3.81	.604	-.649	2.022
Interact_7_rev	3.52	.902	-.507	-.192
VisAttr_1	3.94	.652	-.545	1.661
VisAttr_2	3.78	.649	-.566	1.377
VisAttr_3	3.89	.570	-.762	3.203
OpenEx_1	3.61	.743	-.384	.278
OpenEx_2	3.76	.773	-.588	.537
OpenEx_3	3.77	.701	-.217	-.034
OpenEx_4	3.82	.727	-.430	.225
OpenEx_5	3.70	.756	-.466	.055
OpenEx_6	3.57	.835	-.292	-.238
OpenEx_7	3.71	.625	-.385	.297
OpenEx_8	3.91	.589	-.390	1.028
OpenEx_9_rev	2.50	.763	.235	-.348
OpenEx_10_rev	2.53	.849	.241	-.415
Consc_1	3.76	.621	-.491	.619
Consc_2	3.83	.615	-.367	.612
Consc_3	3.82	.658	-.575	.831
Consc_4	3.84	.587	-.235	.420

Items	Mean	STD	Skewness	Kurtosis
Consc_5	3.93	.579	-.284	.834
Consc_6_rev	3.13	1.150	.177	-.927
Consc_7_rev	3.15	1.122	.240	-.976
Consc_8_rev	3.35	1.073	-.020	-.818
Consc_9_rev	3.54	.975	-.224	-.573
SocInf_1	3.83	.679	-.319	.240
SocInf_2	3.81	.703	-.361	.207
SocInf_3	3.83	.683	-.289	.160
SocInf_4	3.75	.660	-.167	-.001
SocInf_5	3.75	.683	-.248	.064
SocInf_6	3.77	.662	-.184	.028
Usab_1	3.59	.708	-.487	.014
Usab_2_rev	3.39	.945	-.344	-.396
Usab_3	3.82	.602	-.796	1.517
Usab_4_rev	2.83	.892	.223	-.409
Usab_5	3.74	.526	-.765	.681
Usab_6_rev	3.41	.938	-.168	-.668
Usab_7	3.72	.629	-.375	.306
Usab_8_rev	3.56	.969	-.400	-.618
Usab_9	3.61	.762	-.409	.205
Usab_10_rev	2.76	.880	.332	-.579
Att_1	4.16	.625	-.123	-.506
Att_2_rev	4.31	.752	-1.306	2.512
Att_3	4.23	.619	-.198	-.568
Att_4_rev	4.18	.837	-1.109	1.723
IntVisit_1	3.55	.756	-.254	-.267
IntVisit_2	3.52	.763	-.251	-.319
IntVisit_3	3.49	.838	-.501	.096
IntVisit_4	3.43	.835	-.426	-.012
IntUse_1	3.72	.704	-.276	.030
IntUse_2	3.71	.721	-.248	-.063
IntUse_3	3.72	.705	-.260	.003

E.2 Communalities

Items	Initial	Extraction
InQual_7	1.000	.776
InQual_8	1.000	.843
InQual_9	1.000	.864
Interact_3	1.000	.616
Interact_4	1.000	.658
Interact_5	1.000	.777
Interact_6	1.000	.712
VisAttr_1	1.000	.701
VisAttr_2	1.000	.825
VisAttr_3	1.000	.748
OpenEx_1	1.000	.570
OpenEx_2	1.000	.657
OpenEx_3	1.000	.630
OpenEx_4	1.000	.638
OpenEx_5	1.000	.565
OpenEx_6	1.000	.608
OpenEx_7	1.000	.609
OpenEx_8	1.000	.501
Consc_1	1.000	.645
Consc_2	1.000	.621
Consc_3	1.000	.645
Consc_4	1.000	.643
Consc_5	1.000	.627
SocInf_4	1.000	.953
SocInf_5	1.000	.964
SocInf_6	1.000	.968
Usab_2_rev	1.000	.665
Usab_4_rev	1.000	.571
Usab_6_rev	1.000	.620
Usab_8_rev	1.000	.669
Att_1	1.000	.671
Att_2_rev	1.000	.690
Att_3	1.000	.740
Att_4_rev	1.000	.702
IntVisit_1	1.000	.799
IntVisit_2	1.000	.819

Items	Initial	Extraction
IntVisit_3	1.000	.820
IntVisit_4	1.000	.833
IntUse_1	1.000	.932
IntUse_2	1.000	.909
IntUse_3	1.000	.931

E.3 Total variance explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.886	26.552	26.552	10.886	26.552	26.552
2	4.414	10.765	37.316	4.414	10.765	37.316
3	3.585	8.743	46.059	3.585	8.743	46.059
4	2.669	6.511	52.570	2.669	6.511	52.570
5	1.748	4.263	56.833	1.748	4.263	56.833
6	1.610	3.927	60.760	1.610	3.927	60.760
7	1.554	3.789	64.549	1.554	3.789	64.549
8	1.213	2.959	67.508	1.213	2.959	67.508
9	1.068	2.606	70.113	1.068	2.606	70.113
10	.987	2.408	72.521	.987	2.408	72.521
11	.937	2.285	74.806			
12	.845	2.060	76.866			
13	.790	1.927	78.794			
14	.705	1.720	80.514			
15	.635	1.549	82.063			
16	.591	1.441	83.504			
17	.565	1.379	84.883			
18	.519	1.266	86.149			
19	.500	1.219	87.368			
20	.487	1.188	88.556			
21	.436	1.062	89.619			
22	.407	.992	90.610			
23	.396	.966	91.577			
24	.386	.943	92.519			
25	.377	.919	93.438			

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
26	.345	.842	94.281			
27	.334	.815	95.095			
28	.306	.748	95.843			
29	.278	.679	96.522			
30	.256	.624	97.146			
31	.225	.549	97.695			
32	.209	.511	98.205			
33	.172	.420	98.625			
34	.167	.406	99.031			
35	.132	.321	99.352			
36	.103	.252	99.604			
37	.057	.138	99.743			
38	.043	.105	99.848			
39	.031	.077	99.924			
40	.018	.043	99.968			
41	.013	.032	100.000			

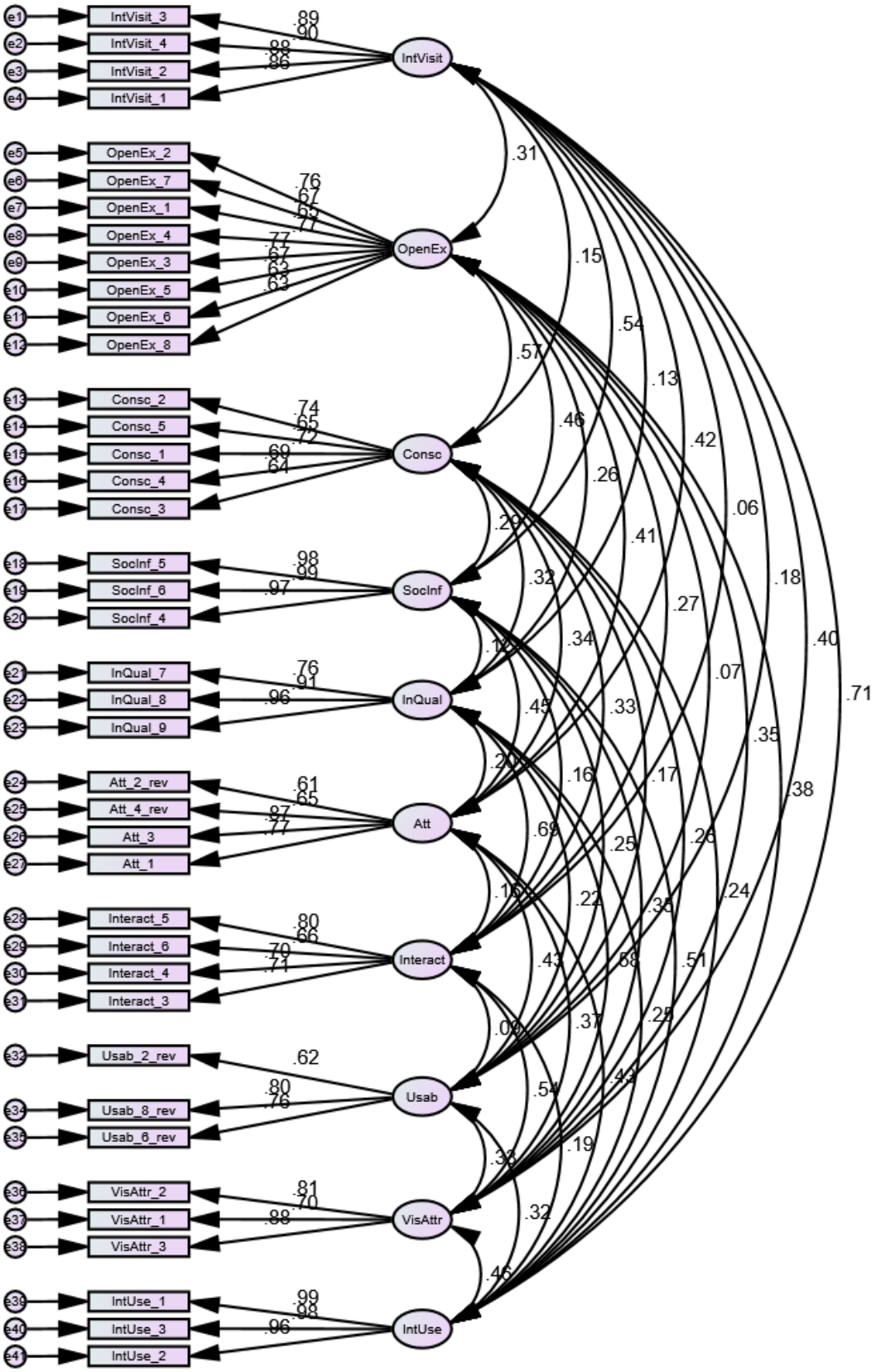
E.4 Exploratory factor analysis

Constructs	Cronbach's Alpha	Items	Factor 1	2	3	4	5	6	7	8	9	10
IntVisit	0.934	IntVisit_3	0.851									
		IntVisit_4	0.844									
		IntVisit_2	0.840									
		IntVisit_1	0.800									
OpenEx	0.878	OpenEx_2		0.775								
		OpenEx_7		0.766								
		OpenEx_1		0.745								
		OpenEx_4		0.711								
		OpenEx_3		0.709								
		OpenEx_5		0.703								
		OpenEx_6		0.667								
		OpenEx_8		0.651								
Consc	0.816	Consc_2			0.759							
		Consc_5			0.758							
		Consc_1			0.749							

Constructs	Cronbach's Alpha	Items	Factor 1	2	3	4	5	6	7	8	9	10
		Consc_4			0.721							
		Consc_3			0.707							
SocInf	0.987	SocInf_5				0.988						
		SocInf_6				0.976						
		SocInf_4				0.952						
InQual	0.899	InQual_7					0.863					
		InQual_8					0.847					
		InQual_9					0.820					
Att	0.813	Att_2_rev						0.874				
		Att_4_rev						0.828				
		Att_3						0.787				
		Att_1						0.647				
Interact	0.809	Interact_5							0.854			
		Interact_6							0.806			
		Interact_4							0.649			
		Interact_3							0.615			
Usab	0.751	Usab_2_rev								0.795		
		Usab_4_rev								0.748		
		Usab_8_rev								0.715		
		Usab_6_rev								0.675		
VisAttr	0.838	VisAttr_2									0.900	
		VisAttr_1									0.817	
		VisAttr_3									0.691	
IntUse	0.984	IntUse_1										0.752
		IntUse_3										0.739
		IntUse_2										0.738

Note: InQual = Information Quality, Interact = Interactivity, VisAttr = Visual Attractiveness, OpenEx = Openness to Experience, Consc = Conscientiousness, SocInf = Social Influence, Usab = Usability, Att = Attitude, IntVisit = Intention to Visit, IntUse = Intention to Use.

E.5 Confirmatory factor analysis



E.6 Common method bias

Harman's Single Factor

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.885	27.213	27.213	10.885	27.213	27.213
2	4.412	11.030	38.243			
3	3.577	8.943	47.186			
4	2.499	6.247	53.433			
5	1.727	4.319	57.752			
6	1.587	3.968	61.720			
7	1.426	3.564	65.284			
8	1.191	2.979	68.262			
9	1.068	2.670	70.932			
10	.986	2.465	73.396			
11	.908	2.270	75.666			
12	.821	2.053	77.719			
13	.741	1.854	79.572			
14	.645	1.612	81.185			
15	.635	1.588	82.772			
16	.582	1.455	84.228			
17	.537	1.342	85.570			
18	.500	1.250	86.820			
19	.488	1.219	88.039			
20	.453	1.133	89.172			
21	.422	1.056	90.228			
22	.403	1.009	91.237			
23	.387	.966	92.203			
24	.378	.944	93.147			
25	.364	.910	94.057			
26	.345	.863	94.920			
27	.309	.773	95.693			
28	.279	.696	96.389			
29	.267	.667	97.056			
30	.229	.572	97.628			
31	.209	.523	98.151			

Component	Initial Eigenvalues Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings Total	% of Variance	Cumulative %
32	.173	.433	98.584			
33	.169	.422	99.006			
34	.132	.329	99.335			
35	.103	.258	99.593			
36	.057	.142	99.735			
37	.043	.108	99.843			
38	.032	.079	99.922			
39	.018	.045	99.966			
40	.013	.034	100.000			

Extraction Method: Principal Component Analysis.

E.7 Variable inflation factor (VIF)

Model		Collinearity Statistics Tolerance	VIF
1	IntVisit_AVG	.460	2.175
	Consc_AVG	.727	1.376
	SocInf_AVG	.601	1.664
	Att_AVG	.706	1.416
	VisAttr_AVG	.646	1.549
	IntUse_AVG	.441	2.270
	Interact_AVG	.752	1.329
	OpenEx_AVG	.633	1.580
	Usab_AVG	.833	1.201

a. Dependent Variable: InQual_AVG

Model		Collinearity Statistics Tolerance	VIF
1	IntVisit_AVG	.464	2.154
	Consc_AVG	.723	1.383
	SocInf_AVG	.598	1.671
	Att_AVG	.710	1.409
	VisAttr_AVG	.626	1.597
	IntUse_AVG	.438	2.283
	OpenEx_AVG	.635	1.575
	Usab_AVG	.832	1.202
	InQual_AVG	.700	1.429

a. Dependent Variable: Interact_AVG

Model		Collinearity Statistics	
		Tolerance	VIF
1	IntVisit_AVG	.467	2.140
	Consc_AVG	.719	1.392
	SocInf_AVG	.597	1.674
	Att_AVG	.712	1.404
	IntUse_AVG	.444	2.252
	OpenEx_AVG	.634	1.577
	Usab_AVG	.826	1.211
	InQual_AVG	.582	1.717
	Interact_AVG	.607	1.646

a. Dependent Variable: VisAttr_AVG

Model		Collinearity Statistics	
		Tolerance	VIF
1	IntVisit_AVG	.459	2.178
	Consc_AVG	.833	1.200
	SocInf_AVG	.628	1.593
	Att_AVG	.718	1.393
	IntUse_AVG	.442	2.262
	Usab_AVG	.830	1.205
	InQual_AVG	.540	1.853
	Interact_AVG	.582	1.718
	VisAttr_AVG	.599	1.669

a. Dependent Variable: OpenEx_AVG

Model		Collinearity Statistics	
		Tolerance	VIF
1	IntVisit_AVG	.460	2.173
	SocInf_AVG	.598	1.671
	Att_AVG	.712	1.405
	IntUse_AVG	.438	2.283
	Usab_AVG	.821	1.217
	InQual_AVG	.547	1.829
	Interact_AVG	.584	1.711
	VisAttr_AVG	.599	1.669
	OpenEx_AVG	.735	1.361

a. Dependent Variable: Consc_AVG

Model		Collinearity Statistics	
		Tolerance	VIF
1	IntVisit_AVG	.491	2.039
	Att_AVG	.719	1.390
	IntUse_AVG	.446	2.240
	Usab_AVG	.823	1.215
	InQual_AVG	.544	1.838
	Interact_AVG	.582	1.718
	VisAttr_AVG	.599	1.669
	OpenEx_AVG	.666	1.501
	Consc_AVG	.720	1.389

a. Dependent Variable: SocInf_AVG

Model		Collinearity Statistics	
		Tolerance	VIF
1	IntVisit_AVG	.473	2.114
	Att_AVG	.757	1.321
	IntUse_AVG	.453	2.208
	InQual_AVG	.548	1.826
	Interact_AVG	.588	1.701
	VisAttr_AVG	.602	1.662
	OpenEx_AVG	.640	1.563
	Consc_AVG	.718	1.392
	SocInf_AVG	.598	1.673

a. Dependent Variable: Usab_AVG

Model		Collinearity Statistics	
		Tolerance	VIF
1	IntVisit_AVG	.464	2.154
	IntUse_AVG	.439	2.279
	InQual_AVG	.540	1.853
	Interact_AVG	.583	1.715
	VisAttr_AVG	.603	1.657
	OpenEx_AVG	.644	1.554
	Consc_AVG	.723	1.383
	SocInf_AVG	.608	1.646
	Usab_AVG	.880	1.137

a. Dependent Variable: Att_AVG

Model		Collinearity Statistics	
		Tolerance	VIF
1	IntUse_AVG	.622	1.607
	InQual_AVG	.540	1.850
	Interact_AVG	.587	1.704
	VisAttr_AVG	.609	1.642
	OpenEx_AVG	.633	1.580
	Consc_AVG	.719	1.390
	SocInf_AVG	.637	1.570
	Usab_AVG	.846	1.182
	Att_AVG	.714	1.400

a. Dependent Variable: IntVisit_AVG

Model		Collinearity Statistics	
		Tolerance	VIF
1	InQual_AVG	.543	1.842
	Interact_AVG	.580	1.724
	VisAttr_AVG	.607	1.649
	OpenEx_AVG	.639	1.565
	Consc_AVG	.718	1.393
	SocInf_AVG	.608	1.646
	Usab_AVG	.849	1.178
	Att_AVG	.708	1.413
	IntVisit_AVG	.652	1.533

a. Dependent Variable: IntUse_AVG

E.8 Latent construct correlation matrix (Fornell-Larcker criterion)

	CR	AVE	IntVisit	OpenEx	Consc	SocInf	InQual	Att	Interact	Usab	VisAttr	IntUse
IntVisit	0.94	0.78	0.89									
OpenEx	0.88	0.48	0.31	0.70								
Consc	0.82	0.47	0.15	0.57	0.69							
SocInf	0.99	0.96	0.54	0.46	0.29	0.98						
InQual	0.91	0.78	0.13	0.26	0.32	0.12	0.88					
Att	0.82	0.54	0.42	0.41	0.34	0.45	0.20	0.73				
Interact	0.81	0.52	0.06	0.27	0.33	0.16	0.69	0.16	0.72			
Usab	0.77	0.54	0.18	0.07	0.17	0.25	0.22	0.43	0.09	0.73		
VisAttr	0.84	0.64	0.41	0.36	0.26	0.35	0.58	0.37	0.54	0.33	0.80	
IntUse	0.99	0.96	0.71	0.38	0.24	0.51	0.25	0.43	0.19	0.32	0.47	0.98

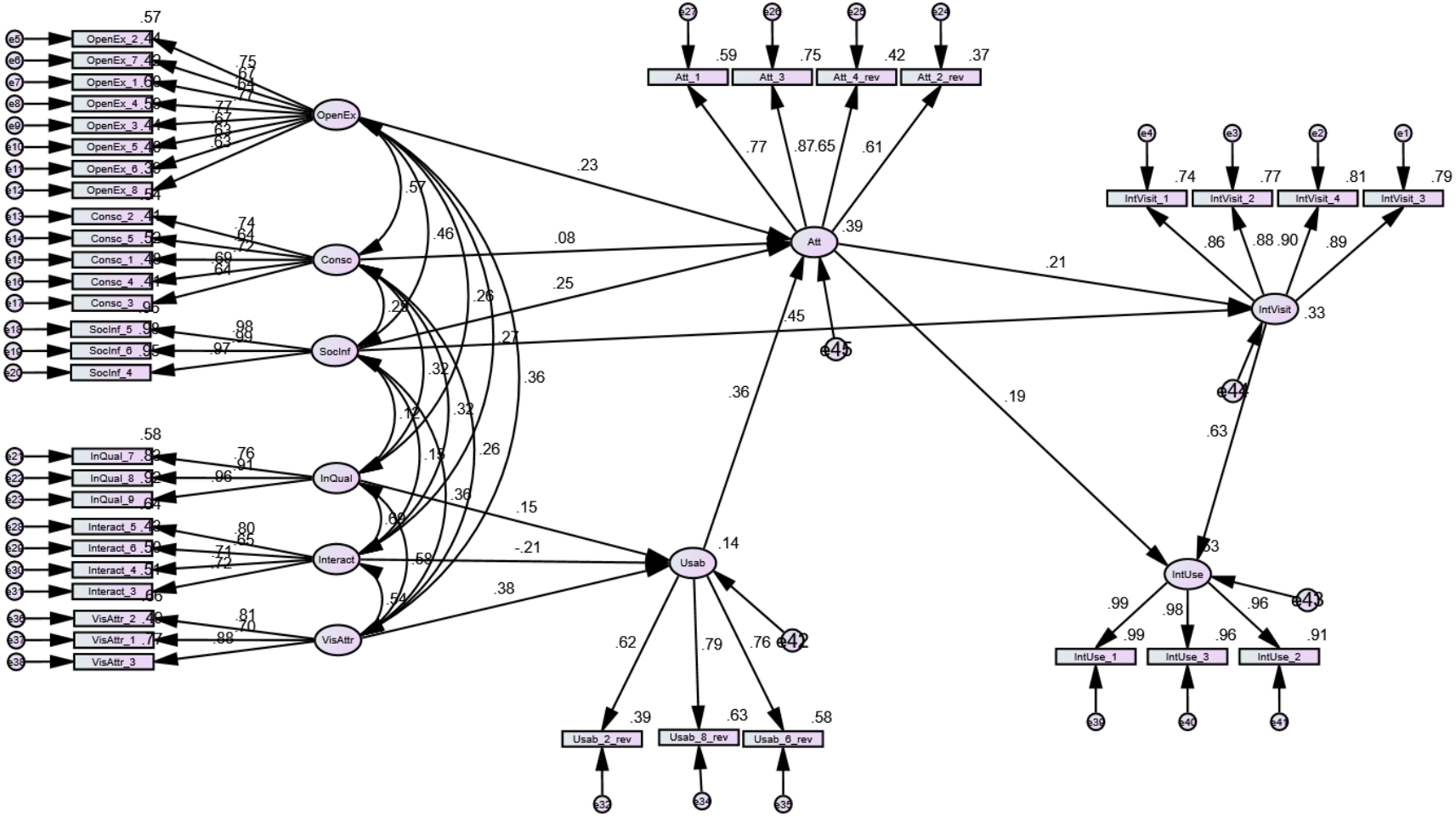
Note: The square root of the AVE shows bolded in diagonal. InQual = Information quality, Interact = Interactivity, VisAttr = Visual attractiveness, OpenEx = Openness to experience, Consc = Conscientiousness, SocInf = Social influence, Usab = Usability, Att = Attitude, IntVisit = Intention to visit, IntUse = Intention to use.

E.9 Heterotrait-monotrait analysis

	IntVisit	OpenEx	Consc	SocInf	InQual	Att	Interact	Usab	VisAttr	IntUse
IntVisit	-									
OpenEx	0.31	-								
Consc	0.16	0.57	-							
SocInf	0.54	0.46	0.30	-						
InQual	0.13	0.25	0.33	0.13	-					
Att	0.41	0.39	0.32	0.44	0.20	-				
Interact	0.05	0.27	0.32	0.15	0.71	0.10	-			
Usab	0.18	0.09	0.18	0.25	0.23	0.47	0.06	-		
VisAttr	0.40	0.33	0.25	0.34	0.58	0.37	0.53	0.33	-	
IntUse	0.71	0.38	0.25	0.52	0.27	0.43	0.19	0.34	0.47	-

Note: InQual = Information quality, Interact = Interactivity, VisAttr = Visual Attractiveness, OpenEx = Openness to experience, Consc = Conscientiousness, SocInf = Social influence, Usab = Usability, Att = Attitude, IntVisit = Intention to visit, IntUse = Intention to use.

E.10 Structural model



Appendix F. Analysis result for Study 2

F.1 Descriptive analysis

Items	Mean	SD	Skewness	Kurtosis
IntVisit_1	3.17	1.191	-.298	-.806
IntVisit_2	2.87	1.208	-.101	-1.030
IntVisit_3	3.31	1.221	-.455	-.725
IntVisit_4	2.95	1.180	-.149	-.923
IntUse_1	3.69	1.156	-.770	-.134
IntUse_2	3.82	1.134	-.965	.296
IntUse_3	3.78	1.135	-.891	.160
InfoQual_1	3.62	.916	-.597	.117
InfoQual_2	3.60	.961	-.521	-.185
InfoQual_3	3.39	1.097	-.234	-.855
InfoQual_4	3.18	.961	-.129	-.382
InfoQual_5	4.02	.908	-1.030	1.176
InfoQual_6	3.83	1.057	-.705	-.305
InfoQual_7	3.95	.882	-.788	.523
InfoQual_8	3.97	.889	-.841	.695
Interact_1	3.87	.956	-.799	.437
Interact_2	3.98	.910	-.773	.343
Interact_3	3.90	1.015	-.719	-.210
Interact_4	3.75	.855	-.752	.890
VisAttr_1	4.09	.917	-1.034	.976
VisAttr_2	4.12	.894	-1.060	1.196
VisAttr_3	4.10	.873	-.902	.724
VisAttr_4	4.11	.883	-1.035	1.242
Usab_1	3.80	1.059	-.585	-.407
Usab_2	3.96	.943	-.877	.589
Usab_3	3.90	1.099	-.668	-.583
Usab_4	3.88	.929	-.759	.516
Usab_5	3.81	.988	-.500	-.411
Usab_6	3.92	.880	-.734	.432
Usab_7	3.56	1.117	-.307	-.686
Usab_8	3.93	.952	-.744	.197
Usab_9	3.67	1.146	-.415	-.892
OpenEx_1	3.56	.956	-.535	-.080

Items	Mean	SD	Skewness	Kurtosis
OpenEx_2	3.66	.958	-.594	-.041
OpenEx_3	3.81	.957	-.617	-.107
OpenEx_4	3.99	.916	-.870	.508
OpenEx_5	3.94	.898	-.716	.276
OpenEx_6	3.42	1.062	-.328	-.556
OpenEx_7	3.75	.985	-.585	-.081
OpenEx_8	4.11	.870	-.947	.848
OpenEx_9	2.77	1.125	.183	-.749
OpenEx_10	3.14	1.173	.015	-1.029
Consc_1	3.93	.877	-.739	.521
Consc_2	4.03	.859	-.853	.917
Consc_3	3.91	.943	-.883	.724
Consc_4	4.20	.813	-.984	1.099
Consc_5	4.14	.870	-.952	.766
Consc_6	3.20	1.194	-.120	-.992
Consc_7	3.49	1.136	-.261	-.877
Consc_8	3.48	1.171	-.285	-.908
Consc_9	3.70	1.110	-.445	-.795
SocInf_1	3.75	.890	-.692	.558
SocInf_2	3.63	.950	-.588	.171
SocInf_3	3.83	.912	-.784	.649
SocInf_4	3.66	.942	-.653	.284
SocInf_5	3.68	.939	-.512	.037
SocInf_6	3.77	.947	-.682	.272
Att_1	4.19	.830	-.919	.782
Att_2	4.20	.956	-1.116	.680
Att_3	4.14	.867	-1.125	1.609
Att_4	4.17	.973	-1.014	.307

F.2 Communalities

Items	Initial	Extraction
IntVisit_1	.699	.757
IntVisit_2	.672	.713
IntVisit_3	.409	.368
IntVisit_4	.678	.762
IntUse_1	.723	.753
IntUse_2	.769	.857
IntUse_3	.776	.822
InfoQual_1	.640	.743
InfoQual_2	.665	.773
InfoQual_3	.372	.396
InfoQual_5	.683	.720
InfoQual_7	.690	.718
InfoQual_8	.722	.796
Interact_1	.600	.674
Interact_2	.632	.715
Interact_3	.492	.518
VisAttr_1	.682	.754
VisAttr_2	.679	.743
VisAttr_3	.593	.581
VisAttr_4	.653	.648
Usab_1	.595	.584
Usab_3	.526	.546
Usab_5	.584	.636
Usab_7	.458	.454
Usab_9	.495	.554
OpenEx_1	.606	.550
OpenEx_2	.622	.580
OpenEx_3	.548	.515
OpenEx_4	.550	.565
OpenEx_5	.609	.645
OpenEx_6	.427	.374
OpenEx_7	.506	.492
OpenEx_8	.570	.554
Consc_1	.475	.484
Consc_2	.555	.601
Consc_3	.560	.655

Items	Initial	Extraction
Consc_4	.572	.567
Consc_5	.523	.527
SocInf_1	.595	.623
SocInf_2	.652	.750
SocInf_3	.694	.763
SocInf_4	.700	.721
SocInf_5	.770	.846
SocInf_6	.748	.802
Att_1	.689	.731
Att_2	.611	.666
Att_3	.655	.674
Att_4	.611	.640

F.3 Total variance explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	15.942	33.213	33.213	15.341	31.961	31.961
2	4.404	9.174	42.387	4.116	8.575	40.535
3	3.256	6.784	49.171	2.403	5.005	45.541
4	2.661	5.544	54.715	2.944	6.134	51.675
5	1.534	3.195	57.910	1.050	2.187	53.862
6	1.410	2.937	60.848	.850	1.770	55.632
7	1.129	2.353	63.201	1.006	2.096	57.728
8	1.066	2.221	65.422	.679	1.415	59.143
9	1.003	2.090	67.512	.840	1.749	60.892
10	.916	1.909	69.421	.620	1.291	62.183
11	.863	1.797	71.218	.552	1.149	63.332
12	.785	1.635	72.853	.509	1.061	64.393
13	.748	1.558	74.411			
14	.690	1.438	75.849			
15	.647	1.347	77.196			
16	.625	1.302	78.498			
17	.571	1.189	79.687			
18	.557	1.160	80.847			

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
19	.524	1.091	81.938			
20	.512	1.067	83.005			
21	.496	1.034	84.039			
22	.457	.951	84.990			
23	.454	.946	85.936			
24	.425	.885	86.822			
25	.419	.873	87.695			
26	.395	.823	88.517			
27	.361	.752	89.270			
28	.344	.716	89.985			
29	.333	.695	90.680			
30	.331	.689	91.369			
31	.319	.665	92.034			
32	.314	.653	92.687			
33	.298	.621	93.308			
34	.291	.607	93.915			
35	.286	.595	94.510			
36	.273	.568	95.079			
37	.259	.540	95.619			
38	.237	.494	96.112			
39	.223	.466	96.578			
40	.220	.458	97.036			
41	.215	.448	97.484			
42	.208	.433	97.917			
43	.196	.409	98.326			
44	.193	.402	98.728			
45	.179	.372	99.100			
46	.160	.334	99.434			
47	.146	.305	99.739			
48	.125	.261	100.000			

F.4 Exploratory factor analysis

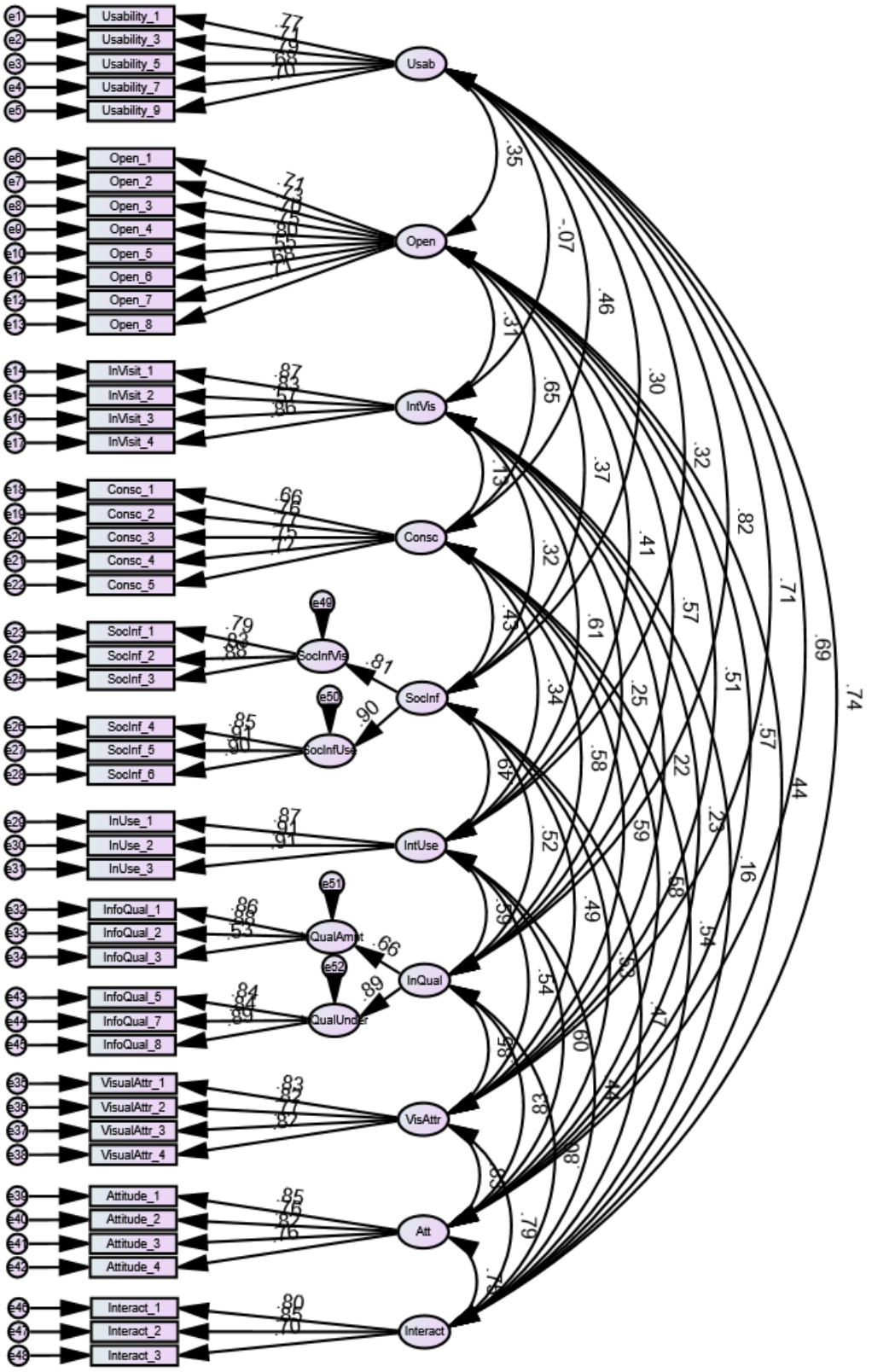
Constructs	Cronbach's Alpha	Items	Factors											
			1	2	3	4	5	6	7	8	9	10	11	12
Usab	0.863	Usab_9	0.783											
		Usab_5	0.732											
		Usab_3	0.729											
		Usab_1	0.656											
		Usab_7	0.560											
		Usab_8	0.344											
OpenEx	0.865	OpenEx_5		0.855										
		OpenEx_4		0.778										
		OpenEx_6		0.699										
		OpenEx_3		0.687										
		OpenEx_2		0.647										
		OpenEx_8		0.583										
		OpenEx_7		0.558										
IntVisit	0.893	IntVisit_4			0.905									
		IntVisit_1			0.865									
		IntVisit_2			0.823									
		IntVisit_3			0.504									
Consc	0.836	Consc_3				0.879								
		Consc_2				0.775								
		Consc_5				0.650								
		Consc_4				0.599								

Constructs	Cronbach's Alpha	Items	Factors											
			1	2	3	4	5	6	7	8	9	10	11	12
		Consc_1				0.588								
SocInf	0.881	SocInf_2					0.891							
		SocInf_3					0.795							
		SocInf_1					0.783							
	0.920	SocInf_5						0.887						
		SocInf_6						0.867						
		SocInf_4						0.853						
IntUse	0.923	IntUse_2							0.948					
		IntUse_3							0.872					
		IntUse_1							0.732					
InfoQual	0.779	InfoQual_2								0.828				
		InfoQual_1								0.808				
		InfoQual_3								0.602				
	0.892	InfoQual_7										0.802		
		InfoQual_8										0.740		
		InfoQual_5										0.692		
VisAttr	0.863	VisAttr_1									0.883			
		VisAttr_2									0.799			
		VisAttr_3									0.510			
Att	0.853	Att_2											0.684	
		Att_1											0.674	
		Att_3											0.635	
		Att_4											0.600	

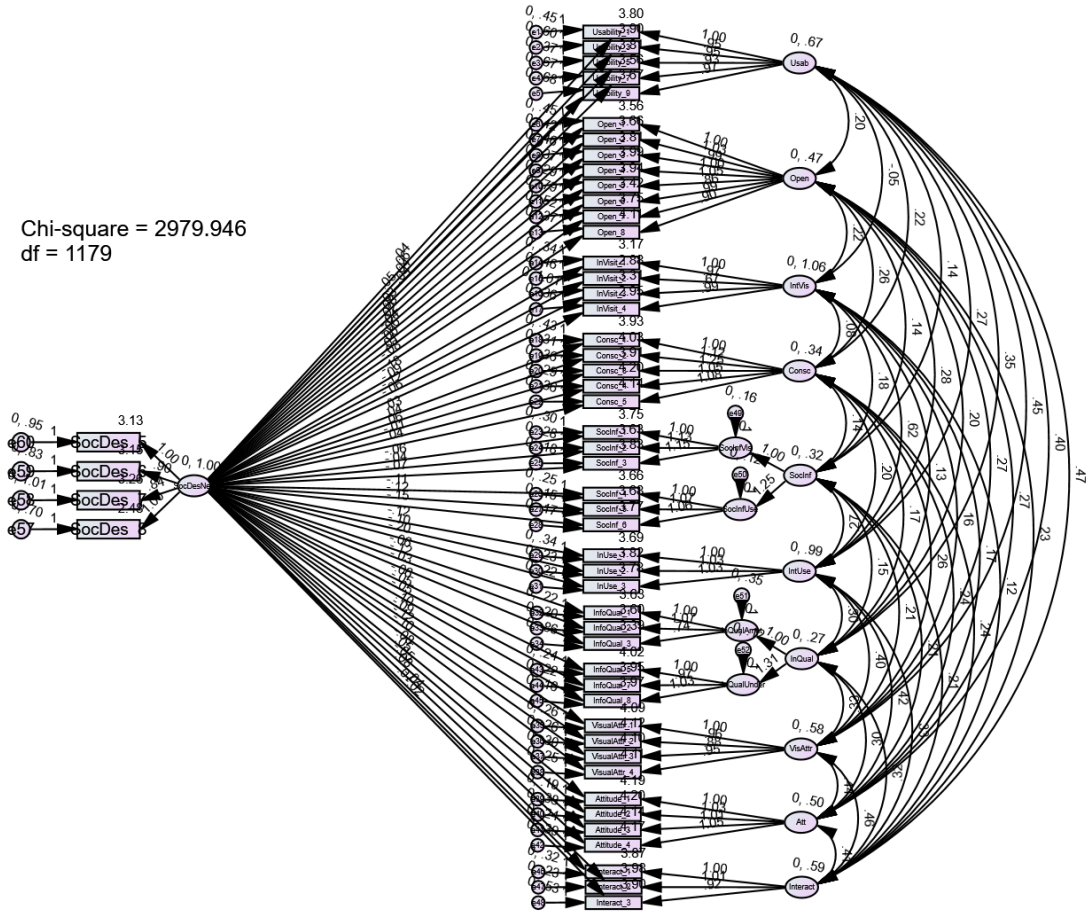
Constructs	Cronbach's Alpha	Items	Factors											
			1	2	3	4	5	6	7	8	9	10	11	12
Interact	0.754	Interact_2												0.830
		Interact_1												0.737
		Interact_4												0.319

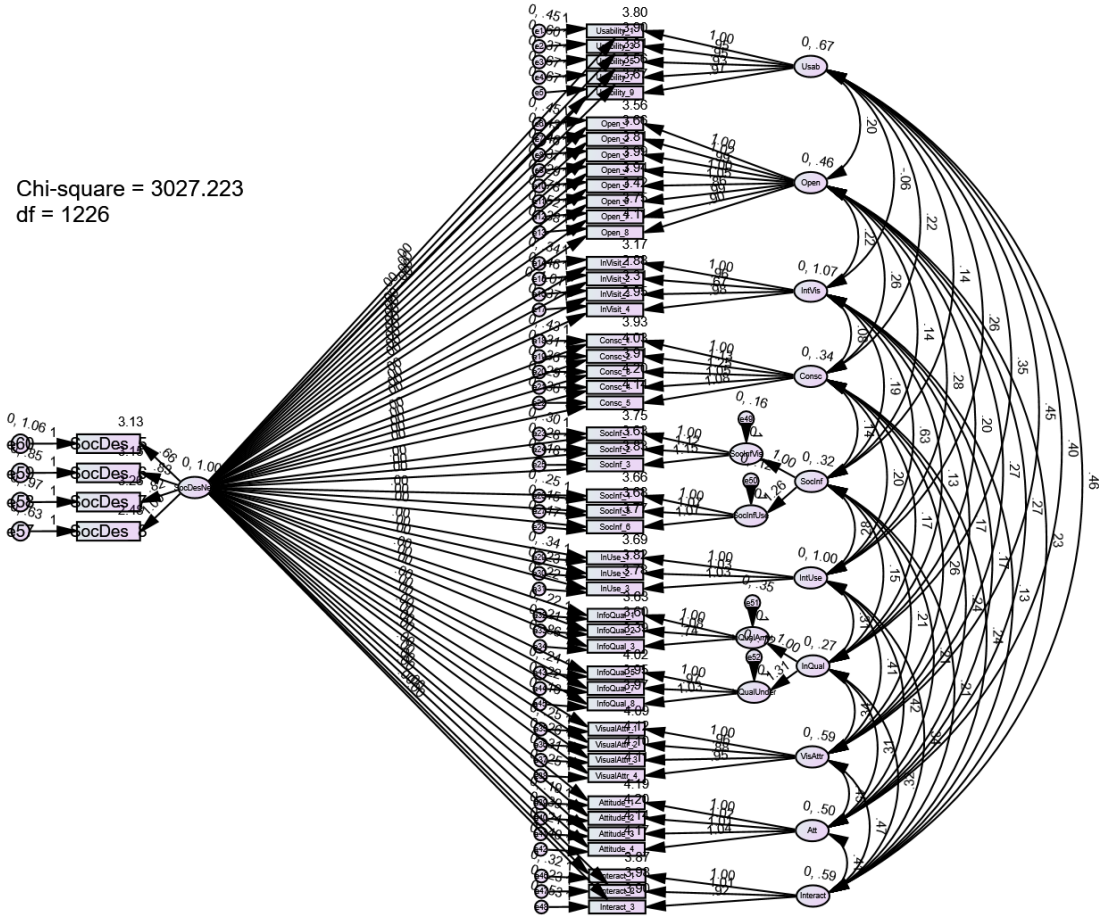
Note: InfoQual = Information quality, Interact = Interactivity, VisAttr = Visual attractiveness, Open = Openness to experience, Consc = Conscientiousness, SocInf = Social Influence, Usab = Usability, Att = Attitude, IntVisit = Intention to visit, IntUse = Intention to use.

F.5 Confirmatory factor analysis



F.6 Common method bias




Chi-square = 3027.223
df = 1226
SocDes
Usab
Open
IntVis
Consc
SocInf
IntUse
InQual
VisAttr
Att
Interact

F.7 Latent construct correlation matrix (Fornell-Larcker criterion)

	CR	AVE	Usab	OpenEx	IntVis	Consc	SocInf	IntUse	InfoQual	VisAttr	Att	Interact
Usab	0.849	0.531	0.729									
OpenEx	0.869	0.489	0.343***	0.699								
IntVis	0.870	0.632	-0.084†	0.300***	0.795							
Consc	0.838	0.510	0.458***	0.615***	0.122**	0.714						
SocInf	0.830	0.710	0.275***	0.339***	0.319***	0.390***	0.842					
IntUse	0.925	0.804	0.306***	0.400***	0.615***	0.326***	0.480***	0.896				
InfoQual	0.746	0.600	0.817***	0.545***	0.258***	0.540***	0.492***	0.582***	0.775			
VisAttr	0.868	0.687	0.684***	0.439***	0.203***	0.521***	0.403***	0.493***	0.795***	0.829		
Att	0.856	0.598	0.702***	0.544***	0.232***	0.541***	0.502***	0.594***	0.831***	0.759***	0.773	
Interact	0.793	0.568	0.680***	0.406***	0.210***	0.495***	0.446***	0.449***	0.789***	0.784***	0.718***	0.754

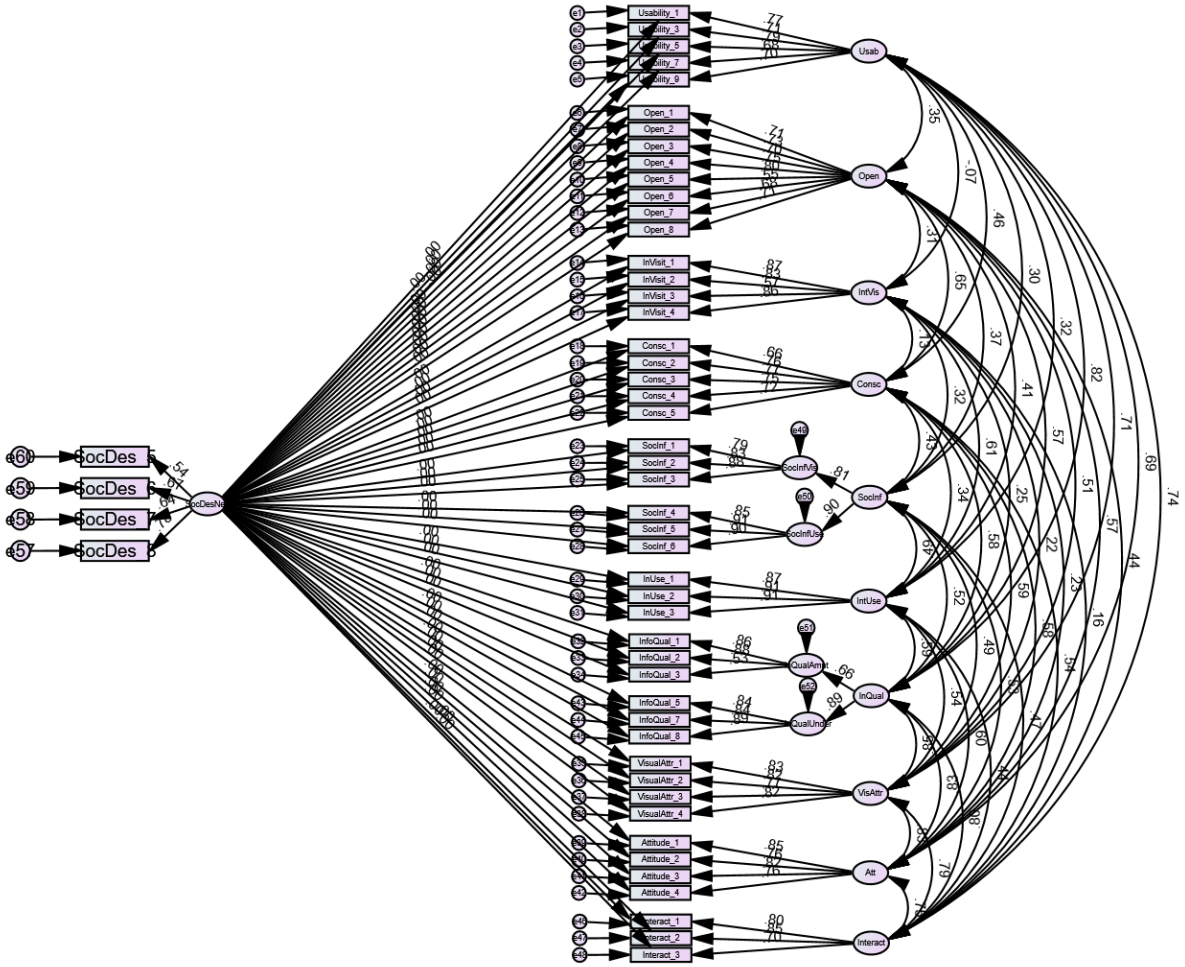
Note: InfoQual = Information quality, Interact = Interactivity, VisAttr = Visual attractiveness, Open = Openness to experience, Consc = Conscientiousness, SocInf = Social Influence, Usab = Usability, Att = Attitude, IntVisit = Intention to visit, IntUse = Intention to use.

F.8 Heterotrait-monotrait analysis

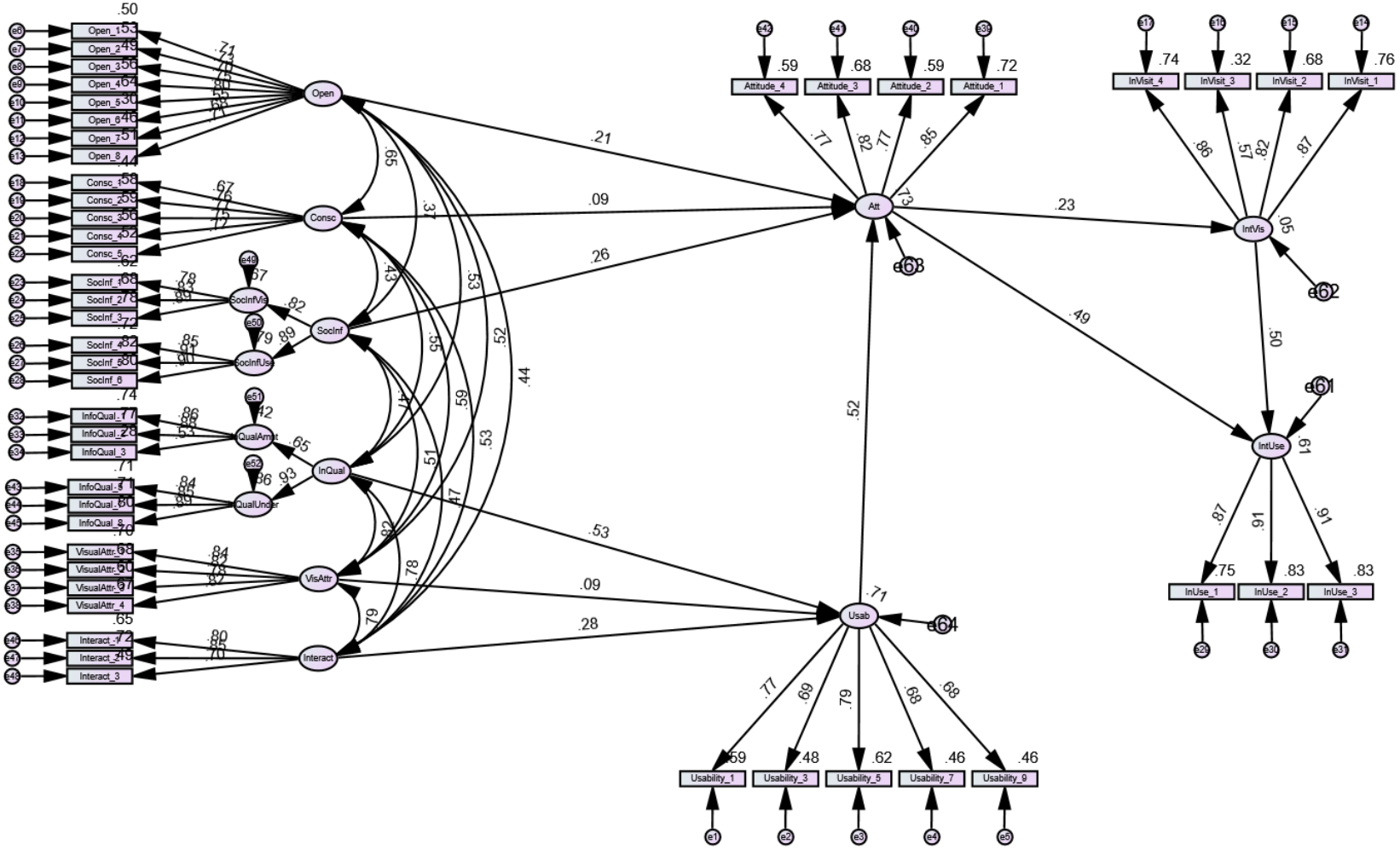
	Usab	OpenEx	IntVis	Consc	SocInf	IntUse	InfoQual	VisAttr	Att	Interact
Usab	-									
OpenEx	0.334	-								
IntVis	0.061	0.348	-							
Consc	0.464	0.625	0.160	-						
SocInf	0.245	0.311	0.306	0.364	-					
IntUse	0.300	0.411	0.649	0.335	0.444	-				
InfoQual	0.743	0.473	0.275	0.494	0.420	0.543	-			
VisAttr	0.694	0.446	0.229	0.535	0.378	0.500	0.749	-		
Att	0.720	0.526	0.218	0.552	0.451	0.579	0.760	0.763	-	
Interact	0.685	0.422	0.244	0.527	0.446	0.462	0.756	0.836	0.729	-

Note: InfoQual = Information quality, Interact = Interactivity, VisAttr = Visual attractiveness, Open = Openness to experience, Consc = Conscientiousness, SocInf = Social Influence, Usab = Usability, Att = Attitude, IntVisit = Intention to visit, IntUse = Intention to use.

F.9 Common method bias with specific bias



F.10 Structural model



Appendix G. Permission statement from the copyright owners

UNWTO
World Tourism Organization

To: Curtin University
Contact: Eko Harry Pratisto

Date: 25/03/2022

Our Ref.: 92844/04/22

Copyright permission request

You requested with date of 20 March 2022 the permission to reproduce/use material, which is copyrighted by UNWTO.

To proceed with your request the following information is needed:

- ☐ Complete details of the work in which our material is used (title, sales price, ISBN, print-run, publisher, market etc.).
- ☐ Context in which our material is used.
- ☐ Please specify UNWTO sources and attach copies of the original UNWTO material.

The permission is

- ☐ not granted.
- × granted in the circumstances proposed.
  We require that full acknowledgment of the source is given and the reference to our authorization is made in the following way: "© UNWTO, 92844/04/22".
  The citation of the sources should be as follows:

  Source:
  World Tourism Organization (2019), 'Map of international tourist arrivals (million) and tourism receipts (USD billion)', *International Tourism Highlights, 2019 Edition*, UNWTO, Madrid, p. 3., DOI: https://doi.org/10.18111/9789284421152.

  A copy of the publication should be provided for our Documentation Center.

Thank you very much,

Sandra Carvão, Chief, Tourism Market Intelligence and Competitiveness

World Tourism Organization (UNWTO) - A Specialized Agency of the United Nations
C/ Poeta Joan Maragall 42, 28020 Madrid, Spain. Tel: (34) 91 567 81 00 / Fax: (34) 91 571 37 33 – info@unwto.org / unwto.org

Re: Permission request [220324-018344]

Permissions Helpdesk <permissionshelpdesk@elsevier.com>
Sat 3/26/2022 12:09 AM
To: Eko Harry Pratisto <ekoharry.pratisto@postgrad.curtin.edu.au>

Dear Eko Harry Pratisto,

We hereby grant you permission to reprint the material below at no charge in your thesis subject to the following conditions:

RE: The theory of planned behavior, Organizational Behavior and Human Decision Processes, Volume 50, Issue 2, December 1991, Pages 179-211, Icek Ajzen

1. If any part of the material to be used (for example, figures) has appeared in our publication with credit or acknowledgement to another source, permission must also be sought from that source. If such permission is not obtained then that material may not be included in your publication/copies.

2. Suitable acknowledgment to the source must be made, either as a footnote or in a reference list at the end of your publication, as follows:

"This article was published in Publication title, Vol number, Author(s), Title of article, Page Nos, Copyright Elsevier (or appropriate Society name) (Year)."

3. Your thesis may be submitted to your institution in either print or electronic form.

4. Reproduction of this material is confined to the purpose for which permission is hereby given.

5. This permission is granted for non-exclusive world English rights only. For other languages please reapply separately for each one required. Permission excludes use in an electronic form other than submission. Should you have a specific electronic project in mind please reapply for permission.

6. As long as the article is embedded in your thesis, you can post/share your thesis in the University repository.

7. Should your thesis be published commercially, please reapply for permission.

8. Posting of the full article/ chapter online is not permitted. You may post an abstract with a link to the Elsevier website [http://www.elsevier.com,]www.elsevier.com, or to the article on ScienceDirect if it is available on that platform.

9. Permission extends to any future revisions and editions of my thesis to the electronic publication of your thesis by Curtin University.

Kind regards,

Roopa Lingayath
Senior Copyrights Coordinator
ELSEVIER | HCM - Health Content Management

Visit Elsevier Permissions

Re: Permission request

Icek Aizen <aizen@umass.edu>

Fri 3/25/2022 2:18 AM

To: Eko Harry Pratisto <ekoharry.pratisto@postgrad.curtin.edu.au>

Dear Mr. Pratisto,

My permission to reproduce this figure of the TRA would not be sufficient as you would also have to get permission from the estate of the late Professor Fishbein. You could simply create your own original drawing of the model. Alternatively, you may use the drawings of the TPB on my website ("https://people.umass.edu/aizen/tpb.diag.html" or "https://people.umass.edu/aizen/tpb.background.html") for non-commercial purposes, including in your dissertation, a presentation, poster, or publication in a journal article, so long as you retain the copyright notice. As I'm sure you know, the TPB is the successor to the TRA and it is the model used in most contemporary reasoned action research.

Best regards,

-Icek Ajzen

[IEICE]Reply of permission request

permission@ieice.org <permission@ieice.org>
Tue 3/22/2022 12:16 PM
To: Eko Harry Pratisto <ekoharry.pratisto@postgrad.curtin.edu.au>
Cc: permission@ieice.org <permission@ieice.org>

Dear Eko Harry Pratisto,
Curtin University

Material details:
Original author's name: Paul Milgram and Fumio Kishino
Document title: A taxonomy of mixed reality visual displays
Book or journal title: IEICE Transactions on Information Systems, Vol E77-D, No.12, December 1994
Portion: Figure 1

Permission No.: 22RB0028

We hereby grant permission for the use of the material requested above
on condition that our requirements are as follows:

* Indication of source (e.g., author's name, document title, name of journal, volume/issue/page number, publication date, etc.)
* Indication of copyright (e.g. "Copyright (c)2016 IEICE")

Sincerely yours,

IEICE Copyright Management Committee
E-mail:permission@ieice.org

Attribution Statement

Publication 1: Pratisto, E.H., Thompson, N. & Potdar, V. Immersive technologies for tourism: a systematic review. Inf Technol Tourism 24, 181–219 (2022). https://doi.org/10.1007/s40558-022-00228-7

	Conception and Design	**Acquisition of Data and Method**	**Data Conditioning and Manipulation**	**Analysis and Statistical Method**	**Interpretation and Discussion**
Author **Eko Harry Pratisto**	v	v	v	v	v
Author Acknowledgement: I acknowledge that these represent my contribution to the above research output and I have approved the final version.					
Co-Author 1 Nik Thompson	v	v			v
Co-Author 1 Acknowledgement: I acknowledge that these represent my contribution to the above research output and I have approved the final version.					
Co-Author 2 Vidyasagar Potdar	v	v			v
Co-Author 1 Acknowledgement: I acknowledge that these represent my contribution to the above research output and I have approved the final version.					

Publication 2: Virtual Reality at a Prehistoric Museum: Exploring the Influence of System Quality and Personality on User Intentions.

	Conception and Design	**Acquisition of Data and Method**	**Data Conditioning and Manipulation**	**Analysis and Statistical Method**	**Interpretation and Discussion**
Author **Eko Harry Pratisto**	v	v	v	v	v
Author Acknowledgement: I acknowledge that these represent my contribution to the above research output and I have approved the final version.					
Co-Author 1 Nik Thompson	v	v			v
Co-Author 1 Acknowledgement: I acknowledge that these represent my contribution to the above research output and I have approved the final version.					
Co-Author 2 Vidyasagar Potdar	v	v			v
Co-Author 1 Acknowledgement: I acknowledge that these represent my contribution to the above research output and I have approved the final version.					

Publication 3: Virtual Reality and Tourism: Effects of System Quality and User Personality on Behavioural Intention.

	Conception and Design	**Acquisition of Data and Method**	**Data Conditioning and Manipulation**	**Analysis and Statistical Method**	**Interpretation and Discussion**
Author **Eko Harry Pratisto**	v	v	v	v	v
Author Acknowledgement: I acknowledge that these represent my contribution to the above research output and I have approved the final version.					
Co-Author 1 Nik Thompson	v	v			v
Co-Author 1 Acknowledgement: I acknowledge that these represent my contribution to the above research output and I have approved the final version.					
Co-Author 2 Vidyasagar Potdar	v	v			v
Co-Author 1 Acknowledgement: I acknowledge that these represent my contribution to the above research output and I have approved the final version.					